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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2020

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to
Commission File Number: 001-38221

PQ Group Holdings Inc.

Delaware	**81-3406833**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
300 Lindenwood Drive **Malvern, Pennsylvania**	**19355**
(Address of principal executive offices)	(Zip Code)

(610) 651-4400
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading symbol	Name of each exchange on which registered
Common stock, par value $0.01 per share	PQG	New York Stock Exchange

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. ☒ Yes ☐ No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. ☐ Yes ☒ No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. ☒ Yes ☐ No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). ☒ Yes ☐ No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☐	Accelerated filer	☒
Non-accelerated filer	☐	Smaller reporting company	☐
		Emerging growth company	☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). ☐ Yes ☒ No

The aggregate market value of PQ Group Holdings Inc. voting and non-voting common equity held by non-affiliates as of June 30, 2020 (the last business day of the registrant's most recently completed second fiscal quarter) based on the closing sale price of $13.24 per share as reported on the New York Stock Exchange was $537,729,982.

The number of shares of common stock outstanding as of March 12, 2021 was 136,937,196.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the PQ Group Holdings Inc. Proxy Statement for the 2021 Annual Meeting of Stockholders are incorporated by reference into Part III of this report.

PQ GROUP HOLDINGS INC.

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December 31, 2020

PART I

Forward-looking Statements and Risk Factor Summary

This Annual Report on Form 10-K ("Form 10-K") includes "forward-looking statements" that express our opinions, expectations, beliefs, plans, objectives, assumptions or projections regarding future events or future results. The words "believe," "may," "will," "estimate," "continue," "anticipate," "intend," "expect," "should" and similar expressions are intended to identify these forward-looking statements. We have based these forward-looking statements largely on our current expectations and projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy, short- and long-term business operations and objections, and financial needs. Examples of forward-looking statements include, but are not limited to, statements we make regarding the announced pending sale of our Performance Chemicals segment, the impact of the novel coronavirus ("COVID-19") pandemic on our operations and financial results and our liquidity, including our belief that our current level of operations, cash and cash equivalents, cash flow from operations and borrowings under our credit facilities and other lines of credit will provide us adequate cash to fund the working capital, capital expenditure, debt service and other requirements for our business for the foreseeable future.

These forward-looking statements are subject to a number of risks, uncertainties and assumptions. Moreover, we operate in a very competitive and rapidly changing environment and new risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. In light of these risks, uncertainties and assumptions, the forward-looking events and circumstances discussed herein may not occur and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements.

Some of the key factors that could cause actual results to differ from our expectations include the following risks related to our business:

- the impact of the ongoing COVID-19 pandemic on the global economy and financial markets, as well as on our business and our suppliers, and the response of governments and of our company to the outbreak;
- as a global business, we are exposed to local business risks in different countries;
- we are affected by general economic conditions and economic downturns;
- exchange rate fluctuations could adversely affect our financial condition, results of operations and cash flows;
- our international operations require us to comply with anti-corruption laws, trade and export controls and regulations of the U.S. government and various international jurisdictions in which we do business;
- alternative technology or other changes in our customers' products may reduce or eliminate the need for certain of our products;
- our new product development and research and development efforts may not succeed and our competitors may develop more effective or successful products;
- our substantial level of indebtedness could adversely affect our financial condition;
- if we are unable to pass on increases in raw material prices, including natural gas, to our customers or to retain or replace our key suppliers, our results of operations and cash flows may be negatively affected;
- we face substantial competition in the industries in which we operate;
- we are subject to the risk of loss resulting from non-payment or non-performance by our customers;
- we rely on a limited number of customers for a meaningful portion of our business;
- multi-year customer contracts in our refining services segment are subject to potential early termination and such contracts may not be renewed at the end of their respective terms;
- our quarterly results of operations are subject to fluctuations because the demand for some of our products is seasonal;
- our growth projects may result in significant expenditures before generating revenues, if any, which may materially and adversely affect our ability to implement our business strategy;
- we may be liable to damages based on product liability claims brought against us or our customers for costs associated with recalls of our or our customers' products;

- we are subject to extensive environmental, health and safety regulations and face various risks associated with potential non-compliance or releases of hazardous materials;
- existing and proposed regulations to address climate change by limiting greenhouse gas emissions may cause us to incur significant additional operating and capital expenses and may impact our business and results of operations;
- production and distribution of our products could be disrupted for a variety of reasons, and such disruptions could expose us to significant losses or liabilities;
- the insurance that we maintain may not fully cover all potential exposures;
- we could be subject to damages based on claims brought against us by our customers or lose customers as a result of the failure of our products to meet certain quality specifications;
- our failure to protect our intellectual property and infringement on the intellectual property rights of third parties;
- losses and damages in connection with information technology risks could adversely affect our operations; and
- the other risks and uncertainties discussed in "Item 1A—Risk Factors."

The forward-looking statements included herein are made only as of the date hereof. You should not rely upon forward-looking statements as predictions of future events. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee that the future results, levels of activity, performance or events and circumstances reflected in the forward-looking statements will be achieved or occur. Moreover, neither we nor any other person assumes responsibility for the accuracy and completeness of the forward-looking statements. We undertake no obligation to update publicly any forward-looking statements for any reason after the date of this Form 10-K to conform these statements to actual results or to changes in our expectations.

ITEM 1. BUSINESS.

PQ Group Holdings Inc. ("PQ Group Holdings" or the "Company") was incorporated in Delaware on August 7, 2015. PQ Holdings Inc. ("PQ Holdings"), a manufacturer of specialty catalysts, chemicals and services, was incorporated in Delaware on June 22, 2007. Founded in 1831, our business has a nearly 200-year history of innovation, enabling environmental improvements in areas such as fuel efficiency and emissions, and healthier personal care products, while improving the sustainability of our planet. On May 4, 2016, we consummated a series of transactions (the "Business Combination") to reorganize and combine the businesses of PQ Holdings and Eco Services Operations LLC under a new holdings company, PQ Group Holdings. On October 3, 2017, PQ Group Holdings completed its initial public offering ("IPO"). Our common stock is listed on the New York Stock Exchange under the stock ticker "PQG". Unless the context otherwise indicates, the terms "PQ Group Holdings Inc.," "we," "us," "our," or the "Company" mean PQ Group Holdings Inc. and our subsidiaries.

On December 14, 2020, PQ Group Holdings completed the sale of its Performance Materials business to Potters Buyer, LLC (the "Purchaser"), an affiliate of The Jordan Company, L.P., for a purchase price of $650 million, which was subject to certain adjustments for indebtedness, working capital, and cash at the closing of the transaction. The results of operations, financial condition, and cash flows for the Performance Materials businesses are presented herein as discontinued operations. Except where noted, any tables, percentages or metrics included within this filing exclude the results of our former Performance Materials business. Refer to Note 4 to our Consolidated Financial Statements for additional information.

On March 1, 2021, PQ Group Holdings announced the entry into a definitive agreement to sell its Performance Chemicals business to a partnership established by Cerberus Capital Management, L.P. and Koch Mineral & Trading LLC for a purchase price of $1.1 billion, which is subject to certain adjustments including for indebtedness, cash, working capital and transaction expenses. The transaction is expected to be completed in 2021.

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Our Company

We are an integrated global provider of specialty catalysts, chemicals and services that enable environmental improvements and enhance consumer and industrial products. Our value-added products seek to address global demand trends that are often either the subject of significant environmental and safety regulations or are driven by consumer preferences for environmentally friendlier alternative products, which provides us with high-margin growth opportunities. Specifically, our products and solutions help companies produce vehicles with improved fuel efficiency and cleaner emissions. Our materials are critical ingredients in consumer products that make teeth brighter and skin softer. Because our products are predominantly inorganic and carbon-free, we believe we contribute to improving the sustainability of our planet.

We believe we are a leader in each of our business segments, holding what we estimate to be a number one or number two supply share position for products that generated more than 90% of our 2020 sales. We believe that our global footprint and efficient network of strategically located manufacturing facilities provide us with a strong competitive advantage in serving our customers both regionally as well as globally.

We believe, with our long history of established partnerships with our customers and our reputation for providing reliable, quality of products and solutions, our products deliver significant value to our customers, as demonstrated by our profit margins. Our products typically constitute a small portion of our customers' overall end-product costs yet are critical to product performance.

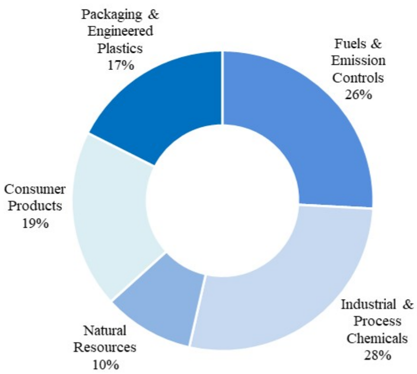
We have a near 200-year track record of innovation that is reflected in our technical and production expertise in silicates, silica, zeolites and catalyst technologies.

We are highly diversified by business, geography and end use. In 2020 the majority of our sales were for applications that have historically had relatively predictable, consistent demand patterns driven by consumption or frequent replacement cycles.

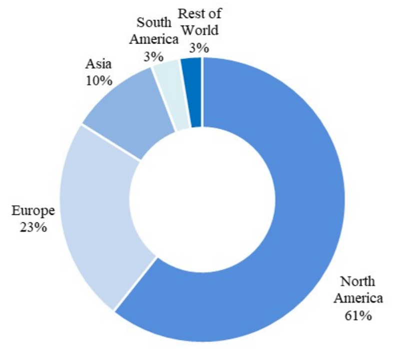
As a result of our competitive strengths, we have generally maintained stable margins through changing macro economic cycles.

In 2020, we served over 2,000 customers globally across many end uses and, as of December 31, 2020, operated 40 manufacturing facilities which are strategically located across five continents.

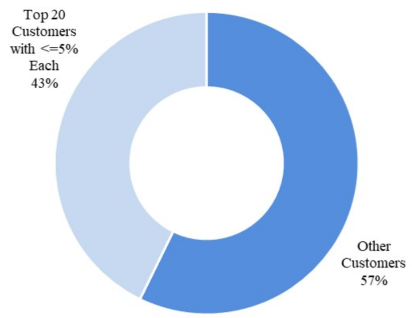
2020 Sales Including Zeolyst Joint Venture Total Sales by End Use(1)



2020 Sales and Zeolyst Joint Venture Total Sales by Destination Geography(1,2)



2020 Sales and Zeolyst Joint Venture Total Sales by Customer(1)



(1) Percentage calculations include $128.6 million of total sales attributable to the Zeolyst Joint Venture ("Zeolyst JV"), which represents 50% of its total sales for the year ended December 31, 2020. The Zeolyst JV sales are included in both the Fuels & Emission Controls and Packaging & Engineered Plastics end uses. Refer to "Management's Discussion and Analysis of Financial Condition and Results of Operations—Basis of Presentation" for a description of the treatment of the Zeolyst Joint Venture in our consolidated financial information.

(2) Based on the delivery destination for products sold in 2020.

Our Strategy

We intend to capitalize on our strong business foundation, market-based approach, and experienced management team to grow sales profitably, maintain high margins, deploy capital efficiently and generate free cash flow in order to create shareholder value. We believe that our long history of operational excellence and proven reliability, technology leadership, strong customer relationships, innovation track record and consistent business execution developed from our almost two centuries of combined industry experience positions us well to execute our business strategy.

Our Industry

Our industry is characterized by constant development of new products and the need to support customers with new product innovation and technical services to meet their needs, coupled with consistent product quality and a reliable source of supply in a safe and environmentally sustainable manner. Products sold to our customers can be high value-add even when they represent a small portion of the overall end product costs, and success can be achieved by helping customers improve their product performance, value, and quality. As a result, operating margins in this sector have historically been high and generally stable through economic cycles. In addition, many products in the specialty chemicals industry benefit from economics that favor incumbent producers because the capital cost to expand existing capacity is typically significantly less than the capital cost necessary to build a new plant. The combination of attractive operating margins and generally predictable maintenance capital expenditure requirements can produce attractive cash flows.

Our Product End Uses

The table below summarizes our key end use applications and products as well as the significant growth drivers in those applications.

	Sales and Zeolyst JV Total Sales[1]				
Key End Uses	**2020**	**2019**	**2018**	**Significant Growth Drivers**	**Key PQ Products**
Fuels & Emission Controls	26%	28%	25%	• Global regulatory requirements to: • Remove nitrogen oxides from emissions • Remove sulfur from diesel and gasoline • Increase gasoline octane in order to improve fuel efficiency while lowering vapor pressure to regulated levels • Improve lubricant characteristics to improve fuel efficiencies	• Refinery catalysts • Emission control catalysts • Catalyst recycling services
Consumer Products	19%	19%	20%	• Substitution of silicate materials for less environmentally friendly chemical additives in detergent and cleaning end uses • Demand for improved quality and shelf life of beverages • Demand for improved oral hygiene and appearance	• Silica gels for edible oil and beer clarification • Precipitated silicas and zeolites for the surface coating, dentifrice, and dishwasher and laundry detergent applications
Packaging & Engineered Plastics	17%	17%	17%	• Demand for increased process efficiency and reduction of by-products in production chemicals • Demand for high-density polyethlene lightweighting of automotive components	• Catalysts for high-density polyethlene and chemicals syntheses • Antiblocks for film packaging • Silicate for catalyst manufacturing
Industrial & Process Chemicals	28%	27%	28%	• Demand in the tire industry for reduced rolling resistance • Usage of silicate in municipal water treatment to inhibit corrosion in aging pipelines	• Silicate precursors for the tire industry
Natural Resources	10%	9%	10%	• More environmentally friendly drilling fluids for oil and gas production • Recovery in global oil drilling/U.S. copper production • Growing demand for lighter weight cements in oil and natural gas wells	• Silicates for drilling muds • Sulfuric acid for mining • Silicates and alum for water treatment mining • Bleaching aids for paper

(1) Percentage calculations include $128.6 million, $170.3 million and $156.7 million of total sales attributable to the Zeolyst JV, which represents 50% of its total sales for each of the years ended December 31, 2020, 2019 and 2018, respectively. The Zeolyst JV sales are included in both the Fuels & Emission Controls and Packaging & Engineered Plastics key end uses. Refer to "Management's Discussion and Analysis of Financial Condition and Results of Operations—Basis of Presentation" for a description of the treatment of the Zeolyst Joint Venture in our consolidated financial information.

Competitive Business Strengths

Favorable Secular Growth Trends Across the Portfolio

We focus on serving end use applications where we believe significant future growth potential exists. Our products address our customers' needs, which are typically driven either by regulatory requirements or consumer preferences, on a global basis. In 2020, a majority of our sales were to end uses such as fuels and emission controls, consumer products and industrial applications that generally do not exhibit as much cyclicality as other applications. We believe that our products incorporate innovative environmental and safety solutions to address evolving customer demands, examples of which include the following:

Increased use of plastics as a substitute for heavier and less versatile materials, such as glass and metal, is driving increased global demand for polyethylene capacity expansions and production. Further, we are seeing expansions shift towards silica-based technology, which we believe will drive growth for our Silica Catalysts product group within our Catalysts segment.

Light- and heavy-duty diesel engines are subject to a broad set of regulatory requirements and are subject to increasingly strict standards. We believe these trends present global opportunities for the Zeolyst Joint Venture to support our customers in meeting these standards through our sales of emission control catalysts. While the US Environmental Protection Agency and European Union have led other nations in terms of standards that limit the amount of nitrogen oxides, carbon dioxide and other emissions for diesel engines, other emerging regions are implementing similar standards, specifically China, with the China VI (equivalent to Euro VI) emission standard enacted in 2020.

Given stringent fuel efficiency standards that are driving the design of new engines and the resulting higher-octane gasoline requirements that can be achieved through alkylate blending, we believe that our Refining Services segment is well positioned to benefit from any related growth in demand for alkylates.

We also believe we have opportunities to displace other less environmentally friendly materials for industrial and consumer good applications through our business segments. Our Refining Services segment is the largest North American recycler and one of the largest consumers of refinery by-products of sulfur, enabling them to be converted to other applications. In our Catalysts segment, we are helping our customers meet evolving regulatory requirements for the reduction of sulfur from diesel fuel and reduction of NOx emissions from diesel engines through our custom zeolites. Similarly, our specialty zeolites and silica supported catalysts are enabling our customers to improve fuel economy and utilize renewable resources through development of improved lubricants, lightweight polymers and renewable transportation fuel. Our Performance Chemicals products are manufactured from commonly found materials such as industrial sand and soda ash, which are more environmentally friendly than carbon-based products.

Leading Supply Positions

We believe that we maintain a leading supply position for certain products sold within each of our segments, holding what we estimate to be the number one or two supply share position in 2020 for products that generated more than 90% of our sales. We believe that our global footprint and efficient network of strategically located manufacturing facilities provides us with a strong competitive advantage in serving our customers both globally and regionally, and that it would be costly for our competitors to replicate our network.

In our Catalysts segment, we primarily compete on a global basis. We are a leading supplier of refinery hydrocracking catalyst finished and support catalysts used to remove sulfur, and emission control catalysts used in the heavy- and light-duty diesel industries to reduce nitrogen oxides emissions. We are also a global supplier of silica catalysts and supports for polyethylene manufacturers and the exclusive supplier of methyl methacrylate ("MMA") catalysts used in the patented Alpha process practiced by a global MMA leader.

In our Refining Services segment, we hold an estimated number one supply share position in the United States in sulfuric acid regeneration based on 2020 sales volume of greater than 50%.

In our Performance Chemicals segment, we are a leading supplier in the United States, Europe and Latin America, and largely support customers with regional and local production due to costs of shipping. We estimate that we had at least two times the sodium silicate supply share of our nearest competitor based on 2020 sales volume.

Innovation Track Record

A key competitive advantage is derived from our depth of expertise in silicates, silica, zeolites and catalysts technologies. Further, we have the ability to tailor and scale specialty grades to meet changing demands and technical support for large scale commercialization. Many of our products require close customer collaboration to address constantly evolving customer application challenges. Given the long lead-time required for product development and commercialization, which can be up to ten years, we work closely and build long-term relationships with our customers. In many cases, our relationships have spanned decades given our ability to meet customized specifications and performance characteristics while also maintaining strict quality standards.

These long-term relationships have allowed us to innovate together with our customers to meet evolving demands. For example, we have developed zeolite-based catalysts that are an effective and efficient method to reduce pollutants from heavy- and light-duty diesel engines and enable our customers to meet increasingly stringent vehicle emission standards worldwide. In personal care applications, we have collaborated with leading consumer products companies over a number of years to develop a family of gentle silica-based dentifrice abrasives that produce more effective cleaning toothpastes. In addition, our proprietary silica catalyst has enabled development of a high strength high-density polyethylene (“HDPE”) resin that is used for making lightweight plastic gasoline tanks for automobiles.

Long-Term, High-Quality Customer Relationships

We collaborate with leading multinational companies that often seek global solutions. Our customers include large industrial companies such as ExxonMobile, BASF, and Unilever, and global catalyst producers such as Albemarle and W.R. Grace. We also supply catalysts to leading chemical and petrochemical producers such as BASF, Dow Chemical, Lucite, LyondellBasell, and Shell. We supply personal care ingredients and additives to leading consumer products companies such as Unilever and Colgate-Palmolive. We have long-term relationships with our top ten customers, based on 2020 sales, that average more than 50 years. In addition, our customer base is diversified, with our top ten customers in 2020 representing approximately 30% of our sales for the year ended December 31, 2020 and no customer representing more than 5% of our sales during this period.

Secured Contractual Pass-through of Raw Material Costs Support Stable Margins

We have been able to mitigate the impact of raw material or energy price volatility using a variety of mechanisms, including hedging and raw material cost pass-through clauses in our sales contracts and other adjustment provisions. For the year ended December 31, 2020, approximately 30% of our Performance Chemicals sales (mostly comprised of sodium silicate sales) were derived from contracts that included raw material pass-through clauses. Most of our Refining Services contracts feature minimum volume protection and/or quarterly price adjustments for items such as commodity inputs, labor, the Chemical Engineering Plant Cost Index and natural gas. In 2020, approximately 80% of our Refining Services segment sales were sold under contracts that included some form of raw material pass-through clause. These price adjustments generally reflect our Refining Services actual cost structure in producing sulfuric acid, and tend to provide us with some protection against volatility in labor, fixed costs and raw material pricing. Freight expenses are generally passed through directly to customers.

Our products are predominantly inorganic and carbon-free, and are produced from readily available raw materials such as industrial sand and soda ash, which prices have historically been less volatile than oil. We also use natural gas in our furnaces where our North American facilities have benefited from the plentiful supplies of shale gas. In addition, we have long-term supply contracts with many of our key raw materials suppliers across all our business segments.

Long Term Customer Contracts Enhance Sales Predictability and Stability

We partner with many of our customers under long-term contract agreements, mutually exclusive product supply arrangements and/or specified products for certain license production processes. In our Refining Services segment, approximately 50% of our production capacity serves customers with staggered five to ten year “take or pay” contracts with potential for value pricing resets and cost pass-through for our regeneration services product line that enhances sales and margin predictability and stability. Excluding contracts with automatic evergreen provisions, approximately 40% of our sulfuric acid volume for the year ended December 31, 2020 was under contracts expiring at the end of 2021 or beyond.

In our Catalysts segment, we are either the sole or dual supplier to key global customers under various term agreements up to 10 years for each of polyolefin catalysts and silica catalysts supports. Further, we are an exclusive multi-year supplier of MMA catalyst to a leading global producer. In our zeolite catalysts product group, we operate with a mix of evergreen and various term contracts depending on the product customization with value pricing ranging from 1 to 3 years to supply catalysts and zeolite powders for the refining, petrochemical and chemical industries and nitrogen oxides control catalysts for diesel transportation industries. These terms, in line with industry standards, provide us with flexibility in satisfying customers. Our Performance Chemicals segment operates under key customer supply contracts with material cost pass-through ranging from 1 to 5 years, largely depending on terms for customer demand given regional and/or product solution needs.

Strategic and Differentiated Manufacturing Know-how and Supply Chain Global Network

Our manufacturing platform is based on furnace technology and proprietary knowledge developed from almost two centuries of combined experience applying silicates chemistry production and the development of applications across a broadening set of end uses. All of our segments produce materials through our furnace process, other than our silica catalysts and zeolite catalysts product groups, which are derivatives of our Performance Chemicals segment. We believe we have a differentiated capability around furnace operations that enables us to operate more efficiently than most of our competitors.

Stable Margins and Cash Flow Generation Across Changing Macroeconomic Cycles

We have demonstrated the ability to maintain stable margins while continuing to grow in different macroeconomic environments given secular trends supporting many of our business segments. We believe that the stability of our margins and cash flows is also aided by long term sales contracts and material cost pass-through. Our ability to enter into favorable contracts and terms with customers is driven by our long history of collaborative relationships and track record of providing value-added products and services. We believe that our value-added products and services have proven to be critical to the performance of our customers’ products, and typically represent only a small portion of our customers’ overall end-product costs.

Our cash flow generation has been driven, in part, by our disciplined capital investment as well as tax attributes that provide us with cash flow benefits. As of December 31, 2020, we had $263.7 million of tax deductible intangibles and goodwill with respect to Eco Services Operations LLC of which provides us with cash tax savings as we generate taxable income.

Our Business Segments

We are an integrated, global provider of specialty catalysts, chemicals and services that share common end uses, manufacturing techniques, and process technology. We conduct operations through three reporting segments: (1) Refining Services, (2) Catalysts (including our 50% interest in the Zeolyst Joint Venture) and (3) Performance Chemicals. Effective October 15, 2020, our former Performance Materials segment was treated as a discontinued operation and was subsequently sold on December 14, 2020.

The table below summarizes certain information regarding our three reporting segments for the year ended December 31, 2020.

Segments and Product Groups	Sales	% of Total Sales	Zeolyst Joint Venture Sales[(1)]	% of Total Sales and Zeolyst Joint Venture Sales[(1)(2)]	Net Income	Adjusted EBITDA[(1)]	% of Total Adjusted EBITDA[(1)(3)]
	Year ended December 31, 2020 (in millions, except percentages)						
Refining Services	$ 401.9	36.3 %	$ —	32.5 %		$ 157.2	42.0 %
Catalysts	94.0	8.5 %	—	7.6 %		74.5	19.9 %
Zeolite Catalyst	—	— %	128.6	10.4 %			
Performance Chemicals	614.7	55.5 %	—	49.7 %		142.4	38.1 %
Eliminations	(3.2)	(0.3)%	—	(0.3)%			
Subtotal	$ 1,107.4	100.0 %	$ 128.6	100.0 %			
Corporate						(36.1)	
Total	$ 1,107.4	100.0 %	$ 128.6	100.0 %	$ (278.8)	$ 338.0	100.0 %

(1) Percentage calculations include $128.6 million of total sales attributable to the Zeolyst JV, which represents 50% of its total sales for the year ended December 31, 2020. The Adjusted EBITDA of our Catalysts segment includes our 50% portion of the Adjusted EBITDA of our Zeolyst JV. Refer to "Management's Discussion and Analysis of Financial Condition and Results of Operations—Basis of Presentation" for a description of the treatment of the Zeolyst Joint Venture in our consolidated financial information.

(2) Percentage calculations exclude $3.2 million in intersegment sales eliminations.

(3) Percentage calculations exclude $36.1 million in corporate expenses.

Refining Services

Our Refining Services segment is a leading provider of sulfuric acid recycling (Regeneration Services) and end-to-end logistics to North American refineries for the production of alkylate, a high value gasoline blending component required for meeting gasoline specifications and producing premium grade fuel. We are also a leading North American producer of on-purpose virgin sulfuric acid for water treatment, mining, and industrial applications. By providing regeneration services, as well as purchasing by-product sulfur from customers as a source of energy and for use in manufacturing virgin sulfuric acid, we believe that we provide our refining customers with a complete solution for their sulfuric acid needs.

Trends for increased alkylate production are being driven by: rising demand for premium gasoline used in smaller, more efficient turbocharged engines, which requires higher octane rated gasoline with an alkylate content of approximately 35%-45%, as compared to the 12% alkylate content in regular gasoline; the need for more alkylate to meet the minimum octane ratings in regular gasoline following the continued significant share growth of shale oil refining in the U.S.; the full implementation of Tier 3 gasoline sulfur standards in the United States was enacted for 2020, which requires the blending of additional low sulfur high octane gasoline components such as alkylate; and rising gasoline exports, which generally contain no ethanol and will generally require more alkylate to replace the ethanol in order to meet the minimum octane requirements for the destination countries.

Our Refining Services segment is highly regionalized due to shipping costs and our customer integration requirements. Our network of facilities is concentrated in the Gulf Coast and the state of California, where approximately 68% of the United States refining capacity is located. The strategic locations of our plants in these key refining regions contribute to our highly efficient supply chain networks with our customers, including in some cases captive pipelines connecting us to our refinery customers. Alternatively, product can be shipped by barge, rail and truck.

Our primary product groups include Regeneration Services and Virgin Sulfuric Acid.

Regeneration Services serves a critical need for refining customers. Sulfuric acid serves as a catalyst in the alkylation process. The resulting spent sulfuric acid needs to be regenerated, which is no longer a core competency of most refiners. Since storage space for fresh and spent acid is typically limited, and the cost to refineries of interruption to their alkylation units would be significant, refineries seek to have a continuous and reliable source of supply for sulfuric acid.

Our end-to-end regeneration service offering takes the spent acid from the refinery, through our network of plants and transportation systems, and recycles the acid into a high strength fresh acid for reuse in the alkylation process. Because of the number and strategic locations of our plants, and the breadth of our transportation logistics, we believe we bring the highest reliability and flexibility to our refining customers, allowing them to focus on their core competency by optimizing their alkylation capacity.

Virgin sulfuric acid is created either through the burning of sulfur in furnaces, or as a by-product of other industrial processes, primarily the smelting of copper and other base metals. We produce a range of high quality virgin sulfuric acid products by burning sulfur in our plants for supply into a diverse set of end uses. Sulfur-burned acid is generally considered to be of higher purity and quality than smelter-produced acid and, as a result, smelter-produced acid is not suitable for some industrial users including several of our larger customers who require higher quality and differentiated sulfuric acid products, such as super-saturated sulfuric acid (oleum) and other high purity specialty acids. Virgin sulfuric acid is produced at all of our facilities utilizing the same production equipment as our regeneration services.

Competition

Given our strategic presence on the Gulf Coast and in California, and our relationships with leading refineries, we estimate that our regenerated sulfuric acid supply share is substantially larger than our closest competitor. We compete in the North American refining services industry with competitors such as Chemtrade and Veolia. We compete on the basis of price, reliability, and responsiveness to changes in customer demand, which is a function of scale, proximity to customer locations and operational expertise. We believe that we benefit from industry economics that favor incumbent producers because the capital cost and regulatory challenges to expand existing capacity are typically significantly less than to build a new plant. In addition, existing robust supply chains, including captive pipeline connections and other transportation logistics add to the competitive advantages available to incumbent producers. As a result, we believe that our integrated and strategically located network of facilities and end-to-end logistics assets in the United States provide us with a significant competitive advantage and would be costly for our competitors to replicate.

Manufacturing

We produce regenerated sulfuric acid and virgin sulfuric acid through our furnace operations. Regenerated sulfuric acid is produced by thermally decomposing the spent acid in our furnace into a clean gas stream which is converted into sulfuric acid. Virgin sulfuric acid is produced by burning sulfur and certain sulfur-rich components at high temperatures within a furnace. The chart below summarizes the manufacturing platform for our Refining Services segment.

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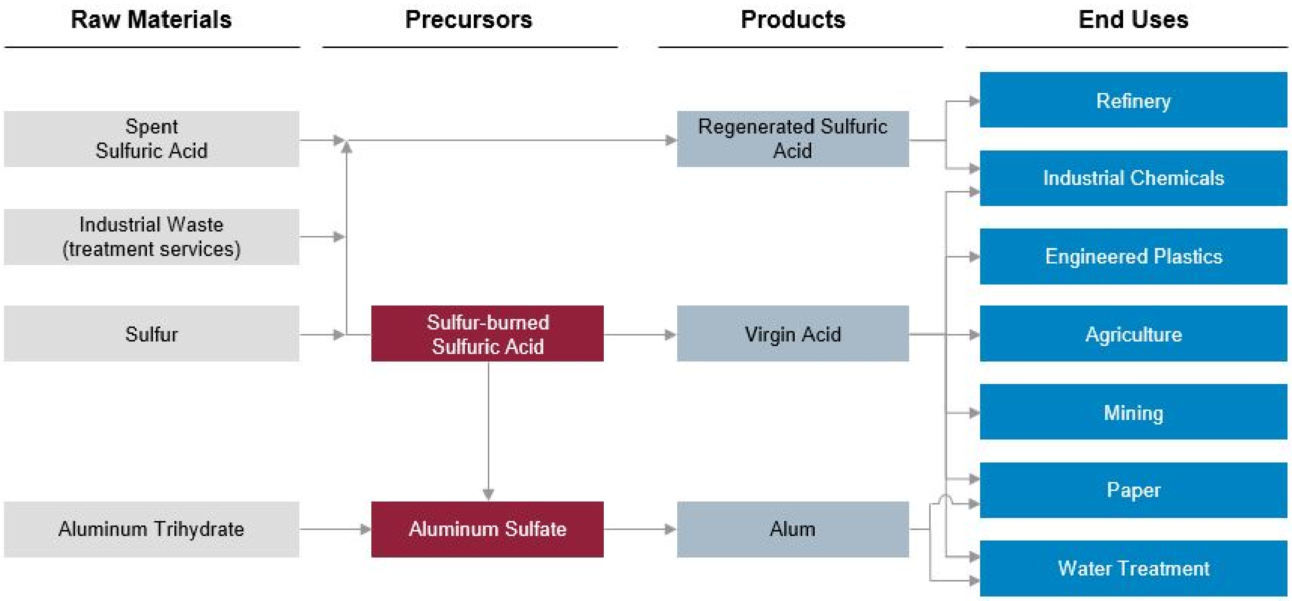
Refining Services Manufacturing Platform



Catalysts

We are a leading global provider of customized and innovative catalyst products and process solutions to leading producers and licensors of polyethylene, or PE, and methyl methacrylate, or MMA. Our finished silica-based catalysts and catalyst supports are necessary to produce high strength and high stiffness plastics used in packaging films, bottles, containers, and other molded applications. Global consumer demand for high strength lightweight plastics is expected to continue in the near to medium term driving increased production capacity expansions. Our zeolite-based emission control catalysts enable the removal of nitrogen oxides from diesel engine emissions as well as sulfur dioxide from fuels during the refining process. The continued expansion of stricter global regulations for reducing sulfur in all fuel pools is expected to drive the ongoing demand for our products.

Our product groups include Silica Catalysts and Zeolite Catalysts. Zeolite Catalyst products are sold through the Zeolyst Joint Venture.

Silica Catalysts supplies both the finished catalyst and catalyst supports, which are critical catalyst components for the production of HDPE, a high strength and high stiffness plastic used in bottles, containers, and molded applications and LLDPE used predominately for films. We also produce a catalyst that is used globally for the production of MMA, the monomer for acrylic engineering resins, a clear scratch-resistant plastic used in sheet or molded form to replace glass and as a durable surface coating. Because these catalysts are highly technical and customized for our customers to produce resins with specific properties, they are often covered under long-term supply agreements and, in some cases, we are a customer’s sole source supplier. In addition, we produce silica anti-blocking products that are used to prevent opposite faces of polyolefin and polyester films from adhering to one another during manufacturing and in use.

The Zeolyst Joint Venture, (formed in 1988 specifically as Zeolyst International and Zeolyst C.V., our 50% owned joint venture with Shell Catalysts & Technologies, an affiliate of Royal Dutch Shell plc. or “Shell”), supplies critical high technology specialty zeolite and zeolite-based catalysts to customers in three end uses: refining (primarily hydrocracking catalyst and dewaxing), petrochemicals, and emission control systems for both on-road and non-road diesel engines. We also supply custom zeolites to catalyst companies who compete in similar industries. The Zeolyst Joint Venture leverages each partner’s technology and production expertise, including Shell’s expertise in hydrocracking catalyst to maximize liquid product yields, especially distillate while at the same time removing sulfur, and PQ’s expertise in zeolite technology. We also believe the Zeolyst Joint Venture is a first mover in zeolite fuels and emissions control technology and we expect continued expansion as environmental emissions standards increase globally.

To meet sulfur emission control standards, hydrocracking catalyst is the most economic method for refiners while maintaining yields for one of the most profitable product streams. The Zeolyst Joint Venture is the sole supplier of hydrocracking catalyst to Shell, but a majority of sales are to third-party refineries. We also provide precursor supports to many of the hydrocracking catalyst suppliers, positioning us as a leading supplier in the global hydrocracking catalyst supply chain.

To meet nitrogen oxides (NOx) emission control regulations that are expanding globally, many of our zeolite powders are used in an advanced emission control technology called selective catalytic reduction, largely focused on heavy duty diesel (HDD) transportation. This process uses ammonia to react with engine exhaust gases via our catalysts in order to convert NOx, a pollutant, into nitrogen and water. We believe that our zeolite catalysts can enable selective catalytic reduction technology to reduce the amount of nitrogen oxides in such exhaust gases by more than 90% and is one of the most cost-effective methods to reduce diesel engine emissions.

Competition

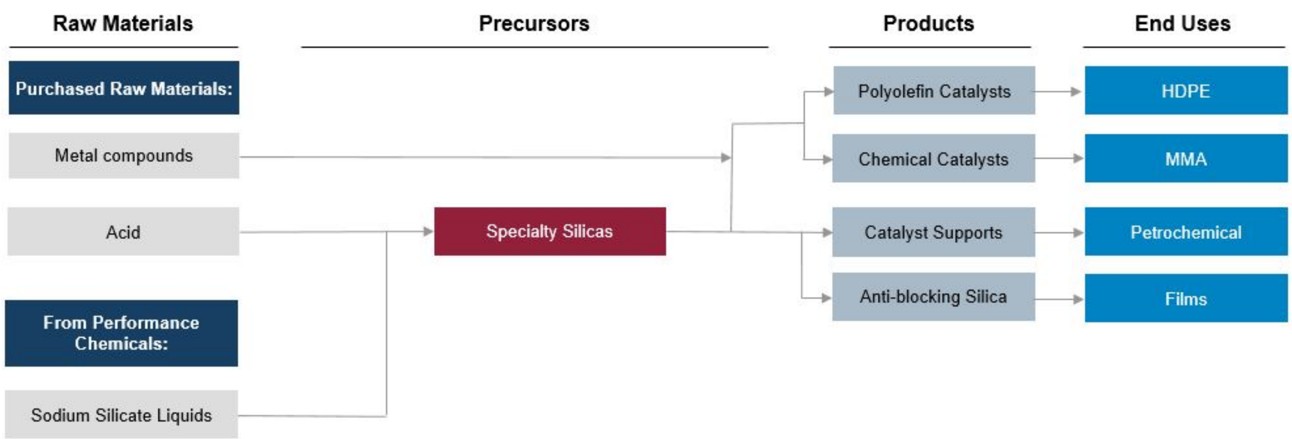
Our Silicia Catalysts product group primarily competes with W.R. Grace. The Zeolyst Joint Venture competes with global catalyst producers such as W.R Grace, BASF, UOP, Axens, and Haldor Topsoe, while at the same time providing many of them customized zeolite solutions for their product offerings. Some direct competition with niche companies exists, including competitors such as Tosoh and Clariant. We typically compete on the basis of performance, product consistency, reliability, and responsiveness to changes in customer demand.

Manufacturing

We manufacture our catalyst products using sodium silicate liquids purchased directly from our Performance Chemicals segment or silica sol liquids made by others from Performance Chemicals sodium silicate to make specialty zeolite and silica products. These zeolites and silicas are either used directly to produce catalysts or are sold as precursors to other catalyst manufacturers.

The chart below summarizes the manufacturing platform for our Catalysts segment.

Silica Catalysts Manufacturing Platform



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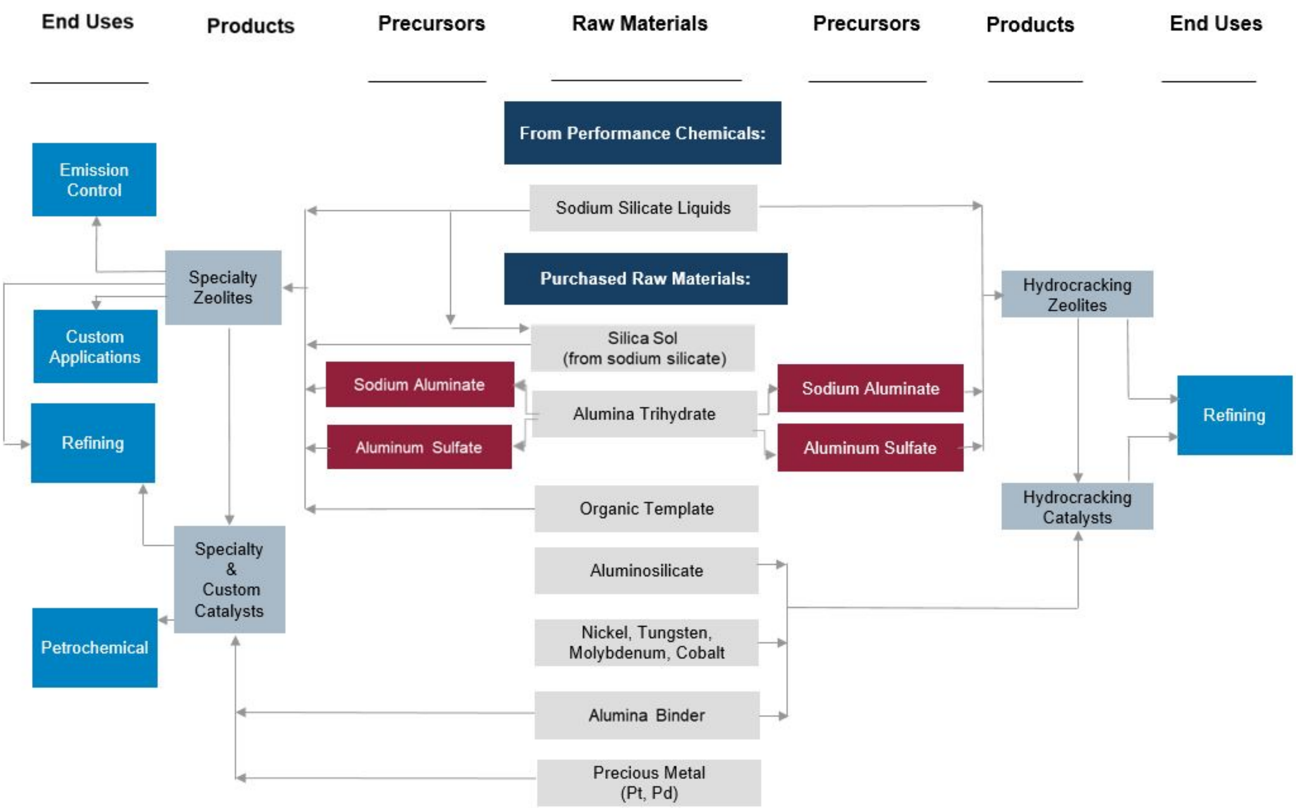
Zeolyst Joint Venture Manufacturing Platform



Performance Chemicals

Our Performance Chemicals segment is a leading global producer of sodium silicates, and downstream specialty silicas as well as other silicate derivative products. These products are used in a wide variety of industrial and consumer applications such as matting agents in surface coatings, clarifying agents for edible oils and beverages, precursors for green tires, additives for dental cleaning and personal care products, and as feedstock for our additives and catalyst platforms. Given our products are derived from quartz sand, which makes them natural and inert materials, we believe they have the environmental and safety profile to address evolving customer demands to replace certain other chemicals. Silicates and silicate derivatives are recognized on the Safer Chemicals Ingredients List of the EPA's Safer Choice program, which we believe positively impacts our ability to compete in consumer product applications.

Given the breadth of our global infrastructure in terms of scale operations, geographic diversity and production know-how, we are a leading global supplier to key multi-national industrial and consumer product companies. While we are global, our network is highly regionalized in silicate products and strategically located to support customers in a cost effective manner because of the expense of shipping sodium silicates extended distances due to their water content. We believe that we are the only global silicates producer who can supply all of the major regions, excluding China, and we estimate that we hold at least two times the sodium silicates supply share as our nearest competitor based on 2020 sales volume.

Our product groups include Sodium Silicates, Specialty Silicas and Other Silicate Derivatives.

Sodium Silicates have functional attributes that are used as additives and ingredients to enhance product performance as binders, detergent-builders, pH buffers, adhesives or as chemical feedstock and are in extensive diverse customer applications for construction, cleaning, water treatment, pulp & paper, foundry & refractory, green tires, electronics and refining catalysts.

Specialty Silicas are used as ingredients in consumer products such as personal care products, food, edible oils and beer where customers are seeking more environmentally friendly products without loss of effectiveness or performance. In industrial, uses include gloss control and corrosion control in coil, wood, general industrial leather, and other high-performance surface coating applications.

Other Silicate Derivatives include metasilicates, spray dried silicates, and magnesium silicates and potassium silicates which supply diverse uses in cleaning, specialty fertilizer, oil & gas, mining, paints, food, and cosmetics. We also produce zeolites, by reaction with aluminum trihydrate, which are used as builders in detergents and in other applications as stabilizers in the production of polyvinylchloride (PVC) applications.

Competition

In our Performance Chemicals segment, we primarily compete with other global producers such as OxyChem, Grace and Evonik. We believe that we have a leading industry position and technical expertise that provides us with a competitive advantage over competitors who manufacture only in particular end uses. Further, we believe that it would be costly and difficult for a new entrant or existing competitor to replicate our breadth or economies of scale in the production of sodium silicate.

We believe that our network of strategically located manufacturing facilities, with operations in North America, Europe, South America and Africa, allows us to serve our customers at a lower cost than our competitors and with quicker delivery times for our products. In the industry, we compete primarily on the basis of performance, product consistency, quality, reliability, and ability to innovate in response to customer demands.

Manufacturing

Performance Chemicals’ products are produced through an integrated supply chain beginning with regional and large scale upstream production of sodium silicates and downstream derivatives. Sodium silicates are produced regionally because of the expense of shipping sodium silicates extended distances due to their water content. Our sodium silicates are produced by fusing readily available industrial sand and soda ash in our proprietary furnace operations. We dissolve the molten silicate from the furnace into water and sell these products in liquid form. Downstream derivatives are produced through a variety of chemical operations that create aqueous, solid, and gel forms for our products.

For the year ended December 31, 2020, approximately 50% of our North American silicate sales, which represented a significant portion of our Performance Chemicals segment sales, were derived from contracts that included raw material cost pass-through clauses. Under these contracts, there is usually a time lag of between three and nine months for cost changes to pass-through, depending on the magnitude of the change, industry dynamics and the terms of the particular contract.

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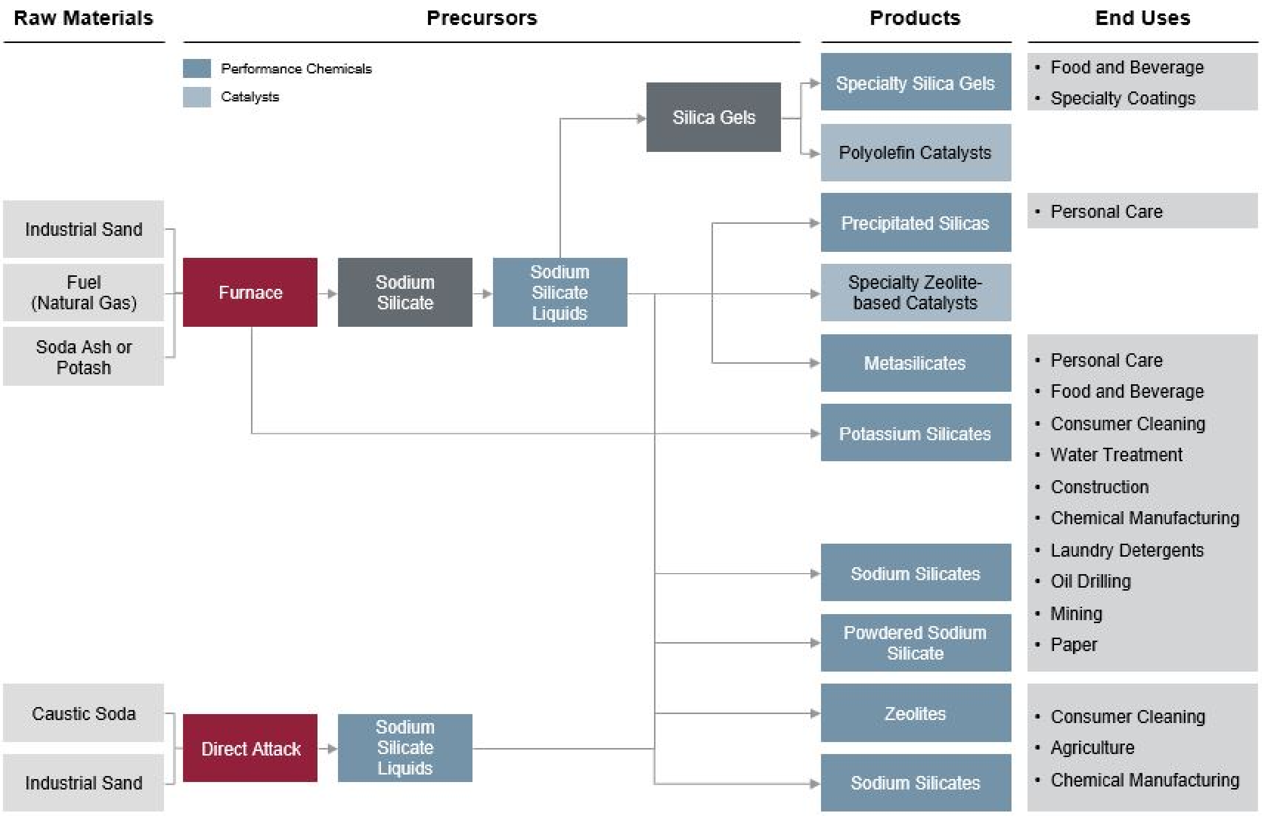
The chart below summarizes the manufacturing platform for our Performance Chemicals segment.

Performance Chemicals Manufacturing Platform



Raw Materials

We estimate that our raw material costs represent approximately 40% of total cost of goods sold in the year ended December 31, 2020. Our products are predominantly inorganic and carbon-free, and are produced from readily available raw materials such as industrial sand and soda ash, which prices have historically been less volatile than oil. We also use natural gas in our furnaces, with our North American facilities benefiting from the plentiful supplies of shale gas. In addition, we have long-term supply contracts with many of our key raw materials suppliers across our segments. We have also been able to mitigate the impact of raw material or energy price volatility using a variety of mechanisms, including hedging and raw material cost pass-through clauses in our sales contracts and other adjustment provisions.

We are able to negotiate our supply agreements for our key raw materials based on our leading industry position and global scale in an effort to achieve competitive pricing. We also maintain a raw material quality audit and qualification program designed to ensure that the material we purchase satisfies stringent quality requirements. Key raw materials for our segments include:

Key Raw Materials	Segments
Soda Ash	Refining Services, Performance Chemicals
Sodium hydroxide ("caustic soda")	Refining Services, Performance Chemicals
Sulfur	Refining Services
Industrial sand	Performance Chemicals
Aluminum trihydrate	Refining Services, Performance Chemicals

While natural gas is not a direct feedstock for any individual product, we use natural gas powered furnaces to heat raw materials and create the chemical reactions necessary to manufacture our products. We maintain multiple suppliers wherever possible and we seek to hedge our exposure to fluctuations in prices for natural gas, forward purchases of natural gas in the United States, Canada, and Europe, and the use of pass-through clauses for raw material and natural gas costs in our customer contracts. However, we may not be successful in passing through all increases in raw material costs or maintaining an uninterrupted supply of natural gas for all of our furnaces. See “Risk Factors-Risks Related to Our Business - If we are unable to pass on increases in raw material prices, including natural gas, to our customers or to retain or replace our key suppliers, our results of operations and cash flows may be negatively affected”.

Joint Ventures

We have entered into several long-standing joint ventures to supplement our businesses and access other geographic locations, minimize costs and accelerate growth in areas we believe have significant business potential, with the most significant of these joint ventures including the following:

Zeolyst Joint Venture. The Zeolyst Joint Venture is a long-standing partnership with Shell Catalysts & Technologies, an affiliate of Royal Dutch Shell plc. or “Shell”, that dates back to 1988 and is focused on the development, manufacture and sale of zeolite-containing catalysts through manufacturing facilities located in Kansas and the Netherlands. We combine our expertise in zeolite supply and technology with our partner’s expertise in global refinery catalyst sales and technology. We have a 50% ownership stake in the Zeolyst Joint Venture. We supply sodium silicate from our Performance Chemicals segment to the Zeolyst Joint Venture to make specialty zeolites, which are used as precursors in emission control and custom catalysts. We also produce specialty zeolites that are precursors for the production of hydrocracking catalyst and other refinery and petrochemical catalysts that are used by our other segments and sold to third parties. We manage the production of these specialty zeolites due to our expertise in zeolite production. These catalysts include aromatic catalysts that upgrade aromatic by-product streams, dewaxing catalysts that improve lube oil performance and diesel cold flow performance, and paraffin isomerization catalysts that upgrade olefins to high octane gasoline blending components for refinery and petrochemical customers.

PQ Holdings Mexicana S.A. de C.V. PQ Holdings Mexicana was established in 2000 as a joint venture with Solvay Alkalis, Inc. for the manufacture, marketing and sale of various chemicals, including sodium silicate, through manufacturing facilities in Tlalnepantla and Guadalajara, Mexico. We have an 80% ownership stake in PQ Holdings Mexicana.

Research and Development

We benefit from the highly-skilled technical capabilities of our employees dedicated to new product development. We operate four research and development facilities in the United States, Canada, the United Kingdom and the Netherlands. Our research and development activities are directed toward the development of new and improved products, processes, systems and applications for customers. Our research and development team is organized to support each of our operating businesses and staffed with experienced scientists, technical service representatives and process engineers with direct knowledge of our products. This business group and customer-oriented team structure provides strong links between our product development and manufacturing functions and our customer collaboration and specifications. These connections enable us to focus our development on timely and relevant products for our customers while remaining attentive to manufacturing considerations to enable us to produce new products profitably and in a timely manner. Product development activities are organized into research and development projects that are subject to regular reviews by the business teams in order to understand and address our customers’ evolving needs and invest in our growth by prioritizing innovation driven by these identified needs. In addition, we hold senior-level project reviews to ensure best practices are shared and consistent metrics are used to determine a project’s merit and the size of the potential opportunity.

Intellectual Property

We evaluate on a case-by-case basis how best to use patents, trademarks, copyrights, trade secrets and other available intellectual property protections in order to protect our products and our critical investments in research and development, manufacturing and marketing. We focus on securing and maintaining patents for certain inventions such as composition-of-matter, while maintaining other inventions such as process improvements as trade secrets, derived from our market-based business model, in an effort to maximize the value of our product portfolio and manufacturing capabilities and reinforce our competitive advantage. Our policy is to seek appropriate intellectual property protection for significant product and process developments in the major areas where the relevant products are manufactured or sold. Patents may cover products, processes, intermediate products and product uses. Patents extend for varying periods in accordance with the date of patent application filing and the legal life of patents in the various countries in which the patents are registered. The protection afforded, which may also vary from country to country, depends upon the type of subject matter covered by the patent and the scope of the claims of the patent.

In most industrial countries, patent protection may be available for new substances and formulations, as well as for unique applications and production processes. However, given the geographical scope of our business and our continued growth strategy, there are regions of the world in which we do business or may do business in the future where intellectual property protection may be limited and difficult to enforce. Moreover, we monitor our competitors' products and, if circumstances were to dictate that we do so, we would vigorously challenge the actions of others that conflict with our patents, trademarks and other intellectual property rights. We maintain appropriate information security policies and procedures reasonably designed to ensure the safeguarding of confidential information including, where appropriate, data encryption, access controls and employee awareness training.

We own or have rights to a number of patents relating to our products and processes. As of December 31, 2020, we owned 39 patented inventions in the United States, with approximately 286 patents issued in countries around the world and approximately 69 patent applications pending worldwide covering more than 11 additional inventions. As of December 31, 2020, we also had trademark rights in approximately 379 trademark registrations worldwide, including approximately 44 U.S. trademark registrations. We also have approximately 21 pending trademark applications, which include applications in the United States and worldwide. In addition to our registered and applied-for intellectual property portfolio, we also claim ownership of certain trade secrets and proprietary know-how developed by and used in our business. Including our joint ventures, we are party to certain arrangements whereby we license in the right to use certain intellectual property rights in connection with our business.

Seasonality

Our Refining Services segment typically experiences seasonal fluctuations as a result of higher demand for gasoline products in the summer and lower demand in the winter months. These demand fluctuations results in higher sales and working capital requirements in the second and third quarter.

Environmental Stewardship

Sustainability is intertwined with our daily business and is reinforced through our strategy and values. Our diverse product technologies enable downstream sustainability. Our Performance Chemicals segment provides products that are designed to support bio-fuel purification, specialty silicas for low-VOC environmentally preferred coatings, and our sodium silicates are designed to extend the durability of municipal water treatment pipelines by inhibiting corrosion. Our Refining Services segment regenerates sulfuric acid for the refining industry avoiding significant landfill or deep well disposal annually. Certain of our Catalyst segment's products are designed to reduce pollutants, such as nitrous oxides (NOx) in vehicle exhaust and by removing sulfur from fuels.

Our global product technology team formalized its ideation process in 2019 and continues to drive transformational growth through innovation. The team considers product sustainability across the life-cycle in its stage-gate process.

As an American Chemistry Council ("ACC") Responsible Care® member company, we continue to report our health, safety, and environmental metrics annually. Our sustainability metrics, including waste generation and water consumption for 2018 and 2019, have been third party assured in 2020. On the sustainability pages of our website, we provided our inaugural sustainability report, including our sustainability goals, materiality matrix, letters of assurance, and the corresponding Global Reporting Initiative (GRI) Disclosure and Sustainability Accounting Standards Board (SASB) Index. Building on our commitment of improvement across sustainability elements, we selected and began implementation of our corporate-wide sustainability software platform in late 2020. Upon full implementation of our software in 2021, we plan to introduce our internal real-time sustainability performance dashboard to enable improved analytics and greater visibility into our sustainability impacts.

Social Responsibility, including human capital discussions

We are focused on the safety of our employees. We continued our flagship health, safety and environmental program - PQ Perfect Days ("Perfect Days"). The Perfect Days program targets at-risk behaviors and celebrates positive health, safety and environmental performance across the organization on a daily basis. As part of that program, we have set annual Perfect Day and Total Recordable Incident Rate goals and targets that link to performance and drive accountability. We concluded 2020 with no material environmental and safety incidents or accidents and achieved our 2020 target of ACC top quartile total case incident rate performance based upon 2019 benchmark data. The COVID-19 pandemic introduced another level of health and safety performance concerns in 2020 as the entire globe entered the COVID-19 pandemic. We quickly introduced, and have maintained protocols to minimize risk of exposure and transmittal within all of our work sites so that we could continue to provide for all of our customers while keeping our employees safe and healthy.

Our executive leadership across the organization, led by our Chairman and CEO, formed our COVID Rapid Response Team (CRRT). The team has worked to maintain our health and safety standards while effectively managing COVID-19 impacts to the business and our sites. The team's responsibilities include tracking and implementing government requirements and CDC guidelines to enable appropriate actions be taken; leading communications to our employees, customers, and entire supply chain; and sharing best practices and lessons learned from our response. Business leadership executed established business continuity plans, which included our market response with the primary goal of safeguarding the health and safety of our people and supporting the needs of our customers, while also maximizing productivity for the Company.

Further in 2020, the leadership and rapid response teams prepared guidance for all sites and functions, which included preventative measures and return-to-work procedures. Operations shifts were adjusted, up to and including temporary shutdowns as necessary, to minimize exposures and to protect all personnel. Most of the practices remain in place today and are now part of our preparation standards.

Our flagship "Success through people" program furthers our strategy by acknowledging our workforce is key to our success. We offer highly competitive salaries, benefits, developmental opportunities and work/life balance. We proactively seek to attract, incentivize and retain a talented and motivated workforce. Our global succession planning process is designed to provide sufficient talented personnel to fill key leadership, innovation and manufacturing roles well into the future and to better prepare employees for their future at the Company. In order to enable a pipeline for our leadership, we maintain a robust Emerging Leaders program to identify top talent to build leadership capabilities and provide the fundamental skills we believe every leader needs to generate passion and productivity in their team. The program also provides an important networking opportunity that creates a connected community of leaders at the Company.

We review our compensation and benefits programs periodically to ensure continued competitiveness. In the US, our benefit program is designed to help protect the health and financial well-being of our full-time employees and their family members today, offering a choice of several medical & dental plans, as well as vision, flexible spending accounts, short-term and long-term disability insurance and an employee assistance program. To help them prepare for their future, we offer a defined contribution savings plan, which includes company contributions. Benefits outside the US are designed to supplement government-provided programs in each country.

We actively promote diversity within the Company and seek to have a workforce that reflects the diversity of the societies in which we operate. We strive to hire candidates from diverse backgrounds, cultures and ethnicities.

Building on a global footprint that spans across 16 countries, we benefit from our talented and dedicated employees that make up a diverse population, where more than half of our workforce of 2,274 employees are located outside the United States. As of December 31, 2020, we had 2,274 employees worldwide, of which 1,019 were employed in the United States, 343 were employed in Canada, Mexico, and Brazil, 735 were employed throughout Europe, 37 were employed in South Africa and 95 were employed in Indonesia. Our remaining employees are dispersed throughout Asia, primarily in Thailand. As of December 31, 2020, approximately 49% of our employees were represented by a union, works council or other employee representative body. We believe we have good relationships with our employees and their respective works councils, unions or other bargaining representatives. Further, at December 31, 2020, approximately 25% of our U.S.-based executives, managers and professionals were women.

This international strength, supported by our core values of integrity and fairness, fosters a rich culture founded on diverse of thought. We firmly believe that success is achieved through the intellect and commitment of our people, so we employ a long-term human capital program to attract, retain and develop talent for the future. We are proud of our highly collaborative teams that enable an inclusive workplace where employees are encouraged to bring their own experiences to promote innovation from all levels of the organization. This constructive work environment has been re-enforced with the recent implementation of a fully integrated on-line performance management process that improves the communication of aligned goals, encourages consistent feedback and furthers employee engagement. Today, there are women on the management teams of each of our businesses as well as in all our functions: R&D, Finance, HSE and Human Resources.

While the COVID-19 pandemic limited the opportunities for in-person engagement in our communities, our sites continued to support food security programs and people in need across our global network. For example, our Hammond site supported efforts to stock food pantries through their participation with the local United Way and Heels for Meals programs. The Malvern office continued its support for local families with donations to the Pennridge FISH Organization.

Governance

Our governance programs and policies can be found in the Company's Ethics section of the sustainability webpages, which is routinely updated and includes our policies on child labor, human trafficking, anti-harassment, antibribery, and cyber security all of which are evaluated by third-parties, including Ecovadis. Our 2020 Ecovadis Assessment scored PQ's Ethics response in the top quartile of our sector category, basic chemicals. We continue to provide annual Code of Conduct training to all our global employees and have enhanced our delivery with online learning modules.

Environmental Regulations

We are subject to extensive, evolving and increasingly stringent national and local environmental laws and regulations, which address, among other things, the following:

- emissions to the air;
- discharges to soils and surface and subsurface waters;
- other releases into the environment;
- prevention and remediation of releases into the indoor or outdoor environment;
- generation, handling, storage, transportation, treatment and disposal of waste materials;
- maintenance of safe conditions in the workplace;
- registration and evaluation of chemicals;
- production, handling, labeling or use of chemicals used or produced by us; and
- stewardship of products after manufacture.

We apply the principles of the Environmental Management standard of the International Organization for Standardization (ISO 14001) at our facilities throughout the world. For chemical facilities in the United States, we also adhere to the Responsible Care RC14001 Technical Specifications of the American Chemistry Council.

We maintain policies and procedures to monitor and control health, safety, and environmental risks, and to monitor compliance with applicable state, national, and international health, safety, and environmental requirements. We have a strong health, safety, environmental organization. We have a staff of professionals who are responsible for environmental, safety, health and product regulatory compliance. We have implemented a corporate audit program for all of our facilities. However, we cannot provide assurance that we will be in full compliance at all times with all applicable environmental laws and regulations. We expect that stringent environmental regulations will continue to be imposed on us and our industry in general. Evolving chemical regulation programs throughout the world could impose testing requirements or restrictions on our chemical raw materials and products.

Environmental Remediation. Environmental laws and regulations require mitigation or remediation of the effects of the disposal or release of chemical substances. Under some of these regulations, as the current or former owner or operator of a property, we could be held liable for the costs of removal or remediation of hazardous substances on or under the property, without regard to whether we knew of or caused the contamination, and regardless of whether the practices that resulted in the contamination were permitted at the time they occurred. Many of our current or former production sites have an extended history of industrial use, and it is impossible to predict precisely what effect these laws and regulations will have on us in the future. Soil and groundwater contamination requiring investigation and remediation has been discovered at some of the sites, and might occur or be discovered at other sites. Several active and former facilities currently are undergoing investigation and remediation, including sites in Dominguez, CA; Martinez, CA; Rahway, NJ; and Tacoma, WA.

Environmental Programs. We have comprehensive health, safety and environmental compliance, auditing and management programs in place to assist in our compliance with applicable regulatory requirements and with internal policies and procedures, as appropriate. Each facility has developed and implemented specific critical occupational health, safety, environmental, security and loss control programs.

We also have implemented a Health, Safety and Environmental (“HSE”) organizational structure with executive committee level leadership and dedicated environmental experts. We have Regional HSE Specialists and Managers who are embedded in the field and provide HSE expertise and support to operating sites. Certain, larger sites may have dedicated environmental or safety personnel.

Product Safety and Product Stewardship

We have established a Product Safety and Product Stewardship management system that is compliant with the RC14001 technical specification and is supported by two highly skilled Product Stewardship Managers, one of which is a REACH Specialist. We conduct Product Stewardship reviews as part of new product development and routinely evaluate product safety risk for raw materials, intermediates, and products.

As a chemical company, we are subject to extensive and evolving regulations regarding the manufacturing, processing, distribution, importing, exporting, and labeling of our products and their raw materials. In the European Union, the REACH regulations came into effect in 2007, with implementation rolling out over time. Registered chemicals then can be subject to further evaluation and potential restrictions. Our high-volume chemicals have been registered under REACH; lower-volume chemicals (mainly catalysts) were registered by the applicable 2018 deadline. To date, no further testing has been required.

Since the promulgation of REACH, other countries have enacted or are in the process of implementing similar comprehensive chemical regulations. These programs include the Korea REACH law, which is requiring registration and potential testing of chemicals, and similar programs under development in the UK, Taiwan, Turkey, India, and elsewhere. In the US, all pertinent chemicals have been designated as “active” under the US EPA Frank R. Lautenberg Chemical Safety for the 21st Century Act. At this time, none have been designated as chemicals which the EPA will prioritize and evaluate for regulation. Based on our chemicals and the various regulations promulgated to date, we do not anticipate costly testing requirements nor severe restrictions, but cannot guarantee that we will not be subject to requirements for our products or raw materials that could materially affect our operations. In particular, some of our products might be characterized as nanomaterials and then be subject to evolving, new nanomaterial regulations.

We remain alert for any regulatory changes which may impact our products and their end uses. In the EU, we are actively working with other industry partners to challenge the recent draft proposal concerning potential listing of silica on Annex II of the regulation on cosmetic products (substances prohibited in cosmetic products).

Available Information

Our website address is www.pqcorp.com. We make available free of charge through our website our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities and Exchange Act of 1934, as amended ("Exchange Act"), as well as reports on Forms 3, 4 and 5 filed pursuant to Section 16 of the Exchange Act, as soon as reasonably practicable after such documents are electronically filed with, or furnished to, the Securities and Exchange Commission ("SEC"). The SEC maintains an Internet website, *http://www.sec.gov,* which contains reports, proxy and information statements, and other information regarding our Company and other issuers that file electronically with the SEC. The information on our website is not, and shall not be deemed to be, a part of this report or incorporated into any other filings we make with the SEC.

Our Corporate Governance Guidelines, Code of Business Conduct and the charters of the Audit Committee, Compensation Committee, Nominating and Corporate Governance Committee and Health, Safety and Environment Committee of our Board of Directors are also available on our website and are available in print to any shareholder upon request by writing to PQ Investor Relations, 300 Lindenwood Drive, Malvern, PA 19355. In accordance with SEC rules, we intend to disclose any amendment (other than any technical, administrative or other non-substantive) to the Code of Business Conduct, or any waiver of any provision thereof with respect to any of our executive officers, on our website within four business days following such amendment or waiver.

ITEM 1A. RISK FACTORS.

In addition to the other information contained in this Form 10-K, you should carefully consider the following risks that we believe are the material risks that we face. The risks described below could have a material adverse impact on our business, financial condition, cash flows and results of operations, and should be read together and in conjunction with the forward-looking statements and "Management's Discussion and Analysis of Financial Condition and Results of Operations" included in Item 7 of this Form 10-K, and our consolidated financial statements and the accompanying notes thereto.

Risks Related to Our Business Operations

As a global business, we are exposed to local business risks in different countries, which could have a material adverse effect on our financial condition, results of operations and cash flows.

We have significant operations in many countries, including manufacturing sites, research and development facilities, sales personnel and customer support operations. As of December 31, 2020, we operated 40 manufacturing facilities across five continents. For the year ended December 31, 2020, our foreign subsidiaries accounted for 40% of our sales. Our operations are affected directly and indirectly by global regulatory, economic and political conditions, including:

- new and different legal and regulatory requirements in local jurisdictions;
- export duties or import quotas;
- domestic and foreign customs and tariffs or other trade barriers, including the threat of escalating trade disputes that may result in higher tariffs;
- potential difficulties in staffing and labor disputes;
- potential difficulties in managing and obtaining support and distribution for local operations;
- increased costs of, and availability of, raw materials, energy, transportation or shipping;
- credit risk and financial condition of local customers and distributors;
- potential difficulties in protecting intellectual property rights;
- risk of nationalization of private enterprises by foreign governments;
- potential imposition of restrictions on investments;
- the imposition of withholding taxes or other taxes or royalties on our income, or the adoption of other restrictions on foreign trade or investment, including currency exchange controls;

- capital controls;
- potential difficulties in obtaining and enforcing legal judgments in jurisdictions outside the United States;
- potential difficulties in obtaining and enforcing relief in the United States against parties located outside the United States;
- potential difficulties in enforcing agreements and collecting receivables;
- risks relating to environmental, health and safety matters;
- risks relating to epidemics and pandemics, including effects caused by the spread of COVID-19 (coronavirus) and variants thereof; and
- local political, economic and social conditions, including the possibility of hyperinflationary conditions and political instability in certain countries.

We may not be successful in developing and implementing policies and strategies to address the foregoing factors in a timely and effective manner at each location where we do business. Consequently, the occurrence of one or more of the foregoing factors could have a material adverse effect on our international operations or upon our financial condition, results of operations and cash flows.

Our operations and financial results have been and may continue to be adversely affected by general economic conditions.

We sell performance chemicals, catalysts and services that are used in manufacturing processes and as components of, or ingredients in, other products and, as a result, our sales are correlated with and affected by fluctuations in the level of industrial production and manufacturing output and by fluctuations in general economic activity. Producers of performance chemicals, in particular, are likely to reduce their output in periods of significant contraction in industrial and consumer demand, while demand for the products we manufacture often depends on trends in demand in the end uses our customers serve. General economic conditions and macroeconomic trends, including economic recessions and inflation, could affect overall demand for our products and any overall decline in such demand could significantly reduce our sales and profitability. In addition, volatility and disruption in financial markets could adversely affect our sales and results of operations by limiting our customers' ability to obtain the financing necessary to maintain or expand their own operations. For example, the ongoing COVID-19 pandemic and the associated economic downturn affected our financial results during 2020, and the prolonged continuation of the COVID-19 pandemic could result in a sustained or further economic downturn that may continue to affect our operations and financial results.

Exchange rate fluctuations could adversely affect our financial condition, results of operations and cash flows.

As a result of our international operations, for the year ended December 31, 2020, we generated 40% of our sales and incurred a significant portion of our expenses in currencies other than U.S. dollars. We incur currency transaction risk whenever we enter into either a purchase or sale transaction using a currency other than the local currency of the transacting entity. The main currencies to which we are exposed, besides the U.S. dollar, are the Euro, British pound, Canadian dollar, Mexican peso and the Brazilian real. The exchange rates between these currencies and the U.S. dollar have fluctuated significantly in recent years and may continue to do so in the future. In many cases, we sell exclusively in those jurisdictions and do not have the ability to mitigate our exposure to currency fluctuations through our operations. Accordingly, to the extent that we are unable to match sales made in such foreign currencies with costs paid in the same currency, exchange rate fluctuations could adversely affect our financial condition, results of operations and cash flows. In the past, we have experienced economic loss and a negative impact on earnings as a result of foreign currency exchange rate fluctuations and any future fluctuations may have similar or greater impacts. We expect that the amount of our sales denominated in non-U.S. dollar currencies may increase in future periods. Given the volatility of exchange rates, there can be no assurance that we will be able to effectively manage our currency transaction risks or that any volatility in currency exchange rates will not have a material adverse effect on our financial condition or results of operations. See "Management's Discussion and Analysis of Financial Condition and Results of Operations—Quantitative and Qualitative Disclosures about Market Risk."

Additionally, because our consolidated financial results are reported in U.S dollars, the translation of sales or earnings generated in other currencies into U.S. dollars can result in a significant increase or decrease in the amount of those sales or earnings in our financial statements, which also affects the comparability of our results of operations and cash flows between financial periods.

Our international operations require us to comply with anti-corruption laws, trade and export controls and regulations of the U.S. government and various international jurisdictions in which we do business.

Doing business on a worldwide basis requires us and our subsidiaries to comply with the laws and regulations of the U.S. government and various international jurisdictions, and our failure to successfully comply with these laws and regulations may restrict our operations, trade practices, investment decisions and partnering activities and may expose us to liabilities. Such laws and regulations apply to companies, individual directors, officers, employees and agents.

In particular, our international operations are subject to U.S. and foreign anti-corruption laws and regulations, such as the Foreign Corrupt Practices Act ("FCPA") and the U.K. Bribery Act ("UKBA"). The FCPA prohibits us from providing anything of value to foreign officials for the purposes of influencing official decisions or obtaining or retaining business or otherwise obtaining favorable treatment, and requires us to maintain adequate record-keeping and internal accounting practices to accurately reflect our transactions. As part of our business, we may deal with state-owned business enterprises, the employees and representatives of which may be considered foreign officials for purposes of the FCPA and UKBA. In addition, some of the international locations in which we operate lack a developed legal system and have elevated levels of corruption. As a result of our international operations, we are exposed to the risk of violating anti-corruption laws.

In addition, we are subject to applicable export controls and economic sanctions laws and regulations imposed by the U.S. government and other countries. Changes in such laws and regulations may restrict our business practices, including cessation of business activities in sanctioned countries or regions or with sanctioned entities or individuals, and may result in modifications to compliance programs. Violations of these legal requirements are punishable by criminal fines and imprisonment, civil penalties, disgorgement of profits, injunctions, debarment from government contracts, loss of export privileges and other remedial measures.

We have established policies and procedures designed to assist us and our personnel in complying with applicable U.S. and international laws and regulations. These policies and procedures are codified in our Code of Conduct and other various policies. However, there can be no assurance that our policies and procedures will effectively prevent us from violating these laws and regulations in every transaction in which we may engage, and such a violation could subject us to governmental investigations and adversely affect our reputation, business, financial condition and results of operations.

Alternative technology or other changes in our customers' products may reduce or eliminate the need for certain of our products.

Many of the products that we sell are used in manufacturing processes and as components of or ingredients in other products and, as a result, changes in our customers' end products or processes or alternative technologies may enable our customers to reduce or eliminate consumption or use of our products. For example, the ongoing shift in customer preferences in the detergent industry from powders to liquid has resulted in lower demand for certain types of zeolites. Additionally, shifting consumer preference could result in a significant reduction in the future use of fossil fuels, which would have a negative impact on our zeolite catalysts and refining services. If we are unable to respond appropriately to such new developments, such changes could seriously impair our ability to profitably market certain of our products.

Our new product development and research and development efforts may not succeed and our competitors may develop more effective or successful products.

The industries in which we operate are subject to periodic technological changes and ongoing product improvements. In order to maintain our margins and remain competitive, we must successfully develop, manufacture and market new or improved products. As a result, we must commit substantial resources each year to new product research and development. Ongoing investments in new product research and development could result in higher costs without a proportional increase in revenues. Additionally, for any new product program, there is a risk of technical or market failure, in which case we may need to commit additional resources to the program and may not be able to develop the new products needed to maintain our competitive position. Moreover, new products may have lower margins than the products they replace or may not successfully attract end users.

We also expect competition to increase as our competitors develop and introduce new and enhanced products. As such products are introduced, our products may become obsolete or our competitors' products may be marketed more effectively. If we fail to develop new products, maintain or improve our margins with our new products or keep pace with technological developments, our business, financial condition, results of operations and cash flows will suffer.

If we are unable to pass on increases in raw material prices, including natural gas, to our customers or to retain or replace our key suppliers, our results of operations and cash flows may be negatively affected.

We purchase significant amounts of raw materials, including soda ash, industrial sand, aluminum trihydrate, sodium hydroxide (commonly known as caustic soda) and sulfur (including hydrogen sulfide), in our Performance Chemicals and Refining Services segments, and we purchase significant amounts of natural gas to supply the energy required in our production process. The cost of these raw materials represents a substantial portion of our operating expenses and our results of operations have been, and could in the future be, significantly affected by increases in the costs of such raw materials. In addition, we obtain a significant portion of our raw materials from certain key suppliers. If any of those suppliers is unable to meet its obligations under current supply agreements, we may be forced to pay higher prices to obtain the necessary raw materials. Furthermore, if any of the raw materials that we use become unavailable within the geographic area from which we currently source them, we may not be able to obtain suitable and cost-effective substitutes. Any interruption of supply or any price increase of raw materials could adversely affect our profitability.

While we attempt to match raw material price increases with corresponding product price increases, our ability to pass on increases in the cost of raw materials to our customers is, to a large extent, dependent upon our contractual arrangements and market conditions. There may be periods of time during which we are not able to recover increases in the cost of raw materials due to our contractual arrangements or weakness in demand for, or oversupply of, our products. Specifically, timing differences between price adjustments of raw materials, which may occur daily, and adjustments to our product prices, which in many cases are adjusted quarterly or less often, have had and may continue to have a negative effect on our profitability. Even in periods during which raw material prices decline, we may suffer decreasing profits if customers seek relief in the form of lower sales prices or if the raw material price reductions occur at a slower rate than decreases in the selling prices of our products. Furthermore, some of our performance chemicals customers may take advantage of fluctuating prices by building inventories when they expect product prices to increase and reducing inventories when they expect product prices to decrease. Such volatility can result in commercial disputes with customers and suppliers with respect to interpretations of complex contractual arrangements, the adverse resolution of which could reduce our profitability.

In the past, we have entered into long-term supply contracts for certain of our raw materials, including for certain of our North American soda ash purchases. As these contracts expire, we may not be able to renegotiate or enter into new long-term supply contracts that will offer similar protection from price increases and other fluctuations on terms that are satisfactory to us or at all. For example, a contract for the supply of caustic soda expired at the end of 2019 and we incurred increased costs to obtain caustic soda in 2020 because the replacement contract increased the price we paid for that raw material.

We face substantial competition in the industries in which we operate.

The industries in which we operate are highly competitive and we face significant competition from large international producers and, particularly in Europe and certain Asia-Pacific regions, smaller regional competitors. Our Catalysts segment primarily competes with other global producers in the petrochemicals and refining industries such as W.R. Grace, BASF, UOP, and Albemarle, as well as other niche competitors such as Tosoh, Axens, and Haldor Topsoe. We compete in the North American refining services industry with competitors such as Chemtrade and Veolia. Additionally, in our Performance Chemicals segment, we primarily compete with other global producers such as OxyChem, Grace and Evonik. We believe that we typically compete on the basis of performance, product consistency, quality, reliability, and ability to innovate in response to customer demands.

Our competitors may improve their competitive position in our core end use applications by successfully introducing new products, improving their manufacturing processes, expanding their capacity or manufacturing facilities or responding more effectively than we do to new or emerging technologies and changes in customer requirements. Some of our competitors may be able to lower prices for products that compete with our products if their costs are lower. In addition, consolidation among our competitors or customers may result in reduced demand for our products or make it more difficult for us to compete. Some of our competitors' financial, technological and other resources may be greater than ours or they may have less debt than we do and, as a result, may be better able to withstand changes to industry conditions. The occurrence of any of these events could materially adversely affect our financial condition and results of operations.

We are subject to the risk of loss resulting from non-payment or non-performance by our customers.

Our credit procedures and policies may not be adequate to minimize or mitigate customer credit risk. Our customers may experience financial difficulties, including bankruptcies, restructurings and liquidations. These and other financial problems our customers may experience, as well as potential financial weakness in the industries in which we operate, may increase our risk in extending trade credit to customers. A significant adverse change in a customer's financial position could cause us to limit or discontinue business with such customer, require us to assume more credit risk relating to such customer's receivables or limit our ability to collect accounts receivable from such customer, any of which could have a material adverse effect on our business, results of operations, financial condition and liquidity.

We rely on a limited number of customers for a meaningful portion of our business. A loss of one or more of these customers could adversely impact our profitability.

A loss of any significant customer, including a pipeline customer, or a decrease in the provision of products to any significant customer could have an adverse effect on our business until alternative arrangements are secured. Any alternative arrangement to replace the loss of a customer could result in increased variable costs relating to product shipment. In addition, any new customer agreement we enter into may not have terms as favorable as those contained in our current customer agreements, which could have a material adverse effect on our business, financial condition and results of operations. For the year ended December 31, 2020 our top 10 customers represented approximately 30% of our sales and no single customer represented more than 5% of our sales.

Refineries, which represent a sizable subset of our Refining Services segment, have undergone significant consolidation and additional consolidation is possible in the future. Such consolidation could further increase our reliance on a small number of customers and further increase our customers' leverage over us, resulting in downward pressure on prices and an adverse effect on our profitability.

Multi-year customer contracts in our Refining Services segment are subject to potential early termination and such contracts may not be renewed at the end of their respective terms.

Many of the customer contracts in our Refining Services segment are multi-year agreements. Sulfuric acid regeneration customer contracts are typically on five- to ten-year terms and virgin sulfuric acid customer contracts are typically on one- to five-year terms, with larger customers typically favoring longer terms. Excluding contracts with automatic evergreen provisions, approximately 40% of our sulfuric acid volume for the year ended December 31, 2020 was under contracts expiring at the end of 2021 or beyond. In addition, our sulfuric acid regeneration contracts with major refinery customers typically allow for termination with advance notice of one to two years. We cannot provide assurance that our existing contracts will not be subjected to early terminations or that our expiring contracts will be renewed at the end of their terms. If we receive a significant number of such contract terminations or experience non-renewals from key customers in our Refining Services segment, our results of operations, financial condition and cash flows may be materially adversely affected.

Our quarterly results of operations are subject to fluctuations because the demand for some of our products is seasonal.

Our Refining Services segment typically experiences seasonal fluctuations as a result of higher demand for gasoline products in the summer months. Because of the seasonality of some of our product groups, the results for any one quarter are not necessarily indicative of the results that may be achieved for any other quarter or for the full year.

Our growth projects may result in significant expenditures before generating revenues, if any, which may materially and adversely affect our ability to implement our business strategy.

We have made and continue to make significant investments in each of our businesses. These projects require us to commit significant capital to, among other things, implement engineering plans and obtain the necessary permits before we generate revenues related to our investments in these businesses. Such projects may take longer to complete or require additional unanticipated expenditures and may never generate profits. If we fail to recover our investment, or these projects never become profitable, our ability to implement our business strategy may be materially and adversely affected.

We may be liable for damages based on product liability claims brought against us or our customers for costs associated with recalls of our or our customers' products.

Even though we are generally a materials and services supplier rather than a manufacturer of finished goods, the sale of our products involves the risk of product liability claims and voluntary or government-ordered product recalls. For example, certain of the products that we manufacture provide critical performance functions to our customers' end products and are used in and around other chemical manufacturing facilities and other locations where personal injury or property damage may occur or are used in certain consumer goods such as beverages, personal care products and medicinal applications. While we attempt to protect ourselves from product liability claims and exposures through our adherence to standards and specifications and through contractual negotiations and provisions, there can be no assurance that our efforts will ultimately protect us from any such claims. A product liability claim or voluntary or government-ordered product recall could result in substantial and unexpected expenditures, affect consumer or customer confidence in our products and divert management's attention from other responsibilities. A product recall or successful product liability claim or series of claims against us in excess of our insurance coverage and for which we are not otherwise indemnified could have a material adverse effect on our business, financial condition, results of operations or cash flows. We have product liability insurance in amounts that we believe are adequate to cover this risk. However, our insurance may not provide adequate coverage against all potential liabilities. If a claim is brought against us, we might be required to pay legal and other expenses to defend the claim, as well as pay uncovered damage awards resulting from a claim brought successfully against us and these damages could be significant and have a material adverse effect on our financial condition. Furthermore, whether or not we are ultimately successful in defending any such claims, we might be required to direct significant financial and managerial resources to such defense and adverse publicity is likely to result.

We are required to comply with a wide variety of laws and regulations, and are subject to regulation by various federal, state and foreign agencies, and our failure to comply with existing and future regulatory requirements could adversely affect our financial condition, results of operations and cash flows.

We compete in industries in which we and our customers are subject to federal, state, local, international and transnational laws and regulations. Such laws and regulations are numerous and sometimes conflicting, and any future changes to such laws and regulations could adversely affect us.

In order to obtain regulatory approval for certain of our new products, we must, among other things, demonstrate to the relevant authority that the product is safe and effective for its intended uses and that we are capable of manufacturing the product in accordance with current regulations. The process of seeking approvals can be costly, time-consuming and subject to unanticipated and significant delays. Any delay in obtaining, or any failure to obtain or maintain, these approvals would adversely affect our ability to introduce new products and to generate sales from those products, and could have an adverse effect on our business, financial condition, results of operations or cash flows.

Our products, including the raw materials we handle, are subject to rigorous chemical registration and industrial hygiene regulations and investigation. There is risk that a key raw material, chemical or substance, or one of the end products of which our products are a part, may be recharacterized as having a toxicological or health-related impact on the environment, our customers or our employees. Industrial hygiene regulations are continually strengthened and if such recharacterization occurs, the relevant raw material, chemical or product may be banned or we may incur increased costs in order to comply with new requirements. Changes in industrial hygiene regulations also affect the marketability of certain of our products, and future regulatory changes may have a material adverse effect on our business.

New laws and regulations, and changes in existing laws and regulations, may become effective in the future and could prevent or inhibit the development, distribution and sale of our products, including, but not limited to, the imposition of additional compliance costs, seizures, confiscation, recall or monetary fines. For example, as discussed in more detail in "Business-Environmental Regulations" and "Business-Chemical Product Regulation," we may be materially impacted by regulatory initiatives worldwide with respect to chemical product safety such as the 2016 amendments to the U.S. Toxic Substances Control Act, the E.U. regulation "Registration, Evaluation, Authorisation and Restriction of Chemicals" ("REACH"), and/or similar regulations being enacted in other countries (e.g., China REACH; Korea REACH). Additionally, the current U.S. administration may seek to tighten current environmental standards and regulations, including, but not limited to, the Corporate Average Fuel Economy standards, which could have a material adverse effect on our sales into the fuels and emission controls industries.

We are subject to extensive environmental, health and safety regulations and face various risks associated with potential non-compliance or releases of hazardous materials.

Like other chemical companies, our operations and properties are subject to extensive and stringent federal, state, local and foreign environmental laws and regulations. U.S. federal environmental laws that affect us include the Resource Conservation and Recovery Act ("RCRA"), the Clean Air Act, the Clean Water Act and the Comprehensive Environmental Response Compensation and Liability Act ("CERCLA"). These laws govern, among other things, emissions to the air, discharges or releases of hazardous substances to land, surface, subsurface strata and water, wastewater discharges and the generation, handling, storage, transportation, treatment, disposal and remediation of hazardous materials and petroleum products. We are also subject to other federal, state, local and foreign laws and regulations regarding chemical and product safety as well as employee health and safety matters, including process safety requirements. These laws and regulations may become more stringent over time and the failure to comply with such laws and regulations can result in significant fines or penalties.

We have in the past been and currently are the subject of investigations and enforcement actions pursuant to environmental laws, including the Clean Air Act. Some of these matters were resolved through the payment of significant monetary penalties and a requirement to implement corrective actions at our facilities. For instance, we remain subject to a 2007 Consent Decree that resolves certain alleged Clean Air Act violations at our seven refining services operating locations involving New Source Review, Prevention of Significant Deterioration and New Source Performance Standard obligations under the U.S. federal rules for the pollutants sulfur dioxide and sulfuric acid mist. The Consent Decree required Solvay (the owner at the time) to pay a $2 million penalty and spend approximately $34 million on air pollution controls at our facilities, the majority of which was received from customers in contractual arrangements. Work under the Consent Decree has proceeded since 2007, and we believe that all of the significant capital improvements related to the Consent Decree have been completed. One of our operating locations has been released from the scope of the Consent Decree and we are seeking release of the other locations covered by the Consent Decree.

We are required by these environmental laws and regulations to obtain registrations, licenses, permits and other approvals in order to operate, to make disclosures to public authorities about our chemical handling and usage activities and to install expensive pollution control and spill containment equipment at our facilities, or to incur other capital expenditures aimed at achieving or maintaining compliance with such laws and regulations. We are in the process of implementing a substantial environmentally-driven capital improvement project over the next three years and failure to complete this project or to timely identify and implement other capital projects required to achieve or maintain compliance could expose us to enforcement and penalty.

Under CERCLA and analogous statutes in local and foreign jurisdictions, current and former owners and operators of land impacted by releases of hazardous substances are strictly liable for the investigation and remediation of the contamination resulting from the release. Liability under CERCLA and analogous laws is strict, unlimited, joint, several and retroactive, may be imposed regardless of fault and may relate to historical activities or contamination not caused by the affected property's current owner or operator. We could be held responsible for all cleanup costs at a site, whether currently or formerly owned or operated, regardless of fault, knowledge, timing or cause of the contamination. Further, under CERCLA and analogous laws, we may be jointly and severally liable for contamination at third party sites where we or our predecessors in interest have sent waste for treatment or disposal, even if we complied with applicable laws. In addition, we may face liability for personal injury, property damage and natural resource damage resulting from environmental conditions attributable to hazardous substance releases at or from facilities we currently own or operate or formerly owned or operated or to which we sent waste. As such, a product spill or emission at one of our facilities or otherwise resulting from our operations could have adverse consequences on the environment and surrounding community and could result in significant liabilities with respect to investigation and remediation.

Our facilities have an extended history of industrial use, and soil and groundwater contamination exists at some of our sites. As of December 31, 2020, we had current investigation, remediation or monitoring obligations at several of our current or former sites, including Rahway, New Jersey; Dominguez, California; Martinez, California; and Tacoma, Washington. As of December 31, 2020, we had established reserves of approximately $2.7 million to cover anticipated expenses at these sites, all of which have reached relatively mature stages of either the investigation, remediation or monitoring process. Actual costs to complete these projects may exceed our current estimates. In addition, we have unresolved liability at several sites to which we or our predecessors allegedly arranged for the disposal or treatment of hazardous wastes. For example, at the Boyertown Sanitary Disposal site in Gilbertsville, Pennsylvania, we are participating in a group of parties who disposed of materials at the site to fund investigatory and remedial work.

As of December 31, 2020, our total reserves associated with environmental remediation and enforcement matters were $4.1 million. In addition to the ongoing remediation and monitoring activities discussed above, there is risk that the long-term industrial use at our facilities may have resulted in, or may in the future result in, contamination that has yet to be discovered, which could require additional, unplanned investigation and remediation efforts by us for which no reserves have been established, potentially without regard to whether we knew of, or caused, the release of such contaminants. Discovery of additional or unknown conditions at our facilities could have an adverse impact on our business by substantially increasing our capital expenditures, including compliance, investigation and remediation costs. Such environmental liabilities attached to our properties, or for properties that we are otherwise responsible for, could have a material adverse effect on our results of operations or financial condition.

Existing and proposed regulations to address climate change by limiting greenhouse gas emissions may cause us to incur significant additional operating and capital expenses and may impact our business and results of operations.

Certain of our operations result in emissions of greenhouse gases ("GHGs"), such as carbon dioxide. Growing concern about the sources and impacts of global climate change has led to a number of domestic and foreign legislative and administrative measures, both proposed and enacted, to monitor, regulate and limit carbon dioxide and other GHG emissions. In the European Union, our emissions are regulated under the E.U. Emissions Trading System (the "E.U. ETS"), an E.U.-wide trading scheme for industrial GHG emissions. The E.U. ETS is anticipated to become progressively more stringent over time, including by reducing the number of allowances to emit GHGs that E.U. member states will allocate without charge to industrial facilities. In the United States, the EPA has promulgated federal GHG regulations under the Clean Air Act that affect certain sources. For example, the EPA has issued mandatory GHG reporting requirements, under which our Dominguez, California and Baton Rouge, Louisiana facilities currently report. Moreover, California has enacted the Global Warming Solutions Act of 2006 ("Assembly Bill 32"), a law that establishes a comprehensive program to reduce GHG emissions from all sources throughout the state and contains reporting requirements under which our Dominguez and Martinez facilities currently report. Our Dominguez facility also participates in the emissions trading market established under Assembly Bill 32. Although we believe it is likely that GHG emissions will continue to be regulated in at least some regions of the United States and in other countries (in addition to the European Union) in the future, we cannot yet predict the form such regulation will take (such as a cap-and-trade program, technology mandate, emissions tax or other regulatory mechanism) or, consequently, estimate any costs that we may be required to incur in respect of such requirements, which could, for example, require that we install emission control equipment, purchase emissions allowances, administer and manage our GHG emissions program or address other regulatory obligations. Such requirements could also adversely affect our energy supply or the costs and types of raw materials that we use for fuel. Accordingly, regulations controlling or limiting GHG emissions could have a material adverse effect on our business, financial condition or results of operations, including by reducing demand for our products.

Sustainability initiatives may result in operational changes and expenditures, reduced demand for our products and adversely affect our business.

We recognize that sustainability is a growing global environmental concern. Continuing political and social attention to the issue of sustainability has resulted in both existing and pending international agreements and national, regional or local legislation and regulatory measures to increase sustainability. As a result of heightened public awareness and attention to the issue of sustainability as well as continued regulatory initiatives, demand for certain of our products may be reduced, which may have an adverse effect on our sales volumes, revenues and margins.

Production and distribution of our products could be disrupted for a variety of reasons, and such disruptions could expose us to significant losses or liabilities.

Certain of the hazards and risks associated with our manufacturing processes and the related storage and transportation of raw materials, products and wastes may disrupt production at our manufacturing facilities and the distribution of products to our customers. These potentially disruptive risks include, but are not limited to, the following:

- pipeline and storage tank leaks and ruptures;
- explosions and fires;
- inclement weather and natural disasters;
- terrorist attacks;
- failure of mechanical, process safety and pollution control equipment;
- chemical spills and other discharges or releases of toxic or hazardous substances or gases;
- epidemics and pandemics, including effects caused by the spread of COVID-19 (coronavirus) and variants thereof; and
- exposure to toxic chemicals.

These hazards could expose employees, customers, the community and others to toxic chemicals and other hazards, contaminate the environment, damage property, result in personal injury or death, lead to an interruption or suspension of operations, damage our reputation and adversely affect the productivity and profitability of a particular manufacturing facility or our business as a whole. Such hazards could also result in the need for remediation, governmental enforcement, regulatory shutdowns, the imposition of government fines and penalties and claims brought by governmental entities or third parties. Legal claims and regulatory actions could subject us to both civil and criminal penalties, which could affect our product sales, reputation and profitability.

If disruptions at our manufacturing facilities or in our distribution channels occur, alternative options with sufficient capacity or capabilities may not be available, may cost substantially more or may require significant time to start production or distribution. Any of these scenarios could negatively affect our business and financial performance. If one of our manufacturing facilities or distribution channels is unable to produce or distribute our products for an extended period of time, our sales may be reduced by the shortfall caused by the disruption and we may not be able to meet our customers' needs, which could cause them to seek other suppliers. Furthermore, to the extent a production disruption occurs at a manufacturing facility that has been operating at or near full capacity, the resulting shortage of our product could be particularly harmful because production at the manufacturing facility may not be able to reach levels achieved prior to the disruption. Such risks are heightened in our Refining Services segment, which has operations and customers primarily located in the Gulf Coast, which is susceptible to a heightened risk of hurricanes, and Northern California, which is susceptible to a heightened risk of earthquakes. For example, in August 2017 we shut down our Houston and Baytown refining services facilities in coordination with our refinery partners in anticipation of Hurricane Harvey. The operational interruption at these facilities negatively impacted our sales in 2017 by approximately $7.7 million.

The insurance that we maintain may not fully cover all potential exposures.

We maintain property, business interruption, casualty and other types of insurance, but such insurance may not cover all risks associated with the operation of our business or our manufacturing process and the related use, storage and transportation of raw materials, products and wastes in or from our manufacturing sites or distribution centers. While we have purchased what we deem to be adequate limits of coverage and broadly worded policies, our coverage is subject to exclusions and limitations, including higher self-insured retentions or deductibles and maximum limits and liabilities covered. Notwithstanding diligent efforts to successfully procure specialty coverage for environmental liability and remediation, we may incur losses beyond the limits or outside the terms of coverage of our insurance policies, including liabilities for environmental remediation. In addition, from time to time, various types of insurance for companies in the industries in which we operate have not been available on commercially acceptable terms or, in some cases, at all. We are potentially at additional risk if one or more of our insurance carriers fail. Additionally, severe disruptions in the domestic and global financial markets could adversely impact the ratings and survival of some insurers. Future downgrades in the ratings of enough insurers could adversely impact both the availability of appropriate insurance coverage and its cost. In the future, we may not be able to obtain coverage at current levels, if at all, and our premiums may increase significantly on coverage that we maintain.

We could be subject to damages based on claims brought against us by our customers or lose customers as a result of the failure of our products to meet certain quality specifications.

Our products provide important performance attributes to our customers' products. If a product fails to perform in a manner consistent with quality specifications, or has a shorter useful life than that which was guaranteed, a customer could seek replacement of the product or damages for costs incurred as a result of the product failing to perform as guaranteed. A successful claim or series of claims against us could cause reputational harm and have a material adverse effect on our financial condition and results of operations and could result in a loss of one or more customers.

We may engage in strategic acquisitions or dispositions of certain assets or businesses that could affect our business, results of operations, financial condition and liquidity.

We may selectively pursue complementary acquisitions, such as the Business Combination, and joint ventures, such as the Zeolyst Joint Venture, each of which inherently involves a number of risks and presents financial, managerial and operational challenges, including:

- potential disruption of our ongoing business and distraction of management;
- difficulty with integration of personnel and financial and other systems;
- hiring additional management and other critical personnel; and
- increasing the scope, geographic diversity and complexity of our operations.

In addition, we may encounter unforeseen obstacles or costs in the integration of acquired businesses. For example, the presence of one or more material liabilities of an acquired company that are unknown to us at the time of acquisition may have a material adverse effect on our business. Our acquisition and joint venture strategy may not be received positively by customers, and we may not realize any anticipated benefits from acquisitions or joint ventures.

We may also opportunistically pursue dispositions of certain assets and businesses, which may involve material amounts of assets or lines of business, which could adversely affect our results of operations, financial condition and liquidity. If any such dispositions were to occur, under the terms of the agreements governing our outstanding indebtedness, we may be required to apply the proceeds of the sale to repay such indebtedness.

In addition, our strategic acquisitions and dispositions may also affect the diversity of our assets and our capital structure. As a result, our acquisitions and dispositions could affect our business, results of operations, financial condition, and liquidity. Further, all the risks associated with our acquisitions and dispositions may not be immediately known to us, and the anticipated benefits of such acquisition or disposition may not be fully realized.

On December 14, 2020, we completed the sale of our Performance Materials business to Potters Buyer, LLC, an affiliate of The Jordan Company, L.P., for a purchase price of $650.0 million, which was subject to certain adjustments for indebtedness, working capital, and cash at the closing of the transaction.

On March 1, 2021, we announced that we entered into a definitive agreement to sell our Performance Chemicals business to a partnership established by Cerberus Capital Management, L.P. and Koch Mineral & Trading LLC for a purchase price of $1.1 billion, which is subject to certain adjustments including for indebtedness, cash, working capital and transaction expenses. The transaction is expected to be completed in 2021, subject to regulatory approvals and customary closing conditions.

Our joint ventures may not operate according to their business plans if our partners fail to fulfill their obligations or differences in views among our partners results in delayed decisions or failures to agree on major issues, which may adversely affect our results of operations and force us to dedicate additional resources to these joint ventures.

We currently participate in a number of joint ventures and may enter into additional joint ventures in the future. The nature of a joint venture requires us to share control with unaffiliated third parties and we sometimes have joint and several liability with our joint venture partners. If our joint venture partners do not fulfill their obligations, or if differences in views among the joint venture participants results in delayed decisions or failures to agree on major issues, the affected joint venture may not be able to operate according to its business plan. For example, the Zeolyst Joint Venture is structured as a general partnership in which we are equal partners with Shell Catalysts & Technologies, an affiliate of Royal Dutch Shell plc. or "Shell". Accordingly, we do not control the Zeolyst Joint Venture and cannot unilaterally undertake strategies, plans, goals and operations or determine when cash distributions will be made to us. Furthermore, we are liable on a joint and several basis with Shell Catalysts & Technologies, an affiliate of Royal Dutch Shell plc. or "Shell" for all of the partnership's liabilities if it does not have sufficient assets to satisfy such liabilities. Such factors may adversely affect our results of operation and force us to dedicate additional and unexpected resources to our joint ventures.

Our failure to protect our intellectual property rights could adversely affect our future performance and growth.

Protection of our proprietary processes, methods, compounds and other technologies is important to our business. We depend upon our ability to develop and protect our intellectual property rights to distinguish our products from those of our competitors. Failure to protect our existing intellectual property rights may allow our competitors to copy our products and may result in the loss of valuable proprietary technologies or other intellectual property. Failure to protect our innovations and trademarks by securing intellectual property rights could also result in our having to pay other companies for infringing on their intellectual property rights. We rely on a combination of patent, trade secret, trademark and copyright law as well as regulatory and judicial enforcement to protect such technologies and trademarks. In addition, the laws of many foreign countries do not protect our intellectual property rights to the same extent as the laws of the United States. As of December 31, 2020, we owned 39 patented inventions in the United States, with approximately 286 patents issued in countries around the world and approximately 69 patent applications pending worldwide covering more than 11 additional inventions. Some of these patents are licensed to others. In addition, we have acquired certain rights under patents and inventions of others through licenses. Should any of these licenses granted to us by third parties terminate prior to the expiration of the licensed intellectual property, we would need to cease using the licensed intellectual property, and either develop or license alternative technologies. In such a case, there can be no assurance that alternative technologies exist or that we would be able to obtain such a license on favorable terms.

Competitors and third parties may infringe on our patents or violate our intellectual property rights. Defending and enforcing our intellectual property rights can involve litigation and can be expensive and time consuming. Such proceedings could put our patents at risk of being invalidated and confidential information may be disclosed through the discovery process; these costs and diversion of resources could harm our business.

We cannot provide any assurances that any of our pending applications will mature into issued patents, or that any patents that have issued or may issue in the future do or will include claims with a scope sufficient to provide any competitive advantage. Patents involve complex legal and factual questions and, therefore, the issuance, scope, validity and enforceability of any patent claims we have or may obtain cannot be predicted with certainty. Patents may be challenged, deemed unenforceable, invalidated or circumvented. Patents may be challenged in the courts, as well as in various administrative proceedings before the United States Patent and Trademark Office or foreign patent offices. We are currently and may in the future be a party to various adversarial patent office proceedings involving our patents or the patents of third parties. Such challenges can result in some or all of the claims of the challenged patent being invalidated, deemed unenforceable, or interpreted narrowly which, in the case of challenges to our own patents, may be adverse to our interests. Accordingly, the issuance of patents is not conclusive of the validity, scope, or enforceability of such patents. Moreover, even if valid and enforceable, competitors may be able to design around our patents or use pre-existing technologies to compete with us.

We also rely upon unpatented proprietary know-how, continuing technological innovation and other trade secrets to develop and maintain our competitive position, which may not provide us with complete protection against competitors. Misappropriation or unauthorized disclosure of our proprietary know-how could harm our competitive position or have an adverse effect on our business. While it is our policy to enter into confidentiality agreements with our employees and third parties to protect our intellectual property rights and we strive to maintain the physical security of our properties and the security of our IT systems, there can be no assurances that:

- our confidentiality agreements will not be breached;
- our security measures will not be breached;
- such agreements will provide meaningful protection for our trade secrets or proprietary know-how; or
- adequate remedies will be available in the event of an unauthorized use or disclosure of such trade secrets and know-how.

In addition, there can be no assurances that others will not obtain knowledge of these trade secrets through independent development or other access by legal means.

Measures taken by us to protect these assets and rights may not provide meaningful protection for our trade secrets or proprietary manufacturing expertise and adequate remedies may not be available in the event of an unauthorized use or disclosure of our trade secrets or manufacturing expertise. In addition, as noted above, our patents and other intellectual property rights may be challenged, invalidated, circumvented or rendered unenforceable.

Furthermore, we cannot provide assurance that any pending patent or trademark application filed by us will result in an issued patent or registered trademark or, if patents are issued to us, that those patents will provide meaningful protection against competitors or against competitive technologies. The failure of our patents or other measures to protect our processes, apparatuses, technology, trade secrets and proprietary manufacturing expertise, methods and compounds or trademarks and provide us with freedom to exclude competition could have an adverse effect on our business, financial condition, results of operations and cash flows. See "Business-Intellectual Property."

Our products may infringe the intellectual property rights of others, which may cause us to incur unexpected costs or prevent us from selling our products.

Our industry is characterized by vigilant pursuit of intellectual property rights, particularly with respect to our silica catalysts and zeolite catalysts product groups. Like us, our competitors rely on intellectual property rights to maintain profitability and competitiveness. As the number of products and competitors has increased, the likelihood of intellectual property disputes has risen. Although it is our policy and intention not to infringe valid patents of which we are aware, our processes, apparatuses, technology, proprietary manufacturing expertise, methods, compounds and products may infringe on issued patents or infringe or misappropriate other intellectual property rights of others. Accordingly, we continually monitor third-party intellectual property to confirm our freedom to operate. Nevertheless, we may be subject to legal proceedings and claims in the ordinary course of our business, including claims of alleged infringement of the patents or trademarks or infringement or misappropriation of other intellectual property rights of third parties by us or our licensees in connection with their use of our products. Intellectual property litigation is expensive and time-consuming, regardless of the merits of any claim, and could divert the attention of our management and technical personnel away from operating our business. If we were to discover that our processes, apparatuses, technology, products or trademarks infringe the valid intellectual property rights of others, we might need to obtain licenses from these parties or substantially reengineer or rebrand our products in order to avoid infringement. We may not be able to obtain the necessary licenses on acceptable terms, or at all, or be able to reengineer our products successfully or at an acceptable cost. Moreover, if we are sued for infringement and lose the suit, we could be required to pay substantial damages and/or be enjoined from using or selling the infringing products or technology or using the infringing trademark. Additionally or alternatively, we may seek to challenge third-party patents in administrative proceedings before the United States patent office or one or more foreign patent offices. Any of the foregoing could cause us to incur significant costs and prevent us from selling our products, which could have an adverse effect on our business, financial condition, results of operations and cash flows. Even if we ultimately prevail, the existence of lawsuits could prompt our customers to switch to alternative products. In addition, we have agreed, and will continue to agree, to indemnify certain customers for certain intellectual property infringement claims related to intellectual property relating to our products and the manufacture thereof. Should there be infringement claims against our licensees, we could be required to indemnify them for losses resulting from such claims or to refund amounts they have paid to us.

Disruption, failure or cyber security breaches affecting or targeting computers and infrastructure used by us or our business partners may adversely impact our business and operations.

We use computers and telecommunication systems to analyze and store financial and operating data and to communicate within our company, with outside business partners, and across international borders. These systems can be subject to technical system flaws; power loss; cyber attacks, including viruses, malware, phishing, ransomware, terrorism, and surveillance; unauthorized access; malicious software; intentional or inadvertent data privacy breaches by employees or others with authorized access; hacktivism; ransomware; physical or electronic break-ins; fires or natural disasters; supply chain attacks; and other cyber security issues. We have no assurance that our systems are appropriately redundant to withstand these events. Accordingly, such events could cause adverse effects and material disruptions to our operations or systems or those of our business partners; compromise the security, integrity, availability, and confidentiality of customer information, employee information, strategic projects, product formulas and other trade secrets, other business or personal sensitive data, including third party confidential information in our possession. Release of third party confidential information could materially harm our reputation, affect our relationships with such parties and expose us to liability. Although we have introduced many security measures, including firewalls and information technology security policies, these measures may not offer the appropriate level of security. A security breach or other compromise of our information security safeguards could expose our confidential information, including third party confidential information in our possession (such as customer information) to theft and misuse, which could in turn adversely affect our relationships with such third parties and have an adverse effect on our business, financial condition, results of operations and cash flows. In addition, a disruption, blockage, failure or a cyber breach of software or operating systems we use, or of the networks and infrastructure on which they rely, could damage critical production, distribution and/or storage assets, delay or prevent delivery to markets, and make it difficult or impossible to accurately account for production and settle transactions.

These impacts may adversely affect our relationships with such employees and third parties and may have an adverse effect on our business reputation, competitiveness, financial condition, results of operations and cash flows, including damage to our operations, employees, or other third parties, resulting in remediation costs, litigation or regulatory actions. Although we have introduced many security measures, including firewalls and information technology security policies, these measures may not offer the appropriate level of security. We routinely experience attempts by external parties to penetrate and attack our networks and systems. Although such attempts to date have not resulted in any material breaches, disruptions, financial loss, or loss of business-critical information, our systems and procedures for protecting against such attacks and mitigating such risks may prove to be insufficient in the future. As technologies evolve and these cyber security attacks become more sophisticated, we may incur significant costs to upgrade or enhance our security measures to protect against such attacks, and we may face difficulties in fully anticipating or implementing adequate preventive measures or mitigating potential harm.

Risks Related to our Financial Condition

The non-GAAP financial information included in this Form 10-K is presented for informational purposes only and may not be an indication of our financial condition or results of operations in the future.

The non-GAAP financial information included in this Form 10-K includes information that we use to evaluate our past performance, but you should not consider such information in isolation or as an alternative to measures of our performance determined under GAAP.

Because our operations are conducted through our subsidiaries and joint ventures, we are dependent on the receipt of distributions and dividends or other payments from our subsidiaries and joint ventures for cash to fund our operations and expenses, including to make future dividend payments, if any.

Our operations are conducted through our subsidiaries and joint ventures. As a result, our ability to make future dividend payments, if any, is dependent on the earnings of our subsidiaries and joint ventures and the payment of those earnings to us in the form of dividends, loans or advances and through repayment of loans or advances from us. Payments to us by our subsidiaries and joint ventures will be contingent upon our subsidiaries' or joint ventures' earnings and other business considerations and may be subject to statutory or contractual restrictions. We have not and do not currently intend to pay regular dividends on our common stock in the foreseeable future; however, we paid a special cash dividend in December 2020 and have announced an intent to pay a special cash dividend of $2.50 to $3.25 per share, subject to board approval and declaration, to be financed with the cash proceeds from our anticipated sale of our Performance Chemicals business. To the extent that we determine in the future to pay dividends on our common stock, the agreements governing our outstanding indebtedness significantly restrict the ability of our subsidiaries to pay dividends or otherwise transfer assets to us.

We may need to recognize impairment charges related to goodwill, identified intangible assets and fixed assets.

We are required to test goodwill and any other intangible asset with an indefinite life for possible impairment on the same date each year and on an interim basis if there are indicators of a possible impairment. We are also required to evaluate indefinite-lived intangible assets and fixed assets for impairment if there are indicators of a possible impairment.

There is significant judgment required in the analysis of a potential impairment of goodwill, identified intangible assets and fixed assets. If, as a result of a general economic slowdown or deterioration in one or more of the industries in which we operate or in our financial performance or future outlook, or if the estimated fair value of our long-lived assets decreases, we may determine that one or more of our long-lived assets is impaired. An impairment charge would be determined based on the estimated fair value of the assets and any such impairment charge could have a material adverse effect on our results of operations and financial position.

We performed our annual impairment test on its goodwill on October 1, 2020, and determined that an impairment existed with respect to our Performance Chemicals segment. As a result, we recorded a non cash goodwill impairment charge of $260.0 million.

We may be subject to future changes in tax legislation or exposure to additional tax liabilities that may adversely affect our results of operations.

We are subject to taxes in the U.S. as well as foreign jurisdictions where our subsidiaries are organized. Due to economic and political conditions, tax rates, tax laws and other non-tax legislation, such as economic substance regulations, our business may experience significant impacts as a result of prospective changes. Our future effective tax rates may be affected by changes in the mix of earnings in countries with differing statutory tax rates, changes in the valuation of deferred tax assets and liabilities, changes in available tax credits or tax deductions, as well as changes in tax and other non-tax laws or their interpretation. Additionally, our organization is engaged in a number of cross-border intercompany transactions, subject to local transfer pricing regimes currently in place. We believe the economics of these transactions have been clearly reported, and the appropriate local transfer pricing documentation is contemporaneously available, although tax authorities may propose and potentially sustain adjustments that could result in changes to our mix of earnings in countries with differing statutory tax rates. The Organization of Economic Cooperation and Development ("OECD"), which represents a coalition of member countries, is supporting changes to numerous long-standing tax principles through its base erosion and profit shifting ("BEPS") project. This project focuses on a number of issues, including the shifting of profits cross-border amongst affiliated entities. Given the scope of the Company's international operations and the fluid and uncertain nature of how the BEPS project might ultimately lead to future legislation, it is difficult to assess how any changes in tax laws would impact the Company's future income tax expense.

Our tax returns and other tax matters are subject to examination by local tax authorities and governmental bodies. We regularly assess the likelihood of an adverse outcome resulting from these examinations, in order to determine any resulting impact to our provision for taxes. There can be no assurance as to the outcome of these examinations. If our effective tax rates were to increase as a result of a tax examination, or if the ultimate determination of the taxes owed by us is for an amount in excess of amounts previously accrued, our operating results, cash flows and financial condition could be adversely affected.

On December 22, 2017, the Tax Cuts and Jobs Act ("TCJA") was enacted into law. The TCJA mandated significant changes to U.S. corporate taxation. Notable legislative changes include a reduction of the corporate tax rate from 35% to 21%, new additional limitations on the tax deductibility of interest, extensive changes to the regime governing the taxation of foreign earnings, immediate deductions for certain investments instead of deductions for depreciation expense over time, as well as modification or repeal of certain business deductions and credits. While our current tax accounting is complete based on existing legislative guidance relating to the TCJA, further interpretive guidance of the TCJA's provisions may result in further adjustments that could have an impact on our future results of operations, cash flows or financial positions.

We have unfunded and underfunded pension plan liabilities. We will require current and future operating cash flow to fund these shortfalls. We have no assurance that we will generate sufficient cash flow to satisfy these obligations.

We maintain defined benefit pension plans covering employees who meet age and service requirements. While some of our plans have been frozen, our net pension liability and cost is materially affected by the discount rate used to measure pension obligations, the longevity and actuarial profile of our workforce, the level of plan assets available to fund those obligations and the actual and expected long-term rate of return on plan assets. Significant changes in investment performance or a change in the portfolio mix of invested assets can result in corresponding increases and decreases in the valuation of plan assets, particularly equity securities, or in a change in the expected rate of return on plan assets. Assets available to fund the pension and other postemployment benefit obligations of our plans as of December 31, 2020 were approximately $362.7 million, or approximately $56.4 million less than the measured pension benefit obligation on a GAAP basis. In addition, any changes in the discount rate could result in a significant increase or decrease in the valuation of pension obligations, affecting the reported funded status of our pension plans as well as the net periodic pension cost in the following years. Similarly, changes in the expected return on plan assets can result in significant changes in the net periodic pension cost in the following years.

We also contribute to one multi-employer pension plan on behalf of certain of our employees in the United States pursuant to union agreements that generally provide defined benefits to employees covered by collective bargaining agreements. A total of approximately 3 employees currently participate in such multi-employer pension plan. Funding requirements for benefit obligations of multi-employer pension plans are subject to certain regulatory requirements and we may be required to make cash contributions to one of these plans to satisfy certain underfunded benefit obligations. Absent an applicable exemption, a contributor to a U.S. multi-employer plan is liable upon its withdrawal from, or the termination of, a plan for its proportionate share of the plan's underfunding, if any.

We also provide certain health care and life insurance benefits to certain of our employees and their dependents in the United States upon the retirement of such employee from us pursuant to union agreements. Costs of these other post-employment benefit plans are dependent upon numerous factors, assumptions and estimates.

Risks Related to our Indebtedness

Our substantial level of indebtedness could adversely affect our financial condition.

We have substantial indebtedness, which, as of December 31, 2020, totaled approximately $1,426.4 million. Our substantial indebtedness, combined with our other financial obligations and contractual commitments, could have important consequences, including:

- requiring us to dedicate a substantial portion of our cash flows from operations to payments on our indebtedness, thereby reducing funds available for working capital, capital expenditures, acquisitions, selling and marketing efforts, product development and other purposes;
- increasing our vulnerability to adverse economic and industry conditions, which could place us at a competitive disadvantage compared to our competitors that have relatively less indebtedness;
- limiting our flexibility in planning for, or reacting to, changes in our business and the industries in which we operate;
- increasing our exposure to rising interest rates because certain of our borrowings are at variable interest rates;
- restricting us from making investments, strategic acquisitions or causing us to make non-strategic divestitures; and

- limiting our ability to borrow additional funds, or to dispose of assets to raise funds, if needed, for working capital, capital expenditures, acquisitions, product development and other corporate purposes.

Although the terms of the agreements governing our outstanding indebtedness contain restrictions on the incurrence of additional indebtedness, such restrictions are subject to a number of important exceptions and indebtedness incurred in compliance with such restrictions could be substantial. If we and our restricted subsidiaries incur significant additional indebtedness, the related risks that we face could increase.

The terms of our indebtedness restrict our current and future operations, particularly our ability to respond to change or to take certain actions.

The indentures governing our outstanding indebtedness contain a number of restrictive covenants that impose significant operating and financial restrictions on us and may limit our ability to engage in acts that may be in our long-term best interest, including restrictions on our ability to incur additional indebtedness, make investments, acquisitions, loans and advances, sell, transfer or otherwise dispose of our assets or incur liens. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Financial Condition, Liquidity and Capital Resources—Debt.” In addition, the restrictive covenants in the agreements governing our senior secured credit facilities require us to maintain specified financial ratios and satisfy other financial condition tests. Our ability to meet these financial ratios and tests can be affected by events beyond our control.

A breach of such covenants could result in an event of default unless we obtain a waiver to avoid such default. If we are unable to obtain a waiver, such a default may allow our creditors to accelerate the related debt and may result in the acceleration of, or default under, any other debt to which a cross-acceleration or cross-default provision applies. In the event our lenders or noteholders accelerate the repayment of our borrowings, we and our subsidiaries may not have sufficient assets to repay that indebtedness.

We may be adversely affected by changes in LIBOR reporting practices or the method in which LIBOR is determined.

LIBOR, the London interbank offered rate, is the basic rate of interest used in lending between banks on the London interbank market and is widely used as a reference for setting the interest rate on loans globally. Our senior secured term loan facilities and asset-based revolving credit facility use LIBOR as a reference rate such that the interest due to our creditors under those facilities is calculated using LIBOR. As of December 31, 2020, we had approximately $1,131.4 million of debt outstanding that was indexed to LIBOR. In addition, we have entered into a LIBOR-based interest rate caps to manage our exposure to interest rate movements resulting from changes in the benchmark interest rate of LIBOR. The interest rate cap agreements extend from July 2020 through July 2022 on $500.0 million of notional variable-rate debt and from August 2020 through August 2023 on $400.0 million of notional variable-rate debt.

On July 27, 2017, the United Kingdom’s Financial Conduct Authority, which regulates LIBOR, announced that it intends to phase out LIBOR by the end of 2021. It is unclear if LIBOR will cease to exist at that time or if new methods of calculating LIBOR will be established such that it continues to exist after 2021. The U.S. Federal Reserve, in conjunction with the Alternative Reference Rates Committee, a steering committee comprised of large U.S. financial institutions, is considering replacing U.S. dollar LIBOR with a new index calculated by short-term repurchase agreements, backed by Treasury securities. The future of LIBOR at this time is uncertain and any changes in the methods by which LIBOR is determined or regulatory activity related to LIBOR’s phaseout could cause LIBOR to perform differently than in the past or cease to exist. If LIBOR ceases to exist, we may need to renegotiate our credit agreements and/or interest rate cap and cross-currency swap agreements, which may result in interest rates and/or payments that do not correlate over time with the interest rates and/or payments that would have been made on our obligations if LIBOR was available in its current form.

Risks Related to our Common Stock

CCMP and INEOS continue to have significant influence over us, which could limit your ability to influence the outcome of key transactions, including a change of control.

As of December 31, 2020, investment funds affiliated with CCMP beneficially owned approximately 45% of our outstanding common stock and INEOS beneficially owned approximately 24% of our outstanding common stock. For as long as affiliates of CCMP and INEOS continue to beneficially own a substantial percentage of the voting power of our outstanding common stock, they will continue to have significant influence over us. For example, they will be able to strongly influence or effectively control the election of all of the members of our board of directors and our business and affairs, including any determinations with respect to mergers or other business combinations, the acquisition or disposition of assets, the incurrence of additional indebtedness, the issuance of any additional shares of common stock or other equity securities, the repurchase or redemption of shares of our common stock and the payment of dividends.

Additionally, CCMP and INEOS are in the business of making investments in companies and may acquire and hold interests in businesses that compete directly or indirectly with us. CCMP and INEOS may also pursue acquisition opportunities that may be complementary to our business, and, as a result, those acquisition opportunities may not be available to us.

Our stock price could be extremely volatile and, as a result, you may not be able to resell your shares at or above the price you paid for them.

Since launching our IPO in September 2017, the price of our common stock, as reported on the New York Stock Exchange, has ranged from a low of $8.50 on March 16, 2020 to a high of $18.90 on March 9, 2021. In addition, the stock market in general has been highly volatile. As a result, the market price of our common stock is likely to be similarly volatile, and investors in our common stock may experience a decrease, which could be substantial, in the value of their stock, including decreases unrelated to our operating performance or prospects, and could lose part or all of their investment. The price of our common stock could be subject to wide fluctuations in response to a number of factors, including those described elsewhere herein and others such as:

- variations in our operating performance and the performance of our competitors;
- actual or anticipated fluctuations in our quarterly or annual operating results;
- publication of research reports by securities analysts about us, our competitors or our industry;
- our failure or the failure of our competitors to meet analysts' projections or guidance that we or our competitors may give to the market;
- additions or departures of key personnel;
- strategic decisions by us or our competitors, such as acquisitions, divestitures, spin-offs, joint ventures, strategic investments or changes in business strategy;
- the passage of legislation or other regulatory developments affecting us or our industry;
- changes in legislation, regulation and government policy as a result of the U.S. presidential and congressional elections;
- speculation in the press or investment community;
- changes in accounting principles;
- terrorist acts, acts of war or periods of widespread civil unrest;
- natural disasters and other calamities; and
- changes in general market and economic conditions.

In addition, broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance, and factors beyond our control may cause our stock price to decline rapidly and unexpectedly. We are exposed to the impact of any global or domestic economic disruption that may occur, including the economic effects of COVID-19.

In the past, securities class action litigation has often been initiated against companies following periods of volatility in their stock price. This type of litigation could result in substantial costs and divert our management's attention and resources, and could also require us to make substantial payments to satisfy judgments or to settle litigation.

Your percentage ownership in us may be diluted by future issuances of capital stock, which could reduce your influence over matters on which stockholders vote.

Our board of directors has the authority, without action or vote of our stockholders, to issue all or any part of our authorized but unissued shares of common stock, including shares issuable upon exercise of options, or shares of our authorized but unissued preferred stock. Issuances of common stock or voting preferred stock would reduce your influence over matters on which our stockholders vote and, in the case of issuances of preferred stock, would likely result in your interest in us being subject to the prior rights of holders of that preferred stock.

There may be sales of a substantial amount of our common stock by our current stockholders, and these sales could cause the price of our common stock to fall.

As of December 31, 2020, there were 136,318,557 shares of our common stock outstanding. Approximately 45% and 24% of our outstanding common stock is held by affiliates of CCMP and by INEOS, respectively.

Sales of substantial amounts of our common stock in the public market, or the perception that such sales will occur, could adversely affect the market price of our common stock and make it difficult for us to raise funds through securities offerings in the future.

Investment funds affiliated with CCMP may require us to register shares of our common stock held by them for resale under the federal securities laws, subject to reduction upon the request of the underwriter of the offering, if any. Registration of those shares would allow the investment funds affiliated with CCMP to immediately resell their shares in the public market. Any such sales or anticipation thereof could cause the market price of our common stock to decline.

In addition, we have registered shares of our common stock that are reserved for issuance under our 2016 Stock Incentive Plan and 2017 Omnibus Incentive Plan, as amended and restated.

Provisions in our charter documents and Delaware law may deter takeover efforts that may be beneficial to stockholder value.

In addition to investment funds affiliated with CCMP's and INEOS's beneficial ownership of a substantial percentage of our common stock, provisions in our certificate of incorporation and bylaws and Delaware law could make it harder for a third party to acquire us, even if doing so might be beneficial to our stockholders. These provisions include a classified board of directors and the ability of our board of directors to issue preferred stock without stockholder approval that could be used to dilute a potential hostile acquiror. Our certificate of incorporation imposes some restrictions on mergers and other business combinations between us and any holder of 15% or more of our outstanding common stock other than INEOS and investment funds affiliated with CCMP. As a result, you may lose your ability to sell your stock for a price in excess of the prevailing market price due to these protective measures, and efforts by stockholders to change the direction or management of the company may be unsuccessful.

Our certificate of incorporation designates courts in the State of Delaware as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers or employees.

Our certificate of incorporation provides that, subject to limited exceptions, the Court of Chancery of the State of Delaware is the sole and exclusive forum for:

- any derivative action or proceeding brought on our behalf;
- any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders;
- any action asserting a claim against us arising pursuant to any provision of the General Corporation Law of the State of Delaware, our certificate of incorporation or our bylaws;

- any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or bylaws; or
- any other action asserting a claim against us that is governed by the internal affairs doctrine (each, a "Covered Proceeding").

In addition, our certificate of incorporation provides that if any action the subject matter of which is a Covered Proceeding is filed in a court other than the specified Delaware courts without the approval of our board of directors (each, a "Foreign Action"), the claiming party will be deemed to have consented to (i) the personal jurisdiction of the specified Delaware courts in connection with any action brought in any such courts to enforce the exclusive forum provision described above and (ii) having service of process made upon such claiming party in any such enforcement action by service upon such claiming party's counsel in the Foreign Action as agent for such claiming party.

Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and to have consented to these provisions. These provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and employees. Alternatively, if a court were to find these provisions of our certificate of incorporation inapplicable to, or unenforceable in respect of, one or more of the specified types of actions or proceedings, we may incur additional costs associated with resolving such matters in other jurisdictions, which could adversely affect our business and financial condition.

Our certificate of incorporation contains a provision renouncing our interest and expectancy in certain corporate opportunities, which could adversely impact our business.

Each of CCMP and INEOS, and the members of our board of directors who are affiliated with CCMP and INEOS, by the terms of our certificate of incorporation, are not required to offer us any corporate opportunity of which they become aware and can take any such corporate opportunity for themselves or offer it to other companies in which they have an investment. We, by the terms of our certificate of incorporation, expressly renounce any interest or expectancy in any such corporate opportunity to the extent permitted under applicable law, even if the opportunity is one that we or our subsidiaries might reasonably have pursued or had the ability or desire to pursue if granted the opportunity to do so. Our certificate of incorporation may not be amended to eliminate our renunciation of any such corporate opportunity arising prior to the date of any such amendment.

CCMP and INEOS are in the business of making investments in companies and may from time to time acquire and hold interests in businesses that compete directly or indirectly with us. These potential conflicts of interest could have a material adverse effect on our business, financial condition, results of operations or prospects if CCMP or INEOS allocate attractive corporate opportunities to themselves or their affiliates instead of to us.

We may not pay additional dividends on our common stock and, consequentially, you may not receive any return on investment unless you sell your common stock for a price greater than that which you paid for it.

Although we paid a special cash dividend in December 2020 and have announced an intent to pay a special cash dividend of $2.50 to $3.25 per share, subject to board approval and declaration, to be financed with the cash proceeds from our anticipated sale of our Performance Chemicals business, our board of directors may decide to retain future earnings, if any, for future operations, expansion and debt repayment and may not pay any special or regular dividends for the foreseeable future. Any decision to declare and pay special or regular dividends in the future will be made at the discretion of our board of directors and will depend on, among other things, our results of operations, financial condition, cash requirements, contractual restrictions and other factors that our board of directors may deem relevant. In addition, our ability to pay dividends may be limited by covenants of any existing and future outstanding indebtedness we or our subsidiaries incur, including our credit facilities and outstanding notes. See "Because our operations are conducted through our subsidiaries and joint ventures, we are dependent on the receipt of distributions and dividends or other payments from our subsidiaries and joint ventures for cash to fund our operations and expenses, including to make future dividend payments, if any." As a result, you may not receive any return on an investment in our common stock unless you sell your common stock for a price greater than that which you paid for it.

General Risk Factors

Significant trade developments stemming from the U.S. administration, U.S. courts' or the United Kingdom's exit from the European Union could have an adverse effect on us.

The United States has in recent years renegotiated a number of trade agreements, such as the United States-Mexico-Canada Agreement ("USMCA"), imposed tariffs on goods imported from China and certain other countries, and increasingly levied sanctions and export controls on China and other countries. All of these actions have resulted in retaliatory action, including retaliatory tariffs and other restrictions by China and other countries. These changes, as well as any other changes in social, political, regulatory and economic conditions, or further changes to foreign or domestic laws and policies governing foreign trade (including export, import and sanctions), manufacturing and development and foreign direct investment in the territories and countries where we or our customers operate could adversely affect our operating results and our business.

Additionally, in June 2016, the United Kingdom held a referendum and voted in favor of leaving the European Union and, on January 31, 2020, the United Kingdom exited the European Union and the implementation period or transition period ended on December 31, 2020. This referendum and exit has created political and economic uncertainty, particularly in the United Kingdom and the European Union, and this uncertainty may last for years. Our business could be affected during this period of uncertainty, and perhaps longer, by the impact of the United Kingdom's referendum and exit. In addition, our business could be negatively affected by new trade agreements between the United Kingdom and other countries, including the United States, and by the possible imposition of trade or other regulatory barriers in the United Kingdom. These possible negative impacts, and others resulting from the United Kingdom's withdrawal from the European Union, may adversely affect our customers' businesses and our operating results.

If we lose certain key personnel or are unable to hire additional qualified personnel, we may not be able to execute our business strategy and our business could be adversely affected.

Our success depends, in part, upon the continued services of our highly skilled personnel involved in management, research, production and distribution and, in particular, upon the efforts and abilities of our key officers. Although we believe that we are adequately staffed in key positions, we may not be able to retain such personnel on acceptable terms or at all, and such personnel may seek to compete with us in the future. If we lose the service of any of our key personnel, we may not be able to hire replacements with the same level of industry experience and knowledge necessary to execute our business strategy, which in turn could have a material adverse effect on our business, financial condition, results of operations or cash flows.

We depend on good relations with our workforce, and any significant disruptions could adversely affect our operations.

As of December 31, 2020, we had 2,274 employees globally, approximately 49% of which were represented by a union, works council or other employee representative body. As of December 31, 2020, approximately 40% of our U.S. unionized employees were covered under collective bargaining agreements that will expire on or before December 31, 2020. Failure to reach agreement with any of our unionized work groups regarding the terms of their collective bargaining agreements or annual pay increases may result in a labor strike, work stoppage or slowdown. In addition, a large number of our employees are employed in countries in which employment laws provide greater bargaining or other rights to employees than the laws of the United States. Such employment rights require us to work collaboratively with the legal representatives of the employees to effect any changes to labor arrangements. For example, many of our employees in Europe are represented by works councils that must approve any changes in conditions of employment, including salaries, benefits and staff changes, and may impede efforts to restructure our workforce. Although we believe that we have a good working relationship with our employees, a strike, work stoppage or slowdown by our employees or a dispute with our employees could result in a significant disruption to our operations or higher ongoing labor costs. In addition, our ability to make adjustments to control compensation and benefit costs, or otherwise adapt to changing business needs, may be limited by the terms and duration of our collective bargaining agreements.

We are subject to certain risks related to litigation filed by or against us, as well as administrative and regulatory proceedings, and adverse results may harm our business.

We cannot predict with certainty the cost of defense, the cost of prosecution or the ultimate outcome of litigation and other administrative and regulatory proceedings filed by or against us, including remedies or damage awards, and adverse results in any litigation or other administrative and regulatory proceedings may materially harm our business. Litigation and other administrative and regulatory proceedings may include, but are not limited to, actions relating to intellectual property, commercial arrangements, environmental, health and safety matters, joint venture agreements, labor and employment matters, domestic and foreign antitrust matters or other harms resulting from the actions of individuals or entities outside of our control. In the case of intellectual property litigation and proceedings, adverse outcomes could include the cancellation, invalidation or other loss of material intellectual property rights used in our business and injunctions prohibiting our use of our processes, apparatuses, technology, trade secrets and proprietary manufacturing expertise, methods and compounds that are subject to third-party patents or other third-party intellectual property rights. Litigation based on environmental matters or exposure to hazardous substances in the workplace or from our products could result in significant liability for us. For example, we are currently subject to various asbestos premises liability claims that relate to employee or contractor exposure to asbestos contained in certain building materials at our sites. Furthermore, our international operations expose us to potential administrative and regulatory proceedings in foreign jurisdictions. Antitrust authorities in Brazil have publicly announced that they are investigating alleged cartel activities by Brazilian silicate manufacturers, including our Brazilian subsidiary ("PQ Brazil"). The authorities allege that the activities occurred over an approximately 10-year period beginning in the late 1990s, which is prior to the time we owned PQ Brazil. PQ Brazil is fully cooperating with the authorities. Adverse outcomes in any of the foregoing could have a material adverse effect on our business.

If we fail to maintain effective internal control over financial reporting and effective disclosure controls and procedures, we may not be able to accurately report our financial results in a timely manner or prevent fraud, which may adversely affect investor confidence in our company.

Pursuant to Section 404 of the Sarbanes-Oxley Act of 2002, as amended, our management is required to report on, and our independent registered public accounting firm is required to attest to, the effectiveness of our internal control over financial reporting. This assessment includes disclosure of any material weakness identified by our management in our internal control over financial reporting. In addition, we are required to comply with the SEC's rules implementing Section 302 of the Sarbanes-Oxley Act, which requires management to certify financial and other information in our quarterly and annual reports, and we are required to disclose significant changes made in our internal controls and procedures on a quarterly basis.

If we identify a material weakness in our internal control over financial reporting, we may not be able to remediate the material weakness identified in a timely manner or maintain all of the controls necessary to remain in compliance with our reporting obligations. If we are unable to assert that our internal control over financial reporting is effective, or if our independent registered public accounting firm is unable to express an unqualified opinion as to the effectiveness of our internal control over financial reporting in future periods, investors may lose confidence in the accuracy and completeness of our financial reports, the market price of our common stock could be negatively affected, and we could become subject to investigations by the New York Stock Exchange, on which our securities are listed, the SEC or other regulatory authorities, which could require additional financial and management resources.

Regulations related to conflict minerals could adversely impact our business.

The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 contains provisions to improve transparency and accountability concerning the supply of certain minerals, known as conflict minerals, originating from the Democratic Republic of Congo (the "DRC") and adjoining countries. The SEC requires annual disclosure and reporting requirements for those companies who use conflict minerals mined from the DRC and adjoining countries in their products. We incur costs associated with complying with these disclosure requirements, including for diligence to determine the sources of conflict minerals used in our products and other potential changes to products, processes or sources of supply as a consequence of such verification activities. These rules could adversely affect the sourcing, supply and pricing of materials used in our products. As there may be only a limited number of suppliers offering "conflict free" conflict minerals, we cannot be sure that we will be able to obtain necessary conflict minerals from such suppliers in sufficient quantities or at competitive prices.

ITEM 1B. UNRESOLVED STAFF COMMENTS.

None.

ITEM 2. PROPERTIES.

Our operating headquarters are located in Malvern, Pennsylvania and our primary research and development facility is in Conshohocken, Pennsylvania. As of December 31, 2020, we had 40 manufacturing facilities in 13 countries on five continents. We also had 9 administrative facilities and 4 research and development facilities located in 6 countries. Our joint ventures operated out of 5 facilities located in 2 countries, including 3 manufacturing facilities. We also own or lease other properties, including office buildings, warehouses, testing facilities and sales offices.

The table below presents summary information regarding our principal manufacturing facilities as of December 31, 2020.

Location	Owned or leased	Segment[(1)]
Rio Claro, Brazil	Owned	PC, CAT
Pasuruan, Indonesia	Owned	PC, CAT
Tlalnepantla, Mexico	Owned	PC
Eijsden, Netherlands	Owned/Leased[(2)]	PC
Warrington, United Kingdom	Owned	CAT, PC
Baton Rouge, Louisiana, United States	Owned	RS
Baytown, Texas, United States	Owned	RS
Dominguez, California, United States	Owned	RS
Hammond, Indiana, United States	Owned	RS
Houston, Texas, United States	Owned	RS
Kansas City, Kansas, United States	Owned[(3)]	CAT
Martinez, California, United States	Owned	RS
Portland, Oregon, United States	Owned	RS

(1) RS: Refining Services; CAT: Catalysts; PC: Performance Chemicals.

(2) Approximately 26,902 square feet is owned and approximately 1,767 square feet is leased.

(3) We lease a portion of the site to our Zeolyst Joint Venture.

ITEM 3. LEGAL PROCEEDINGS.

From time to time we may be subject to various legal claims and proceedings incidental to the normal conduct of business, relating to such matters as personal injury, product liability and warranty claims, waste disposal practices, release of chemicals into the environment and other matters that may arise in the ordinary course of our business. We currently believe that there is no litigation pending that is likely to have a material adverse effect on our business. Regardless of the outcome, legal proceedings can have an adverse impact on us because of defense and settlement costs, diversion of management resources and other factors.

ITEM 4. MINE SAFETY DISCLOSURES.

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES.

Market Information, Holders and Dividends

Our common stock began trading on the New York Stock Exchange ("NYSE") under the symbol "PQG" on September 29, 2017. As of March 12, 2021, there were 80 shareholders of record of our common stock. A substantially greater number of holders of our common stock hold their shares in "street name" through banks, brokers and other financial institutions.

On December 14, 2020, we announced that our board of directors had declared a special cash dividend of $1.80 per share, using after tax cash proceeds and cash on hand from the sale of the Performance Materials business. The dividend was paid to our stockholders of record at the close of business on December 21, 2020.

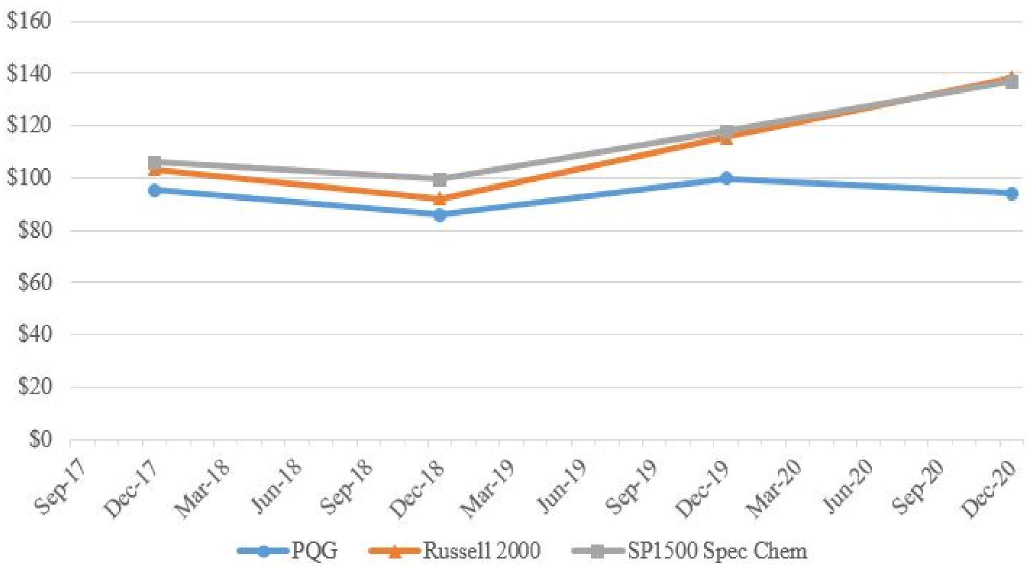
We have announced an intent to pay a special cash dividend of $2.50 to $3.25 per share, subject to board approval and declaration, to be financed with the cash proceeds from our anticipated sale of our Performance Chemicals business upon the anticipated close in 2021.

We have not and do not currently intend to pay regular dividends on our common stock in the foreseeable future. The declaration and payment of any future dividends by our Board of Directors is subject to compliance with the covenants contained in the agreements governing our credit facilities, the indentures governing our outstanding notes, applicable law and other considerations. See Note 17 to our consolidated financial statements included in this Form 10-K for details regarding covenant restrictions on the payment of dividends under our debt agreements.

Stock Performance Graph

The graph below shows the cumulative total shareholder return of our common stock for the period from September 29, 2017 to December 31, 2020 as compared to the cumulative total return of the Russell 2000 Total Return Index and the S&P 1500 Specialty Chemicals Index, assuming an investment of $100 made at the respective closing prices on September 29, 2017. The information contained in the graph below is furnished and therefore not to be considered "filed" with the SEC, and is not incorporated by reference into any document that incorporates this Form 10-K by reference.

Comparison of Cumulative Total Return as of December 31, 2020
Assumes Initial Investment of $100 on September 29, 2017



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	9/29/2017		12/31/2017		12/31/2018		12/31/2019		12/31/2020	
PQG	$	100	$	95	$	86	$	100	$	94
Russell 2000		100		103		92		112		138
SP 1500 Spec Chem		100		106		99		114		137

Issuer Purchases of Equity Securities

Tax Withholdings

The following table contains information about shares of common stock delivered to the Company by employees to satisfy withholding tax obligations of the employees in connection with the vesting of restricted stock awards and restricted stock units during the fourth quarter of 2020.

	Total Number of Shares of Common Stock Purchased	Average Price Paid per Share of Common Stock		Total Number of Shares of Common Stock Purchased as Part of Publicly Announced Plan or Programs	Maximum Number (or Dollar Value) of Shares of Common Stock that May Yet Be Purchased Under the Plans or Programs
October 2020	52,733	$	10.38	N/A	N/A
November 2020	—	$	—	N/A	N/A
December 2020	—	$	—	N/A	N/A
Total	52,733				

ITEM 6. [Removed and Reserved]

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS.

Overview

We are a global provider of specialty catalysts, chemicals and services with leading supply positions across our portfolio. We compete in the global specialty chemicals and materials industry where we seek to focus on attractive, high-growth applications. Our products and services provide critical performance to our customers' products and we are able to offer many of our customers regionally sourced materials to reduce costs and improve delivery logistics. We provide our customers with a combination of product technology and applications knowledge, global supply chain capabilities, and local production and logistical support.

We conduct operations through three reporting segments: (1) Refining Services, (2) Catalysts (including our 50% interest in the Zeolyst Joint Venture) and (3) Performance Chemicals.

Refining Services: We are the leading provider of sulfuric acid recycling services to North American refineries for the production of alkylate, an essential gasoline component for lowering vapor pressure and increasing octane to meet stringent gasoline specifications and fuel efficiency standards. We are also a leading North American producer of on-purpose virgin sulfuric acid for water treatment, mining, and industrial applications.

Catalysts: We are a global supplier of finished silica catalysts and catalyst supports necessary to produce high strength and high stiffness plastics used in packaging films, bottles, containers, and other molded applications. We are also a leading global supplier of zeolites used for catalysts that remove nitrogen oxides from diesel engine emissions as well as sulfur from fuels during the refining process.

Performance Chemicals: We are a leading global supplier of silicate and derivative products which serve as an environmentally friendly substitute for materials used in a variety of applications. These include end uses such as matting agents in surface coatings, clarifying agents for edible oils and beverages, additives for paints and coatings, and in cosmetics to improve feel attributes.

In 2020, we served over 2,000 customers globally across many end uses and, as of December 31, 2020, operated out of 40 manufacturing facilities, which are strategically located across five continents.

On December 14, 2020, we completed the sale of our Performance Materials business to Potters Buyer, LLC (the "Purchaser"), an affiliate of The Jordan Company, L.P., for a purchase price of $650 million, which was subject to certain adjustments for indebtedness, working capital and cash at the closing of the transaction. The results of operations, financial condition, and cash flows for the Performance Materials businesses are presented herein as discontinued operations. Refer to Note 4 to our Consolidated Financial Statements for additional information.

Recent Developments

On March 1, 2021, we announced that we entered into a definitive agreement to sell our Performance Chemicals business for a purchase price of $1.1 billion. We expect to use after-tax cash proceeds from the sale to reduce debt and return capital to our shareholders, subject to board approval and declaration. The transaction is expected to close by the end of 2021, subject to regulatory approvals and customary closing conditions. Beginning in the first quarter of 2021, we expect to present the financial results of the Performance Chemicals business as discontinued operations.

Impact of COVID-19 on our Business and Results

In March 2020, the outbreak of COVID-19 was declared a national emergency by the United States. COVID-19 continues to spread throughout the world and has adversely impacted economic activity and contributed to volatility in financial markets. In response to the COVID-19 pandemic, the federal government, various states, local and foreign governments have issued decrees and orders that have disrupted many businesses and implemented social distancing, travel and other restrictions. In response to these restrictions, we have taken a variety of actions, including an international travel ban, distribution of personal protective equipment to employees, and work-at-home requirements for many of our employees who are not an integral part of our manufacturing operations. We have also implemented and refined our existing business continuity plans in an effort to minimize disruptions to our operations. These measures remain in place as of December 31, 2020.

Recent and Near Term Trends on Business Segment End Uses

The COVID-19 pandemic led to unprecedented disruptions within the macro economy, with lower sales volume demand during 2020, including the fourth quarter. The timing and magnitude of the impact to sales volume demand varied across our portfolio of businesses due to the many end uses.

Most of PQ's end use customers experienced improved demand during the fourth quarter, largely driven by a recovery of consumer products ranging from packaged products to automotive sales. The construction and mining segments also demonstrated improving demand. The company continues to match costs and production with the pattern and pace of demand recovery, which remains variable across end use subsectors.

During the year ended December 31, 2020 we took actions to mitigate the slowdown in our business as a result of the effects of COVID-19, including adjusting our production levels to meet anticipated customer demand, reducing discretionary spending, furloughs, delaying headcount additions and deferring capital maintenance expenditures.

Key end use trends in our business segments during the year and expectations are described below:

- Refining Services: This business segment was impacted the quickest by COVID-19, but began to see a significant rebound in demand through the fourth quarter of 2020. Stay-at-home mandates during the first and second quarters led to rapid and significant reductions in gasoline demand in the U.S. As stay-at-home restrictions were lifted near the end of the second quarter, gasoline consumption recovered to approximately 90% of 2019 levels during the third and fourth quarters. Apart from weather events, we expect refinery utilization to continue to improve through 2021. Once demand is restored to 2019 levels, PQ believes alkylate production will continue to grow, driven by higher octane fuel blending. Virgin sulfuric acid demand from industrial and mining customers began to rebound during the third quarter and reached 2019 demand levels by year end. We expect demand for virgin sulfuric acid to grow in 2021.
- Catalysts: We experienced strong demand for hydrocracking catalysts, which we sold through our Zeolyst Joint Venture during the first half of the year. During the second half of 2020, some customers deferred catalyst bed change-outs due to lower refinery utilization rates. We expect a rebound in the second half of 2021 with demand for hydrocracking catalysts improving as the year progresses. Demand for our emission control catalysts used in heavy-duty diesel vehicles decreased during the second and third quarters as our customers temporarily curtailed their production to align with lower demand. Demand for emission control catalysts began to improve near year end and the improvement is continuing into 2021. Polyethene catalyst demand remains strong due to increased consumer consumption of films and packaging. Demand for catalysts used to make polyethylene improved in 2020 and we expect it to continue to improve in 2021. Overall, we expect the strong polyolefin catalyst demand and recovering emission catalyst demand to be more than offset by lower refinery catalyst demand during the first half of 2021. During the second half of the year we also expect to see improvement in refinery catalyst demand.
- Performance Chemicals: We experienced lower demand for sodium silicate used in industrial applications and chemical manufacturing beginning in the second quarter of 2020. By year end, we experienced recovery of demand across multiple end uses including automotive, coatings and fuel efficient tires. Consumption for our products sold to the personal care and consumer cleaning experienced steady demand during the pandemic.

Operations and Supply

Throughout the COVID-19 pandemic, our manufacturing facilities have continued to operate and have been providing critical materials necessary to aid in combating the COVID-19 pandemic and products we manufacture for other essential businesses. Our manufacturing plants require a limited number of on-site employees in order to continue to operate effectively. We have not experienced any material production issues to date, but have had limited and temporary shutdowns or slowdowns in some of our facilities. We have also seen limited disruptions in the availability of certain of our raw materials and other supplies, which to date have not had a material impact on production.

Coronavirus Aid, Relief and Economic Security ("CARES") Act

On March 27, 2020, the CARES Act was signed into law. The provisions of the CARES Act provide substantial stimulus and financial assistance measures intended to mitigate the impact of the COVID-19 pandemic, including certain tax relief provisions. As permitted within the CARES Act, we began deferring payment of the employer portion of social security taxes in the second quarter and continued to defer through the end of 2020, with 50% of the deferred amount due December 31, 2021 and the remaining 50% due December 31, 2022. This deferral provided approximately $4.5 million in additional liquidity in 2020.

The impact of the COVID-19 outbreak and associated containment and remediation efforts is rapidly evolving. We expect the duration and magnitude of the virus's impact on the levels of economic activity in the United States and globally to affect the magnitude of its impact on our results of operations, which could be material.

Basis of Presentation

Our zeolite catalysts product group operates through the Zeolyst Joint Venture, which we account for as an equity method investment in accordance with GAAP. We do not record sales by the Zeolyst Joint Venture as revenue and such sales are not consolidated within our results of operations. However, Adjusted EBITDA reflects our share of the earnings of the Zeolyst Joint Venture that have been recorded as equity in net income from affiliated companies in our consolidated statements of income and includes Zeolyst Joint Venture adjustments on a proportionate basis based on our 50% ownership interest.

Key Performance Indicators

Adjusted EBITDA and Adjusted Net Income

Adjusted EBITDA and adjusted net income are financial measures that are not prepared in accordance with GAAP and that we use to evaluate our operating performance, for business planning purposes and to measure our performance relative to that of our competitors. Adjusted EBITDA and adjusted net income are presented as key performance indicators as we believe these financial measures will enhance a prospective investor's understanding of our results of operations and financial condition. EBITDA consists of net income (loss) attributable to continuing operations before interest, taxes, depreciation and amortization. Adjusted EBITDA consists of EBITDA adjusted for (i) non-operating income or expense, (ii) the impact of certain non-cash, nonrecurring or other items included in net income (loss) and EBITDA that we do not consider indicative of our ongoing operating performance, and (iii) depreciation, amortization and interest of our 50% share of the Zeolyst Joint Venture. Adjusted net income consists of net income (loss) attributable to PQ Group Holdings adjusted for (i) non-operating income or expense and (ii) the impact of certain non-cash, nonrecurring or other items included in net income (loss) that we do not consider indicative of our ongoing operating performance. We believe that these non-GAAP financial measures provide investors with useful financial metrics to assess our operating performance from period-to-period by excluding certain items that we believe are not representative of our core business.

You should not consider adjusted EBITDA or adjusted net income in isolation or as alternatives to the presentation of our financial results in accordance with GAAP. The presentation of adjusted EBITDA and adjusted net income financial measures may differ from similar measures reported by other companies and may not be comparable to other similarly titled measures. In evaluating adjusted EBITDA and adjusted net income, you should be aware that we are likely to incur expenses similar to those eliminated in this presentation in the future and that certain of these items could be considered recurring in nature. Our presentation of adjusted EBITDA and adjusted net income should not be construed as an inference that our future results will be unaffected by unusual or nonrecurring items. Reconciliations of adjusted EBITDA and adjusted net income to GAAP net income (loss) are included in the results of operations discussion that follows for each of the respective periods.

Key Factors and Trends Affecting Operating Results and Financial Condition

Sales

Our Refining Services and Catalysts segments' sales have grown primarily due to expansion into new end applications, including emission control catalysts, polymer catalysts, and refining catalysts, as well as continued supply share gains. Sales in our Refining Services and Catalysts segments are made on both a purchase order basis and pursuant to long-term contracts.

Historically, our Performance Chemicals segment has experienced relatively stable demand throughout economic cycles, due to the diverse consumer and industrial end uses that our products serve. Expansions into new applications, including personal care and consumer cleaning, as well as share gains in existing end uses, have added to our sales growth. Product sales from our Performance Chemicals segment are made on both a purchase order basis and pursuant to long-term contracts.

Cost of Goods Sold

Cost of goods sold consists of variable product costs, fixed manufacturing expenses, depreciation expense and freight expenses. Variable product costs include all raw materials, energy and packaging costs that are directly related to the manufacturing process. Fixed manufacturing expenses include all plant employment costs, manufacturing overhead and periodic maintenance costs. The primary raw materials for our Refining Services segment include spent sulfuric acid, sulfur, sodium silicates, acids, bases, and certain metals. The primary raw materials used in the manufacture of products in our Performance Chemicals and Catalysts segments include soda ash, industrial sand, aluminum trihydrate and sodium hydroxide (also known as "caustic soda").

Most of our Refining Services contracts feature take-or-pay volume protection and/or quarterly price adjustments for commodity inputs, labor, the Chemical Engineering Index (U.S. chemical plant construction cost index) and natural gas. Spent acid for our Refining Services segment is supplied by customers for a nominal charge as part of their contracts. Over 80% of our Refining Services segment sales for the year ended December 31, 2020 were under contracts featuring quarterly price adjustments. The price adjustments generally reflect actual costs for producing acid and tend to protect us from volatility in labor, fixed costs and raw material pricing.

For the year ended December 31, 2020, approximately 50% of our North American silicate sales, which is a significant portion of our Performance Chemicals segment sales, were derived from contracts that included raw material pass-through clauses. Under these contracts, there generally is a time lag of three to nine months for price changes to pass through, depending on the magnitude of the change in cost and other market dynamics. Freight expenses are generally passed through directly to customers.

While natural gas is not a direct feedstock for any product, all businesses use natural gas powered furnaces to heat raw materials and create the chemical reactions necessary to produce end-products. We maintain multiple suppliers wherever possible, hedge exposure to fluctuations in prices for natural gas purchases in the United States, make forward purchases of natural gas in the United States, Canada, and Europe to mitigate our exposure to price volatility, and structure our customer contracts when possible to allow for the pass-through of raw material and natural gas costs.

Joint Ventures

We account for our investments in our equity joint ventures under the equity method. Our largest joint venture, the Zeolyst Joint Venture, manufactures high performance, specialty, zeolite-based catalysts for use in the emission control industry, the petrochemical industry and other areas of the broader chemicals industry. We share proportionally in the management of our joint ventures with the other parties to each such joint venture.

Seasonality

Our Refining Services segment typically experiences seasonal fluctuations as a result of higher demand for gasoline products in the summer and lower demand in the winter months. These demand fluctuations results in higher sales and working capital requirements in the second and third quarter.

Foreign Currency

As a global business, we are subject to the impact of gains and losses on currency translations, which occur when the financial statements of foreign operations are translated into U.S. dollars. We operate a geographically diverse business with approximately 40% of our sales for the years ended December 31, 2020 and 2019 in currencies other than the U.S. dollar. Because our consolidated financial results are reported in U.S. dollars, sales or earnings generated in currencies other than the U.S. dollar can result in a significant increase or decrease in the amount of those sales and earnings when translated to U.S. dollars. The foreign currencies to which we have the most significant exchange rate exposure include the Euro, British pound, Canadian dollar, Brazilian real and the Mexican peso.

Results of Operations

Year Ended December 31, 2020 Compared to the Year Ended December 31, 2019

Highlights

The following is a summary of our financial performance for the year ended December 31, 2020 compared with the year ended December 31, 2019.

Sales

- Sales decreased $92.5 million to $1,107.4 million. The decrease in sales was primarily due to lower sales volumes, the unfavorable effects of foreign currency translation, and pass-through of lower sulfur pricing.

Gross Profit

- Gross profit decreased $25.0 million to $273.4 million. The decrease in gross profit was primarily due to lower sales volumes and the unfavorable effects of foreign currency translation, partly offset by favorable fixed manufacturing costs.

Operating (Loss) Income

- Operating (loss) income decreased $310.4 million to $162.9 million. The decrease in operating (loss) income was primarily due to a goodwill impairment charge of $260.0 million related to our Performance Chemicals segment, a decrease in gross profit and an increase in transaction-related charges for the year ended December 31, 2020.

Equity in Net Income from Affiliated Companies

- Equity in net income of affiliated companies for the year ended December 31, 2020 was $21.2 million, compared with net income of $46.0 million for the year ended December 31, 2019. The decrease was due to lower earnings of $24.6 million generated by the Zeolyst Joint Venture during the year ended December 31, 2020 as compared to the year ended December 31, 2019.

The following is our consolidated statement of income and a summary of financial results for the years ended December 31, 2020 and 2019.

	Years ended December 31,		Change	
	2020	2019	$	%
	(in millions, except percentages)			
Sales	$ 1,107.4	$ 1,199.9	$ (92.5)	(7.7)%
Cost of goods sold	834.0	901.5	(67.5)	(7.5)%
Gross profit	273.4	298.4	(25.0)	(8.4)%
Gross profit margin	*24.7 %*	*24.9 %*		
Selling, general and administrative expenses	125.3	129.5	(4.2)	(3.2)%
Goodwill impairment charge	260.0	—	260.0	— %
Other operating expense, net	51.0	21.4	29.6	138.3 %
Operating (loss) income	(162.9)	147.5	(310.4)	(210.4)%
Operating income margin	*(14.7)%*	*12.3 %*		
Equity in net income from affiliated companies	(21.2)	(46.0)	24.8	(53.9)%
Interest expense, net	67.0	87.1	(20.1)	(23.1)%
Debt extinguishment costs	25.0	3.4	21.6	635.3 %
Other (income) expense, net	(6.1)	(2.4)	(3.7)	154.2 %
Loss (income) from continuing operations before income taxes and noncontrolling interest	(227.6)	105.4	(333.0)	(315.9)%
(Benefit) provision for income taxes	(48.1)	39.7	(87.8)	(221.2)%
Effective tax rate	*21.1 %*	*37.6 %*		
Net (loss) income from continuing operations	(179.5)	65.7	(245.2)	(373.2)%
Net (loss) income from discontinued operations, net of tax	(102.2)	14.6	(116.8)	(800.0)%
Net (loss) income	(281.7)	80.3	(362.0)	(450.8)%
Less: Net (loss) income attributable to the noncontrolling interest - continuing operations	(3.2)	0.6	(3.8)	(633.3)%
Less: Net income (loss) attributable to the noncontrolling interest - discontinued operations	$ 0.3	$ 0.2	$ 0.1	50.0 %
Net (loss) income attributable to PQ Group Holdings Inc.	$ (278.8)	$ 79.5	$ (358.3)	(450.7)%

Sales

	Years ended December 31, 2020	Years ended December 31, 2019	Change $	Change %
	(in millions, except percentages)			
Sales:				
Refining Services	$ 401.9	$ 447.1	$ (45.2)	(10.1)%
Catalysts	94.0	85.7	8.3	9.7 %
Performance Chemicals	614.7	670.5	(55.8)	(8.3)%
Eliminations	(3.2)	(3.4)	0.2	
Total sales	$ 1,107.4	$ 1,199.9	$ (92.5)	(7.7)%

Refining Services: Sales in Refining Services for the year ended December 31, 2020 were $401.9 million, a decrease of $45.2 million, or 10.1%, compared to sales of $447.1 million for the year ended December 31, 2019. The decrease in sales was primarily due to lower sales volumes of $26.7 million and lower average selling price from pass-through costs of $18.5 million.

The decrease in volumes was due to lower regeneration services demand from refinery utilization rates driven by COVID-19. The unfavorable pricing was driven by pass-through of lower sulfur costs.

Catalysts: Sales in Catalysts for the year ended December 31, 2020 were $94.0 million, an increase of $8.3 million, or 9.7%, compared to sales of $85.7 million for the year ended December 31, 2019. The increase in sales was primarily due to higher sales volumes of $10.6 million, partly offset by lower average selling price from product mix of $1.2 million and the unfavorable effects of foreign currency translation of $1.1 million.

The increase in sales was due to higher customer demand within our polyolefin catalysts product line.

Performance Chemicals: Sales in Performance Chemicals for the year ended December 31, 2020 were $614.7 million, a decrease of $55.8 million, or 8.3%, compared to sales of $670.5 million for the year ended December 31, 2019. The decrease in sales was primarily due to lower sales volumes driven by COVID19 of $48.6 million and the unfavorable effects of foreign currency translation of $15.0 million, which was partially offset by higher average selling price and favorable mix of $7.8 million.

The decrease in sales was a result of lower volumes sold for consumer products and industrial and process chemicals applications and the unfavorable effects of foreign currency translation driven by the stronger U.S. dollar.

Gross Profit

Gross profit for the year ended December 31, 2020 was $273.4 million, a decrease of $25.0 million, or 8.4%, compared with $298.4 million for the year ended December 31, 2019. The decrease in gross profit was due to lower volumes of $37.7 million, unfavorable average selling price of $11.9 million, and the unfavorable effects of foreign currency translation of $4.2 million, partly offset by favorable manufacturing costs of $30.9 million.

The decrease in volumes was due to a decline in sulfuric acid sales and lower sales for consumer and industrial products applications. Unfavorable customer pricing was primarily a result of pass-through of lower sulfur costs. The unfavorable effects of foreign currency were driven by the stronger U.S. dollar. The favorable change in manufacturing costs were driven by lower labor costs and the timing of plant maintenance projects.

Selling, General and Administrative Expenses

Selling, general and administrative expenses for the year ended December 31, 2020 were $125.3 million, a decrease of $4.2 million, or 3.2%, compared with $129.5 million for the year ended December 31, 2019. The decrease in selling, general and administrative expenses was due to lower discretionary spending and lower research and development expenditures partially offset by an increase in stock compensation expense.

Goodwill Impairment Charge

We assess goodwill for impairment annually, or more frequently, if events or circumstances change that would more likely than not reduce the fair value of the reporting unit below its carrying amount. We perform our annual impairment test of goodwill as of October 1 of each year. As a result of our annual test, we determined that the fair value of our Performance Chemicals reporting unit was lower than its carrying value. This resulted in a $260.0 million charge for the year ended December 31, 2020.

Other Operating Expense, Net

Other operating expense, net for the year ended December 31, 2020 was $51.0 million, an increase of $29.6 million, or 138.3%, compared with $21.4 million for the year ended December 31, 2019. The increase in other operating expense, net was primarily due to current year restructuring costs incurred on asset disposals and business divestiture costs associated with our pending sale of our Performance Chemicals business. During the year ended December 31, 2019, we realized a gain of $11.0 million on the disposition of assets related to a non-core product line as well a gain of $7.1 million on the sale of property.

Equity in Net Income of Affiliated Companies

Equity in net income of affiliated companies for the year ended December 31, 2020 was $21.2 million, a decrease of $24.8 million, compared with income of $46.0 million for the year ended December 31, 2019. The decrease was primarily due to $26.7 million of earnings generated by the Zeolyst Joint Venture during the year ended December 31, 2020 as compared to $52.2 million for the year ended December 31, 2019, which was a result of the timing of hydrocracking catalyst change-outs and lower demand for custom catalysts and emission control catalysts in heavy duty diesel production driven by the COVID-19 pandemic.

Interest Expense, Net

Interest expense, net for the year ended December 31, 2020 was $67.0 million, a decrease of $20.1 million, as compared with $87.1 million for the year ended December 31, 2019. The decrease in interest expense was due to lower interest rates on our variable rate debt along with lower average debt balances and a favorable increase in variable versus fixed rate debt.

Debt Extinguishment Costs

Debt extinguishment costs for the years ended December 31, 2020 and 2019 were $25.0 million and $3.4 million, respectively.

On December 14, 2020, we completed the sale of our Performance Materials business which triggered an obligation to provide partial payment under our existing senior secured term loan facility and our new senior secured term loan facility. As a result of the required payments, previous unamortized deferred financing costs of $2.7 million and original issue discount of $5.8 million were written off as debt extinguishment costs.

On July 22, 2020, we entered into an agreement for a new senior secured term loan facility in an aggregate principal amount of $650.0 million, which was used to repay the remaining outstanding balance of $625.0 million on the 6.75% Senior Secured Notes due 2022. In conjunction with the issuance of the senior secured term loan facility, we paid $10.6 million in prepayment premiums and recorded $0.1 million of new creditor and third-party financing fees as debt extinguishment costs. In addition, previous unamortized deferred financing costs of $2.1 million and original issue discount of $1.2 million associated with the 6.75% Senior Secured Notes due 2022 were written off as debt extinguishment costs.

On February 7, 2020, we amended our existing senior secured term loan facility to reduce the applicable interest rates and extend the maturity of the facility to February 2027. We recorded $2.2 million of new creditor and third-party financing fees as debt extinguishment costs. In addition, previously unamortized deferred financing costs of $0.1 million and original issue discount of $0.2 million associated with the existing senior secured term loan facility were written off as debt extinguishment costs.

During the year ended December 31, 2019, we prepaid $210.0 million of outstanding principal balance on the Term Loan Facility (as defined below). In connection with this prepayment, we wrote off $1.0 million of previously unamortized deferred financing costs and original issue discount of $2.4 million as debt extinguishment costs.

Other (Income) Expense, Net

Other (income) expense, net was income of $6.1 million for the year ended December 31, 2020, a favorable change of $3.7 million, compared with income of $2.4 million for the year ended December 31, 2019. The change primarily related to $4.2 million of foreign currency gains on the non-permanent intercompany debt denominated in local currency and translated to U.S. dollars and transactional currency translation in the current year period as compared to foreign currency losses of $2.4 million in the prior year period.

(Benefit) Provision for Income Taxes

The (benefit) provision for income taxes for the year ended December 31, 2020 was a $48.1 million benefit compared to a $39.7 million provision for the year ended December 31, 2019. The effective income tax rate for the year ended December 31, 2020 was 21.1% compared to 37.6% for the year ended December 31, 2019. The difference between the U.S. federal statutory income tax rate and our effective income tax rate for the year ended December 31, 2020 was mainly due to the impact of the Global Intangible Low Taxed Income ("GILTI") provisions of U.S. tax reform, foreign tax credit benefit and goodwill impairment. The difference between the U.S. federal statutory income tax rate and our effective income tax rate for the year ended December 31, 2019 was mainly due to the impact of the GILTI provisions of U.S. tax reform, the effect of permanent differences related to foreign currency exchange gain or loss, differing tax rates in foreign jurisdictions as compared to the U.S. statutory tax rate, tax rate changes and state taxes.

Net (Loss) Income Attributable to PQ Group Holdings

For the foregoing reasons and after the effect of the non-controlling interest in earnings of subsidiaries for each period presented, net loss attributable to PQ Group Holdings was $278.8 million for the year ended December 31, 2020 as compared to net income of $79.5 million for the year ended December 31, 2019.

Adjusted EBITDA

Summarized Segment Adjusted EBITDA information is shown below in the following table:

	Years ended December 31,		Change	
	2020	2019	$	%
	(in millions, except percentages)			
Segment Adjusted EBITDA[1]:				
Refining Services	$ 157.2	$ 175.6	$ (18.4)	(10.5)%
Catalysts[2]	74.5	107.8	(33.3)	(30.9)%
Performance Chemicals	142.4	151.5	(9.1)	(6.0)%
Total Segment Adjusted EBITDA[3]	374.1	434.9	(60.8)	(14.0)%
Unallocated corporate expenses	(36.1)	(41.0)	4.9	(12.0)%
Adjusted EBITDA	$ 338.0	$ 393.9	$ (55.9)	(14.2)%

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(1) We define Segment Adjusted EBITDA as EBITDA adjusted for certain items as noted in the reconciliation below. Our management evaluates the performance of our segments and allocates resources based primarily on Segment Adjusted EBITDA. Segment Adjusted EBITDA does not represent cash flow for periods presented and should not be considered as an alternative to net income as an indicator of our operating performance or as an alternative to cash flows as a source of liquidity. Segment Adjusted EBITDA may not be comparable with EBITDA or Adjusted EBITDA as defined by other companies.

(2) The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $42.5 million for the year ended December 31, 2020, which includes $21.2 million of equity in net income, excluding $6.6 million of amortization of investment in affiliate step-up, plus $14.7 million of joint venture depreciation, amortization and interest. The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $68.1 million for the year ended December 31, 2019, which includes $45.9 million of equity in net income, excluding $7.5

million of amortization of investment in affiliate step-up, plus $14.7 million of joint venture depreciation, amortization and interest.

(3) Our total Segment Adjusted EBITDA differs from our total consolidated Adjusted EBITDA due to unallocated corporate expenses.

Refining Services: Adjusted EBITDA for the year ended December 31, 2020 was $157.2 million, a decrease of $18.4 million, or 10.5%, compared with $175.6 million for the year ended December 31, 2019. Refining Services adjusted EBITDA decreased due to lower regeneration services demand as a result of reduced refinery utilization rates, partially offset by fixed and SG&A related cost savings.

Catalysts: Adjusted EBITDA for the year ended December 31, 2020 was $74.5 million, a decrease of $33.3 million, or 30.9%, compared with $107.8 million for the year ended December 31, 2019. Adjusted EBITDA decreased due to lower volumes in the Zeolyst joint venture and unfavorable inventory absorption due to lower production and inventory depletion to align with expected lower demand.

Performance Chemicals: Adjusted EBITDA for the year ended December 31, 2020 was $142.4 million, a decrease of $9.1 million, or 6.0%, compared with $151.5 million for the year ended December 31, 2019. The decrease in Adjusted EBITDA was due to lower volumes of product sold for industrial and consumer product applications and the strengthening of the U.S. dollar, which was partially offset by fixed and selling, general and administrative related cost savings.

A reconciliation of net (loss) income attributable to PQ Group Holdings to Segment Adjusted EBITDA is as follows:

	Years ended December 31, 2020	2019
	(in millions)	
Reconciliation of net (loss) income attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA		
Net (loss) income from continuing operations	$ (176.3)	$ 65.1
(Benefit) provision for income taxes	(48.1)	39.7
Interest expense, net	67.0	87.1
Depreciation and amortization	151.8	151.8
EBITDA	(5.6)	343.7
Joint venture depreciation, amortization and interest[(a)]	14.7	14.7
Amortization of investment in affiliate step-up[(b)]	6.6	7.5
Goodwill impairment charge	260.0	—
Debt extinguishment costs	25.0	3.4
Net gain on asset disposals[(c)]	(0.1)	(13.2)
Foreign currency exchange (gain) loss[(d)]	(4.2)	2.4
LIFO expense[(e)]	(5.2)	9.7
Transaction and other related costs[(f)]	8.6	0.4
Equity-based compensation	21.5	16.2
Restructuring, integration and business optimization expenses[(g)]	15.6	3.6
Defined benefit plan pension cost[(h)]	—	3.0
Other[(i)]	1.1	2.5
Adjusted EBITDA	338.0	393.9
Unallocated corporate expenses	36.1	41.0
Segment Adjusted EBITDA	$ 374.1	$ 434.9

(a) We use Adjusted EBITDA as a performance measure to evaluate our financial results. Because our Catalysts segment includes our 50% interest in the Zeolyst Joint Venture, we include an adjustment for our 50% proportionate share of depreciation, amortization and interest expense of the Zeolyst Joint Venture.

(b) Represents the amortization of the fair value adjustments associated with the equity affiliate investment in the Zeolyst Joint Venture as a result of the Business Combination. We determined the fair value of the equity affiliate investment and the fair value step-up was then attributed to the underlying assets of the Zeolyst Joint Venture. Amortization is primarily related to the fair value adjustments associated with fixed assets and intangible assets, including customer relationships and technical know-how.

(c) When asset disposals occur, we remove the impact of net gain/loss of the disposed asset because such impact primarily reflects the non-cash write-off of long-lived assets no longer in use. During the years ended December 31, 2020 and 2019, respectively, the net gain on asset disposals includes the gains related to the sale of a non-core product line and sale of property.

(d) Reflects the exclusion of the foreign currency transaction gains and losses in the statements of income primarily related to the non-permanent intercompany debt denominated in local currency translated to U.S. dollars.

(e) Represents non-cash adjustments to the Company's LIFO reserves for certain inventories in the U.S. that are valued using the LIFO method, which we believe provides a means of comparison to other companies that may not use the same basis of accounting for inventories.

(f) Represents the costs related to several transactions that are completed, pending or abandoned and that we believe are not representative of our ongoing business operations.

(g) Includes the impact of restructuring, integration and business optimization expenses which are incremental costs that are not representative of our ongoing business operations.

(h) Represents adjustments for defined benefit pension plan costs in our statement of income. More than two-thirds of our defined benefit pension plan obligations are under defined benefit pension plans that are frozen, and the remaining obligations primarily relate to plans operated in certain of our non-U.S. locations that, pursuant to jurisdictional requirements, cannot be frozen. As such, we do not view such expenses as core to our ongoing business operations.

(i) Other costs consist of certain expenses that are not core to our ongoing business operations, including environmental remediation-related costs associated with the legacy operations of our business prior to the Business Combination, capital and franchise taxes and non-cash asset retirement obligation accretion. Included in this line-item are rounding discrepancies that may arise from rounding from dollars (in thousands) to dollars (in millions).

Adjusted Net Income

Summarized adjusted net income information is shown below in the following table:

	Years ended December 31,					
	2020			2019		
	Pre-tax	Tax expense (benefit)	After-tax	Pre-tax	Tax expense (benefit)	After-tax
	(in millions)					
Reconciliation of net (loss) income attributable to PQ Group Holdings Inc. to Adjusted Net Income [1][2]						
Net (loss) income from continuing operations	$ (227.6)	$ (48.1)	$ (179.5)	$ 105.4	$ 39.7	$ 65.7
Less: Net (loss) income attributable to the non-controlling interest - continuing operations	(3.2)	—	(3.2)	0.6	—	0.6
Net (loss) income attributable to PQ Group Holdings Inc.	(224.4)	(48.1)	(176.3)	104.8	39.7	65.1
Amortization of investment in affiliate step-up[b]	6.6	1.7	4.9	7.5	1.9	5.6
Goodwill impairment charge	260.0	—	260.0	—	—	—
Debt extinguishment costs	25.0	6.3	18.7	3.4	0.9	2.5
Net (gain) loss on asset disposals[c]	(0.1)	(2.5)	2.4	(13.2)	(3.3)	(9.9)
Foreign currency exchange (gain) loss[d]	(4.2)	0.3	(4.5)	2.4	1.4	1.0
LIFO (benefit) expense[e]	(5.2)	(1.3)	(3.9)	9.7	2.4	7.3
Transaction and other related costs[f]	8.6	2.1	6.5	0.4	0.1	0.3
Equity-based compensation	21.5	4.9	16.6	16.2	3.7	12.5
Restructuring, integration and business optimization expenses[g]	15.6	3.9	11.7	3.6	0.9	2.7
Defined benefit plan pension cost[h]	—	—	—	3.0	0.7	2.3
Other[i]	1.1	0.3	0.8	2.5	0.5	2.0
Adjusted Net Income, including non-cash GILTI tax and tax reform	104.5	(32.4)	136.9	140.3	48.9	91.4
Impact of non-cash GILTI tax[3]	—	—	—	—	(9.4)	9.4
Impact of tax reform[4]	—	—	—	—	(2.3)	2.3
Adjusted Net Income	$ 104.5	$ (32.4)	$ 136.9	$ 140.3	$ 37.2	$ 103.1

(1) We define adjusted net income as net (loss) income attributable to PQ Group Holdings adjusted for non-operating income or expense and the impact of certain non-cash or other items that are included in net income that we do not consider indicative of our ongoing operating performance. Adjusted net income is presented as a key performance indicator as we believe it will enhance a prospective investor's understanding of our results of operations and financial condition. Adjusted net income may not be comparable with net income or adjusted net income as defined by other companies.

(2) Refer to the Adjusted EBITDA notes above for more information with respect to each adjustment.

(3) Amount represents the impact to tax expense in net income before non-controlling interest and the related adjustments to net income associated with the GILTI provisions of the Tax Cuts and Jobs Act of 2017 ("TCJA"). We are required to record the incremental tax provision impact with respect to GILTI as a result of having historical U.S. net operating loss ("NOL") amounts to offset the GILTI taxable income inclusion. This NOL utilization precluded us from recognizing GILTI credits which would otherwise help offset the tax impacts of GILTI. During the fourth quarter of 2020, as a result of the sale of the Performance Materials business, our NOL balance will be fully utilized. Beginning in the fourth quarter of 2020, we are no longer adjusting for the impact of the GILTI provisions of the TCJA since the NOLs have been fully utilized and GILTI now represents a cash tax impact.

(4) Represents the transition tax adjustment for the impact of the TCJA and the rate change in the Netherlands related to the Dutch Tax Plan 2019 recorded in net income.

The adjustments to net (loss) income attributable to PQ Group Holdings Inc. are shown net of applicable statutory tax rates.

Year Ended December 31, 2019 Compared to the Year Ended December 31, 2018

Highlights

The following is a summary of our financial performance for the year ended December 31, 2019 compared with the year ended December 31, 2018.

Sales

- Sales decreased $29.0 million to $1,199.9 million. The decrease in sales was primarily due to lower sales volumes and the unfavorable effects of foreign currency translation, which was partially offset by higher average customer prices and favorable mix.

Gross Profit

- Gross profit decreased $5.0 million to $298.4 million. Our decrease in gross profit was primarily due to lower sales volumes, unfavorable manufacturing costs and the unfavorable effects of foreign currency translation, which was partially offset by favorable customer pricing.

Operating Income

- Operating income decreased by $8.1 million to $147.5 million. Our decrease in operating income was primarily due to a decrease in gross profit for the year ended December 31, 2019.

Equity in Net Income from Affiliated Companies

- Equity in net income of affiliated companies for the year ended December 31, 2019 was $46.0 million, compared with net income of $37.6 million for the year ended December 31, 2018. The increase was due to higher earnings of $9.3 million generated by the Zeolyst Joint Venture during the year ended December 31, 2019 as compared to the year ended December 31, 2018.

The following is our consolidated statement of income and a summary of financial results for the years ended December 31, 2019 and 2018.

	Years ended December 31,		Change	
	2019	2018	$	%
	(in millions, except percentages)			
Sales	$ 1,199.9	$ 1,228.9	$ (29.0)	(2.4)%
Cost of goods sold	901.5	925.5	(24.0)	(2.6)%
Gross profit	298.4	303.4	(5.0)	(1.6)%
Gross profit margin	*24.9 %*	*24.7 %*		
Selling, general and administrative expenses	129.5	131.4	(1.9)	(1.4)%
Other operating expense, net	21.4	16.4	5.0	30.5 %
Operating income	147.5	155.6	(8.1)	(5.2)%
Operating income margin	*12.3 %*	*12.7 %*		
Equity in net income from affiliated companies	(46.0)	(37.6)	(8.4)	22.3 %
Interest expense, net	87.1	90.8	(3.7)	(4.1)%
Debt extinguishment costs	3.4	7.8	(4.4)	(56.4)%
Other (income) expense, net	(2.4)	10.6	(13.0)	(122.6)%
Income from continuing operations before income taxes and noncontrolling interest	105.4	84.0	21.4	25.5 %
Provision for income taxes	39.7	33.6	6.1	18.2 %
Effective tax rate	*37.6 %*	*40.0 %*		
Net income from continuing operations	65.7	50.4	15.3	30.4 %
Net income from discontinued operations, net of tax	14.6	9.2	5.4	58.7 %
Net income	80.3	59.6	20.7	34.7 %
Less: Net income attributable to the noncontrolling interest - continuing operations	0.6	1.1	(0.5)	(45.5)%
Less: Net income attributable to the noncontrolling interest - discontinued operations	$ 0.2	$ 0.2	$ —	— %
Net income attributable to PQ Group Holdings Inc.	$ 79.5	$ 58.3	$ 21.2	36.4 %

Sales

	Years ended December 31,		Change	
	2019	2018	$	%
	(in millions, except percentages)			
Sales:				
Refining Services	$ 447.1	$ 455.6	$ (8.5)	(1.9)%
Catalysts	85.7	72.1	13.6	18.9 %
Performance Chemicals	670.5	704.4	(33.9)	(4.8)%
Eliminations	(3.4)	(3.2)	(0.2)	
Total sales	$ 1,199.9	$ 1,228.9	$ (29.0)	(2.4)%

Refining Services: Sales in Refining Services for the year ended December 31, 2019 were $447.1 million, a decrease of $8.5 million, or 1.9%, compared to sales of $455.6 million for the year ended December 31, 2018. The decrease in sales was primarily due to lower sales volumes of $30.4 million, which was partially offset by favorable customer mix driving higher average selling prices of $21.9 million.

The decrease in volumes was due to lower demand for virgin sulfuric acid and unexpected customer plant outages. The favorable customer mix was driven by the roll-off of a below-market contract and other contract renewals in our regenerated sulfuric acid and virgin sulfuric acid product lines.

Catalysts: Sales in Catalysts for the year ended December 31, 2019 were $85.7 million, an increase of $13.6 million, or 18.9%, compared to sales of $72.1 million for the year ended December 31, 2018. The increase in sales was primarily due to higher sales volumes of $11.6 million and higher average selling price from product mix of $3.3 million.

The increase in sales was due to the timing of customer orders for methyl methacrylate catalyst and higher customer demand and pricing within our polyolefin catalysts product line.

Performance Chemicals: Sales in Performance Chemicals for the year ended December 31, 2019 were $670.5 million, a decrease of $33.9 million, or 4.8%, compared to sales of $704.4 million for the year ended December 31, 2018. The decrease in sales was primarily due to lower sales volumes of $36.4 million and the unfavorable effects of foreign currency translation of $17.5 million, which was partially offset by higher average selling price and favorable mix of $20.0 million.

The decrease in sales was a result of lower volumes sold to the consumer products and industrial and process chemicals industries and the unfavorable effects of foreign currency translation driven by the stronger U.S. dollar, which was partially offset by higher pricing to cover raw material cost increases.

Gross Profit

Gross profit for the year ended December 31, 2019 was $298.4 million, a decrease of $5.0 million, or 1.6%, compared with $303.4 million for the year ended December 31, 2018. The decrease in gross profit was due to lower volumes of $31.7 million, unfavorable manufacturing costs of $22.0 million, and unfavorable foreign currency translation of $5.2 million, which was partially offset by favorable customer pricing of $45.1 million and favorable product mix of $8.3 million.

The decrease in volumes was due to a decline in sulfuric acid sales and lower sales to the consumer and industrial products industries. The unfavorable change in manufacturing costs was driven by the higher labor costs, timing of plant maintenance projects and increased transportation costs during the year ended December 31, 2019. The unfavorable effects of foreign currency were driven by the stronger U.S. dollar. Favorable customer pricing was primarily a result of a roll-off of a below-market contract in our virgin sulfuric acid product line. Favorable product mix was driven by increased volumes of higher-margin Silica Catalysts products.

Selling, General and Administrative Expenses

Selling, general and administrative expenses for the year ended December 31, 2019 were $129.5 million, a decrease of $1.9 million, or 1.4%, compared with $131.4 million for the year ended December 31, 2018. The decrease in selling, general and administrative expenses was due to lower research and development expenditures and a decrease in professional fees, which was partially offset by an increase in compensation-related costs.

Other Operating Expense, Net

Other operating expense, net for the year ended December 31, 2019 was $21.4 million, an increase of $5.0 million, or 30.5%, compared with $16.4 million for the year ended December 31, 2018. The increase in other operating expense, net was primarily due to the impact of non-recurring gains in the current year as compared to the prior year. During the year ended December 31, 2019 we realized a gain of $11.0 million on the disposition of assets related to a non-core product line as well as a gain of $7.1 million on the sale of property. During the year ended December 31, 2018, we recognized non-recurring gains on the termination of a customer supply contract of $20.6 million and insurance recoveries totaling $6.5 million related to losses sustained as a result of Hurricane Harvey in August 2017 (of which $5.5 million was recorded in other operating expense, net).

Equity in Net Income of Affiliated Companies

Equity in net income of affiliated companies for the year ended December 31, 2019 was $46.0 million, an increase of $8.4 million, compared with income of $37.6 million for the year ended December 31, 2018. The increase was primarily due to $52.2 million of earnings generated by the Zeolyst Joint Venture during the year ended December 31, 2019 as compared to $42.9 million for the year ended December 31, 2018 which was a result of higher year-over-year growth in hydrocracking catalyst and specialty chemical event-driven sales.

Interest Expense, Net

Interest expense, net for the year ended December 31, 2019 was $87.1 million, a decrease of $3.7 million, as compared with $90.8 million for the year ended December 31, 2018. The decrease in interest expense was due to lower average debt balances.

Debt Extinguishment Costs

Debt extinguishment costs for the years ended December 31, 2019 and 2018 were $3.4 million and $7.8 million, respectively.

During the year ended December 31, 2019, we prepaid $210.0 million of outstanding principal balance on the Term Loan Facility (as defined below). In connection with this prepayment, we wrote off $1.0 million of previously unamortized deferred financing costs and original issue discount of $2.4 million as debt extinguishment costs.

During the year ended December 31, 2018, we prepaid $100.0 million of outstanding principal balance on the Term Loan Facility (as defined below). In connection with this prepayment, we wrote off $0.6 million of previously unamortized deferred financing costs and original issue discount of $1.3 million as debt extinguishment costs.

On February 8, 2018 we refinanced our existing senior secured term loan facility with a $1,267.0 million senior secured term loan facility to reduce the applicable interest rates. We recorded $2.1 million of new creditor and third-party financing fees as debt extinguishment costs. In addition, previously unamortized deferred financing costs of $1.4 million and original issue discount of $2.4 million associated with the existing senior secured term loan facility were written off as debt extinguishment costs.

Other (Income) Expense, Net

Other (income) expense, net was income of $2.4 million for the year ended December 31, 2019, a favorable change of $13.0 million, compared with expense of $10.6 million for the year ended December 31, 2018. The change primarily consisted of $2.3 million in sales and use tax refunds received during the year ended December 31, 2019 and $10.1 million of lower foreign currency losses primarily related to the non-permanent intercompany debt denominated in local currency and translated to U.S. dollars.

Provision for Income Taxes

The provision for income taxes for the year ended December 31, 2019 was $39.7 million compared to a $33.6 million provision for the year ended December 31, 2018. The effective income tax rate for the year ended December 31, 2019 was 37.6% compared to 40.0% for the year ended December 31, 2018. The difference between the U.S. federal statutory income tax rate and our effective income tax rate for the year ended December 31, 2019 was mainly due to the impact of the GILTI provisions of U.S. tax reform, the effect of permanent differences related to foreign currency exchange gain or loss, differing tax rates in foreign jurisdictions compared to the U.S. statutory tax rate, tax rate changes and state taxes. The difference between the U.S. federal statutory income tax rate and our effective income tax rate for the year ended December 31, 2018 was mainly due to the impact of the GILTI provisions of U.S. tax reform, the effect of permanent differences related to foreign currency exchange gain or loss, changes in valuation allowances, differing tax rates in foreign jurisdictions as compared to the U.S. statutory tax rate and tax rate changes.

Net Income Attributable to PQ Group Holdings

For the foregoing reasons and after the effect of the non-controlling interest in earnings of subsidiaries for each period presented, net income attributable to PQ Group Holdings was $79.5 million for the year ended December 31, 2019 as compared to a net income of $58.3 million for the year ended December 31, 2018.

Adjusted EBITDA

Summarized Segment Adjusted EBITDA information is shown below in the following table:

	Years ended December 31,		Change	
	2019	2018	$	%
	(in millions, except percentages)			
Segment Adjusted EBITDA[1]:				
Refining Services	$ 175.6	$ 176.5	$ (0.9)	(0.5)%
Catalysts[2]	107.8	81.1	26.7	32.9 %
Performance Chemicals	151.5	168.2	(16.7)	(9.9)%
Total Segment Adjusted EBITDA[3]	434.9	425.8	9.1	2.1 %
Unallocated corporate expenses	(41.0)	(37.8)	(3.2)	8.5 %
Adjusted EBITDA	$ 393.9	$ 388.0	$ 5.9	1.5 %

(1) We define Segment Adjusted EBITDA as EBITDA adjusted for certain items as noted in the reconciliation below. Our management evaluates the performance of our segments and allocates resources based primarily on Segment Adjusted EBITDA. Segment Adjusted EBITDA does not represent cash flow for periods presented and should not be considered as an alternative to net income as an indicator of our operating performance or as an alternative to cash flows as a source of liquidity. Segment Adjusted EBITDA may not be comparable with EBITDA or Adjusted EBITDA as defined by other companies.

(2) The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $68.1 million for the year ended December 31, 2019, which includes $45.9 million of equity in net income, excluding $7.5 million of amortization of investment in affiliate step-up plus $14.7 million of joint venture depreciation, amortization and interest. The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $56.7 million for the year ended December 31, 2018, which includes $37.5 million of equity in net income, excluding $6.6 million of amortization of investment in affiliate step-up plus $12.6 million of joint venture depreciation, amortization and interest.

(3) Our total Segment Adjusted EBITDA differs from our total consolidated Adjusted EBITDA due to unallocated corporate expenses.

Refining Services: Adjusted EBITDA for the year ended December 31, 2019 was $175.6 million, a decrease of $0.9 million, or 0.5%, compared with $176.5 million for the year ended December 31, 2018. Refining Services adjusted EBITDA was consistent with the prior year, and negatively impacted by decreased demand for virgin sulfuric acid, unexpected customer plant outages, timing of plant turnaround costs and the absence of a gain from insurance proceeds related to Hurricane Harvey, which was offset by the roll-off of a below-market contract and other contract renewals in our regenerated sulfuric acid and virgin sulfuric acid product lines.

Catalysts: Adjusted EBITDA for the year ended December 31, 2019 was $107.8 million, an increase of $26.7 million, or 32.9%, compared with $81.1 million for the year ended December 31, 2018. Adjusted EBITDA increased due to favorable costs from building inventories to meet future sales commitments, higher polyolefin catalysts product group sales and increased sales of chemical synthesis catalysts sold to the methyl methacrylate end market.

Performance Chemicals: Adjusted EBITDA for the year ended December 31, 2019 was $151.5 million, a decrease of $16.7 million, or 9.9%, compared with $168.2 million for the year ended December 31, 2018. The decrease in Adjusted EBITDA was due to lower volumes of product sold to the industrial and consumer product industries and the strengthening of the U.S. dollar, which was partially offset by favorable product mix.

A reconciliation of net income attributable to PQ Group Holdings to Segment Adjusted EBITDA is as follows:

	Years ended December 31,	
	2019	2018
	(in millions)	
Reconciliation of net income attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA		
Net income from continuing operations	$ 65.1	$ 49.3
Provision for income taxes	39.7	33.6
Interest expense, net	87.1	90.8
Depreciation and amortization	151.8	153.9
EBITDA	343.7	327.6
Joint venture depreciation, amortization and interest[(a)]	14.7	12.6
Amortization of investment in affiliate step-up[(b)]	7.5	6.6
Debt extinguishment costs	3.4	7.8
Net (gain) loss on asset disposals[(c)]	(13.2)	4.2
Foreign currency exchange loss[(d)]	2.4	12.5
LIFO expense[(e)]	9.7	3.0
Transaction and other related costs[(f)]	0.4	0.5
Equity-based compensation	16.2	18.4
Restructuring, integration and business optimization expenses[(g)]	3.6	8.7
Defined benefit plan pension cost[(h)]	3.0	0.4
Gain on contract termination[(i)]	—	(20.6)
Other[(j)]	2.5	6.2
Adjusted EBITDA	393.9	387.9
Unallocated corporate expenses	41.0	37.8
Segment Adjusted EBITDA	$ 434.9	$ 425.7

(a) We use Adjusted EBITDA as a performance measure to evaluate our financial results. Because our Catalysts segment includes our 50% interest in the Zeolyst Joint Venture, we include an adjustment for our 50% proportionate share of depreciation, amortization and interest expense of the Zeolyst Joint Venture.

(b) Represents the amortization of the fair value adjustments associated with the equity affiliate investment in the Zeolyst Joint Venture as a result of the Business Combination. We determined the fair value of the equity affiliate investment and the fair value step-up was then attributed to the underlying assets of the Zeolyst Joint Venture. Amortization is primarily related to the fair value adjustments associated with inventory, fixed assets and intangible assets, including customer relationships and technical know-how.

(c) When asset disposals occur, we remove the impact of net gain/loss of the disposed asset because such impact primarily reflects the non-cash write-off of long-lived assets no longer in use. During the year ended December 31, 2019, the net gain on asset disposals includes the gains related to the sale of a non-core product line and sale of property.

(d) Reflects the exclusion of the foreign currency transaction gains and losses in the statements of income primarily related to the Euro-denominated term loan (which was settled as part of the February 2018 term loan refinancing) and the non-permanent intercompany debt denominated in local currency translated to U.S. dollars.

(e) Represents non-cash adjustments to the Company's LIFO reserves for certain inventories in the U.S. that are valued using the LIFO method, which we believe provides a means of comparison to other companies that may not use the same basis of accounting for inventories.

(f) Represents the costs related to several transactions that are completed, pending or abandoned and that we believe are not representative of our ongoing business operations.

(g) Includes the impact of restructuring, integration and business optimization expenses which are incremental costs that are not representative of our ongoing business operations.

(h) Represents adjustments for defined benefit pension plan costs in our statement of income. More than two-thirds of our defined benefit pension plan obligations are under defined benefit pension plans that are frozen, and the remaining obligations primarily relate to plans operated in certain of our non-U.S. locations that, pursuant to jurisdictional requirements, cannot be frozen. As such, we do not view such expenses as core to our ongoing business operations.

(i) Represents a non-cash gain on the write-off of the remaining liability under a contractual supply arrangement. As part of Eco's acquisition of substantially all of the assets of Solvay USA Inc' sulfuric acid refining services business unit on December 1, 2014, we recognized a liability as part of business combination accounting related to our obligation to serve a customer under a pre-existing unfavorable supply agreement. In December 2018, the customer who was party to the agreement closed its facility, and as a result, we were relieved from our obligation to continue to supply the customer on the below market contract. Because the fair value of the unfavorable contract liability was recognized as part of the application of business combination accounting, and since the write-off of the remaining liability was non-cash in nature, we believe this gain is a special item that is not representative of our ongoing business operations.

(j) Other costs consist of certain expenses that are not core to our ongoing business operations, including environmental remediation-related costs associated with the legacy operations of our business prior to the Business Combination, capital and franchise taxes, non-cash asset retirement obligation accretion and the initial implementation of procedures to comply with Section 404 of the Sarbanes-Oxley Act. Included in this line-item are rounding discrepancies that may arise from rounding from dollars (in thousands) to dollars (in millions).

Adjusted Net Income

Summarized adjusted net income information is shown below in the following table:

	Years ended December 31,					
	2019			2018		
	Pre-tax	Tax expense (benefit)	After-tax	Pre-tax	Tax expense (benefit)	After-tax
	(in millions)					
Reconciliation of net income attributable to PQ Group Holdings Inc. to Adjusted Net Income [1][2]						
Net income from continuing operations	$ 105.4	$ 39.7	$ 65.7	$ 84.0	$ 33.6	$ 50.4
Less: Net income attributable to the non-controlling interest - continuing operations	0.6	—	0.6	1.1	—	1.1
Net income attributable to PQ Group Holdings Inc.	104.8	39.7	65.1	82.9	33.6	49.3
Amortization of investment in affiliate step-up[b]	7.5	1.9	5.6	6.6	1.7	4.9
Debt extinguishment costs	3.4	0.9	2.5	7.8	2.0	5.8
Net (gain) loss on asset disposals[d]	(13.2)	(3.3)	(9.9)	4.2	1.0	3.2
Foreign currency exchange loss[e]	2.4	1.4	1.0	12.5	3.6	8.9
LIFO expense[f]	9.7	2.4	7.3	3.0	0.8	2.2
Transaction and other related costs[h]	0.4	0.1	0.3	0.5	0.1	0.4
Equity-based compensation	16.2	3.7	12.5	18.4	4.2	14.2
Restructuring, integration and business optimization expenses[i]	3.6	0.9	2.7	8.7	2.2	6.5
Defined benefit plan pension cost[j]	3.0	0.7	2.3	0.4	0.1	0.3
Gain on contract termination[k]	—	—	—	(20.6)	(5.2)	(15.4)
Other[l]	2.5	0.5	2.0	6.2	1.6	4.6
Adjusted Net Income, including non-cash GILTI tax and tax reform	140.3	48.9	91.4	130.6	45.7	84.9
Impact of non-cash GILTI tax[3]	—	(9.4)	9.4	—	(14.5)	14.5
Impact of tax reform[4]	—	(2.3)	2.3	—	2.6	(2.6)
Adjusted Net Income	$ 140.3	$ 37.2	$ 103.1	$ 130.6	$ 33.8	$ 96.8

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(1) We define adjusted net income as net income attributable to PQ Group Holdings adjusted for non-operating income or expense and the impact of certain non-cash or other items that are included in net income that we do not consider indicative of our ongoing operating performance. Adjusted net income is presented as a key performance indicator as we believe it will enhance a prospective investor's understanding of our results of operations and financial condition. Adjusted net income may not be comparable with net income or adjusted net income as defined by other companies.

(2) Refer to the Adjusted EBITDA notes above for more information with respect to each adjustment.

(3) Amount represents the impact to tax expense in net income before non-controlling interest and the related adjustments to net income associated with the GILTI provisions of the TCJA. We were required to record incremental tax provision impact with respect to GILTI even though we had historical NOL amounts to offset the GILTI taxable income inclusion. This NOL utilization precluded us from recognizing GILTI credits which would otherwise help offset the tax impacts of GILTI. No GILTI credits will be recognized with respect to GILTI until the cumulative NOL balance had been exhausted. Because the GILTI provision did not impact our cash taxes (given available U.S. NOLs), we do not view this item as a component of core operations.

(4) Represents the transaction tax adjustment for the impact of the TCJA and the rate change in the Netherlands related to the Dutch Tax Plan 2019 recorded in net income.

The adjustments to net income attributable to PQ Group Holdings Inc. are shown net of applicable statutory tax rates.

Financial Condition, Liquidity and Capital Resources

Our primary sources of liquidity consist of cash flow from operations, existing cash balances as well as funds available under our asset based lending revolving credit facility. We expect that ongoing requirements for debt service and capital expenditures will be funded from these sources of funds. Our primary liquidity requirements include funding working capital requirements (primarily inventory and accounts receivable, net of accounts payable and other accrued liabilities), debt service requirements and capital expenditures. Our capital expenditures include both maintenance of business, which includes spending on maintenance and health, safety and environmental initiatives as well as growth, which includes spending to drive organic sales growth and cost savings initiatives.

We believe that our existing cash, cash equivalents and cash flows from operations, combined with availability under our asset based lending revolving credit facility, will be sufficient to meet our presently anticipated future cash needs for at least the next 12 months. We may also pursue strategic acquisition opportunities, which may impact our future cash requirements. We may, from time to time, increase borrowings under our asset based lending revolving credit facility to meet our future cash needs. As of December 31, 2020, we had cash and cash equivalents of $135.5 million and availability of $102.5 million under our asset based lending revolving credit facility, after giving effect to $18.2 million of outstanding letters of credit and no revolving credit facility borrowings, for a total available liquidity of $238.0 million. As of December 31, 2020, we were in compliance with all covenants under our debt agreements.

Included in our cash and cash equivalents balance as of December 31, 2020 was $33.4 million of cash and cash equivalents held in foreign jurisdictions. We repatriate cash held outside of the United States from certain foreign subsidiaries in order to meet domestic liquidity needs. Depending on domestic and foreign cash balances, we have certain flexibility to repatriate funds in order to meet domestic liquidity needs. In certain cases, the repatriation of foreign cash under previous U.S. tax law had generally been subject to U.S. income taxes at the time of cash distribution. Due to the enactment of the TCJA in December 2017, our overseas earnings repatriation will generally no longer be subject to U.S. federal income taxes at the time of cash distribution. However, future earnings may still be taxed for foreign and state income tax purposes.

Over the course of the next twelve months and beyond, we anticipate making significant cash payments for known contractual and other obligations, including:

Principal and interest on long-term debt

As of December 31, 2020, our total indebtedness was $1,426.4 million, with up to $102.5 million of available borrowings under our asset based lending revolving credit facility. Our liquidity requirements are significant, primarily due to debt service requirements. As reported, our cash interest expense for the years ended December 31, 2020, 2019 and 2018 was approximately $90.3 million, $117.8 million and $110.8 million, respectively. Before any impact of hedges, a one percent change in assumed interest rates for our variable interest credit facilities would have an annual impact of approximately $11.3 million on interest expense. None of the principal balances on our debt are due in the next twelve months.

Interest payments due within the next twelve months are $54.2 million using the interest rate effective as of December 31, 2020 on our variable interest credit facilities. Interest on long-term debt excludes amortization of deferred financing fees and original issue discount. The actual interest payments may differ materially based on actual amounts of long-term debt outstanding and actual interest rates in future periods.

Subject to approval by our board of directors, we may raise additional capital or borrowings from time to time or seek to refinance our existing debt. There can be no assurances that future capital or borrowings will be available to us, and the cost and availability of new capital or borrowings could be materially impacted by market conditions. Further, the decision to refinance our existing debt is based on a number of factors, including general market conditions and our ability to refinance on attractive terms at any given point in time. Any attempts to raise additional capital or borrowings or refinance our existing debt could cause us to incur significant charges. Such charges could have a material impact on our financial position, results of operations, or cash flows.

Purchase commitments

We have entered into short and long-term purchase commitments for various key raw materials and energy requirements. The purchase obligations include agreements with various suppliers to purchase goods that are enforceable and legally binding, and that specify all significant terms, including fixed and minimum quantities to be purchased, fixed, minimum or variable provisions, and the approximate timing of the transaction. As of December 31, 2020, we had $22.0 million in purchase commitments, excluding agreements that are cancellable without penalty, of which $13.7 million is expected to be incurred in 2021.

Cash Flow

	Years ended December 31,		
	2020	2019	2018
	(in millions)		
Continuing Operations			
Net cash provided by (used in)			
Operating activities	$ 205.3	$ 227.7	$ 213.2
Investing activities	562.3	(18.8)	(98.7)
Financing activities	(721.1)	(214.9)	(135.3)
Discontinued Operations			
Net cash provided by (used in)			
Operating activities	18.1	40.0	35.5
Investing activities	(10.8)	(16.5)	(20.6)
Financing activities	(1.6)	(1.2)	(1.9)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	11.1	(2.1)	0.4
Net change in cash, cash equivalents and restricted cash	63.3	14.2	(7.4)
Cash, cash equivalents and restricted cash at beginning of period	73.9	59.7	67.2
Cash, cash equivalents and restricted cash at end of period	$ 137.2	$ 73.9	$ 59.8

	Years ended December 31,		
	2020	2019	2018
	(in millions)		
Continuing Operations			
Net (loss) income	$ (179.5)	$ 65.8	$ 50.4
Non-cash and non-operating activities[(1)]	385.2	160.2	175.5
Changes in working capital	9.2	7.0	(12.0)
Other operating activities	(9.6)	(5.3)	(0.7)
Net cash provided by operating activities, continuing operations	$ 205.3	$ 227.7	$ 213.2

(1) Includes depreciation, amortization, changes related to purchase accounting fair value adjustments, amortization of deferred financing costs and original issue discount, goodwill impairment charges, debt extinguishment costs, foreign currency exchange gains and losses, pension and postretirement healthcare benefit expense and funding, deferred income tax benefit, net losses on asset disposals, stock compensation expense, equity in net income and dividends received from affiliated companies, and net interest income on swaps designated as net investment hedges.

	Years ended December 31, 2020	2019	2018
	(in millions)		
Continuing Operations			
Working capital changes that provided (used) cash:			
Receivables	$ 7.0	$ 11.4	$ (4.2)
Inventories	9.4	(10.0)	(7.2)
Prepaids and other current assets	2.0	2.3	(7.0)
Accounts payable	4.2	(0.6)	(3.5)
Accrued liabilities	(13.4)	3.9	9.9
	$ 9.2	$ 7.0	$ (12.0)

	Years ended December 31, 2020	2019	2018
	(in millions)		
Continuing Operations			
Purchases of property, plant and equipment	$ (97.1)	$ (111.1)	$ (111.8)
Investment in affiliated companies	—	—	(5.0)
Proceeds from business divestiture, net of cash and indebtedness	624.3	—	—
Proceeds from sale of assets	9.4	17.6	12.4
Proceeds from sale of product line	18.0	27.7	—
Proceeds from sale of investment	1.8	—	—
Proceeds from settlement of swaps designated as net investment hedges	—	38.1	—
Net interest proceeds on swaps designated as net investment hedges	5.0	8.5	4.9
Other, net	0.9	0.4	0.8
Net cash provided by (used in) investing activities, continuing operations	$ 562.3	$ (18.8)	$ (98.7)

	Years ended December 31, 2020	2019	2018
	(in millions)		
Continuing Operations			
Net revolver borrowings	$ —	$ —	$ (25.0)
Net cash repayments on debt obligations	(470.3)	(215.0)	(107.5)
Dividends paid to stockholders	(243.7)	—	—
Other financing activities	(7.1)	0.1	(2.8)
Net cash used in financing activities, continuing operations	$ (721.1)	$ (214.9)	$ (135.3)

The following discussions related to our cash flows are presented on a continuing operations basis, which excludes the cash flows from our former Performance Materials business accounted for as a discontinued operation.

Year Ended December 31, 2020 Compared to the Year Ended December 31, 2019

Net cash provided by operating activities was $205.3 million for the year ended December 31, 2020, compared to $227.7 million provided for the year ended December 31, 2019. Cash generated by net income and non-working capital related activities was lower during the year ended December 31, 2020 by $24.4 million compared to the prior year. Cash provided by working capital during the year ended December 31, 2020 was favorable compared to the year ended December 31, 2019. Working capital for the year ended December 31, 2020 provided cash of $9.2 million, compared to cash provided of $7.0 million for the year ended December 31, 2019.

The decrease in cash generated by net income and non-working capital related activities of $24.4 million as compared to the prior year period was primarily due to a decrease in gross profit driven by lower sales volumes and higher transaction related costs.

The $2.2 million increase in cash from working capital as compared to the prior year was primarily due to favorable changes in inventory and accounts payable, which were partially offset by unfavorable changes in accrued liabilities, accounts receivable and prepaid and other assets balances.

The favorable change in inventory balances is due to a reduction in inventory in 2020 compared to an inventory build in 2019. We increased inventory levels at the end of the 2019 period within our polyolefin catalyst product group to meet sales demand in the 2020 period. The favorable change in accounts payable is due to timing of payments. The unfavorable change in accrued liabilities was primarily due to the timing of interest payments. The reduced cash flow contribution from accounts receivable was driven by the timing of collections on our receivable balances during the current year period versus prior year periods. The prior year period began with a higher receivable balances due to increased sales volumes at the end of December 31, 2018, of which those receivables were collected early in the 2019 period.

Net cash provided by investing activities was $562.3 million for the year ended December 31, 2020, compared to net cash used of $18.8 million during the year ended December 31, 2019. Cash used in investing activities primarily consisted of $97.1 million and $111.1 million to fund capital expenditures during the years ended December 31, 2020 and 2019, respectively. During the year ended December 31, 2020, we sold our Performance Materials business for net cash proceeds of $624.3 million, sold a product line which resulted in proceeds of $18.0 million, sold additional assets which generated proceeds of $9.4 million, received $5.0 million in interest proceeds related to our cross currency swaps and sold our investment in a joint venture of $1.8 million. During the year ended December 31, 2019, we settled our cross currency swaps and received cash proceeds of $38.1 million, sold a product line which resulted in proceeds of $27.7 million, sold additional assets which generated proceeds of $17.6 million and received $8.5 million in interest proceeds related to our cross currency swaps.

Net cash used in financing activities was $721.1 million for the year ended December 31, 2020, compared to net cash used of $214.9 million during the year ended December 31, 2019. Net cash used in financing activities was primarily driven by $470.3 million and $215.0 million in net repayments of our debt and revolving credit facility made during the years ended December 31, 2020 and 2019, respectively. During the year ended December 31, 2020, we paid a dividend of $1.80 per common share, which resulted in a cash outflow of $243.7 million.

Year Ended December 31, 2019 Compared to the Year Ended December 31, 2018

Net cash provided by operating activities was $227.7 million for the year ended December 31, 2019, compared to $213.2 million provided for the year ended December 31, 2018. Cash generated by net income and non-working capital related activities was lower during the year ended December 31, 2019 by $4.5 million compared to the prior year. Cash used by working capital during the year ended December 31, 2019 was favorable compared to the year ended December 31, 2018. Working capital for the year ended December 31, 2019 provided cash of $7.0 million, compared to cash used of $12.0 million for the year ended December 31, 2018.

The decrease in cash generated by net income and non-working capital related activities of $4.5 million as compared to the prior year period was primarily due to a decrease in gross profit driven by lower customer volumes and higher labor costs.

The $19.0 million increase in cash from working capital as compared to the prior year was primarily due to favorable changes in accounts receivable, prepaid and other current assets and accounts payable, which were partially offset by unfavorable changes in accrued liabilities and inventory balances.

The increase in cash flow related to accounts receivable was due the timing of collections on our receivable balances during the current year period. We had higher receivables at the end of the 2018 period, of which those receivables were collected early in the 2019 period. The favorable change in prepaid and other current assets was due to lower receivable balances with our joint ventures and other related parties as well as the receipt of insurance proceeds during the year ended December 31, 2019. The favorable change in accounts payable was due to decrease in capital spending. The unfavorable change in accrued liabilities was primarily due to the timing of wage and interest payments. The unfavorable change in inventory was due to higher inventory build to meet future sales commitments.

Net cash used in investing activities was $18.8 million for the year ended December 31, 2019, compared to net cash used of $98.7 million during the year ended December 31, 2018. Cash used in investing activities primarily consisted of $111.1 million and $111.8 million to fund capital expenditures during the years ended December 31, 2019 and 2018, respectively. During the year ended December 31, 2019, we settled our cross currency swaps and received proceeds of $38.1 million, sold a product line which resulted in proceeds of $27.7 million, sold additional assets which generated proceeds of $17.6 million and received $8.5 million in interest proceeds related to our cross currency swaps. During the year ended December 31, 2018, we sold assets which generated proceeds of $12.4 million and received $4.9 million in interest proceeds related to our cross currency swaps.

Net cash used in financing activities was $214.9 million for the year ended December 31, 2019, compared to net cash used of $135.3 million during the year ended December 31, 2018. Net cash used in financing activities was primarily driven by $215.0 million and $107.5 million in repayments of our term debt and revolving credit facility made during the years ended December 31, 2019 and 2018, respectively.

Debt

	December 31,	
	2020	2019
	(in millions)	
Senior Secured Term Loan Facility due February 2027	$ 671.7	$ 947.5
New Senior Secured Term Loan Facility due February 2027	459.7	—
6.75% Senior Secured Notes due 2022	—	625.0
5.75% Senior Unsecured Notes due 2025	295.0	295.0
ABL Facility	—	—
Total debt	1,426.4	1,867.5
Original issue discount	(15.6)	(13.4)
Deferred financing costs	(10.4)	(10.8)
Total debt, net of original issue discount and deferred financing costs	1,400.4	1,843.3
Less: current portion	—	—
Total long-term debt, excluding current portion	$ 1,400.4	$ 1,843.3

As of December 31, 2020 our total debt was $1,426.4 million excluding the original issue discount of $15.6 million and deferred financing fees of $10.4 million for our senior secured credit facilities and notes. Our net debt was $1,290.9 million, including cash of $135.5 million. Our total available liquidity as of December 31, 2020 was $238.0 million, which represents our cash on hand of $135.5 million plus our excess availability under our asset based lending revolving credit facility of $102.5 million, after giving effect to $18.2 million of outstanding letters of credit and no revolving credit facility borrowings. We may seek, subject to market conditions and other factors, opportunities to repurchase, refinance or otherwise reprice our debt.

Senior Secured Credit Facilities

On May 4, 2016, we entered into senior secured credit facilities (collectively, the “Senior Secured Credit Facilities”) that were comprised of a $1,200.0 million term loan facility consisting of a $900.0 million U.S. dollar-denominated tranche and a $300.0 million Euro-denominated (or €265.0 million) tranche (the “2016 Term Loan Facility”), and a $200.0 million asset-based revolving credit facility (the “ABL Facility”).

On February 8, 2018, we refinanced the 2016 Term Loan Facility with a new $1,267.0 million senior secured term loan facility (the “Term Loan Facility”) by entering into the Third Amendment Agreement to the 2016 Term Loan Facility, which amended and restated the 2016 Term Loan Facility. Pursuant to the Third Amendment Agreement, the Term Loan Facility accrued interest at a floating rate of LIBOR (with a zero percent minimum LIBOR floor) plus 2.50% per annum and was scheduled to mature in February 2025.

In February 2020, we re-priced the $459.7 million Term Loan Facility to reduce the applicable interest rate and extend the maturity of the facility to February 2027. The terms of the facility were substantially consistent following the re-pricing, except that borrowings under the term loan will bear interest at a rate equal to a floating rate of LIBOR plus 2.25% per annum.

The ABL Facility provides for up to $200.0 million in revolving credit borrowings consisting of up to $150.0 million in U.S. available borrowings, up to $10.0 million in Canadian available borrowings and up to $40.0 million of European available borrowings. Borrowings under the ABL Facility bear interest at a rate equal to the LIBOR rate or the base rate elected by us at the time of the borrowing plus a margin of between 1.50%-2.00% or 0.50%-1.00%, respectively, depending on availability under the ABL Facility. In addition, there is an annual commitment fee equal to 0.375%, with a step-down to 0.25% based on the average usage of the revolving credit borrowings available. As of December 31, 2020, there were no revolving credit borrowings under the ABL Facility. Revolving credit borrowings are payable at our option throughout the term of the ABL Facility with the balance due May 4, 2021. We were in compliance with all debt covenants as of December 31, 2020 and 2019, respectively. On March 20, 2020, we amended our existing ABL facility to increase the aggregate amount of the revolving loan commitments available by $50.0 million to $250.0 million, consisting of up to $195.0 million in U.S. commitments, up to $15.0 million in Canadian commitments and up to $40.0 million in European commitments. The maturity of the facility has been extended to March 20, 2025. Following the amendment, the borrowings under the amended ABL Facility bear interest at a rate equal to the LIBOR rate or the base rate plus a margin of between 1.25% and 1.75% or 0.25% to 0.75%, respectively.

The Company has the ability to request letters of credit under the ABL Facility. The Company had $18.2 million of letters of credit outstanding as of December 31, 2020, which reduce available borrowings under the ABL Facility by such amounts.

6.75% Senior Secured Notes due 2022 - Redeemed in 2020

Concurrent with the Business Combination, we issued $625.0 million of 6.750% Senior Secured Notes due November 2022 (the “6.75% Senior Secured Notes”) in transactions exempt from or not subject to registration under the Securities Act pursuant to Rule 144A and Regulation S under the Securities Act of 1933. Interest on the 6.75% Senior Secured Notes was payable on May 15 and November 15 of each year, commencing November 15, 2016. No principal payments were required with respect to the 6.75% Senior Secured Notes prior to their final maturity. The 6.75% Senior Secured Notes were to mature on November 15, 2022.

In July 2020, we entered into an agreement for a new senior secured term loan facility. The proceeds were used to redeem the 6.75% Senior Secured Notes. Refer to the New Senior Secured Term Loan Facility section of this note for further discussion.

New Senior Secured Term Loan Facility due February 2027

In July 2020, we entered into an agreement for a new senior secured term loan facility in an aggregate principal amount of $650.0 million with an original issue discount of 1.5% and interest at a floating rate of LIBOR (with a 1.0% minimum LIBOR floor) plus 3.0% per annum. The proceeds were used to redeem our existing $625.0 million of 6.75% Senior Secured Notes due 2022 and pay the associated early redemption premiums. The new senior secured term loan facility requires scheduled quarterly amortization payments, each equal to 0.25% of the original principal amount of the loans under the new senior secured term loan facility.

5.75% Senior Unsecured Notes due 2025

On December 11, 2017, we issued $300.0 million aggregate principal amount of 5.75% Senior Unsecured Notes due 2025 (the “5.75% Senior Unsecured Notes”) in a private placement exempt from the registration requirements of the Securities Act. The 5.75% Senior Unsecured Notes mature on December 15, 2025. Interest on the 5.75% Senior Unsecured Notes is to be paid semi-annually on February 15 and August 15, commencing August 15, 2018, at an annual rate of 5.75% per year.

Capital Expenditures

Maintenance capital expenditures include spending on maintenance of business, health, safety and environmental initiatives. Growth capital expenditures include spending to drive organic sales growth and cost savings initiatives. These capital expenditures represent our “book” capital expenditures for which the company has recorded, but not necessarily paid for the capital expenditures.

	Years ended December 31,		
	2020	2019	2018
	(in millions)		
Maintenance capital expenditures	$ 68.3	$ 81.7	$ 82.1
Growth capital expenditures	18.8	26.2	32.1
Total capital expenditures	$ 87.1	$ 107.9	$ 114.2

Capital expenditures remained at a level sufficient for required maintenance and certain expansion growth initiatives during these periods. Growth capital expenditures are lower in the year ended December 31, 2020 as compared to December 31, 2019 due to delayed expansion capital to align with market conditions. Maintenance capital expenditures are lower in the year ended December 31, 2019 as compared to December 31, 2018 due to lower plant maintenance costs and the timing of turnaround projects.

Pension Funding

We paid $9.1 million, $8.8 million and $6.8 million in cash contributions into our defined benefit pension plans and other postretirement plans during the years ended December 31, 2020, 2019 and 2018, respectively. The net periodic pension and postretirement expense was $0.9 million, $3.5 million, and $2.3 million for those same periods, respectively.

As of December 31, 2020 and 2019, our pension plans and other post-retirement benefit plans were underfunded by $44.0 million and $55.3 million, respectively. In addition, our supplemental retirement plan had a liability balance of $12.4 million and $11.7 million as of December 31, 2020 and 2019, respectively, which is funded by our general assets including assets held in a Rabbi trust, or restoration plan assets, of $3.7 million and $4.2 million as of December 31, 2020 and 2019, respectively.

Off-Balance Sheet Arrangements

We had $18.2 million and $19.9 million of outstanding letters of credit on our revolver facility as of December 31, 2020 and 2019, respectively.

Critical Accounting Policies and Estimates

We prepare our consolidated financial statements in conformity with GAAP and our significant accounting policies are described in Note 2 to our consolidated financial statements. The preparation of financial statements in conformity with GAAP requires us to make estimates and assumptions that affect reported amounts and related disclosures. We base our estimates and judgments on historical experience and other relevant factors that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions. We review these matters and reflect changes in estimates as appropriate. We have identified below the accounting policies, estimates and critical judgment areas that we believe could have a material effect on our financial position, liquidity or results of operations.

Revenue Recognition

In determining the appropriate amount of revenue to be recognized as we fulfill our obligations under our agreements, we perform the following steps: (i) identify the contract with the customer; (ii) determine whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measure the transaction price; (iv) allocate the transaction price to the performance obligations based on estimated selling prices; and (v) recognize revenue when (or as) we satisfy each performance obligation.

We identify a contract when an agreement with a customer creates legally enforceable rights and obligations, which occurs when a contract has been approved by both parties, the parties are committed to perform their respective obligations, each party's rights and payment terms are clearly identified, commercial substance exists and it is probable that we will collect the consideration to which we are entitled.

Evidence of a contract with a customer may take the form of a master service agreement ("MSA"), a MSA in combination with an underlying purchase order, a combination of a pricing quote with an underlying purchase order or an individual purchase order received from a customer. Certain of our customers enter into MSAs that establish the terms, including prices, under which orders to purchase goods may be placed. In cases where the MSA contains a distinct order for goods or contains an enforceable minimum quantity to be purchased by the customer, we consider the MSA to be evidence of a contract with a customer as the MSA creates enforceable rights and obligations. In cases where the MSA does not contain a distinct order for goods, evidence of a contract with a customer is the purchase order issued under the MSA. Our customers may also negotiate orders via pricing quotes, which typically detail product pricing, delivery terms and payment information. When a customer procures goods under this method, we consider the combination of the pricing quote and the purchase order to create enforceable rights and obligations. Absent either a MSA or pricing quote, we consider an individual purchase order to create enforceable rights and obligations.

We identify a performance obligation in a contract for each promised good that is separately identifiable from other promises in the contract and for which the customer can benefit from the good. The majority of our contracts have a single performance obligation, which is the promise to transfer individual goods to the customer. Certain of our contracts include multiple performance obligations under which the purchase price for each distinct performance obligation is defined in the contract. These distinct performance obligations may include stand-ready provisions, which are arrangements to provide a customer assurance that they will have access to output from our manufacturing facilities, or monthly reservations of capacity fees. We consider stand-ready provisions and reservation of capacity fees to be performance obligations satisfied over time. Revenues related to stand-ready provisions and reservation of capacity fees are recognized on a ratable basis throughout the contract term and billed to the customer on a monthly basis.

As described above, our MSAs with our customers may outline prices for individual products or contract provisions. MSAs in the our Performance Chemicals and Refining Services segments may contain provisions whereby raw materials costs are passed-through to the customer per the terms of their contract. Our exposure to fluctuations in raw materials prices is limited, as the majority of pass-through contract provisions reset based on fluctuations in the underlying raw material price. MSAs in our Refining Services segment also contain take-or-pay arrangements, whereby the customer would incur a penalty in the form of a shortfall volume fee. Currently there is no history in which customers fail to meet the contractual minimum. Revenue from product sales are recorded at the sales price, which includes estimates of variable consideration for which reserves are established and which result from discounts, returns or other allowances that are offered within contracts with our customers.

We recognize revenues when performance obligations under the terms of a contract with our customer are satisfied, which generally occurs at a point in time by transferring control of a product to the customer. We determine the point in time when a customer obtains control of a product and we satisfy the performance obligation by considering factors including when we have a right to payment for the product, the customer has legal title to the product, we have transferred possession of the product, the customer has assumed the risks and rewards of ownership of the product and the customer has accepted the product. Revenue is measured as the amount of consideration we expect to receive in exchange for transferring goods. We do not have any significant payment terms as payment is received at, or shortly after, the point of sale.

Goodwill and Intangible Assets

Assets and liabilities of acquired businesses are measured at their estimated fair values at the dates of acquisition. The excess of the purchase price over the estimated fair value of the net assets acquired, including identified intangibles, is recorded as goodwill. The determination and allocation of fair value to the assets acquired and liabilities assumed is based on various assumptions and valuation methodologies requiring considerable management judgment, including estimates based on historical information, current market data and future expectations.

Goodwill and intangible assets with indefinite lives are not amortized, but are tested for impairment annually or more frequently if events or circumstances exist that would more likely than not reduce the fair value of the reporting unit below its carrying amount.

Goodwill is tested for impairment at the reporting unit level. In performing tests for goodwill impairment, we are able to use our discretion to first perform an optional qualitative assessment about the likelihood of the carrying value of a reporting unit exceeding its fair value. The qualitative assessment need not be applied to all reporting units. If we determine that it is more likely than not that the fair value of a reporting unit is less than its carrying amount based on the qualitative assessment, we perform a quantitative goodwill impairment test to identify the potential goodwill impairment and measure the amount of the goodwill impairment loss, if any, to be recognized for that reporting unit. For the annual assessments in 2020 and 2019, we bypassed the option to perform the qualitative assessment and proceeded directly to performing the quantitative goodwill impairment test for each of our reporting units. The quantitative test identifies both the potential existence of impairment and the amount of impairment loss. In performing our annual impairment test on goodwill as of October 1, 2020, we determined that an impairment existed with respect to our Performance Chemicals segment. As a result, we recorded a non-cash goodwill impairment charge of $260.0 million.

In applying the quantitative test, the Company calculates and compares the reporting unit's estimated fair value to its carrying value, including goodwill. If the fair value of a reporting unit exceeds its carrying value, goodwill is not impaired. If the carrying value of a reporting unit exceeds its implied fair value, an impairment charge is recognized, requiring recognition of a goodwill impairment charge for the differential up to the carrying value of goodwill. An impairment loss cannot exceed the carrying value of goodwill assigned to a reporting unit and the loss establishes a new basis in the goodwill. Subsequent reversal of an impairment loss is not permitted.

For the purposes of the quantitative goodwill impairment test, we determine the fair value of our reporting units using a combination of a market approach and an income, or discounted cash flow, approach. Estimating the fair value of a reporting unit requires various assumptions including the use of projections of future cash flows and discount rates that reflect the risks associated with achieving those cash flows. The key assumptions used in estimating the fair value are operating margin growth rates, revenue growth rates, the weighted average cost of capital, the perpetual growth rate, and the estimated earnings market multiples of each reporting unit. The market value is estimated using publicly traded comparable company values by applying their most recent annual adjusted EBITDA multiples to the reporting unit's adjusted EBITDA for the trailing twelve months. The income approach value is estimated using a discounted cash flow approach. The assumptions about future cash flows and growth rates are based on our assessment of a number of factors including the reporting unit's recent performance against budget as well as management's ability to execute planned future strategic initiatives. Discount rate assumptions are based on an assessment of the risk inherent in those future cash flows.

For intangible assets other than goodwill, definite-lived intangible assets are amortized over their respective estimated useful lives. Intangible assets with indefinite lives are not amortized, but rather are tested for impairment at least annually or more frequently if events occur or circumstances change that would more likely than not reduce the fair value of the intangible asset below its carrying amount. Our indefinite-lived intangible assets include trade names and certain trademarks. Similar to the goodwill impairment test, we may first assess qualitative factors to determine whether it is necessary to perform a quantitative impairment test. If we choose to bypass the qualitative assessment, or if the qualitative assessment indicates that the indefinite-lived intangible asset is more likely than not impaired, a quantitative impairment test must be performed. Unlike the goodwill impairment test, the quantitative test for indefinite-lived intangible assets is a one-step test comparing the fair value of the asset to its carrying amount. If the fair value of the indefinite-lived intangible asset is less than the carrying amount, an impairment loss is recognized in an amount equal to the difference.

The unit of accounting used to test our indefinite-lived intangible assets for impairment is at the reporting unit level. The fair values of our indefinite-lived trade names and trademarks are determined for impairment testing purposes based on an income approach using a discounted cash flow valuation model under a relief from royalty methodology. Significant assumptions under the relief from royalty method include the royalty rate a market participant may assume, projected sales and the discount rate applied to the estimated cash flows.

For definite-lived intangible assets, we amortize technical know-how over periods that range from fourteen to twenty years, customer relationships over periods that range from seven to fifteen years, trademarks over a fifteen year period, contracts over periods that range from two to sixteen years, and permits over five years. We perform an impairment review of definite-lived intangible assets when facts and circumstances indicate that the carrying value of an asset may not be recoverable from its undiscounted future cash flows. The impairment test for definite-lived intangible assets is consistent with the test applied to property, plant and equipment as described in our policy.

Assessment of the potential impairment of goodwill and intangible assets is an integral part of our normal ongoing review of operations. Testing for potential impairment of these assets is significantly dependent on numerous assumptions and reflects management's best estimates at a particular point in time. Estimates based on these assumptions may differ significantly from actual results. Changes in factors and assumptions used in assessing potential impairments can have a significant impact on the existence and magnitude of impairments, as well as the time in which such impairments are recognized.

In addition, we continually review our diverse portfolio of assets to ensure they are achieving their greatest potential and are aligned with our growth strategy. Strategic decisions involving a particular group of assets may trigger an assessment of the recoverability of the related assets. Such an assessment could result in impairment losses.

For further information see Note 15 Goodwill and Other Intangible Assets.

Income Taxes

We operate within multiple taxing jurisdictions and are subject to tax filing requirements and potential audits within these jurisdictions. Our operations and the global complexity of tax regulations require assessments of uncertainties and judgments in estimating taxes we will ultimately pay. The final taxes paid are dependent upon many factors, including negotiations with taxing authorities in various jurisdictions, outcomes of tax litigation and resolution of disputes arising from federal, state and international tax audits in the normal course of business. The resolution of these uncertainties may result in adjustments to our tax assets and tax liabilities. We use the asset and liability method in accounting for income taxes. Deferred tax assets and liabilities are recorded for temporary differences between the tax basis of assets and liabilities and their reported amounts in the financial statements, using statutory tax rates in effect for the year in which the differences are expected to reverse. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in the results of operations in the period that includes the enactment date. We evaluate our deferred tax assets each period to ensure that estimated future taxable income will be sufficient in character (e.g., capital gain versus ordinary income treatment), amount and timing, to result in their realizability. A valuation allowance is recorded to reduce the carrying amounts of deferred tax assets, unless it is more likely than not that those assets will be realized. Considerable judgments are required in establishing deferred tax valuation allowances. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences and carryforward deferred tax assets become deductible or utilized. We consider the scheduled reversal of taxable temporary differences, projected future taxable income and tax-planning strategies in making this assessment. As events and circumstances change, valuation allowances are adjusted within results from operations when applicable.

Generally, APB 23 of ASC Topic 740, Income Taxes (“ASC 740”), provides guidance with respect to establishing deferred income taxes on earnings from foreign subsidiaries, to the extent that these earnings are considered to be available for repatriation. Further, ASC 740-30 requires that deferred taxes be established with respect to the earnings of a foreign subsidiary, unless existing tax law provides a means by which the investment in a subsidiary can be recovered tax-free. We have determined that we are able repatriate the non-permanently reinvested earnings of our foreign subsidiaries in a tax-free manner. As such, we are able to assert for purposes of ASC 740-30 that no deferred income taxes are needed with respect to earnings from foreign subsidiaries.

We recognize net tax benefits under the recognition and measurement criteria of ASC 740, which prescribes requirements and other guidance for financial statement recognition and measurement of positions taken or expected to be taken on tax returns. We recognize a financial statement benefit for positions taken for tax return purposes when it will be more likely than not (i.e. greater than 50%) that the positions will be sustained upon tax examination, based solely on the technical merits of the tax positions. Otherwise, no tax benefit is recognized. The tax benefits recognized are measured based on the largest benefit that has a greater than 50% likelihood of being realized upon ultimate settlement. We recognize potential accrued interest and penalties related to unrecognized tax benefits as a component of income tax expense. Tax examinations are often complex as tax authorities may disagree with the treatment of items reported by us and may require several years to resolve. These accrued liabilities represent a provision for taxes that are reasonably expected to be incurred on the basis of available information but which are not certain.

On December 22, 2017, the TCJA was enacted into law. The TCJA provided for several significant tax law changes and modifications, including the reduction of the U.S. federal corporate income tax rate from 35% to 21%, the requirement for companies to pay a one-time transition tax on earnings of certain foreign subsidiaries that were previously tax deferred, as well as the creation of new taxes on certain foreign-sourced earnings. At December 31, 2018 we had completed our accounting for the impacts of the enactment of the Act.

The 2020 U.S. federal impact to tax expense with respect to GILTI is $7.8 million. Based on FASB guidance, we are permitted to make an accounting policy election to either (1) treat the taxes incurred as a result of the GILTI provision as a current-period expense when incurred or (2) factor such amounts into our measurement of deferred taxes. We have elected to treat any expense incurred as a current-period expense.

Stock-Based Compensation

We grant stock-based compensation awards in connection with our stock incentive plans. Under the terms of the incentive plans, we are authorized to issue equity awards to our employees, directors and affiliates. The grants have taken the form of restricted stock awards, restricted stock units, performance stock units and stock options. Restricted stock awards provide the recipient with shares of our stock subject to certain vesting requirements. Restricted stock units and performance stock units provide the recipient with the right to receive shares of our stock at a future date if certain vesting conditions are met. Stock option awards provide the recipient the ability to purchase shares of our stock at a given strike price upon the satisfaction of certain vesting requirements.

The vesting requirements associated with the awards include a mix of both service and/or performance conditions. Depending on the award and recipient, the service condition may reflect a cliff vesting provision (e.g., 100% vested upon four years of service) or a graded vesting provision (e.g., 33.3% vested each year over a period of three years). Restricted stock awards and stock options issued with performance conditions vest based on the occurrence of a defined liquidity event upon which certain investment funds affiliated with CCMP receive proceeds exceeding certain thresholds. Although achievement of the performance condition is subject to continued service with us, the terms of awards issued with performance conditions stipulate that the performance vesting condition can be attained for a period of six months following separation from service under certain circumstances, depending on the means of separation from the Company and subject to other factors such as individual separation agreements. The same performance vesting condition for our restricted stock awards also governs the achievement of the performance vesting condition for our stock options. The value of the restricted stock awards granted was based on the average of the high and low trading prices of our common stock on the NYSE on the preceding trading day, in accordance with our policy for valuing such awards.

In addition to restricted stock awards, we have granted restricted stock units and performance stock units as part of our equity incentive compensation program. Each restricted stock unit provides the recipient with the right to receive a share of common stock subject to graded vesting terms based on service, which generally requires one year of service for members of our board of directors and three years of service for employees. Performance stock units vest upon the achievement of Company-specific financial performance targets and the provision of service through the vesting date.

We recognize compensation expense related to our equity awards with service conditions on a straight-line basis over the stated vesting period for each award. Expense related to our equity awards with performance conditions is recognized in the period in which it becomes probable that the performance target will be achieved. No compensation expense has been recognized to-date on any of our restricted stock awards and stock options subject to vesting based on performance conditions, since a liquidity event triggering vesting of the awards has not occurred, nor is it considered probable.

The grant date fair value of restricted stock awards, restricted stock units and performance stock units is based on the value of our common stock as traded on the New York Stock Exchange. The grant date fair value of stock option awards is estimated using a Black-Scholes option pricing model. Determining the fair value of stock option awards at the grant date requires judgment, including estimates of the average risk-free interest rate, dividend yield, volatility and expected term. Since we have limited experience with respect to historical exercise and forfeiture rates or patterns, we have estimated certain assumptions using acceptable simplified methods and through benchmarking to our peer group of companies.

Recently Issued Accounting Standards

See Note 3 to our consolidated financial statements for a discussion of recently issued accounting standards and their effect on us.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK.

Our major market risk exposure is potential losses arising from changing rates and prices regarding foreign currency exchange rate risk, interest rate risk, commodity price risk and credit risk. The audit committee of our board of directors regularly reviews foreign exchange, interest rate and commodity hedging activity and monitors compliance with our hedging policy. We do not use financial instruments for speculative purposes, and we limit our hedging activity to the underlying economic exposure.

Foreign Exchange Risk

Our financial results are subject to the impact of gains and losses on currency translations, which occur when the financial statements of foreign operations are translated into U.S. dollars. We operate a geographically diverse business with approximately 40% of our sales during the years ended December 31, 2020 and 2019 coming from our international operations in currencies other than the U.S. dollar. Because consolidated financial results are reported in U.S. dollars, sales or earnings generated in currencies other than the U.S. dollar can result in a significant increase or decrease in the amount of those sales and earnings when translated to U.S. dollars. The financial statements of our operations outside the United States, where the local currency is considered to be the functional currency, are translated into U.S. dollars using the exchange rate in effect at each balance sheet date for assets and liabilities and the average exchange rate for each period for sales, expenses, gains, losses and cash flows. The exchange rates between these currencies and the U.S. dollar in recent years have fluctuated significantly and may continue to do so in the future. The foreign currencies to which we have the most significant exchange rate exposure include the euro, British pound, Canadian dollar, Brazilian real and the Mexican peso. Sales in these top five currencies represented approximately 34% of our sales during the year ended December 31, 2020. A 10% change in these currencies would have impacted sales by approximately $37.5 million, or 3% of sales assuming product pricing remained constant. The effect of translating foreign subsidiaries' balance sheets into U.S. dollars is included in other comprehensive income. The impact of gains and losses on transactions denominated in currencies other than the functional currency of the relevant operations are included in other non-operating expense. Income and expense items are translated at average exchange rates during the year. Net foreign exchange included in other expense was a $4.2 million gain for the year ended December 31, 2020. The foreign currency gain realized in the year ended December 31, 2020 was primarily driven by the Euro-denominated term loan and the non-permanent intercompany debt denominated in local currency and translated to U.S. dollars, and was principally non-cash in nature.

On February 8, 2018, we refinanced our existing senior secured term loan facility whereby the Term Loan Facility was used to repay the then-existing U.S. dollar denominated and Euro denominated Term Loan Facilities, thus reducing our exposure to fluctuations in the euro. Concurrent with the term loan refinancing, we entered into multiple cross currency swap arrangements to hedge foreign currency risk. The swaps are intended to enable us to effectively hedge our exposure on the net investments of certain of our Euro denominated subsidiaries.

As described in Note 3 to the consolidated financial statements included in this Form 10-K, the Financial Accounting Standards Board ("FASB") issued guidance in August 2017 with the objective of improving the financial reporting of hedging relationships to better portray the economic results of an entity's risk management activities in its financial statements. As a result of our early adoption of the FASB guidance, and because the swap agreements are designated as net investment hedges, changes in the fair value of the cross-currency swap agreements will be recognized as a component of "Foreign currency translation, net of tax" within "Other comprehensive income (loss), net of tax" in the consolidated statement of comprehensive income. In this regard, a favorable foreign currency change in the designated investment value of our foreign subsidiaries that use the Euro as their functional currency generally will be offset by an unfavorable foreign currency change in the cross-currency swap agreements, and vice versa. At December 31, 2020, a 10% fluctuation in the U.S. dollar-to-Euro currency exchange rate would have an approximately $34.4 million impact on the fair value of the notional amount of the cross-currency swap agreements and an offsetting $34.4 million impact on the designated net investment value of the foreign subsidiaries. In addition, in the event of a significant decline in the U.S. dollar-to-Euro exchange rate, our payment obligations to the counterparties could have a material adverse effect on our cash flows. In this regard, if, at the expiration or earlier termination of the swap agreements, the U.S. dollar-to-Euro currency exchange rate has declined by 10% from the rate in effect at December 31, 2020, we would be required to pay approximately $34.4 million to the counterparties. The swap agreements entail risk that the counterparties will not fulfill their obligations under the agreements. However, we believe the risk is reduced because we have entered into separate agreements with three different counterparties, all of whom are large, well-established financial institutions.

Interest Rate Risk

We are exposed to fluctuations in interest rates on our Senior Secured Credit Facilities. Changes in interest rates will not affect the market value of such debt but will affect the amount of our interest payments over the term of the loans. Likewise, an increase in interest rates could have a material impact on our cash flow. As of December 31, 2020, a 100 basis point increase in assumed interest rates for our variable interest credit facilities, before impact of any hedges, would have an annual impact of approximately $11.3 million on interest expense.

We hedge the interest rate fluctuations on debt obligations through interest rate cap agreements. We record the fair value of these hedges as assets or liabilities and the related unrealized gains or losses are deferred in stockholders' equity as a component of other comprehensive income (loss), net of tax. The interest rate caps had a fair value net asset of $3.7 million and $3.2 million at December 31, 2020 and 2019, respectively. Fair value is determined based on estimated amounts that would be received or paid to terminate the contracts at the reporting date based on quoted market prices.

In July 2016, we entered into interest rate cap agreements, paying a premium of $1.6 million to mitigate interest rate volatility from July 2016 through July 2020 by employing varying cap rates ranging from 1.50% to 3.00% on $1.0 billion of notional variable debt. In November 2018, the Company entered into additional interest rate cap agreements to mitigate interest rate volatility from July 2020 through July 2022, with a cap rate of 3.50% on $500.0 million of notional variable-rate debt and a $0.5 million premium annuitized during the effective period.

In February 2020, we restructured our $500.0 million notional interest rate cap agreements from July 31, 2020 through July 31, 2022 to lower the interest cap rate to 2.50% with a $0.1 million premium annuitized during the effective period. In March 2020, we further restructured our $500.0 million notional interest rate cap agreements from July 31, 2020 through July 31, 2022 to lower the interest rate cap to 0.84% with a $0.9 million premium annuitized during the effective period. Including premiums on the original November 2018 agreement and the February and March 2020 restructurings, the total cumulative annuitized premium of $4.4 million will be paid through July 31, 2022 on our interest rate cap agreements.

In July 2020, we entered into additional interest rate cap agreements to mitigate interest rate volatility from August 2020 to August 2023, with a cap rate of 1.00% on $400.0 million of notional variable-rate debt.

Commodity Risk

We purchase significant amounts of natural gas to supply the energy required in our production processes for our products in each of our segments. Since we are a producer of inorganic chemicals, natural gas provides an energy source for us but is not a direct feedstock for our products. Therefore, exposure to the volatility in energy prices is less than that of producers of organic petrochemicals. We purchase approximately 8.8 million MMBtu's of natural gas in a given year. Thus, a $1 increase in the cost of natural gas would impact our cost of goods sold by approximately $8.8 million absent hedging. Our purchase agreements with our customers typically provide for the pass through of natural gas price increases; however, there is no guarantee that we will continue to be able to pass through future price increases without loss of existing customers. We also make forward purchases of natural gas related to our production at certain subsidiary locations.

Credit Risk

We are exposed to credit risk on financial instruments to the extent our counterparty fails to perform certain duties as required under the provisions of an agreement. We only transact with counterparties having an appropriate credit rating for the risk involved. Credit exposure is managed through credit approval and monitoring procedures.

Concentration of credit risk can result primarily from trade receivables, for example, with certain customers operating in the same industry or customer groups located in the same geographic region. Credit risk related to these types of receivables is managed through credit approval and monitoring procedures. In the year ended December 31, 2020, we wrote off a nominal amount of bad debt on total sales of $1,107.4 million.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA.

The consolidated financial statements, supplementary information and financial statement schedules of the Company are set forth beginning on page F-1 of this report.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE.

None.

ITEM 9A. CONTROLS AND PROCEDURES.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2020. The term “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC’s rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company’s management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognized that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at a reasonable assurance level.

Management’s Annual Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act as a process, designed by, or under the supervision of the Company’s principal executive and principal financial officers and effected by the Company’s board of directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Internal control over financial reporting includes maintaining records that in reasonable detail accurately and fairly reflect our transactions and dispositions of assets; providing reasonable assurance that transactions are recorded as necessary for preparation of our financial statements; providing reasonable assurance that receipts and expenditures are made only in accordance with management and board authorizations; and providing reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on our financial statements. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate. Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2020. In making this assessment, management used the criteria for effective internal control over financial reporting described in the “Internal Control-Integrated Framework” (2013) set forth by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”). Based on the assessment, management concluded that, as of December 31, 2020, our internal control over financial reporting was effective based on those criteria.

The effectiveness of our internal control over financial reporting as of December 31, 2020 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report, which is included in Item 8.

Changes in Internal Control Over Financial Reporting

No changes in our internal control over financial reporting occurred during the quarter ended December 31, 2020 that materially affected, or which are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION.

None.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE.

The information required by this Item 10 will be included in our 2021 Proxy Statement, which we intend to file with the SEC within 120 days of our December 31, 2020 fiscal year end, and is incorporated herein by reference.

ITEM 11. EXECUTIVE COMPENSATION.

The information required by this Item 11 will be included in our 2021 Proxy Statement, which we intend to file with the SEC within 120 days of our December 31, 2020 fiscal year end, and is incorporated herein by reference.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS.

The information required by this Item 12 will be included in our 2021 Proxy Statement, which we intend to file with the SEC within 120 days of our December 31, 2020 fiscal year end, and is incorporated herein by reference.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE.

The information required by this Item 13 will be included in our 2021 Proxy Statement, which we intend to file with the SEC within 120 days of our December 31, 2020 fiscal year end, and is incorporated herein by reference.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES.

The information required by this Item 14 will be included in our 2021 Proxy Statement, which we intend to file with the SEC within 120 days of our December 31, 2020 fiscal year end, and is incorporated herein by reference.

PART IV

ITEM 15. EXHIBITS, FINANCIAL STATEMENT SCHEDULES.

(a) The following documents are filed as part of this report:

(1) and (2) The response to this portion of Item 15 is submitted as a separate section of this report beginning on page F-1. All other schedules have been omitted as inapplicable or are not required, or because the required information is included in the consolidated financial statements or accompanying notes. (3) The exhibits filed as part of this report are listed in the accompanying index.

			Incorporated by Reference			
Exhibit No.	Exhibit Description	Filed Herewith	Form	File No.	Exhibit	Filing Date
2.1	Stock Purchase Agreement, dated as of October 15, 2020, by and among PQ Corporation and Potters Buyer, LLC		8-K	001-38221	2.1	10/16/2020
2.2	Stock Purchase Agreement, dated as of February 28, 2021, by and among PQ Group Holdings Inc. and Sparta Aggregator L.P		8-K	001-38221	2.1	03/04/2021
3.1	Second Restated Certificate of Incorporation of PQ Group Holdings Inc.		10-Q	001-38221	3.1	11/14/2017
3.2	Amended and Restated Bylaws of PQ Group Holdings Inc.		S-1/A	333-218650	3.2	9/1/2017
4.1	Indenture, dated as of May 4, 2016, among PQ Corporation, as Issuer, the Guarantors from time to time party thereto and Wells Fargo Bank, National Association, as Trustee and Collateral Agent, including the form of Global Note attached as Exhibit A thereto		S-1	333-218650	4.2	6/9/2017
4.2	Indenture, dated as of December 11, 2017, among PQ Corporation, as Issuer, the guarantors party thereto and Wells Fargo Bank, National Association, as trustee		8-K	001-38221	4.1	12/13/2017
4.3	Description of PQ Group Holdings Inc.'s common stock		10-K	001-38221	4.3	12/31/2019
10.1	Term Loan Credit Agreement, dated as of May 4, 2016, by and among PQ Corporation, CPQ Midco I Corporation, the Lenders from time to time party thereto, and Credit Suisse AG, Cayman Islands Branch, as Administrative Agent and Collateral Agent, with Citigroup Global Markets Inc., Credit Suisse Securities (USA) LLC, JPMorgan Chase Bank, N.A., Morgan Stanley Senior Funding, Inc., Deutsche Bank Securities Inc., Goldman Sachs Lending Partners LLC, Jefferies Finance LLC and KeyBanc Capital Markets Inc., as Joint Lead Arrangers and Joint Bookrunners		S-1	333-218650	10.1	6/9/2017
10.1	New Term Loan Credit Agreement, dated as of July 22, 2020 among CPQ Midco I Corporation, PQ Corporation, Eco Services Operations Corp., Credit Suisse AG, Cayman Islands Branch, as administrative agent and collateral agent, and the lenders from time to time party thereto		8-K	001-38221	10.1	7/28/2020
10.2	First Amendment Agreement, dated as of November 14, 2016, to the Term Loan Credit Agreement dated as of May 4, 2016, among PQ Corporation, CPQ Midco I Corporation, the Guarantors named on the signature pages thereto, JPMorgan Chase Bank, N.A., as an Additional Term Lender, and Credit Suisse AG, Cayman Islands Branch, as Administrative Agent and Collateral Agent		S-1	333-218650	10.2	6/9/2017

Exhibit No.	Exhibit Description	Filed Herewith	Incorporated by Reference Form	File No.	Exhibit	Filing Date
10.3	Second Amendment Agreement, dated as of August 7, 2017, to the Term Loan Credit Agreement dated as of May 4, 2016 (as amended by the First Amendment Agreement dated as of November 14, 2016), among PQ Corporation, CPQ Midco I Corporation, the Guarantors named on the signature pages thereto, Citibank, N.A., as an Additional Term Lender, and Credit Suisse AG, Cayman Islands Branch, as Administrative Agent and Collateral Agent		S-1/A	333-218650	10.19	8/14/2017
10.4	Third Amendment Agreement, dated as of February 8, 2018, to the Term Loan Credit Agreement dated as of May 4, 2016 (as amended by the First Amendment Agreement dated as of November 14, 2016 and the Second Amendment Agreement dated as of August 7, 2017) among PQ Corporation, CPQ Midco I Corporation, the Guarantors named on the signature pages thereto, Citibank, N.A., as an Additional Term Lender, and Credit Suisse AG, Cayman Island Branch, as Administrative Agent and Collateral Agent		8-K	001-38221	10.1	2/9/2018
10.5	Fourth Amendment Agreement, dated as of February 7, 2020, to the Term Loan Credit Agreement dated as of May 4, 2016 (as amended by the First Amendment Agreement dated as of November 14, 2016, the Second Amendment Agreement dated as of August 7, 2017 and the Third Amendment Agreement dated as of February 8, 2018) among PQ Corporation, CPQ Midco I Corporation, the Guarantors named on the signature pages thereto, Citibank, N.A., as the replacement lender, and Credit Suisse AG, Cayman Island Branch, as Administrative Agent and Collateral Agent		8-K	001-38221	10.1	2/13/2020
10.6	ABL Credit Agreement, dated as of May 4, 2016, by and among PQ Corporation, CPQ Midco I Corporation, the Canadian Borrowers from time to time party thereto, the European Borrowers from time to time party thereto, the Lenders from time to time party thereto and Citibank, N.A., as Administrative Agent and Issuing Bank, with Citigroup Global Markets Inc., Credit Suisse Securities (USA) LLC, JPMorgan Chase Bank, N.A., Morgan Stanley Senior Funding, Inc., Deutsche Bank Securities Inc., Goldman Sachs Lending Partners LLC, Jefferies Finance LLC and KeyBanc Capital Markets Inc., as Joint Lead Arrangers and Joint Bookrunners		S-1	333-218650	10.3	6/9/2017
10.7	Partnership Agreement, dated as of February 1, 1988, by and between PQ Corporation and Shell Polymers and Catalysts Enterprises Inc.		S-1/A	333-218650	10.10	8/14/2017
10.8	First Amendment to Partnership Agreement, dated January 1, 1993, by and among PQ Corporation, Shell Catalyst Ventures Inc. and CRI Zeolites Inc.		S-1/A	333-218650	10.11	8/14/2017
10.9	Second Amendment to Partnership Agreement, dated October 18, 2002, by and between PQ Corporation and Shell Catalyst Ventures Inc.		S-1/A	333-218650	10.12	8/14/2017
10.10	Third Amendment to Partnership Agreement, dated January 1, 2005, by and between PQ Corporation and CRI Zeolites Inc.		S-1/A	333-218650	10.13	8/14/2017
10.11	Lease Agreement, dated January 1, 2017, by and between The Realty Associates Fund X, L.P. and PQ Corporation		S-1	333-218650	10.4	6/9/2017

Exhibit No.	Exhibit Description	Filed Herewith	Incorporated by Reference Form	File No.	Exhibit	Filing Date
10.12	Form of Amended and Restated Stockholders Agreement between PQ Group Holdings Inc. and certain stockholders of PQ Group Holdings Inc.		S-1/A	333-218650	10.5	9/1/2017
10.13*	PQ Group Holdings Inc. 2017 Omnibus Incentive Plan		S-1/A	333-218650	10.14	9/19/2017
10.14*	Form of Stock Option Award Agreement under the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan		S-1/A	333-218650	10.15	9/1/2017
10.15*	Form of Restricted Stock Award Agreement under the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan		S-1/A	333-218650	10.16	9/1/2017
10.16*	Form of Restricted Stock Unit Award Agreement under the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan		S-1/A	333-218650	10.17	9/1/2017
10.17*	Form of Performance Stock Unit Award Agreement under the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan		10-Q	001-38221	10.1	5/10/2019
10.18*	PQ Group Holdings Inc. Stock Incentive Plan		S-1	333-218650	10.6	6/9/2017
10.19*	Form of Nonqualified Stock Option Award Agreement under the PQ Group Holdings Inc. Stock Incentive Plan		S-1	333-218650	10.7	6/9/2017
10.20*	Form of Restricted Stock Agreement under the PQ Group Holdings Inc. Stock Incentive Plan		S-1	333-218650	10.8	6/9/2017
10.21*	Form of Director and Officer Indemnification Agreement		S-1/A	333-218650	10.9	9/1/2017
10.22*	Severance Agreement, dated August 9, 2018, by and between PQ Corporation and Belgacem Chariag		8-K	001-38221	10.2	8/9/2018
10.23*	Severance Agreement, dated August 31, 2017, by and between PQ Corporation and James F. Gentilcore		S-1/A	333-218650	10.18	9/19/2017
10.24*	Letter Agreement, dated August 9, 2018, by and between PQ Corporation, PQ Group Holdings Inc. and James F. Gentilcore		8-K	001-38221	10.1	8/9/2018
10.25*	Separation and General Release Agreement, dated December 21, 2018, by and between PQ Corporation, PQ Group Holdings Inc. and James F. Gentilcore		8-K	001-38221	10.1	12/26/2018
10.26*	Severance Agreement, dated August 31, 2017, by and between PQ Corporation and Michael Crews		S-1/A	333-218650	10.19	9/19/2017
10.27*	Severance Agreement, dated August 31, 2017, by and between PQ Corporation and Scott Randolph		S-1/A	333-218650	10.20	9/19/2017
10.28*	Severance Agreement, dated August 31, 2017, by and between PQ Corporation and Paul Ferrall		S-1/A	333-218650	10.21	9/19/2017
10.29*	Severance Agreement and General Release, dated August 31, 2017, by and between PQ Corporation and Michael R. Boyce		S-1/A	333-218650	10.22	9/19/2017
10.30*	Letter of employment, dated August 30, 2017, by and between PQ Corporation and David Taylor		10-Q	001-38221	10.2	5/10/2019
10.31*	Consent under the August 31, 2017 Severance Agreement, dated March 29, 2019, by and between PQ Corporation and Scott Randolph		10-Q	001-38221	10.3	5/10/2019
10.32*	Transition Agreement and General Release, dated November 15, 2019, between PQ Corporation and David J. Taylor		8-K	001-38221	10.1	11/21/2019
10.33*	Transition Agreement and General Release, dated November 26, 2019, between PQ Corporation and Paul J. Ferrall		8-K	001-38221	10.1	12/03/2019

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Exhibit No.	Exhibit Description	Filed Herewith	Incorporated by Reference Form	File No.	Exhibit	Filing Date
10.34*	Consulting Agreement, dated November 26, 2019, between PQ Corporation and Paul J. Ferrall		8-K	001-38221	10.2	12/03/2019
10.35*	Amendment to the Severance Agreement, dated August 31, 2017, by and between PQ Corporation and Scott Randolph		10-K	001-38221	10.35	2/27/2020
10.36*	Letter of employment, dated December 8, 2015, by and between PQ Corporation and Ray Kolberg		10-K	001-38221	10.36	2/27/2020
10.37*	Severance Agreement, dated September 25, 2017, by and between PQ Corporation and Joseph S. Koscinksi		10-K	001-38221	10.37	2/27/2020
10.38*	Transition Agreement and General Release and Waiver of Claims, dated December 16, 2020, between PQ Corporation and Scott Randolph		8-K	001-38221	10.1	12/18/2020
10.39*	PQ Group Holdings Inc. 2017 Omnibus Incentive Plan as Amended and Restated		8-K	001-38221	10.1	05/05/2020
10.40*	First Amendment Agreement, dated as of March 20,2020, to the ABL Credit Agreement, dated as of May 4,2016, by and among PQ Corporation, CPQ Midco I Corporation, the Canadian Borrowers from time to time party thereto, the European Borrowers from time to time party thereto, the Guarantors from time to time party thereto, the Replacement Lenders from time to time party thereto, and Citibank, N.A., as Administrative Agent and as Collateral Agent		8-K	001-38221	10.1	05/11/2020
10.41*	Form of Performance Stock Unit Award Agreement under the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan		10-Q	001-38221	10.2	05/11/2020
21.1	Subsidiaries of PQ Group Holdings Inc.	X				
23.1	Consent of PricewaterhouseCoopers LLP related to the consolidated financial statements and financial statement schedule of PQ Group Holdings Inc. as of December 31, 2020 and 2019 and for each of the three years in the period ended December 31, 2020	X				
23.2	Consent of PricewaterhouseCoopers LLP related to the financial statements of Zeolyst International as of December 31, 2020 and 2019 and for each of the three years in the period ended December 31, 2020	X				
31.1	Certification of Chief Executive Officer of PQ Group Holdings Inc. pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	X				
31.2	Certification of Chief Financial Officer of PQ Group Holdings Inc. pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	X				
32.1	Certification of Chief Executive Officer of PQ Group Holdings Inc. pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002	X				
32.2	Certification of Chief Financial Officer of PQ Group Holdings Inc. pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002	X				

Exhibit No.	Exhibit Description	Filed Herewith	Incorporated by Reference			
			Form	File No.	Exhibit	Filing Date
101	The following financial statements from the Annual Report on Form 10-K of PQ Group Holdings Inc. for the year ended December 31, 2020, formatted in Inline XBRL: (i) Consolidated Statements of Income, (ii) Consolidated Statements of Comprehensive Income, (iii) Consolidated Balance Sheets, (iv) Consolidated Statements of Stockholders' Equity, (v) Consolidated Statements of Cash Flows, and (vi) Notes to Consolidated Financial Statements, tagged as blocks of text and including detailed tags	X				
104	The cover page from the Annual Report on Form 10-K of PQ Group Holdings Inc. for the year ended December 31, 2020, formatted in Inline XBRL	X				

* Management contract or compensatory plan

ITEM 16. FORM 10-K SUMMARY.

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

PQ GROUP HOLDINGS INC.

Date: March 17, 2021

By: /s/ MICHAEL CREWS
Michael Crews
Executive Vice President and Chief Financial Officer
(Duly Authorized Officer and Principal Financial and Accounting Officer)

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ BELGACEM CHARIAG Belgacem Chariag	Chairman of the Board, President and Chief Executive Officer (Principal Executive Officer)	March 17, 2021
/s/ MICHAEL CREWS Michael Crews	Executive Vice President and Chief Financial Officer (Principal Financial and Accounting Officer)	March 17, 2021
/s/ GREG BRENNEMAN Greg Brenneman	Director	March 17, 2021
/s/ TIMOTHY WALSH Timothy Walsh	Director	March 17, 2021
/s/ MARK McFADDEN Mark McFadden	Director	March 17, 2021
/s/ CHRISTOPHER BEHRENS Christopher Behrens	Director	March 17, 2021
/s/ ROBERT COXON Robert Coxon	Director	March 17, 2021
/s/ ANDREW CURRIE Andrew Currie	Director	March 17, 2021
/s/ JONNY GINNS Jonny Ginns	Director	March 17, 2021
/s/ KYLE VANN Kyle Vann	Director	March 17, 2021
/s/ MARTIN S. CRAIGHEAD Martin S. Craighead	Director	March 17, 2021
/s/ SUSAN F. WARD Susan F. Ward	Director	March 17, 2021

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PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
Audited Consolidated Financial Statements

ZEOLYST INTERNATIONAL
Audited Financial Statements

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of PQ Group Holdings Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of PQ Group Holdings Inc. and its subsidiaries (the "Company") as of December 31, 2020 and 2019, and the related consolidated statements of income, of comprehensive income (loss), of stockholders' equity and of cash flows for each of the three years in the period ended December 31, 2020, including the related notes and schedule of condensed parent company information as of December 31, 2020 and 2019 and for each of the three years in the period ended December 31, 2020 listed in the accompanying index (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2020, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2020 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2020, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Annual Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Goodwill Impairment Assessment - Performance Chemicals Reporting Unit

As described in Notes 2 and 15 to the consolidated financial statements, the Company's consolidated goodwill balance was $717.7 million as of December 31, 2020, and the goodwill associated with the Performance Chemicals reporting unit was $326.2 million. Management is required to test goodwill associated with each of its reporting units for impairment at least annually and whenever events or circumstances indicate that it is more likely than not that goodwill may be impaired. Management performs its annual goodwill impairment test as of October 1. Goodwill is tested for impairment at the reporting unit level. If the carrying value of a reporting unit exceeds its implied fair value, an impairment charge is recognized. Management applied the market approach to estimate the fair value of the Performance Chemicals reporting unit. The Company recorded a goodwill impairment charge of $260 million in the fourth quarter of 2020 related to the Performance Chemicals reporting unit. In applying the market approach, management estimates the reporting unit fair value using publicly traded comparable company values and applies the selected market multiples to each reporting unit's trailing twelve months adjusted EBITDA.

The principal considerations for our determination that performing procedures relating to the goodwill impairment assessment of the Performance Chemicals reporting unit is a critical audit matter are (i) the significant judgment by management when determining the fair value estimate of the reporting unit; (ii) a high degree of auditor judgment, subjectivity, and effort in performing procedures and evaluating the significant assumption related to market multiples; and (iii) the audit effort involved the use of professionals with specialized skill and knowledge.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to management's goodwill impairment assessment, including controls over the valuation of the Performance Chemicals reporting unit. These procedures also included, among others, (i) testing management's process for determining the fair value estimate of the Performance Chemicals reporting unit; (ii) evaluating the appropriateness of the market approach method; (iii) evaluating the reasonableness of the significant assumption used by management related to market multiples; and (iv) testing the completeness and accuracy of the underlying data used in the estimate. Evaluating management's assumption related to market multiples involved evaluating whether the assumption was reasonable considering (i) the current and past performance of the reporting unit; (ii) consistency with external industry data, and (iii) whether this assumption was consistent with evidence obtained in other areas of the audit. Professionals with specialized skill and knowledge were used to assist in evaluating (i) the appropriateness of the market approach method and (ii) reasonableness of the significant assumption related to market multiples.

/s/ PricewaterhouseCoopers LLP
Philadelphia, Pennsylvania
March 17, 2021

We have served as the Company's auditor since 2015.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF INCOME
(in thousands, except share and per share amounts)

	Years ended December 31, 2020	2019	2018
Sales	$ 1,107,363	$ 1,199,914	$ 1,228,926
Cost of goods sold	834,007	901,512	925,534
Gross profit	273,356	298,402	303,392
Selling, general and administrative expenses	125,294	129,516	131,402
Goodwill impairment charge	260,000	—	—
Other operating expense, net	50,986	21,378	16,427
Operating (loss) income	(162,924)	147,508	155,563
Equity in net income from affiliated companies	(21,237)	(46,022)	(37,569)
Interest expense, net	66,979	87,072	90,758
Debt extinguishment costs	25,028	3,400	7,751
Other (income) expense, net	(6,109)	(2,372)	10,603
(Loss) income from continuing operations before income taxes and noncontrolling interest	(227,585)	105,430	84,020
(Benefit) provision for income taxes	(48,122)	39,677	33,641
Net (loss) income from continuing operations	(179,463)	65,753	50,379
Net (loss) income from discontinued operations, net of tax	(102,241)	14,557	9,242
Net (loss) income	(281,704)	80,310	59,621
Less: Net (loss) income attributable to the noncontrolling interest - continuing operations	(3,198)	617	1,108
Less: Net income (loss) attributable to the noncontrolling interest - discontinued operations	265	154	213
Net (loss) income attributable to PQ Group Holdings Inc.	$ (278,771)	$ 79,539	$ 58,300
(Loss) income from continuing operations	$ (176,265)	$ 65,136	$ 49,271
(Loss) income from discontinued operations	(102,506)	14,403	9,029
Net (loss) income attributable to PQ Group Holdings Inc.	$ (278,771)	$ 79,539	$ 58,300
Net (loss) income per share:			
Basic (loss) income per share - continuing operations	$ (1.30)	$ 0.48	$ 0.37
Diluted (loss) income per share - continuing operations	$ (1.30)	$ 0.48	$ 0.37
Basic (loss) income per share - discontinued operations	$ (0.76)	$ 0.11	$ 0.07
Diluted (loss) income per share - discontinued operations	$ (0.76)	$ 0.11	$ 0.07
Basic (loss) income per share	$ (2.06)	$ 0.59	$ 0.44
Diluted (loss) income per share	$ (2.06)	$ 0.59	$ 0.43
Weighted average shares outstanding:			
Basic	135,528,977	134,389,667	133,380,567
Diluted	135,528,977	135,548,694	134,684,931

See accompanying notes to consolidated financial statements.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
(in thousands)

	Years ended December 31,		
	2020	2019	2018
Net (loss) income	$ (281,704)	$ 80,310	$ 59,621
Other comprehensive income (loss), net of tax:			
Pension and postretirement benefits	1,938	2,430	(7,958)
Net (loss) gain from hedging activities	166	(2,665)	(330)
Foreign currency translation	(17,519)	22,889	(35,056)
Total other comprehensive income (loss)	(15,415)	22,654	(43,344)
Comprehensive (loss) income	(297,119)	102,964	16,277
Less: Comprehensive (loss) income attributable to noncontrolling interests	(3,856)	1,543	1,392
Comprehensive (loss) income attributable to PQ Group Holdings Inc.	$ (293,263)	$ 101,421	$ 14,885

See accompanying notes to consolidated financial statements.

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PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
CONSOLIDATED BALANCE SHEETS
(in thousands, except share and per share amounts)

	December 31, 2020	December 31, 2019
ASSETS		
Cash and cash equivalents	$ 135,531	$ 53,861
Accounts receivables, net	132,619	140,044
Inventories, net	127,436	137,622
Prepaid and other current assets	32,554	31,591
Current assets held for sale	—	206,369
Total current assets	428,140	569,487
Investments in affiliated companies	458,452	472,814
Property, plant and equipment, net	983,235	1,011,156
Goodwill	717,738	973,578
Other intangible assets, net	526,303	555,272
Right-of-use lease assets	48,239	48,417
Other long-term assets	35,714	27,373
Long-term assets held for sale	—	663,644
Total assets	$ 3,197,821	$ 4,321,741
LIABILITIES		
Current maturities of long-term debt	$ —	$ —
Accounts payable	112,333	114,994
Operating lease liabilities—current	15,194	11,857
Accrued liabilities	73,811	85,410
Current liabilities held for sale	—	58,103
Total current liabilities	201,338	270,364
Long-term debt, excluding current portion	1,400,369	1,843,224
Deferred income taxes	175,901	209,425
Operating lease liabilities—noncurrent	32,019	34,908
Other long-term liabilities	111,015	91,304
Long-term liabilities of held for sale	—	87,198
Total liabilities	1,920,642	2,536,423
Commitments and contingencies (Note 24)		
EQUITY		
Common stock ($0.01 par); authorized shares 450,000,000; issued shares 137,102,143 and 136,861,382 on December 31, 2020 and 2019, respectively; outstanding shares 136,318,557 and 136,464,961 on December 31, 2020 and 2019, respectively	1,371	1,369
Preferred stock ($0.01 par); authorized shares 50,000,000; no shares issued or outstanding on December 31, 2020 and 2019, respectively	—	—
Additional paid-in capital	1,477,859	1,696,899
(Accumulated deficit) retained earnings	(175,758)	103,013
Treasury stock, at cost; shares 783,586 and 396,421 on December 31, 2020 and 2019, respectively	(11,081)	(6,483)
Accumulated other comprehensive loss	(15,265)	(15,348)
Total PQ Group Holdings Inc. equity	1,277,126	1,779,450
Noncontrolling interest	53	5,868
Total equity	1,277,179	1,785,318
Total liabilities and equity	$ 3,197,821	$ 4,321,741

See accompanying notes to consolidated financial statements.

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PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands, except share data)

	Shares of Common stock	Common stock	Additional paid-in capital	Retained earnings (accum. deficit)	Shares of Treasury stock	Treasury stock, at cost	Accum. other comp. income (loss)	Non-controlling interest	Total
December 31, 2017	135,244,379	$ 1,352	$ 1,655,114	$ (32,777)	—	$ —	$ 4,311	$ 3,919	$ 1,631,919
Net income	—	—	—	58,300	—	—	—	1,321	59,621
Other comprehensive income (loss)	—	—	—	—	—	—	(43,415)	71	(43,344)
Repurchases of common shares	—	—	—	—	(166,224)	(2,920)	—	—	(2,920)
Distributions to noncontrolling interests	—	—	—	—	—	—	—	(726)	(726)
Stock compensation expense	—	—	19,464	—	—	—	—	—	19,464
Shares issued under equity incentive plan, net of forfeitures	513,890	6	125	—	—	—	—	—	131
December 31, 2018	135,758,269	$ 1,358	$ 1,674,703	$ 25,523	(166,224)	$ (2,920)	$ (39,104)	$ 4,585	$ 1,664,145
Cumulative effect adjustment from adoption of new accounting standards	—	—	—	(2,049)	—	—	1,874	—	(175)
December 31, 2018, as adjusted	135,758,269	$ 1,358	$ 1,674,703	$ 23,474	(166,224)	$ (2,920)	$ (37,230)	$ 4,585	$ 1,663,970
Net income	—	—	—	79,539	—	—	—	771	80,310
Other comprehensive income (loss)	—	—	—	—	—	—	21,882	772	22,654
Repurchases of common shares	—	—	—	—	(230,197)	(3,563)	—	—	(3,563)
Distributions to noncontrolling interests	—	—	—	—	—	—	—	(260)	(260)
Stock compensation expense	—	—	18,225	—	—	—	—	—	18,225
Shares issued under equity incentive plan, net of forfeitures	1,103,113	11	3,971	—	—	—	—	—	3,982
December 31, 2019	136,861,382	$ 1,369	$ 1,696,899	$ 103,013	(396,421)	$ (6,483)	$ (15,348)	$ 5,868	$ 1,785,318
Net loss	—	—	—	(278,771)	—	—	—	(2,933)	(281,704)
Other comprehensive income (loss)	—	—	—	—	—	—	(14,492)	(923)	(15,415)
Repurchases of common shares	—	—	—	—	(387,165)	(4,598)	—	—	(4,598)
Distributions to noncontrolling interests	—	—	—	—	—	—	—	(1,219)	(1,219)
Dividends paid on common stock ($1.80 per share)	—	—	(243,749)	—	—	—	—	—	(243,749)
Disposal of business	—	—	—	—	—	—	14,575	(740)	13,835
Stock compensation expense	—	—	24,366	—	—	—	—	—	24,366
Shares issued under equity incentive plan, net of forfeitures	240,761	2	343	—	—	—	—	—	345
December 31, 2020	137,102,143	$ 1,371	$ 1,477,859	$ (175,758)	(783,586)	$ (11,081)	$ (15,265)	$ 53	$ 1,277,179

See accompanying notes to consolidated financial statements.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Years ended December 31,		
	2020	2019	2018
Cash flows from operating activities:			
Net (loss) income	$ (281,704)	$ 80,310	$ 59,621
Net loss (income) from discontinued operations	102,241	(14,557)	(9,242)
Adjustments to reconcile net (loss) income to net cash provided by operating activities:			
Depreciation	114,641	111,032	111,491
Amortization	37,199	40,765	42,440
Goodwill impairment charge	260,000	—	—
Amortization of deferred financing costs and original issue discount	3,750	3,786	4,230
Debt extinguishment costs	22,658	3,400	5,627
Foreign currency exchange (gain) loss	(4,172)	2,410	12,543
Pension and postretirement healthcare benefit expense	879	3,536	2,280
Pension and postretirement healthcare benefit funding	(9,138)	(8,825)	(6,805)
Deferred income tax provision (benefit)	(64,693)	15,489	4,072
Net (gain) loss on asset disposals	(11,392)	(13,207)	4,190
Stock compensation	21,527	16,212	18,419
Equity in net income from affiliated companies	(21,237)	(46,022)	(37,569)
Dividends received from affiliated companies	40,098	40,073	40,195
Net interest income on swaps designated as net investment hedges	(4,963)	(8,480)	(4,859)
Gain on contract termination	—	—	(20,612)
Other, net	(9,479)	(5,292)	(907)
Working capital changes that provided (used) cash, excluding the effect of acquisitions and dispositions:			
Receivables	7,031	11,407	(4,191)
Inventories	9,392	(9,981)	(7,165)
Prepaids and other current assets	2,016	2,294	(6,996)
Accounts payable	4,163	(576)	(3,491)
Accrued liabilities	(13,435)	3,886	9,855
Net cash provided by operating activities, continuing operations	205,382	227,660	213,126
Net cash provided by operating activities, discontinued operations	18,216	40,103	35,518
Net cash provided by operating activities	223,598	267,763	248,644
Cash flows from investing activities:			
Purchases of property, plant and equipment	(97,135)	(111,102)	(111,795)
Investment in affiliated companies	—	—	(5,000)
Proceeds from business divestiture, net of cash and indebtedness	624,256	—	—
Proceeds from sale of assets	9,375	17,600	12,380
Proceeds from sale of product line	18,000	27,658	—
Proceeds from sale of investment	1,761	—	—
Proceeds from settlement of swaps designated as net investment hedges	—	38,070	—
Net interest proceeds on swaps designated as net investment hedges	4,963	8,480	4,859
Other, net	1,015	475	829
Net cash provided by (used in) investing activities, continuing operations	562,235	(18,819)	(98,727)
Net cash (used in) provided by investing activities, discontinued operations	(10,763)	(16,540)	(20,563)
Net cash (used in) provided by investing activities	551,472	(35,359)	(119,290)

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	Years ended December 31,		
	2020	2019	2018
Cash flows from financing activities:			
Draw down of revolving credit facilities	140,626	177,874	119,134
Repayments of revolving credit facilities	(140,626)	(177,874)	(144,134)
Issuance of long-term debt, net of original issue discount and financing fees	640,340	—	1,267,000
Debt issuance costs	(8,987)	—	(6,395)
Repayments of long-term debt	(1,091,134)	(215,000)	(1,367,959)
Debt prepayment fees	(10,550)	—	—
Dividends paid to stockholders	(243,749)	—	—
Repurchases of common shares	(4,598)	(3,563)	(2,920)
Proceeds from stock options exercised	373	3,975	131
Other, net	(2,868)	(317)	(134)
Net cash used in financing activities, continuing operations	(721,173)	(214,905)	(135,277)
Net cash used in financing activities, discontinued operations	(1,647)	(1,188)	(1,948)
Net cash used in financing activities	(722,820)	(216,093)	(137,225)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	11,052	(2,120)	354
Net change in cash, cash equivalents and restricted cash	63,302	14,191	(7,517)
Cash, cash equivalents and restricted cash at beginning of period	73,917	59,726	67,243
Cash, cash equivalents and restricted cash at end of period	$ 137,219	$ 73,917	$ 59,726
Less cash, cash equivalents and restricted cash of discontinued operations	$ —	$ (18,725)	$ (21,127)
Cash, cash equivalents and restricted cash at end of period of continuing operations	$ 137,219	$ 55,192	$ 38,599

For supplemental cash flow disclosures, see Note 28.
See accompanying notes to consolidated financial statements.

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PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(Dollars in thousands, except share and per share amounts)

1. Background and Basis of Presentation:

Description of Business

PQ Group Holdings Inc. and subsidiaries (the "Company" or "PQ Group Holdings") is a leading integrated and innovative global provider of specialty catalysts, chemicals and services. The Company supports customers globally through its strategically located network of manufacturing facilities. The Company believes that its products, which are predominantly inorganic, and services contribute to improving the sustainability of the environment.

Basis of Presentation

The Company has three uniquely positioned specialty businesses: Refining Services provides sulfuric acid recycling to the North American refining industry; Catalysts serves the packaging and engineered plastics industry and the global refining, petrochemical and emissions control industries through its Zeolyst joint venture; and Performance Chemicals supplies diverse product end uses, including personal and industrial cleaning products, fuel-efficient tires, surface coatings, and food and beverage products.

Effective December 14, 2020, the Company completed the sale of its Performance Materials business and the results of operations of this business have been presented as discontinued operations in the consolidated statements of income for all periods presented. See Note 4 for more information on the assets and liabilities classified as held for sale. The notes to the consolidated financial statements, unless otherwise indicated, are on a continuing operations basis.

The Company's Refining Services segment typically experiences seasonal fluctuations as a result of higher demand for gasoline products in the summer months and lower demand in the winter months. These demand fluctuations result in higher sales and working capital requirements in the second and third quarter.

COVID-19

In March 2020, the outbreak of a novel coronavirus ("COVID-19") was declared a national emergency in the United States. COVID-19 continues to spread in the United States and other parts of the world and has adversely impacted economic activity and contributed to volatility in financial markets. In response to the COVID-19 pandemic, the federal government and various state, local and foreign governments have issued decrees and orders that have disrupted many businesses and implemented social distancing, travel and other restrictions. In response to these restrictions, the Company has taken a variety of actions, including an international travel ban, distribution of personal protective equipment to employees and work-at-home requirements for many of the Company's employees who are not an integral part of its manufacturing operations. The Company has also implemented and refined its existing business continuity plans in an effort to minimize operational disruptions. The Company's manufacturing operations, as well as the operations of its key vendors and the majority of its key customers, have continued to operate with limited interruptions. The extent and timing of the impact of the COVID-19 pandemic on the Company's business led to lower sales volume demand beginning in the second quarter of 2020. The Company is not aware of any specific event or circumstance that would require an update to our estimates or judgments or a revision of the carrying value of its assets or liabilities as of the date of the issuance of the consolidated financial statements. These estimates may change, as the pandemic continues to evolve and the duration remains uncertain, and may adversely impact the Company's results of operations, financial condition or cash flow.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(Dollars in thousands, except share and per share amounts)

2. Summary of Significant Accounting Policies:

Principles of Consolidation. The consolidated financial statements include the accounts of the Company and its controlled subsidiaries. Investments in affiliated companies are recorded at cost plus the Company's equity in their undistributed earnings. All intercompany transactions have been eliminated. Noncontrolling interests represent third-party equity ownership in certain of the Company's consolidated subsidiaries and are presented as a component of equity separate from the equity attributable to the Company's shareholders. The noncontrolling interests' share in the Company's net earnings are included in net income attributable to the noncontrolling interest in the Company's consolidated statements of income, and their portion of the Company's comprehensive income is included in comprehensive income (loss) attributable to noncontrolling interests in the Company's consolidated statements of comprehensive income (loss). The Company's noncontrolling interests relate to third-party minority ownership interests held in certain of the Company's foreign subsidiaries acquired as part of a former business combination.

Foreign Currency Translation. All assets and liabilities of foreign subsidiaries and affiliated companies are translated to U.S. dollars using exchange rates in effect at the balance sheet date. Adjustments resulting from translation of the balance sheets and intercompany loans, which are considered permanent, are included in stockholders' equity as part of accumulated other comprehensive income (loss). Adjustments resulting from translation of certain intercompany loans, which are not considered permanent and are denominated in foreign currencies, are included in other (income) expense, net in the consolidated statements of income. The Company considers intercompany loans to be of a permanent or long-term nature if management expects and intends that the loans will not be repaid. For the years ended December 31, 2020, 2019 and 2018, all intercompany loan arrangements were determined to be non-permanent based on management's intention as well as actual lending and repayment activity. Therefore, the foreign currency transaction gains or losses associated with the intercompany loans were recorded in the consolidated statements of income for the years ended December 31, 2020, 2019 and 2018.

Income and expense items are translated at average exchange rates during the year. Net foreign currency exchange (gains) and losses included in other (income) expense, net were $(4,172), $2,410 and $12,543 for the years ended December 31, 2020, December 31, 2019 and December 31, 2018, respectively. The net foreign currency losses realized in 2020 were driven by the non-permanent intercompany debt denominated in local currency and translated to U.S. dollars. The net foreign currency losses realized in 2019 and in 2018 were primarily driven by the Euro-denominated term loan (which was settled as part of the February 2018 term loan refinancing, see Note 17 to these consolidated financial statements for further information) and the non-permanent intercompany debt denominated in local currency and translated to U.S. dollars.

Cash and Cash Equivalents. Cash and cash equivalents include highly liquid investments with original terms to maturity of 90 days or less from the time of purchase.

Restricted Cash. Restricted cash, which is restricted as to withdrawal or usage, is classified separately from cash and cash equivalents on the Company's consolidated balance sheets. The Company's total restricted cash balances were $1,688 and $1,331 as of December 31, 2020 and 2019, respectively, and are included on the Company's consolidated balance sheets as other current assets.

Accounts Receivable and Allowance for Credit Losses. Trade accounts receivable are recorded at the invoiced amount and do not bear interest. The allowance for credit losses is the Company's best estimate of the amount of probable credit losses in its existing accounts receivable and is reviewed during each reporting period over their contractual life. The Company recognizes an allowance for credit losses based on historical collection experience, current regional economic and market conditions, the aging of accounts receivable and assessments of current creditworthiness of customers. Account balances are charged against the allowance when the Company believes it is probable that the associated receivables will not be recovered. If the financial condition of the Company's customers were to deteriorate resulting in an impairment of their ability to make payments, additional allowances may be required. The Company does not have any off-balance sheet credit exposure related to its customers. As of December 31, 2020 and 2019, the Company's allowance for credit losses was $1,521 and $2,068, respectively.

Inventories. Certain domestic inventories are stated at the lower of cost or market and valued using the last-in, first-out ("LIFO") method. All other inventories are stated at the lower of cost and net realizable value and valued using the weighted average cost or first-in, first-out ("FIFO") methods.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(Dollars in thousands, except share and per share amounts)

Property, Plant and Equipment. Property, plant and equipment are carried at cost and include expenditures for new facilities, major renewals and betterments. The Company capitalizes the cost of furnace rebuilds as part of property, plant and equipment. Maintenance, repairs and minor renewals are charged to expense as incurred. The Company capitalizes certain internal costs associated with the implementation of purchased software. When property, plant and equipment is retired or otherwise disposed of, the net carrying amount is eliminated with any gain or loss on disposition recognized in earnings at that time.

Depreciation is provided on the straight-line method based on the estimated useful lives of the assets, which generally range from 15 to 33 years for buildings and improvements and 3 to 10 years for machinery and equipment. Leasehold improvements are depreciated using the straight-line method based on the shorter of the useful life of the improvement or remaining lease term.

The Company capitalizes the interest cost associated with the development and construction of significant new plant and equipment and depreciates that amount over the lives of the related assets. Capitalized interest recorded during the years ended December 31, 2020, 2019 and 2018 was $1,780, $1,981 and $3,576, respectively.

Leases. The Company has operating and finance lease agreements with remaining lease terms as of December 31, 2020 of up to 30 years, including leases of land, buildings, railcars, vehicles, manufacturing equipment and general office equipment. Some leases include options to terminate or extend for one or more years. These options are incorporated in the Company's lease term when it is reasonably certain that the option will be exercised. Some leases include options to purchase, which the Company assesses under the guidance to determine if these leases should be classified as finance lease agreements.

When the Company enters into an arrangement, at inception, the Company determines if the arrangement contains a lease and whether that lease meets the classification criteria of a finance or operating lease. Some of the Company's lease arrangements contain lease components (e.g. minimum rent payments) and non-lease components (e.g. maintenance). The Company accounts for the lease and non-lease components separately based on the estimated standalone price of each component. Certain of the Company's lease agreements include rental payments that are adjusted periodically for an index or rate and these are initially measured using the index or rate in effect at the commencement date. Variable lease expense is recognized in the period in which the obligation for those payments is incurred. The Company's lease agreements do not contain any material residual value guarantees or material restrictive covenants.

The Company recognizes a right-of-use lease asset and lease liability at the lease commencement date based on the present value of the remaining lease payments over the lease term. The Company assesses its leasing arrangements to determine the rate implicit in the lease arrangement. Historically, the Company's leasing arrangements do not contain the information necessary to determine the rate implicit in the lease. As such, the Company utilizes its incremental borrowing rate over the relevant lease term, which is the rate of interest that it would have to pay to borrow on a collateralized basis over a similar term an amount equal to the lease payments in a similar economic environment. The incremental borrowing rate is determined at the lease commencement date and is developed utilizing a readily available market interest rate curve adjusted for the Company's credit quality. The Company has elected to use a portfolio approach to apply its incremental borrowing rate to individual leases based on lease term and geographic jurisdiction. Short-term leases, which have an initial term of twelve months or less, are not recorded on the Company's balance sheet.

Lease expense for operating leases is recognized on a straight-line basis over the lease term. Lease expense for financing leases is bifurcated into two components, with the amortization expense component of the right-of-use asset recognized on a straight-line basis and the interest expense component recognized using the effective interest method over the lease term. The amortization expense component of the right-of-use lease asset is included in cost of goods sold and in selling, general and administrative expenses and the interest expense component is included in interest expense, net on the consolidated statements of income.

Spare Parts. Spare parts are maintained by the Company's facilities to keep machinery and equipment in working order. Spare parts are capitalized and included in other long-term assets. Spare parts are measured at cost and are not depreciated or expensed until utilized; however, reserves may be provided on aged spare parts. When a spare part is utilized as part of an improvement to property, plant and equipment, the carrying value is depreciated over the applicable life once placed in service. Otherwise, the spare part is expensed and charged as a cost of production when utilized.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
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Investments in Affiliated Companies. Investments in affiliated companies are accounted for using the equity method of accounting if the investment provides the Company with the ability to exercise significant influence, but not control, over the investee. Significant influence is generally deemed to exist if the Company's ownership interest in the voting stock of the investee ranges between 20% and 50%, although other factors, such as representation on the investee's board of directors and the impact of commercial arrangements, are considered in determining whether the equity method of accounting is appropriate. Under the equity method of accounting, the investments in equity-method investees are recorded in the consolidated balance sheets as investments in affiliated companies, and the Company's share of the investees' earnings or losses, together with other than temporary impairments in value, is recorded as equity in net income from affiliated companies in the consolidated statements of income. Any differences between the Company's cost of an equity method investment and the underlying equity in the net assets of the investment, such as fair value step-ups resulting from acquisitions, are accounted for according to their nature and impact the amounts recognized as equity in net income from affiliated companies in the consolidated statements of income.

The Company evaluates all distributions received from its equity method investments using the nature of distribution approach. Under this approach, the Company evaluates the nature of activities of the investee that generated the distribution. The distributions received are either classified as a return on investment, which is presented as a component of operating activities on the Company's consolidated statements of cash flows, or as a return of investment, which is presented as a component of investing activities on the Company's consolidated statements of cash flows.

The Company evaluates its equity method investments for impairment whenever events or changes in circumstances indicate that the carrying amounts of such investments may be impaired. If a decline in the value of an equity method investment is determined to be other than temporary, a loss is recorded in earnings in the current period.

Goodwill and Intangible Assets. Goodwill is an asset representing the future economic benefits arising from other assets acquired in a former business combination that are not individually identified and separately recognized. The Company is required to test goodwill associated with each of its reporting units for impairment at least annually and whenever events or circumstances indicate that it is more likely than not that goodwill may be impaired. The Company performs its annual goodwill impairment test as of October 1.

Goodwill is tested for impairment at the reporting unit level. In performing tests for goodwill impairment, the Company is able to use its discretion to first perform an optional qualitative assessment about the likelihood of the carrying value of a reporting unit exceeding its fair value. The qualitative assessment need not be applied to all reporting units. If the Company determines that it is more likely than not that the fair value of a reporting unit is less than its carrying amount based on the qualitative assessment, the Company will perform a quantitative goodwill impairment test to identify the potential goodwill impairment and measure the amount of the goodwill impairment loss, if any, to be recognized for that reporting unit. For the annual assessments in 2020 and 2019, the Company bypassed the option to perform the qualitative assessment and proceeded directly to performing the quantitative goodwill impairment test for each of our reporting units. The quantitative test identifies both the potential existence of impairment and the amount of impairment loss.

In applying the quantitative test, the Company calculates and compares the reporting unit's estimated fair value to its carrying value, including goodwill. If the fair value of a reporting unit exceeds its carrying value, goodwill is not impaired. If the carrying value of a reporting unit exceeds its implied fair value, an impairment charge is recognized, requiring recognition of a goodwill impairment charge for the differential up to the carrying value of goodwill. An impairment loss cannot exceed the carrying value of goodwill assigned to a reporting unit and the loss establishes a new basis in the goodwill. Subsequent reversal of an impairment loss is not permitted.

For intangible assets other than goodwill, definite-lived intangible assets are amortized over their respective estimated useful lives. Intangible assets with indefinite lives are not amortized, but rather are tested for impairment at least annually or more frequently if events occur or circumstances change that would more likely than not reduce the fair value of the intangible asset below its carrying amount. The Company tests its indefinite-lived intangible assets as of October 1 of each year in conjunction with its annual goodwill impairment test.

Impairment Assessment of Long-Lived Assets. The Company performs an impairment review of property, plant and equipment and definite-lived intangible assets when facts and circumstances indicate that the carrying value of an asset or asset group may not be recoverable from its undiscounted future cash flows. When evaluating long-lived assets for

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
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impairment, if the carrying amount of an asset or asset group is found not to be recoverable, a potential impairment loss may be recognized. An impairment loss is measured by comparing the carrying amount of the asset or asset group to its fair value. Fair value is determined using quoted market prices when available, or other techniques including discounted cash flows. The Company's estimates of future cash flows involve assumptions concerning future operating performance, economic conditions and technological changes that may affect the future useful lives of the assets.

Derivative Financial Instruments. The Company utilizes certain derivative financial instruments to enhance its ability to manage risk, including exposure to interest rate, commodity price and foreign currency fluctuations that exist as part of ongoing business operations. Derivative instruments are entered into for periods consistent with the related underlying exposures and do not constitute positions independent of those exposures.

All derivatives designated as hedges are recognized on the consolidated balance sheets at fair value. The Company may designate a derivative as a hedge of the fair value of a recognized asset or liability or of an unrecognized firm commitment (fair value hedge), a hedge of a forecasted transaction or the variability of cash flows to be received or paid related to a recognized asset or liability (cash flow hedge), a foreign currency fair-value or cash-flow hedge (foreign currency hedge), or a hedge of a net investment in a foreign operation (net investment hedge). The Company's hedging strategies include derivatives designated as cash flow hedges and net investment hedges.

Changes in the fair value of a derivative that is highly effective and that is designated and qualifies as a cash flow hedge are recorded in other comprehensive income and subsequently reclassified into earnings in the same period(s) in which the hedged transaction affects earnings. Changes in the fair value of a derivative that is highly effective and that is designated and qualifies as a hedge of a net investment in a foreign operation are recorded in the foreign currency translation adjustment account within accumulated other comprehensive income, where the associated gains and losses will remain until such time that the hedged net investment (foreign subsidiary) is sold or liquidated.

Changes in the fair value of a derivative that is not designated or does not qualify as a hedge are recorded in the consolidated statements of income. Cash flows from derivative instruments are reported in the same cash flow category as the cash flows from the items being hedged.

The Company formally documents all relationships between hedging instruments and hedged items, as well as its risk-management objective and strategy for undertaking various hedge transactions. The Company also formally assesses whether each hedging relationship is highly effective in achieving offsetting changes in fair values or cash flows of the hedged item during the period, both at the inception of the hedge and on an ongoing basis. If it is determined that a derivative is not highly effective as a hedge, or if a derivative ceases to be a highly-effective hedge, hedge accounting is discontinued with respect to that derivative prospectively.

Fair Value Measurements. The Company measures fair value using the guidelines under U.S. generally accepted accounting principles ("GAAP"). An asset's fair value is defined as the price at which the asset could be exchanged in a current transaction between market participants. A liability's fair value is defined as the amount that would be paid to transfer the liability to a market participant, not the amount that would be paid to settle the liability with the creditor. See Note 6 to these consolidated financial statements regarding the application of fair value measurements.

The carrying values of cash, accounts receivable, accounts payable and accrued liabilities approximate fair value due to the short-term nature of these items. See Note 17 to these consolidated financial statements regarding the fair value of debt.

Revenue Recognition. In determining the appropriate amount of revenue to be recognized as the Company fulfills its obligations under its agreements, the Company performs the following steps: (i) identification of the contract with the customer; (ii) determination of whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measurement of the transaction price; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) the Company satisfies each performance obligation.

The Company identifies a contract when an agreement with a customer creates legally enforceable rights and obligations, which occurs when a contract has been approved by both parties, the parties are committed to perform their respective obligations, each party's rights and payment terms are clearly identified, commercial substance exists and it is probable that the Company will collect the consideration to which it is entitled.

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The Company may offer rebates to customers who have reached a specified volume of optional purchases. The Company recognizes rebates given to customers as a reduction of revenue based on an allocation of the cost of honoring rebates earned and claimed to each of the underlying revenue transactions that result in progress by the customer toward earning the rebate. Rebates are recognized at the time revenue is recorded. The Company measures the rebate obligation based on the estimated amount of sales that will result in a rebate at the adjusted sales price per the respective sales agreement.

Shipping and Handling Costs. Amounts billed to a customer in a sale transaction related to shipping and handling, if any, represent revenues earned for the goods provided and are classified as revenue. Costs related to shipping and handling of products shipped to customers are classified as cost of goods sold. Refer to Note 5 for disclosures regarding the recognition of revenue for shipping and handling costs that are billed to customers.

Research and Development. Research and development costs of $11,597, $12,514 and $13,719 for the years ended December 31, 2020, 2019 and 2018, respectively, were expensed as incurred and reported in selling, general and administrative expenses in the consolidated statements of income.

Income Taxes. The Company operates within multiple taxing jurisdictions and is subject to tax filing requirements and potential audits within these jurisdictions. The Company uses the asset and liability method in accounting for income taxes. Deferred tax assets and liabilities are recorded for temporary differences between the tax basis of assets and liabilities and their reported amounts in the financial statements, using statutory tax rates in effect for the year in which the differences are expected to reverse. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in the results of operations in the period that includes the enactment date. The Company evaluates its deferred tax assets each period to ensure that estimated future taxable income will be sufficient in character (e.g., capital gain versus ordinary income treatment), amount and timing, to result in their realizability. A valuation allowance is recorded to reduce the carrying amounts of deferred tax assets, unless it is more likely than not that those assets will be realized.

Generally, APB 23 of ASC Topic 740, Income Taxes ("ASC 740"), provides guidance with respect to establishing deferred income taxes on earnings from foreign subsidiaries, to the extent that these earnings are considered to be available for repatriation. Further, ASC 740-30 requires that deferred taxes be established with respect to the earnings of a foreign subsidiary, unless existing tax law provides a means by which the investment in a subsidiary can be recovered tax-free. The Company has determined that it is able to repatriate the non-permanently reinvested earnings of its foreign subsidiaries in a tax-free manner. As such, the Company is able to asset, for purposes of ASC 740-30, that no deferred income taxes are needed with respect to earnings from foreign subsidiaries.

The Company recognizes a financial statement benefit for positions taken for tax return purposes when it will be more likely than not (i.e. greater than 50%) that the positions will be sustained upon tax examination, based solely on the technical merits of the tax positions. Otherwise, no tax benefit is recognized. The tax benefits recognized are measured based on the largest benefit that has a greater than 50% likelihood of being realized upon ultimate settlement. The Company recognizes potential accrued interest and penalties related to unrecognized tax benefits as a component of income tax expense. Tax examinations are often complex as tax authorities may disagree with the treatment of items reported by the Company and may require several years to resolve. These accrued liabilities represent a provision for taxes that are reasonably expected to be incurred on the basis of available information but which are not certain.

Pursuant to the Securities and Exchange Commission ("SEC") Staff Accounting Bulletin No.118 ("SAB 118"), the Company was allowed a measurement period of up to one year after the enactment date of the Tax Cuts and Jobs Act ("TCJA") to finalize the recording of any related tax impacts with respect to its transition tax liability. In accordance with SAB 118, the Company finalized the impacts of the transition tax as of December 31, 2018 and recorded a measurement period adjustment of $2,102 as a benefit to tax expense. There was no cash tax outlay associated with the final transition tax amount, as the Company elected to utilize net operating loss ("NOL") carryforwards to offset the associated taxable income.

Based on FASB guidance, the Company is permitted to make an accounting policy election to either (1) treat the taxes incurred as a result of the Global Intangible Low Taxed Income ("GILTI") provision as a current-period expense when incurred or (2) factor such amounts into its measurement of deferred taxes. The Company has elected to treat any expense incurred as a current-period expense.

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Asset Retirement Obligations. The Company records a liability when the fair value of any future obligation to retire a long-lived asset as a result of an existing or enacted law, statute, ordinance or contract is reasonably estimable. The Company also records a liability for the fair value of a conditional asset retirement obligation if the fair value can be reasonably estimated. When the liability is initially recorded, the Company capitalizes the cost by increasing the amount of the related long-lived asset. Over time, the Company adjusts the liability to its present value by recognizing accretion expense as an operating expense in the consolidated statements of income each period, and the capitalized cost is depreciated over the useful life of the related asset. Upon settlement of the liability, the Company records a gain or loss if the actual costs differ from the accrued amount.

The Company has recorded asset retirement obligations ("AROs") in other long-term liabilities in order to recognize legal obligations associated with the retirement of tangible long-lived assets. The Company has assessed whether an ARO is required at each manufacturing facility and has recorded an obligation for those locations for which an obligation exists. The most significant of these are primarily attributable to environmental remediation liabilities associated with current operations that were incurred during the course of normal operations. The Company has AROs that are conditional in nature. The Company identified certain conditional AROs upon which it was able to reasonably estimate their fair value and recorded a liability. These AROs were triggered upon commitments by the Company to comply with local, state and national laws to remove environmentally hazardous materials. The AROs have been recognized on a discounted basis using a credit adjusted risk free rate. Accretion of the AROs is recorded in other operating expense, net in the Company's consolidated statements of income.

The following table includes the changes in the Company's ARO liability during the years ended December 31, 2020 and 2019:

	Years ended December 31, 2020	Years ended December 31, 2019
Beginning balance	$ 4,555	$ 4,224
Accretion expense	342	311
Foreign exchange impact	46	20
Ending balance	$ 4,943	$ 4,555

Environmental Expenditures. Environmental expenditures that pertain to current operations or to future revenues are expensed or capitalized consistent with the Company's capitalization policy for property, plant and equipment. Expenditures that result from the remediation of an existing condition caused by past operations and that do not contribute to current or future revenues are expensed. Liabilities are recognized for remedial activities when the remediation is probable and the cost can be reasonably estimated. Recoveries of expenditures for environmental remediation are recognized as assets only when recovery is deemed probable. See Note 24 to these consolidated financial statements regarding commitments and contingencies and Note 16 regarding the accrued environmental reserve.

Deferred Financing Costs. Financing costs incurred in connection with the issuance of long-term debt are deferred and presented as a direct reduction from the related debt instruments on the Company's consolidated balance sheets. Deferred financing costs are amortized as interest expense using the effective interest method over the respective terms of the associated debt instruments.

Stock-Based Compensation. The Company applies the fair value based method to account for stock options, restricted stock awards, restricted stock units and performance stock units issued in connection with its equity incentive plans. Stock-based compensation expense is recognized on a straight-line basis over the vesting periods of the respective awards, and the Company accounts for forfeitures of equity incentive awards as they occur. In connection with the vesting of restricted stock awards, restricted stock units and performance stock units, shares of common stock may be delivered to the Company by employees to satisfy withholding tax obligations at the instruction of the employee award holders. These transactions when they occur are accounted for as stock repurchases by the Company, with the shares returned to treasury stock at a cost representing the payment by the Company of the tax obligations on behalf of the employees in lieu of shares for the vesting event. See Note 22 to these consolidated financial statements regarding compensation expense associated with the Company's equity incentive awards.

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Pensions and Postretirement Benefits. The Company maintains qualified and non-qualified defined benefit pension plans that cover employees in the United States and Canada, as well as certain employees in other international locations. Benefits for a majority of the plans are based on average final pay and years of service. Our funding policy, consistent with statutory requirements, is based on actuarial computations utilizing the projected unit credit method of calculation. Not all defined benefit pension plans are funded. In the United States and Canada, the pension plans' assets include equity and fixed income securities. In our other international locations, the pension plans' assets include equity and fixed income securities, as well as insurance contracts. Certain assumptions are made regarding the occurrence of future events affecting pension costs, such as mortality, withdrawal, disablement and retirement, changes in compensation and benefits, and discount rates to reflect the time value of money.

The major elements in determining pension income and expense are pension liability discount rates and the expected return on plan assets. The Company references rates of return on high-quality, fixed income investments when estimating the discount rate, and the expected period over which payments will be made based upon historical experience. The long-term rate of return used to calculate the expected return on plan assets is the average rate of return estimated to be earned on invested funds for providing pension benefits.

In addition to pension benefits, the Company provides certain health care benefits for employees who meet age, participation and length of service requirements at retirement. The Company uses explicit assumptions using the best estimates available of the plan's future experience. Principal actuarial assumptions include: discount rates, present value factors, retirement age, participation rates, mortality rates, cost trend rates, Medicare reimbursement rates and per capita claims cost by age. Current interest rates as of the measurement date are used for discount rates in present value calculations.

The Company also has defined contribution plans covering domestic employees of the Company and certain subsidiaries.

Contingencies. Certain conditions may exist as of the date the financial statements are issued, which may result in a loss to the Company but which will only be resolved when one or more future events occur or fail to occur. The Company's management and its legal counsel assess such contingent liabilities, and such assessment inherently involves an exercise of judgment. In assessing loss contingencies related to legal proceedings that are pending against the Company or unasserted claims that may result in such proceedings, the Company and legal counsel evaluate the perceived merits of any legal proceedings or unasserted claims as well as the perceived merits of the amount of relief sought or expected to be sought therein. If the assessment of a contingency indicates that it is probable that a loss has been incurred and the amount of the liability can be estimated, then the estimated liability is accrued in the Company's financial statements. If the assessment indicates that a loss contingency is not probable, but is reasonably possible, or is probable but cannot be estimated, then the nature of the contingent liability, together with an estimate of the range of possible loss if determinable and material, would be disclosed. Loss contingencies considered remote are generally not disclosed unless they involve guarantees, in which case the nature of the guarantee would be disclosed, including the approximate term, how the guarantee arose, and the events or circumstances that would require the guarantor to perform under the guarantee.

Use of Estimates. The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

3. New Accounting Standards:

Recently Adopted Accounting Standards

In June 2016, the Financial Accounting Standards Board ("FASB") issued guidance that affects loans, trade receivables and any other financial assets that have the contractual right to receive cash. Under the new guidance, an entity is required to recognize expected credit losses rather than incurred losses for financial assets. The new guidance is effective for fiscal years beginning after December 15, 2019 and interim periods within those fiscal years. The Company adopted the new guidance effective January 1, 2020, with no material impact to the Company's consolidated financial position, results of operations or cash flows.

In August 2018, the FASB issued guidance which modifies certain disclosure requirements over fair value measurements. The guidance is effective for fiscal years beginning after December 15, 2019, including all interim periods within that fiscal year. The Company adopted the new guidance effective January 1, 2020. The Company does not currently classify any of its derivative contracts or restoration plan assets as Level 3 assets or liabilities, nor did the Company have any transfers amongst fair value levels during the year ended December 31, 2020. As a result, the guidance did not have an impact on Company's the fair value measurement disclosures upon adoption.

In January 2017, the FASB issued guidance which eliminates the second step from the traditional two-step goodwill impairment test. Under current guidance, an entity performed the first step of the goodwill impairment test by comparing the fair value of a reporting unit with its carrying amount; if an impairment loss was indicated, the entity computed the implied fair value of goodwill to determine whether an impairment loss existed, and if so, the amount to recognize. Under the new guidance, an impairment loss is recognized for the amount by which the carrying amount exceeds the reporting unit's fair value (the Step 1 test), with no further testing required. Any impairment loss recognized is limited to the amount of goodwill allocated to the reporting unit. The new guidance is effective for public companies that are Securities and Exchange Commission ("SEC") registrants for fiscal years beginning after December 15, 2019. The Company adopted the new guidance on January 1, 2020, and applied the guidance prospectively to its goodwill impairment tests.

Accounting Standards Not Yet Adopted as of December 31, 2020

In December 2019, the FASB issued new guidance to simplify the accounting for income taxes by removing certain exceptions to the general principles and also simplification of areas such as franchise taxes, step-up in tax basis goodwill, separate entity financial statements and interim recognition of enactment of tax laws or rate changes. The new guidance is effective for fiscal years beginning after December 15, 2020 and interim periods within those fiscal years, with early adoption permitted. The Company is currently evaluating the impact of this new guidance on its consolidated financial statements.

In March 2020, the FASB issued guidance to address certain accounting consequences from the anticipated transition from the use of the London Interbank Offered Rate ("LIBOR") and other interbank offered rates to alternative reference rates. The new guidance contains practical expedients for reference rate reform related activities that impact debt, leases, derivatives and other contracts. The guidance is optional and may be elected over time as reference rate reform activities occur. During the year ended December 31, 2020, the Company elected to apply the hedge accounting expedients related to probability and the assessments of effectiveness for future LIBOR-indexed cash flows to assume that the index upon which future hedged transactions will be based on matches the index of the corresponding derivatives. Application of these expedients preserves the presentation of derivatives consistent with past presentation. The Company continues to evaluate the impact of the guidance and may apply other elections as applicable as additional changes in the market occur.

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4. Performance Materials Divestiture:

On December 14, 2020, the Company completed the sale of its Performance Materials business to Potters Buyer, LLC (the "Purchaser"), an affiliate of The Jordan Company, L.P., for a purchase price of $650,000. The net cash proceeds to the Company from the sale were $624,256 after certain customary adjustments for indebtedness, working capital and cash at the closing of the transaction. The Company classified the proceeds within net cash provided by (used in) investing activities – continuing operations in the consolidated statements of cash flows and used the net proceeds from the sale as well as cash on hand to pay down debt and issue a special cash dividend of $1.80/share to stockholders.

In the fourth quarter of 2020, the Performance Materials business met the criteria set forth in Accounting Standards Codification 205-20, Presentation of Financial Statements – Discontinued Operations ("ASC 205-20"), as the sale represents a strategic shift that will have a major effect on the Company's operations and financial results. As a result, the Company's consolidated financial statements for all periods presented reflect the Performance Materials business as a discontinued operation. The divested business was historically reported in the Performance Materials reportable segment, with the exception of certain Australian operations that were historically reported in the Performance Chemicals reportable segment.

The total transaction costs incurred in connection with the sale were approximately $13,161 for the year ended December 31, 2020. The Company recorded a pre-tax loss on sale of $70,878, which is included in (loss) income from discontinued operations, net of tax in the Company's consolidated statements of income for the year ended December 31, 2020. The following is a reconciliation of the loss recorded on the sale:

Net proceeds received from the sale of Performance Materials	$	624,256
Transaction costs		(13,161)
Net assets derecognized		(681,973)
Loss on sale of Performance Materials	$	(70,878)

In connection with the sale of Performance Materials and the related loss, as noted above, the Company has recognized a tax expense of $58,008 within discontinued operations.

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The following table summarizes the results of discontinued operations for the periods presented:

	Years ended December 31, 2020	2019	2018
Sales	$ 342,738	$ 373,686	$ 386,921
Cost of goods sold	251,917	281,566	308,679
Selling, general and administrative expenses	33,195	37,364	37,226
Other operating expense, net	18,289	14,462	13,023
Operating income	39,337	40,294	27,993
Equity in net income from affiliated companies	(37)	(12)	(42)
Interest expense, net [1]	16,210	24,453	22,965
Other (income) expense, net	(3,481)	274	474
Loss on sale of Performance Materials	70,878	—	—
(Loss) Income from discontinued operations before income tax	(44,233)	15,579	4,596
Provision (benefit) for income taxes	58,008	1,022	(4,646)
(Loss) income from discontinued operations, net of tax	$ (102,241)	$ 14,557	$ 9,242

(1) The closing of the transaction triggered the Company's obligation to provide partial repayment under both its Amended and Restated Term Loan Credit Agreement, dated May 4, 2016, and its New Term Loan Credit Agreement, dated as of July 22, 2020. As such, interest expense has been allocated to discontinued operations on the basis of the Company's mandatory repayment of $275,787 of the Senior Secured Term Loan Facility due February 2027 and its mandatory payment of $188,722 of the New Senior Secured Term Loan Facility due February 2027.

Net income attributable to the noncontrolling interest related to the Performance Materials business, net of tax was $265, $154, and $213 for the years ended December 31, 2020, 2019, and 2018, respectively.

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The following table summarizes the assets and liabilities of discontinued operations at December 31, 2019:

	December 31, 2019
ASSETS	
Cash and cash equivalents	$ 18,423
Accounts receivables, net	40,484
Inventories, net	143,323
Prepaid and other current assets	4,139
Investments in affiliated companies	115
Property, plant and equipment, net	175,614
Goodwill	286,227
Other intangible assets, net	121,113
Right-of-use lease assets	8,878
Other long-term assets	71,697
Total assets held for sale	$ 870,013
LIABILITIES	
Notes payable and current maturities of long-term debt	$ 7,766
Accounts payable	30,267
Operating lease liabilities—current	3,326
Accrued liabilities	16,744
Long-term debt, excluding current portion	55,972
Deferred income taxes	8,612
Operating lease liabilities—noncurrent	5,248
Other long-term liabilities	17,366
Total liabilities held for sale	$ 145,301

In connection with the transaction, the Company entered into a Transition Services Agreement with the Purchaser pursuant to which the Purchaser is receiving certain services to provide for the orderly transition of various functions and processes after the closing of the transaction. The services under the Transition Services Agreement include information technology, accounting, tax, financial services, human resources, facilities, and other administrative support services. These services are being provided at cost for a period of 9 months, with three 30-day extensions available.

Additionally, in connection with the transaction, the Company entered into various supply agreements with the Purchaser. Cash flows associated with these transition services and supply agreements are not expected to be material to the Company's results of operations.

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5. Revenue from Contracts with Customers:

Revenue Recognition Model

As described in Note 2, the Company applies the five-step revenue recognition model to each contract with its customers.

Evidence of a contract between the Company and its customers may take the form of a master service agreement ("MSA"), a MSA in combination with an underlying purchase order, a combination of a pricing quote with an underlying purchase order or an individual purchase order received from a customer. The Company and certain of its customers enter into MSAs that establish the terms, including prices, under which orders to purchase goods may be placed. In cases where the MSA contains a distinct order for goods or contains an enforceable minimum quantity to be purchased by the customer, the Company considers the MSA to be evidence of a contract between the Company and its customer as the MSA creates enforceable rights and obligations. In cases where the MSA does not contain a distinct order for goods, the Company's contract with a customer is the purchase order issued under the MSA. Customers of the Company may also negotiate orders via pricing quotes, which typically detail product pricing, delivery terms and payment information. When a customer procures goods under this method, the Company considers the combination of the pricing quote and the purchase order to create enforceable rights and obligations. Absent either a MSA or pricing quote, the Company considers an individual purchase order remitted by a customer to create enforceable rights and obligations.

The Company identifies a performance obligation in a contract for each promised good that is separately identifiable from other promises in the contract and for which the customer can benefit from the good. The majority of the Company's contracts have a single performance obligation, which is the promise to transfer individual goods to the customer. Single performance obligations are satisfied according to the shipping terms noted within the MSA or purchase order. The Company has certain contracts that include multiple performance obligations under which the purchase price for each distinct performance obligation is defined in the contract. These distinct performance obligations may include stand-ready provisions, which are arrangements to provide a customer assurance that they will have access to output from the Company's manufacturing facilities, or monthly reservations of capacity fees. The Company considers stand-ready provisions and reservation of capacity fees to be performance obligations satisfied over time. Revenues related to stand-ready provisions and reservation of capacity fees are recognized on a ratable basis throughout the contract term and billed to the customer on a monthly basis.

As described above, the Company's MSAs with its customers may outline prices for individual products or contract provisions. MSAs in the Company's Performance Chemicals and Refining Services segments may contain provisions whereby raw material costs are passed-through to the customer per the terms of their contract. The Company's exposure to fluctuations in raw material prices is limited, as the majority of pass-through contract provisions reset based on fluctuations in the underlying raw material price. MSAs in the Company's Refining Services segment also contain take-or-pay arrangements, whereby the customer would incur a penalty in the form of a volume shortfall fee. During the year ended December 31, 2020, some customers fell short of monthly orders due to the pandemic and take-or-pay were acted upon. In 2019, there have been no issues in which Refining Services customers failed to meet their contractual obligations. Revenue from product sales are recorded at the sales price, which includes estimates of variable consideration for which reserves are established and which result from discounts, returns or other allowances that are offered within contracts between the Company and its customers.

The Company recognizes revenues when performance obligations under the terms of a contract with its customer are satisfied, which generally occurs at a point in time by transferring control of a product to the customer. The Company determines the point in time when a customer obtains control of a product and the Company satisfies the performance obligation by considering factors including when the Company has a right to payment for the product, the customer has legal title to the product, the Company has transferred possession of the product, the customer has assumed the risks and rewards of ownership of the product and the customer has accepted the product. Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring goods. The Company does not have any significant payment terms as payment is received at, or shortly after, the point of sale.

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Refining Services

Contracts between the Company's Refining Services segment and its customers are typically evidenced by entering into a MSA which generally has a term in excess of one year. Though each MSA is unique, the terms may include performance obligations such as stand-ready provisions and minimum purchase requirements. Stand-ready provisions within these contracts are billed on a monthly basis, as the performance obligation resets on a monthly basis and does not carry-over to the following month. Certain of the Company's Refining Services MSAs contain minimum purchase requirements that expire within the calendar year. The Company reviews each contract with minimum purchase requirements to determine if the customer will meet the provisions within the current calendar year. During the years ended December 31, 2020 and 2019, there have been no issues in which Refining Services customers failed to meet their contractual obligations. Contracts within Refining Services may also contain raw material pricing adjustments which are typically based on a commodity index or Refining Services' cost to acquire the commodity. These raw material pass-through provisions reset on a periodic basis and prospectively adjust the raw material cost component of the goods sold to the customer. The Company accounts for the raw material costs on a prospective basis, as the price changes affect the future consideration of the sale of goods.

Catalysts

The Company's Catalysts segment sells customized products to its customers. These customized products are reformulations of existing Catalysts products, tailored to meet individual customer specifications. Prior to entering into an arrangement, the Company will allow a customer to obtain a sample of goods to ensure that it meets their needs. The customer will enter into a long-term supply arrangement that outlines the specification of the products to be sold and contains terms and conditions under which purchase orders are issued. These supply arrangements typically have a duration from one to ten years. Although the duration of these supply arrangements are in excess of one year, a contract is formed between the Company and its customer upon receipt of a purchase order.

Performance Chemicals

Contracts between the Company's Performance Chemicals segment and its customers are typically evidenced by entering into a supply arrangement that outlines the specification of the products to be sold and contains terms and conditions under which purchase orders are issued. Certain Performance Chemicals supply arrangements may contain raw material pricing adjustments which are typically based on a commodity index. These raw material pass-through provisions reset on a periodic basis and prospectively adjust the raw material cost component of the goods sold to the customer. The Company accounts for the raw material pass-through costs on a prospective basis, as the price changes affect the future consideration of the sale of goods.

Contract Assets and Liabilities

A contract asset is a right to consideration in exchange for goods that the Company has transferred to a customer when that right is conditional on something other than the passage of time. A contract liability exists when the Company receives consideration in advance of the fulfillment of its performance obligations. The Company has no contract assets recorded on its consolidated balance sheets as of December 31, 2020 and 2019, respectively.

The Company recognized a €10,216 ($11,486) contract liability associated with the sale of its magnesium silicate product line in July 2020, of which €9,202 ($11,318) of deferred revenue remained as of December 31, 2020. The Company recognized revenue of €1,014 ($1,197) related to this contract liability during the year ended December 31, 2020. Refer to Note 8 of these condensed consolidated financial statements for additional information related to the sale of the product line.

The Company recognized a $9,000 contract liability associated with the sale of a portion of its sulfate salts product line in June 2019, of which $2,070 and $6,450 of deferred revenue remained as of December 31, 2020 and 2019, respectively. The Company recognized revenue of $4,374 and $2,550 related to this contract liability during the year ended December 31, 2020 and 2019, respectively. Refer to Note 8 of these consolidated financial statements for additional information related to the sale of the product line.

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Practical Expedients and Accounting Policy Elections

The Company has elected to use certain practical expedients and has made certain accounting policy elections as permitted under the new revenue recognition guidance. The majority of the Company's contracts with customers are based on an individual purchase order; thus, the duration of these contracts are for one year or less. As described above, the Company's performance obligations reset either monthly or at the end of the calendar year. The Company has made an accounting policy election to omit certain disclosures related to these performance obligations, as the initial term of the Company's performance obligations are for a term of one year or less.

The Company uses an output method to recognize revenues related to performance obligations satisfied over time. These performance obligations, as described above, are satisfied within a calendar year. As such, the Company has elected to utilize the "as-invoiced" practical expedient, which permits the Company to recognize revenue in the amount to which it has a right to invoice the customer, provided that the amount corresponds directly with the value provided by the performance obligation as completed to date.

When the Company performs shipping and handling activities after the transfer of control to the customer (e.g. when control transfers prior to delivery), they are considered fulfillment activities as opposed to separate performance obligations, and the Company recognizes revenue upon the transfer of control to the customer. Accordingly, the costs associated with these shipping and handling activities are accrued when the related revenue is recognized under the Company's policy election. The Company does not utilize sales-based commissions plans, and as a result, the Company does not capitalize any costs which could be considered incremental costs of obtaining a contract. Sales, value added and other taxes the Company collects concurrent with revenue producing activities are excluded from revenues.

Disaggregated Revenue

The Company's primary means of disaggregating revenues is by reportable segment, which can be found in Note 14 to these consolidated financial statements.

The Company's portfolio of products are integrated into a variety of end uses, which are described in the table below:

Key End Uses	Key Products
Industrial & process chemicals	• Silicate precursors for the tire industry • Silica gels for surface coatings
Fuels & emission control	• Refinery catalysts • Emission control catalysts • Catalyst recycling services
Packaging & engineered plastics	• Catalysts for high-density polyethlene and chemicals syntheses • Antiblocks for film packaging • Sulfur derivatives for nylon production • Silicate precursors for catalysts used in plastics manufacturing • Silicate for catalyst manufacturing
Consumer products	• Silica gels for edible oil and beer clarification • Precipitated silicas, silicates and zeolites for the dentifrice and dishwasher and laundry detergent applications
Natural resources	• Silicates for drilling muds • Silicates and alum for water treatment mining • Bleaching aids for paper

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The following table disaggregates the Company's sales, by segment and end use, for the years ended December 31, 2020, 2019 and 2018:

	Year ended December 31, 2020			
	Refining Services	Catalysts	Performance Chemicals	Total
Industrial & process chemicals	$ 70,648	$ 125	$ 279,296	$ 350,069
Fuels & emission control[1]	225,042	—	—	225,042
Packaging & engineered plastics	38,772	93,882	47,451	180,105
Consumer products	—	—	235,792	235,792
Natural resources	67,451	—	52,165	119,616
Total segment sales	401,913	94,007	614,704	1,110,624
Inter-segment sales eliminations	(3,256)	(5)	—	(3,261)
Total	$ 398,657	$ 94,002	$ 614,704	$ 1,107,363

	Year ended December 31, 2019			
	Refining Services	Catalysts	Performance Chemicals	Total
Industrial & process chemicals	$ 80,661	$ 96	$ 299,651	$ 380,408
Fuels & emission control[1]	252,294	—	—	252,294
Packaging & engineered plastics	48,056	85,571	51,725	185,352
Consumer products	—	—	260,495	260,495
Natural resources	66,070	—	58,692	124,762
Total segment sales	447,081	85,667	670,563	1,203,311
Inter-segment sales eliminations	(3,397)	—	—	(3,397)
Total	$ 443,684	$ 85,667	$ 670,563	$ 1,199,914

	Year ended December 31, 2018			
	Refining Services	Catalysts	Performance Chemicals	Total
Industrial & process chemicals	$ 77,866	$ 86	$ 315,827	$ 393,779
Fuels & emission control[1]	246,452	—	—	246,452
Packaging & engineered plastics	59,168	72,013	53,623	184,804
Consumer products	—	—	272,187	272,187
Natural resources	72,076	—	62,865	134,941
Total segment sales	455,562	72,099	704,502	1,232,163
Inter-segment sales eliminations	(3,237)	—	—	(3,237)
Total	$ 452,325	$ 72,099	$ 704,502	$ 1,228,926

(1) As described in Note 1, the Company experiences seasonal sales fluctuations to customers in the fuels & emission control end use.

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6. Fair Value Measurements:

Fair values are based on quoted market prices when available. When market prices are not available, fair values are generally estimated using discounted cash flow analyses, incorporating current market inputs for similar financial instruments with comparable terms and credit quality. In instances where there is little or no market activity for the same or similar instruments, the Company estimates fair values using methods, models and assumptions that management believes a hypothetical market participant would use to determine a current transaction price. These valuation techniques involve some level of management estimation and judgment that becomes significant with increasingly complex instruments or pricing models. Where appropriate, adjustments are included to reflect the risk inherent in a particular methodology, model or input used.

The Company's financial assets and liabilities carried at fair value have been classified based upon a fair value hierarchy. The hierarchy gives the highest ranking to fair values determined using unadjusted quoted prices in active markets for identical assets and liabilities (Level 1) and the lowest ranking to fair values determined using methodologies and models with unobservable inputs (Level 3). The classification of an asset or a liability is based on the lowest level input that is significant to its measurement. For example, a Level 3 fair value measurement may include inputs that are both observable (Levels 1 and 2) and unobservable (Level 3). The levels of the fair value hierarchy are as follows:

- Level 1—Values are unadjusted quoted prices for identical assets and liabilities in active markets accessible at the measurement date. Active markets provide pricing data for trades occurring at least weekly and include exchanges and dealer markets.
- Level 2—Inputs include quoted prices for similar assets or liabilities in active markets, quoted prices from those willing to trade in markets that are not active, or other inputs that are observable or can be corroborated by market data for the term of the instrument. Such inputs include market interest rates and volatilities, spreads and yield curves.
- Level 3—Certain inputs are unobservable (supported by little or no market activity) and significant to the fair value measurement. Unobservable inputs reflect the Company's best estimate of what hypothetical market participants would use to determine a transaction price for the asset or liability at the reporting date.

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The following table presents information about the Company's assets and liabilities that were measured at fair value on a recurring basis as of December 31, 2020 and 2019, and indicates the fair value hierarchy of the valuation techniques the Company utilized to determine such fair value.

	December 31, 2020	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Derivative contracts (Note 19)	$ 3,249	$ —	$ 3,249	$ —
Restoration plan assets	3,724	3,724	—	—
Total	$ 6,973	$ 3,724	$ 3,249	$ —
Liabilities:				
Derivative contracts (Note 19)	$ 34,466	$ —	$ 34,466	$ —

	December 31, 2019	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Derivative contracts (Note 19)	$ 3,928	$ —	$ 3,928	$ —
Restoration plan assets	4,199	4,199	—	—
Total	$ 8,127	$ 4,199	$ 3,928	$ —
Liabilities:				
Derivative contracts (Note 19)	$ 11,376	$ —	$ 11,376	$ —

The following table presents information about the Company's assets and liabilities that were measured at fair value on a non-recurring basis as of December 31, 2020 (there were no such assets or liabilities measured during the year ended December 31, 2019). The Company performed its annual impairment test on its goodwill on October 1, 2020, and determined that an impairment existed with respect to the Performance Chemicals segment. As a result, the Company recorded a non cash goodwill impairment charge of $260,000. Refer to Note 15 to these consolidated financial statements for a description of the valuation techniques the Company utilized to determine such fair value and for the results of the impairment testing procedures performed.

	As of December 31, 2020	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total Losses
Assets:					
Goodwill[(1)]	$ 717,738	$ —	$ 717,738	$ —	$ (260,000)

[(1)] Goodwill with a carrying amount of $973,578 was written down to $717,738 as part of the Company's annual impairment assessment on October 1, 2020. This resulted in an impairment charge of $260,000 on the consolidated statements of income.

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Restoration plan assets

The fair values of the Company's restoration plan assets are determined through quoted prices in active markets. Restoration plan assets are assets held in a Rabbi trust to fund the obligations of the Company's defined benefit supplementary retirement plans and include various stock and fixed income mutual funds. See Note 21 to these consolidated financial statements regarding defined benefit supplementary retirement plans. The Company's restoration plan assets are included in other long-term assets on its consolidated balance sheets. Gains and losses related to these investments are included in other expense, net in the Company's consolidated statements of income. Unrealized gains associated with the underlying stock and fixed income mutual funds were $545 and $944 as of December 31, 2020 and 2019, respectively and an unrealized loss of $346 as of December 31, 2018.

Derivative contracts

Derivative assets and liabilities can be exchange-traded or traded over-the-counter ("OTC"). The Company generally values exchange-traded derivatives using models that calibrate to market transactions and eliminate timing differences between the closing price of the exchange-traded derivatives and their underlying instruments. OTC derivatives are valued using market transactions and other market evidence whenever possible, including market-based inputs to models, model calibration to market transactions, broker or dealer quotations or alternative pricing sources with reasonable levels of price transparency. When models are used, the selection of a particular model to value an OTC derivative depends on the contractual terms of, and specific risks inherent in, the instrument as well as the availability of pricing information in the market. The Company generally uses similar models to value similar instruments. Valuation models require a variety of inputs, including contractual terms, market prices and rates, forward curves, measures of volatility, and correlations of such inputs. For OTC derivatives that trade in liquid markets, such as forward contracts, swaps and options, model inputs can generally be corroborated by observable market data by correlation or other means, and model selection does not involve significant management judgment.

The Company has interest rate caps and cross currency swaps that are fair valued using Level 2 inputs. In addition, the Company applies a credit valuation adjustment to reflect credit risk which is calculated based on credit default swaps. To the extent that the Company's net exposure under a specific master agreement is an asset, the Company utilizes the counterparty's default swap rate. If the net exposure under a specific master agreement is a liability, the Company utilizes a default swap rate comparable to PQ Group Holdings. The credit valuation adjustment is added to the discounted fair value to reflect the exit price that a market participant would be willing to receive to assume the Company's liabilities or that a market participant would be willing to pay for the Company's assets.

7. Stockholders' Equity:

Accumulated Other Comprehensive Income (Loss)

The following table presents the components of accumulated other comprehensive income (loss), net of tax, as of December 31, 2020 and 2019:

	December 31,	
	2020	2019
Amortization and unrealized gains (losses) on pension and postretirement plans, net of tax of $(1,649) and $(994)	$ 5,278	$ 3,568
Net changes in fair values of derivatives, net of tax of $549 and $604	(660)	(1,838)
Foreign currency translation adjustments, net of tax of $1,223 and $7,474	(19,883)	(17,078)
Accumulated other comprehensive loss	$ (15,265)	$ (15,348)

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The following table presents the tax effects of each component of other comprehensive income (loss) for the years ended December 31, 2020, 2019 and 2018:

	Years ended December 31,								
	2020			2019			2018		
	Pre-tax amount	Tax benefit/ (expense)	After-tax amount	Pre-tax amount	Tax benefit/ (expense)	After-tax amount	Pre-tax amount	Tax benefit/ (expense)	After-tax amount
Defined benefit and other postretirement plans:									
Amortization of net gains and (losses)	$ 2,824	$ (712)	$ 2,112	$ 2,970	$ (423)	$ 2,547	$ (10,279)	$ 2,380	$ (7,899)
Amortization of prior service cost	(232)	58	(174)	(156)	39	(117)	(78)	19	(59)
Benefit plans, net	2,592	(654)	1,938	2,814	(384)	2,430	(10,357)	2,399	(7,958)
Net (loss) gain from hedging activities	221	(55)	166	(3,553)	888	(2,665)	(441)	110	(331)
Foreign currency translation[(1)]	(11,268)	(6,251)	(17,519)	20,539	2,350	22,889	(39,419)	4,364	(35,055)
Other comprehensive income (loss)	$ (8,455)	$ (6,960)	$ (15,415)	$ 19,800	$ 2,854	$ 22,654	$ (50,217)	$ 6,873	$ (43,344)

(1) The income tax benefit or expense included in other comprehensive income is attributed to the portion of foreign currency translation associated with the Company's cross-currency interest rate swaps, for which the tax effect is based on the applicable U.S. deferred income tax rate. See Note 19 to these consolidated financial statements for information regarding the Company's cross currency interest rate swaps.

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The following table presents the change in accumulated other comprehensive income (loss), net of tax, by component for the years ended December 31, 2020 and 2019:

	Defined benefit and other postretirement plans	Net gain (loss) from hedging activities	Foreign currency translation	Total
December 31, 2018	$ (546)	$ 637	$ (39,195)	$ (39,104)
Other comprehensive income (loss) before reclassifications	2,497	(3,388)	22,117	21,226
Amounts reclassified from accumulated other comprehensive income[1]	(67)	723	—	656
Net current period other comprehensive loss	2,430	(2,665)	22,117	21,882
Tax Cuts and Jobs Act, reclassification from AOCI to retained earnings	1,684	190	—	1,874
December 31, 2019	3,568	(1,838)	(17,078)	(15,348)
Other comprehensive income (loss) before reclassifications	1,850	125	(16,596)	(14,621)
Amounts reclassified from accumulated other comprehensive income[1]	88	41	—	129
Disposal of business	(228)	1,012	13,791	14,575
Net current period other comprehensive income (loss)	1,710	1,178	(2,805)	83
December 31, 2020	$ 5,278	$ (660)	$ (19,883)	$ (15,265)

(1) See the following table for details about these reclassifications. Amounts in parentheses indicate debits.

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The following table presents the reclassifications out of accumulated other comprehensive income for the years ended December 31, 2020 and 2019.

Details about Accumulated Other Comprehensive Income Components	Amount Reclassified from Accumulated Other Comprehensive Income[(1)] Years ended December 31, 2020	2019	Affected Line Item in the Statements of Income
Amortization of defined benefit and other postretirement plans:			
Prior service credit (cost)	$ 119	$ 133	Other income (expense)[(2)]
Actuarial gains (losses)	(232)	(21)	Other income (expense)[(2)]
	(113)	112	Total before tax
	25	(45)	Tax benefit (expense)
	$ (88)	$ 67	Net of tax
Gains and losses on cash flow hedges:			
Interest rate caps	$ (54)	$ (625)	Interest expense
Natural gas swaps	—	(335)	Cost of goods sold
	(54)	(960)	Total before tax
	13	237	Tax benefit
	$ (41)	$ (723)	Net of tax
Total reclassifications for the period	$ (129)	$ (656)	Net of tax

(1) Amounts in parentheses indicate debits to profit/loss.

(2) These accumulated other comprehensive income (loss) components are components of net periodic pension and other postretirement cost (see Note 21 to these consolidated financial statements for additional details).

Stock Repurchase Program

The Company records repurchases of its common stock for treasury at cost. Upon the reissuance of the Company's common stock from treasury, differences between the proceeds from reissuance and the average cost of the treasury stock are credited or charged to capital in excess of par value to the extent of prior credits related to the reissuance of treasury stock. If no such credits exist, the differences are charged to retained earnings.

On March 12, 2020, the Company announced plans to purchase up to $50,000 of PQ Group Holdings Inc. common stock under a stock repurchase program approved by the Company's Board of Directors. The Company may repurchase shares from time to time for cash in open market transactions or in privately negotiated transactions in accordance with applicable federal securities laws. The Company will determine the timing and the amount of any repurchases based on its evaluation of market conditions, share price and other factors. The stock repurchase program is valid until March 2022.

From the announcement date of the program through December 31, 2020, the Company repurchased 211,700 shares on the open market at an average price of $9.73 for a total of $2,059. As of December 31, 2020, $47,941 was available for additional share repurchases under the program.

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Dividends Paid

On December 14, 2020, the Company's Board of Directors declared a special cash dividend of $1.80 per share, using after tax cash proceeds and cash on hand from the sale of the Performance Materials business. The dividend was paid to our stockholders of record at the close of business on December 21, 2020. Refer to Note 4 of these consolidated financial statements for additional details.

8. Dispositions:

Magnesium Silicate Product Line Sale

On July 1, 2020, the Company completed the sale of its magnesium silicate product line within its Performance Chemicals segment for $18,000 and recorded a pre-tax gain on sale of $4,958. The transaction was recorded as an asset sale, with the gain on disposition included in the other operating expense, net line item in the Company's condensed consolidated statement of income for the year ended December 31, 2020 (see Note 9 to these condensed consolidated financial statements for additional details). At the time of disposition, the carrying value of the Company's inventory related to this non-core product line was $1,556. The Company allocated $11,486 of the consideration received to a contract liability for deferred revenue.

Concurrent with the product line sale, the Company entered into a tolling arrangement with the buyer in which the Company agreed to manufacture the product for the buyer through June 2025. The Company deferred $11,486 of the $18,000 consideration received as a liability, to be recognized as the Company executes its performance obligations over the term of the contractual agreement with the buyer.

Sulfate Salts Product Line Sale

On June 28, 2019, the Company completed the sale of a portion of its sulfate salts product line within its Performance Chemicals segment for $28,000, with net cash consideration of $27,658 and a pre-tax gain on sale of $11,518. The transaction was recorded as an asset sale, with the gain on disposition included in the other operating expense, net line item in the Company's consolidated statement of income for the year ended December 31, 2019 (see Note 9 to these consolidated financial statements for additional details). At the time of disposition, the carrying value of the Company's net working capital related to this non-core product line was $4,215. In addition to the net working capital sold as part of the transaction, the Company also derecognized $3,276 of property, plant and equipment related to the product line and allocated $9,000 of the consideration received to a liability for deferred revenue.

Concurrent with the product line sale, the Company entered into a tolling arrangement with the buyer in which the Company will use its existing manufacturing facilities for the product line to manufacture the product for the buyer, the majority of which runs until June 2021. The Company deferred $9,000 of the consideration received as a liability, to be recognized as the Company executes its performance obligations over the term of the contractual agreement with the buyer. Additionally, the Company concluded that an embedded lease arrangement exists as a result of the combination of the sale and tolling agreements. Given the ability of the buyer to control substantially all of the output of the facilities and the existence of bargain purchase options on the manufacturing assets, the Company determined that the buyer is effectively leasing the assets from the Company and derecognized the associated property, plant and equipment under a sales-type leasing arrangement. The gain on the sale of fixed assets is included as part of the Company's overall gain on sale related to the transaction, with the Company's net investment in the leased assets having been settled as part of the consideration received in the transaction with no additional future cash flows to be recognized on the lease.

Sale of Assets

On December 19, 2019, the Company completed the sale of real property for $19,100, with net cash consideration of $17,100 and a holdback receivable to be settled by December 2021 of $1,000, and recorded a pre-tax gain on sale of $7,150. On December 30, 2019, the Company entered into a leaseback arrangement with the buyer-lessor which expires in December 2021. The Company recorded the asset sale separately from the leaseback, with the gain on disposition included in the other operating expense, net line item in the Company's consolidated statement of income for the year ended December 31, 2019 (see Note 9 to these consolidated financial statements for additional details).

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At the time of disposition, the Company derecognized $10,735 of property, plant and equipment and accounted for the leased asset as an operating lease. A right-of-use lease asset of $3,588 and lease liability of $3,524 was recorded at December 31, 2020, based on the present value of the lease payments and future demolition costs associated with the lease.

9. Other Operating Expense, Net:

A summary of other operating expense, net is as follows:

	Years ended December 31,		
	2020	2019	2018
Amortization expense	$ 26,923	$ 26,888	$ 27,258
Transaction and other related costs[(1)]	8,274	407	491
Restructuring, integration and business optimization costs[(2)]	13,028	2,692	5,819
Net (gain) loss on asset disposals[(3)]	(134)	(13,207)	4,190
Insurance recoveries[(4)]	—	—	(5,480)
Write-off of long-term supply contract obligation (Note 25)	—	—	(20,612)
Environmental related costs	1,092	2,522	638
Other, net	1,803	2,076	4,123
	$ 50,986	$ 21,378	$ 16,427

(1) Transaction and other related costs during the year ended December 31, 2020 primarily related to costs incurred from the strategic review of the Company's Performance Chemicals business. Refer to Note 29 of these consolidated financial statements for additional details.

(2) During the year ended December 31, 2020, the Company's results were impacted by costs associated with the execution of the Company's strategic initiatives. The costs incurred during the year ended December 31, 2020 primarily relate to demolition and decommissioning costs related to various asset sales. The costs incurred during the years ended December 31, 2019 and 2018 relate to severance charges for certain executives and employees, transition/duplicate staffing, professional fees and other expenses related to the Company's organization changes.

(3) During the year ended December 31, 2020, the Company recognized a gain of $4,958 related to the sale of a product line and a gain of $672 related to the sale of its interest in the Quaker Holdings joint venture, which were offset by fixed asset write-offs. During the year ended December 31, 2019, the Company recognized a gain of $11,518 related to the sale of a product line and a gain of $7,150 related to a property sale, which were partially offset by fixed asset write-offs. Refer to Note 8 of these consolidated financial statements for additional details.

(4) During the year ended December 31, 2018, the Company recognized $6,450 of insurance recoveries in its consolidated statement of income related to the Company's claim for losses sustained during Hurricane Harvey in August 2017. For the year ended December 31, 2018, $5,480 was recorded as a gain in other operating expense, net, as reimbursement of expenses, $207 was recorded as a gain in net loss on asset disposals within other operating expense, net, for the Company's previously recognized property losses, and $763 represented recoveries in excess of the Company's property losses which was recorded as a non-operating gain in other expense, net, in the Company's consolidated statement of income.

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10. Inventories, Net:

Inventories, net are classified and valued as follows:

	December 31, 2020	December 31, 2019
Finished products and work in process	$ 102,388	$ 106,980
Raw materials	25,048	30,642
	$ 127,436	$ 137,622
Valued at lower of cost or market:		
LIFO basis	$ 55,283	$ 60,190
Valued at lower of cost and net realizable value:		
FIFO or average cost basis	72,153	77,432
	$ 127,436	$ 137,622

The domestic inventory acquired as part of a previous business combination is valued based on the LIFO method. Therefore, the fair value allocated to the acquired LIFO inventory was treated as the new base inventory value. If inventories valued under the LIFO basis had been valued using the FIFO method, inventories would have been $4,255 lower and $974 higher than reported as of December 31, 2020 and 2019, respectively, driven primarily by the purchase accounting fair value step-up of the LIFO inventory base value associated with the business combination.

11. Investments in Affiliated Companies:

The Company accounts for investments in affiliated companies under the equity method. Affiliated companies accounted for on the equity method as of December 31, 2020 are as follows:

Company	Country	Percent Ownership
PQ Silicates Ltd.	Taiwan	50%
Zeolyst International	USA	50%
Zeolyst C.V.	Netherlands	50%

Following is summarized information of the combined investments[(1)]:

	December 31, 2020	December 31, 2019
Current assets	$ 219,002	$ 248,685
Noncurrent assets	254,416	256,104
Current liabilities	66,423	52,638
Noncurrent liabilities	36,788	5,950

	Years ended December 31, 2020	2019	2018
Sales	$ 278,414	$ 380,381	$ 351,839
Gross profit	89,471	144,828	126,505
Operating income	54,010	106,195	88,294
Net income	55,722	107,112	88,411

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(1) Summarized information of the combined investments is presented at 100%; the Company's share of the net assets and net income of affiliates is calculated based on the percent ownership specified in the table above.

In March 2020, the Company sold its 49% interest in the Quaker Holdings joint venture to a third party. Prior to the Company's disposition of its shares in the joint venture, the Company received a liquidating dividend of $729 as well as $1,032 for the sale of the joint venture shares, which was included in the proceeds from sale of investment within the investing activities section of the Company's consolidated statement of cash flows.

The Company's investments in affiliated companies balance as of December 31, 2020 and 2019 includes net purchase accounting fair value adjustments of $243,899 and $250,532, respectively, related a prior business combination, consisting primarily of goodwill and intangible assets such as customer relationships, technical know-how and trade names. Consolidated equity in net income from affiliates is net of $6,634, $7,534 and $6,634 of amortization expense related to purchase accounting fair value adjustments for the years ended December 31, 2020, 2019 and 2018, respectively.

The following table summarizes the activity related to the Company's investments in affiliated companies balance on the consolidated balance sheets:

	Years ended December 31,	
	2020	2019
Balance at beginning of period	$ 472,814	$ 468,055
Equity in net income of affiliated companies	27,871	53,556
Charges related to purchase accounting fair value adjustments	(6,634)	(7,534)
Dividends received	(40,989)	(40,073)
Foreign currency translation adjustments	5,390	(1,190)
Balance at end of period	$ 458,452	$ 472,814

The Company had net receivables due from affiliates of $3,814 and $3,586 as of December 31, 2020 and 2019, respectively, which are included in prepaid and other current assets. Net receivables due from affiliates are generally non-trade receivables. Sales to affiliates were $9,144, $4,181 and $2,823 for the years ended December 31, 2020, 2019 and 2018, respectively. The Company did not purchase goods from affiliates during the years ended December 31, 2020, 2019 and 2018.

On December 18, 2013, PQ Holdings and its joint venture, Zeolyst International, entered into a ten year real estate tax abatement agreement with the Unified Government of Wyandotte County, Kansas. The agreement utilizes an Industrial Revenue Bond ("IRB") financing structure to achieve a 75% real estate tax abatement on the value of the improvements that were constructed during the expansion of PQ Holdings and Zeolyst International's facilities at the jointly-operated Kansas City, Kansas plant. A similar tax abatement agreement has been executed on an annual basis since December 18, 2013 with respect to additional plant expansions during those years.

During the year ended December 31, 2019, the original IRB financing structure from December 2013 was exhausted. In order to fund future plant expansions, the Company entered into an additional IRB financing structure on December 19, 2019 with similar terms and conditions, which also provides for 75% real estate tax abatement on the value of future improvements. The financing obligations and the industrial bonds receivable have been presented net, as the financing obligations and the industrial bonds meet the criteria for right of set off conditions under GAAP.

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12. Property, Plant and Equipment:

A summary of property, plant and equipment, at cost, and related accumulated depreciation is as follows:

	December 31, 2020	December 31, 2019
Land	$ 158,517	$ 160,321
Buildings	168,204	160,653
Machinery and equipment	1,097,949	1,027,775
Construction in progress	78,641	76,242
	1,503,311	1,424,991
Less: accumulated depreciation	(520,076)	(413,835)
	$ 983,235	$ 1,011,156

Depreciation expense was $114,641, $111,032 and $111,491 for the years ended December 31, 2020, 2019 and 2018, respectively.

13. Leases:

Operating lease costs of $16,817 and $15,125 are included in cost of goods sold and in selling, general and administrative expenses on the consolidated statement of income for the year ended December 31, 2020 and 2019, respectively. Finance lease, short-term lease and variable lease costs for the years ended December 31, 2020 and 2019 were not material. Lease income is not material to the results of operations for the years ended December 31, 2020 and 2019.

The Company entered into a sale-leaseback transaction during the year ended December 31, 2019. Disclosures related to this transaction can be found within Note 8 to these consolidated financial statements.

The table below presents the operating and finance right-of-use lease assets and lease liabilities recognized on the consolidated balance sheet as of December 31, 2020 and 2019:

	Classification	December 31, 2020	December 31, 2019
Assets			
Operating lease assets	Right-of-use lease assets	$ 48,239	$ 48,417
Finance lease assets	Property, plant and equipment, net	1,752	1,556
Total leased assets		$ 49,991	$ 49,973
Liabilities			
Current:			
Operating lease liabilities	Operating lease liabilities—current	$ 15,194	$ 11,857
Finance lease liabilities	Accrued liabilities	262	185
Noncurrent:			
Operating lease liabilities	Operating lease liabilities—noncurrent	32,019	34,908
Finance lease liabilities	Other long-term liabilities	366	315
Total lease liabilities		$ 47,841	$ 47,265

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The Company's weighted average remaining lease term and weighted average discount rate for operating and financing leases as of December 31, 2020 are as follows:

	December 31, 2020	December 31, 2019
Weighted average remaining lease term (in years):		
Operating leases	5.18	5.51
Finance leases	2.45	2.65
Weighted average discount rate:		
Operating leases	5.55 %	5.66 %
Finance leases	4.67 %	4.67 %

Maturities of lease liabilities as of December 31, 2020 are as follows:

Year	Operating Leases	Finance Leases
2021	$ 17,363	$ 406
2022	10,707	161
2023	8,655	40
2024	6,404	35
2025	3,917	8
Thereafter	7,785	—
Total lease payments	54,831	650
Less: Interest	(7,618)	(22)
Total lease liabilities	$ 47,213	$ 628

(1) Refer to the above table regarding the Company's right-of-use lease assets and lease liabilities for the presentation of the lease liabilities in the Company's consolidated balance sheet at December 31, 2020.

The following table presents other information related to the Company's operating and finance leases and the impact on the Company's consolidated statement of cash flows:

	Years ended December 31, 2020	Years ended December 31, 2019
Cash paid for amounts included in the measurement of lease liabilities:		
Payments on operating leases included in operating cash flows	$ 16,135	$ 14,814
Interest payments under finance lease obligations included in operating cash flows	21	26
Principal payments under finance lease obligations included in financing cash flows	209	177
Right-of-use assets obtained in exchange for new lease liabilities (non-cash):		
Operating leases	14,439	8,798
Finance leases	353	—

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Under prior lease guidance, total rent expense related to the Company's various leasing arrangements was $20,594 for the year ended December 31, 2018. Rent expense for the year ended December 31, 2018 included both lease and non-lease costs related to leasing arrangements in place during those years.

14. Reportable Segments:

The Company has organized its business around three operating segments based on the review of discrete financial results for each of the operating segments by the Company's chief operating decision maker (the Company's Chairman of the Board, President and Chief Executive Officer), or CODM, for performance assessment and resource allocation purposes. Each of the Company's operating segments represents a reportable segment under GAAP. The Company's reportable segments are organized based on the nature and economic characteristics of the Company's products. The Company's three reportable segments are as follows: (1) Refining Services provides sulfuric acid recycling to the North American refining industry; (2) Catalysts serves the packaging and engineered plastics and the global refining, petrochemical and emissions control industries; and (3) Performance Chemicals supplies diverse product end uses, including personal and industrial cleaning products, fuel-efficient tires, surface coatings, and food and beverage products.

The Catalysts segment includes equity in net income from Zeolyst International and Zeolyst C.V. (collectively, the "Zeolyst Joint Venture"), each of which are 50/50 joint ventures with CRI Zeolites Inc. (a wholly-owned subsidiary of Royal Dutch Shell). The Zeolyst Joint Venture is accounted for using the equity method in the Company's consolidated financial statements (see Note 11 to these consolidated financial statements for further information). Company management evaluates the Catalysts segment's performance, including the Zeolyst Joint Venture, on a proportionate consolidation basis. Accordingly, the revenues and expenses used to compute the Catalysts segment's adjusted earnings before interest, income taxes, depreciation and amortization ("Adjusted EBITDA") include the Zeolyst Joint Venture's results of operations on a proportionate basis based on the Company's 50% ownership level. Since the Company uses the equity method of accounting for the Zeolyst Joint Venture, these items are eliminated when reconciling to the Company's consolidated results of operations.

The Company's management evaluates the operating results of each reportable segment based upon Adjusted EBITDA. Adjusted EBITDA consists of EBITDA, which is a measure defined as net income before interest, income taxes, depreciation and amortization (each of which is included in the Company's consolidated statements of income), and adjusted for certain items as discussed below.

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Summarized financial information for the Company's reportable segments is shown in the following table:

	Years ended December 31, 2020	2019	2018
Sales:			
Refining Services	$ 401,913	$ 447,081	$ 455,562
Catalysts[(1)]	94,007	85,667	72,099
Performance Chemicals	614,704	670,563	704,502
Eliminations[(2)]	(3,261)	(3,397)	(3,237)
Total	$ 1,107,363	$ 1,199,914	$ 1,228,926
Segment Adjusted EBITDA:[(3)]			
Refining Services	$ 157,198	$ 175,640	$ 176,499
Catalysts[(4)]	74,504	107,808	81,067
Performance Chemicals	142,372	151,547	168,196
Total Segment Adjusted EBITDA[(5)]	$ 374,074	$ 434,995	$ 425,762

(1) Excludes the Company's proportionate share of sales from the Zeolyst Joint Venture accounted for using the equity method. The proportionate share of sales is $128,623, $170,338 and $156,687 for the years ended December 31, 2020, 2019 and 2018, respectively.

(2) The Company eliminates intersegment sales when reconciling to the Company's consolidated statements of income.

(3) The Company defines Adjusted EBITDA as EBITDA adjusted for certain items as noted in the reconciliation below. Management evaluates the performance of its segments and allocates resources based on several factors, of which the primary measure is Adjusted EBITDA. Adjusted EBITDA should not be considered as an alternative to net income as an indicator of the Company's operating performance. Adjusted EBITDA as defined by the Company may not be comparable with EBITDA or Adjusted EBITDA as defined by other companies.

(4) The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $42,515 for the year ended December 31, 2020, which includes $21,157 of equity in net income plus $6,634 of amortization of investment in affiliate step-up plus $14,724 of joint venture depreciation, amortization and interest.

The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $68,138 for the year ended December 31, 2019, which includes $45,899 of equity in net income plus $7,534 of amortization of investment in affiliate step-up plus $14,705 of joint venture depreciation, amortization and interest.

The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $56,663 for the year ended December 31, 2018, which includes $37,437 of equity in net income plus $6,634 of amortization of investment in affiliate step-up plus $12,592 of joint venture depreciation, amortization and interest.

(5) Total Segment Adjusted EBITDA differs from the Company's consolidated Adjusted EBITDA due to unallocated corporate expenses.

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A reconciliation of net income attributable to PQ Group Holdings to Segment Adjusted EBITDA is as follows:

	Years ended December 31,		
	2020	2019	2018
Reconciliation of net (loss) income attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA			
Net (loss) income from continuing operations	$ (176,265)	$ 65,136	$ 49,271
(Benefit) provision for income taxes	(48,122)	39,677	33,641
Interest expense, net	66,979	87,072	90,758
Depreciation and amortization	151,840	151,797	153,931
Segment EBITDA	(5,568)	343,682	327,601
Joint venture depreciation, amortization and interest	14,724	14,705	12,592
Amortization of investment in affiliate step-up	6,634	7,534	6,634
Goodwill impairment charge	260,000	—	—
Debt extinguishment costs	25,028	3,400	7,751
Net (gain) loss on asset disposals	(134)	(13,207)	4,190
Foreign currency exchange (gain) loss	(4,172)	2,410	12,543
LIFO (benefit) expense	(5,229)	9,700	3,039
Transaction and other related costs	8,618	415	490
Equity-based compensation	21,527	16,212	18,419
Restructuring, integration and business optimization expenses	15,596	3,554	8,707
Defined benefit pension plan cost	12	2,960	411
Gain on contract termination[1]	—	—	(20,612)
Other	959	2,597	6,155
Adjusted EBITDA	337,995	393,962	387,920
Unallocated corporate expenses	36,079	41,033	37,842
Segment Adjusted EBITDA	$ 374,074	$ 434,995	$ 425,762

[1] Includes the non-cash write-off of a long-term supply contract obligation (see Note 25), which was recorded as a reduction in other operating expense, net in the consolidated statement of income for the year ended December 31, 2018.

The Company's consolidated results include equity in net income from affiliated companies of $21,237, $46,022 and $37,569 for the years ended December 31, 2020, 2019, and 2018, respectively. This is primarily comprised of equity in net income of $21,157, $45,899 and $37,437 in the Catalysts segment from the Zeolyst Joint Venture for the years ended December 31, 2020, 2019 and 2018, respectively. The remaining equity in net income for the Company is included in the Performance Chemicals segment, which was attributed to smaller investments and was not material. The Company's equity in net income from affiliated companies in the consolidated results includes amortization expense related to purchase accounting fair value adjustments associated with the Zeolyst Joint Venture as a result of a prior business combination.

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Capital expenditures for the Company's reportable segments are shown in the following table:

	Years ended December 31,		
	2020	2019	2018
Capital expenditures:			
Refining Services	$ 31,799	$ 42,310	$ 46,617
Catalysts[1]	11,177	8,984	8,390
Performance Chemicals	40,864	53,910	56,759
Corporate[2]	13,295	5,898	29
Capital expenditures per the consolidated statements of cash flows	$ 97,135	$ 111,102	$ 111,795

(1) Excludes the Company's proportionate share of capital expenditures from the Zeolyst Joint Venture.

(2) Includes corporate capital expenditures, the cash impact from changes in capital expenditures in accounts payable and capitalized interest.

Total assets by segment are not disclosed by the Company because the information is not prepared or used by the CODM to assess performance and to allocate resources.

Sales and long-lived assets by geographic area are presented in the following tables. Sales are attributed to countries based upon location of products shipped.

	Years ended December 31,		
	2020	2019	2018
Sales[1]:			
United States	$ 655,015	$ 735,752	$ 740,190
Netherlands	108,338	117,211	127,803
United Kingdom	107,539	99,048	101,277
Other foreign countries	236,471	247,903	259,656
Total	$ 1,107,363	$ 1,199,914	$ 1,228,926

(1) Except for the United States, no sales in an individual country exceeded 10% of the Company's total sales.

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	December 31, 2020	December 31, 2019
Long-lived assets[1]:		
United States	$ 749,635	$ 784,699
Netherlands	53,006	49,559
United Kingdom	100,392	92,229
Other foreign countries	128,441	133,086
Total	$ 1,031,474	$ 1,059,573

(1) Long-lived assets includes property, plant and equipment, net and right-of-use lease assets.

15. Goodwill and Other Intangible Assets:

The changes in the carrying amount of goodwill for the years ended December 31, 2020 and 2019 is summarized as follows:

	Refining Services	Catalysts	Performance Chemicals	Total
Balance as of December 31, 2018	$ 311,892	$ 77,759	$ 580,023	$ 969,674
Foreign exchange impact	—	852	3,052	3,904
Balance as of December 31, 2019	311,892	78,611	583,075	973,578
Goodwill impairment	—	—	(260,000)	(260,000)
Foreign exchange impact	—	1,062	3,098	4,160
Balance as of December 31, 2020	$ 311,892	$ 79,673	$ 326,173	$ 717,738

The carrying amounts of goodwill at December 31, 2020, 2019 and 2018 are net of the following accumulated impairment losses:

	Refining Services	Catalysts	Performance Chemicals	Total
Accumulated impairment losses as of December 31, 2018	—	—	—	—
Accumulated impairment losses as of December 31, 2019	—	—	—	—
Accumulated impairment losses as of December 31, 2020	—	—	(260,000)	(260,000)

The Company completed its annual goodwill impairment assessments as of October 1, 2020 and 2019. For the annual assessments, the Company bypassed the option to perform the qualitative assessment and proceeded directly to performing the quantitative goodwill impairment test for each of its reporting units. The quantitative test identifies both the potential existence of impairment and the amount of impairment loss. For each of the October 1, 2020 and 2019 assessments, the Company identified three reporting units, which align with the Company's operating segments.

The Company determined the fair value of its reporting units using a split between a market approach and an income, or discounted cash flow, approach. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.

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The Company estimates reporting unit market approach fair value using publicly traded comparable company values and applies the selected market multiples to each reporting unit's trailing twelve months adjusted EBITDA. The Company estimates reporting unit income-based fair value using the discounted cash flow approach. This approach requires use of significant assumptions about future cash flows and based on management's assessment of a number of factors. Such factors include reporting unit revenue growth rates from implementation of strategic plans, operating margin growth rates, the perpetual growth rate, and the weighted average cost of capital, as well as the reporting unit's recent performance and management's ability to execute on planned future strategic initiatives. Discount rate assumptions are based on an assessment of the risk inherent in those future cash flows.

Based on the Company's announced strategic review of the Performance Chemicals reporting unit in the fourth quarter, the Company concluded the market approach was more appropriate to estimate the fair value of the reporting unit for the annual impairment test. The Company reviewed the recent reporting unit performance and peer company performance under current market conditions. As a result, the Company recorded a goodwill impairment charge of $260,000 in the fourth quarter of 2020, included in goodwill impairment charge in the consolidated statements of income related to the Performance Chemicals reporting unit. The carrying value of the Performance Chemicals reporting unit's goodwill was $326,173 at December 31, 2020. No other goodwill impairments were identified as a result of the 2020 testing.

As of October 1, 2019, the fair values of each of the Company's reporting units exceeded their respective carrying values and therefore, no goodwill impairment exists for the year ended December 31, 2019.

In addition to the annual goodwill impairment assessment, the Company also performed the annual impairment test over its other indefinite-lived intangible assets as of October 1, 2020 and 2019. The fair values of the Company's indefinite-lived trade names and trademarks were in excess of their carrying amounts as of the respective testing dates, and as such, there was no further impairment of the Company's indefinite-lived intangible assets for the years ended December 31, 2020 and 2019.

Gross carrying amounts and accumulated amortization for intangible assets other than goodwill are as follows:

	December 31, 2020			December 31, 2019		
	Gross Carrying Amount	Accumulated Amortization	Net Balance	Gross Carrying Amount	Accumulated Amortization	Net Balance
Technical know-how	$ 180,768	$ (47,207)	$ 133,561	$ 177,873	$ (37,102)	$ 140,771
Customer relationships	325,773	(134,842)	190,931	321,434	(106,627)	214,807
Contracts	—	—	—	16,200	(15,258)	942
Trademarks	7,709	(2,399)	5,310	7,600	(1,858)	5,742
Permits	9,100	(9,100)	—	9,100	(9,100)	—
In-process research and development	500	(25)	475	—	—	—
Total definite-lived intangible assets	523,850	(193,573)	330,277	532,207	(169,945)	362,262
Indefinite-lived trade names	108,713	—	108,713	106,811	—	106,811
Indefinite-lived trademarks	82,613	—	82,613	80,999	—	80,999
In-process research and development	4,700	—	4,700	5,200	—	5,200
Total intangible assets	$ 719,876	$ (193,573)	$ 526,303	$ 725,217	$ (169,945)	$ 555,272

The Company amortizes technical know-how over periods that range from eleven years to twenty years, customer relationships over periods that range from seven years to fifteen years, trademarks over periods that range from eleven years to fifteen years, contracts over periods that range from two years to sixteen years, and permits over five years. In-process research and development intangible assets are considered indefinite-lived until such time as the associated projects are completed, at which time amortization commences on the assets, or abandoned, which results in the impairment of the assets.

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Amortization expense related to technical know-how, contracts and permits is included in cost of goods sold in the consolidated statements of income and was $9,369, $13,877 and $13,579 for the years ended December 31, 2020, 2019 and 2018, respectively. Amortization expense related to customer relationships and trademarks is included in other operating expense, net in the consolidated statements of income and was $26,923, $26,888 and $27,258 for the years ended December 31, 2020, 2019 and 2018, respectively.

Estimated future aggregate amortization expense of intangible assets is as follows:

Year	Amount
2021	$ 36,292
2022	36,292
2023	36,292
2024	36,292
2025	36,292
Thereafter	148,817
Total estimated future aggregate amortization expense	$ 330,277

16. Accrued Liabilities:

The following table summarizes the components of accrued liabilities as follows:

	December 31, 2020	December 31, 2019
Compensation and bonus	$ 35,251	$ 40,374
Interest	11,573	19,110
Property tax	2,656	2,250
Environmental reserves (Note 24)	4,309	4,548
Income taxes	869	4,900
Commissions and rebates	854	1,459
Pension, postretirement and supplemental retirement plans (Note 21)	1,852	1,825
Derivative liabilities	1,954	420
Other	14,493	10,524
	$ 73,811	$ 85,410

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17. Long-term Debt:

The summary of long-term debt is as follows:

	December 31, 2020	December 31, 2019
Senior Secured Term Loan Facility due February 2027	$ 671,710	$ 947,497
New Senior Secured Term Loan Facility due February 2027	459,653	—
6.75% Senior Secured Notes due 2022	—	625,000
5.75% Senior Unsecured Notes due 2025	295,000	295,000
ABL Facility	—	—
Total debt	1,426,363	1,867,497
Original issue discount	(15,641)	(13,434)
Deferred financing costs	(10,353)	(10,839)
Total debt, net of original issue discount and deferred financing costs	1,400,369	1,843,224
Less: current portion	—	—
Total long-term debt, excluding current portion	$ 1,400,369	$ 1,843,224

Senior Secured Credit Facilities

On May 4, 2016, the Company entered into senior secured credit facilities (collectively, the “2016 Senior Secured Credit Facilities”) comprised of a $1,200,000 term loan facility, which consisted of a $900,000 U.S. dollar-denominated tranche and a $300,000 Euro-denominated (or €265,000) tranche (the “2016 Term Loan Facility”), and a $200,000 asset-based revolving credit facility (the “ABL Facility”).

On February 8, 2018 (the “Third Amendment Closing Date”), PQ Corporation (the “Borrower”), an indirect, wholly owned subsidiary of the Company, refinanced its existing U.S. Dollar and Euro denominated senior secured term loan facilities with a new $1,267,000 senior secured term loan facility (the “ Senior Secured Term Loan Facility”) by entering into the Third Amendment Agreement to the 2016 Term Loan Facility (the “Third Amendment”), which amended and restated the Term Loan Credit Agreement dated as of May 4, 2016, among the Borrower, CPQ Midco I Corporation, Credit Suisse AG, Cayman Island Branch, as administrative agent and collateral agent, and the lenders and the other parties party thereto from time to time (as amended prior to the Third Amendment, the “Existing Credit Agreement” and as amended and restated by the Amendment, the “New Credit Agreement”).

On February 7, 2020, the Company amended its Senior Secured Term Loan Facility to, among other things, (a) reduce the interest rate applicable to all LIBOR rate tranche B-1 term loans to LIBOR plus 2.25% per annum, (b) reduce the interest rate applicable to all base rate tranche B-1 term loans to the alternate base rate plus 1.25% per annum and (c) extend the maturity date of all tranche B-1 term loans to February 7, 2027.

On July 22, 2020, the Company entered into an agreement for a new senior secured term loan facility (the “New Senior Secured Term Loan Facility”, collectively with the Senior Secured Term Loan Facility, the “Term Loan Facilities”) in an aggregate principal amount of $650,000 with an original issue discount of 1.5% and interest at a floating rate of LIBOR (with a 1.0% minimum LIBOR floor) plus 3.0% per annum. The proceeds were used to redeem its existing $625,000 of 6.75% Senior Secured Notes due 2022 and pay the associated early redemption premiums. The New Senior Secured Term Loan Facility requires scheduled quarterly amortization payments, each equal to 0.25% of the original principal amount of the loans under the New Senior Secured Term Loan Facility.

As of December 31, 2020, the Senior Secured Term Loan Facility accrued interest at a floating rate of LIBOR plus 2.50% per annum and is scheduled to mature in February 2027. The Term Loan Facility requires scheduled quarterly amortization payments, each equal to 0.25% of the original principal amount of the loans under the Term Loan Facility.

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On the Third Amendment Closing Date, the Company also entered into multiple cross currency swap arrangements to hedge foreign currency risk. The swaps were designed to enable the Company to effectively convert a portion of its fixed-rate U.S. dollar denominated debt obligations into approximately €280,000. The swaps were to mature in February 2023. In October 2019, the Company settled all of its cross-currency interest rate swap arrangements (the "February 2018 swaps") and concurrently entered into new cross-currency interest rate swap arrangements (the "October 2019 swaps") with the same notional amount of €280,000 equivalent ($344,403 as of December 31, 2020) and same maturity of February 2023. Consistent with the February 2018 swaps, the October 2019 swaps are designed to enable the Company to effectively convert a portion of its fixed-rate U.S. dollar-denominated debt obligations under the Term Loan Facility into a Euro-denominated equivalent. The October 2019 swaps have been designated and qualify as net investment hedges of the Company's foreign currency exchange rate exposure on the net investments of certain of its Euro-denominated subsidiaries. The settlement of the February 2018 swaps resulted in cash proceeds to the Company of $38,070, which the Company used for additional debt repayment on the Company's Senior Secured Term Loan Facility.

The Company may at any time or from time to time voluntarily prepay loans under the Term Loan Facilities in whole or in part without premium or penalty.

The Term Loan Facilities requires mandatory prepayments from (i) 50% of "Excess Cash Flow" (as defined in the New Credit Agreement) on an annual basis with step downs to lower percentages based on the Borrower's leverage ratio, if applicable, (ii) net cash proceeds from the issuance or incurrence of certain indebtedness and (iii) net cash proceeds received from certain non-ordinary course disposition of assets and casualty events to the extent such net cash proceeds were not reinvested in the Company's business within a certain specified time period. Prepayments are applied to remaining amortization installments in direct order of maturity. The remaining principal balance of the term loans are due upon maturity.

In addition, the New Credit Agreement contains customary affirmative and negative covenants and events of default, all of which are substantially the same as under the Existing Credit Agreement.

The Borrower and certain Canadian and European subsidiaries of the Borrower also have a $200,000 asset-based revolving credit facility (the "ABL Facility") which provides for $150,000 in U.S. available borrowings, up to $10,000 in Canadian available borrowings and up to $40,000 of European available borrowings. Borrowings under the ABL Facility bear interest at a rate equal to the LIBOR rate or the base rate elected by the Company at the time of the borrowing plus a margin of between 1.50%-2.00% or 0.50%-1.00%, respectively, depending on availability under the ABL Facility. In addition, there is an annual commitment fee equal to 0.375%, with a step-down to 0.25% based on the average usage of the revolving credit borrowings available. As of December 31, 2020, there were no revolving credit borrowings under the ABL Facility. Revolving credit borrowings are payable at the option of the Company throughout the term of the ABL Facility with the balance due May 4, 2021.

On March 20, 2020, the Company amended its existing ABL Facility to increase the aggregate amount of the revolving loan commitments available by $50,000 to $250,000, consisting of up to $195,000 in U.S. commitments, up to $15,000 in Canadian commitments and up to $40,000 in European commitments. The maturity of the facility has been extended to March 20, 2025. Following the amendment, the borrowings under the amended ABL Facility bear interest at a rate equal to the LIBOR rate or the base rate plus a margin of between 1.25% to 1.75% or 0.25% to 0.75% respectively.

The Company has the ability to request letters of credit under the ABL Facility. The Company had $18,190 of letters of credit outstanding as of December 31, 2020, which reduce available borrowings under the ABL Facility by such amounts.

The Term Loan Facilities are guaranteed by CPQ Midco I Corporation, a subsidiary of the Company and the direct parent of the Borrower ("Holdings") and substantially all of the Borrower's wholly owned U.S. subsidiaries. The obligations under the Term Facility are secured (i) by a first-priority security interest in, among other things, a pledge of substantially all of the Borrower's and the guarantors' assets (other than collateral securing the ABL Facility on a first-priority basis) and (ii) by a second-priority security interest in receivables, inventory, deposit accounts and other collateral of the Borrower and the U.S. subsidiary guarantors securing the ABL Facility. The liens securing the Term Loan Facilities and the guarantees are pari passu with the liens securing the Senior Secured Notes subject to the pari passu intercreditor agreement.

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The obligations of the Borrower under the ABL Facility are guaranteed by Holdings and the same U.S. subsidiary guarantors that guarantee the Term Loan Facilities, the obligations of the Canadian Borrowers under the ABL Facility are guaranteed by a Canadian subsidiary of the Borrower and the obligations of the European Borrowers under the ABL Facility are guaranteed by certain other European subsidiaries of the Borrower. The obligations of the borrowers and guarantors under the ABL Facility are secured (i) by a first-priority security interest in, among other things, substantially all of their receivables, inventory, deposit accounts and other collateral securing the ABL Facility on a first-priority basis and (ii) by a second-priority security interest in the property and assets of Holdings, the Borrower and the U.S. subsidiary guarantors that secure the Term Loan Facilities. In addition, the ABL Facility is secured by the equity interests in, and substantially all of the assets of, certain foreign guarantors in connection with the Canadian dollar-denominated and Euro-denominated availability.

The Term Loan Facilities and the ABL Facility contain various non-financial restrictive covenants. Each limits the ability of PQ Corporation and its restricted subsidiaries to incur certain indebtedness or liens, merge, consolidate or liquidate, dispose of certain property, make investments or declare or pay dividends, make optional payments, modify certain debt instruments, enter into certain transactions with affiliates, enter into certain sales and leasebacks, and certain other non-financial restrictive covenants. The ABL Facility also contains one financial covenant which applies when minimum availability under the ABL Facility exceeds a certain threshold. During such time, the Company is required to maintain a fixed-charge coverage ratio of at least 1.0 to 1.0. The Company is in compliance with all debt covenants as of December 31, 2020 and 2019, respectively.

During the year ended December 31, 2020, the Company prepaid $466,134 of outstanding principal balance on its Term Loan Facilities. The Company wrote off $162 of previously unamortized deferred financing costs and original issue discount of $12,781 as debt extinguishment costs. The prepayments were applied against the remaining scheduled installments of principal due in respect of the loans under the Term Loan Facilities in direct order of maturity.

During the year ended December 31, 2019, the Company prepaid $210,000 of outstanding principal balance on the Senior Secured Term Loan Facility. The Company wrote off $1,027 of previously unamortized deferred financing costs and original issue discount of $2,414 as debt extinguishment costs. The prepayments were applied against the remaining scheduled installments of principal due in respect of the loans under the Senior Secured Term Loan Facility in direct order of maturity.

Debt extinguishment costs resulting from Term Loan amendments

As a result of amending the Term Loan Facilities during the year ended December 31, 2020, the Company recorded $2,188 of new creditor and third-party financing costs as debt extinguishment costs. In addition, previous unamortized deferred financing costs of $97 and original issue discount of $228 associated with the previously outstanding debt were written off as debt extinguishment costs.

As a result of amending the Term Loan Facilities during the year ended December 31, 2018, the Company recorded $2,124 of new creditor and third-party financing costs as debt extinguishment costs. In addition, previous unamortized deferred financing costs of $1,403 and original issue discount of $2,352 associated with the previously outstanding debt were written off as debt extinguishment costs.

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6.75% Senior Secured Notes - Redeemed in 2020

On May 4, 2016, the Borrower issued $625,000 of 6.750% Senior Secured Notes due November 2022 (the “6.75% Senior Secured Notes”) in transactions exempt from or not subject to registration under the Securities Act pursuant to Rule 144A and Regulation S under the Securities Act of 1933. The 6.75% Senior Secured Notes were guaranteed by guaranteed by PQ Holdings Inc. and by the U.S. subsidiary guarantors that guarantee the Term Loan Facility and were secured by liens on the assets of the Borrower and the U.S. subsidiary guarantors on a *pari passu* with the liens securing the Term Loan Facility subject to the *pari passu* intercreditor agreement. The guarantee by PQ Holdings Inc. was unsecured. The indenture relating to the 6.75% Senior Secured Notes contains various limitations on the Company’s and its restricted subsidiaries’ ability to incur additional indebtedness, pay dividends or repay certain debt, make loans and investments, sell assets, create liens, enter into transactions with affiliates, enter into agreements restricting the Borrower’s subsidiaries ability to pay dividends, and merge and consolidate with other companies, among other things. Interest on the 6.75% Senior Secured Notes was payable on May 15 and November 15 of each year, commencing November 15, 2016. No principal payments were required with respect to the 6.75% Senior Secured Notes prior to their final maturity. Prior to redeeming the notes, the 6.75% Senior Secured Notes had mature on date of November 15, 2022.

The 6.75% Senior Secured Notes were redeemable, in whole or in part, at the redemption prices (expressed as percentages of principal amount of the 6.75% Senior Secured Notes to be redeemed) set forth below, plus accrued and unpaid interest, if any, to, but not including, the redemption date, if redeemed on or after any of the dates below until the subsequent date below:

Year	Percentage
May 15, 2020	101.688%
May 15, 2021 and thereafter	100.000%

As a result of redeeming the 6.75% Senior Secured Notes due 2022, the Company paid a redemption premium of $10,550 which was recorded as debt extinguishment costs during the year ended December 31, 2020. In addition, previous unamortized deferred financing costs of $2,085 and original issue discount of $1,186 associated with the previously outstanding debt were written off as debt extinguishment costs for the year ended December 31, 2020.

New Senior Secured Term Loan Facility due February 2027

In July 2020, the Company entered into an agreement for a new senior secured term loan facility in an aggregate principal amount of $650,000 with an original issue discount of 1.5% and interest at a floating rate of LIBOR (with a 1.0% minimum LIBOR floor) plus 3.0% per annum. The proceeds were used to redeem its existing $625,000 of 6.75% Senior Secured Notes due 2022 and pay the associated early redemption premiums. The new senior secured term loan facility requires scheduled quarterly amortization payments, each equal to 0.25% of the original principal amount of the loans under the new senior secured term loan facility.

5.75% Senior Unsecured Notes due 2025

On December 11, 2017, the Borrower issued $300,000 aggregate principal amount of 5.75% Senior Unsecured Notes due 2025 (the “5.75% Senior Unsecured Notes”) in a private placement exempt from the registration requirements of the Securities Act. The 5.75% Senior Unsecured Notes mature on December 15, 2025. Interest on the 5.75% Senior Unsecured Notes is to be paid semi-annually on February 15 and August 15, commencing August 15, 2018, at an annual rate of 5.75%. The indenture relating to the 5.75% Senior Unsecured Notes contained various limitations on the Borrower’s and its restricted subsidiaries’ ability to incur additional indebtedness, pay dividends or repay certain debt, make loans and investments, sell assets, create liens, enter into transactions with affiliates, enter into agreements restricting the Borrower’s subsidiaries ability to pay dividends, and merge and consolidate with other companies, among other things. No principal payments are required with respect to the Senior Secured Notes prior to their final maturity.

The obligations of the Borrower under the 5.75% Senior Unsecured Notes and the related indenture are guaranteed by its U.S. subsidiary guarantors that guarantee the Term Loan Facility. The obligations of the Company under the 5.75% Senior Unsecured Notes and the indenture are unsecured.

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If any Event of Default (other than a default relating to certain events of bankruptcy or insolvency of PQ Corporation or certain of its subsidiaries) occurs and is continuing under the Indenture, the Trustee or the Holders of at least 30% in principal amount of the then total outstanding notes by notice to the Company may declare the principal, premium, if any, interest and any other monetary obligations on all the then outstanding notes to be due and payable immediately. If an event of default arising from certain events of bankruptcy or insolvency of the Company occurs, the principal of, premium, if any, and interest on all the Senior Secured Notes shall become immediately due and payable without any declaration or other act on the part of the trustee or any holders.

At any time prior to December 15, 2020, the Borrower may, at its option and on one more occasions, redeem (a) up to 40% of the aggregate principal amount of the 5.75% Senior Unsecured Notes with the cash proceeds from certain equity offerings at a redemption price equal to the sum of 105.75% of the aggregate principal amount thereof plus accrued and unpaid interest thereon, and (b) all or part of the 5.75% Senior Unsecured Notes at 100.00% of the aggregate principal amount redeemed plus accrued and unpaid interest thereon and a make-whole premium (the “Applicable Premium”). The Applicable Premium is equal to the greater of: (a) 1% of the principal amount of notes redeemed, or (b) the excess, if any, of: (1) the present value at the redemption date of (i) the redemption price of such notes at December 15, 2020 (as set forth in the table below), plus (ii) all required remaining scheduled interest payments due on such notes through December 15, 2020 (excluding accrued but unpaid interest to, but excluding, the redemption date), computed using a discount rate equal to the applicable United States Treasury rate as of such redemption date plus 50 basis points; over (2) the outstanding principal amount of such notes on the redemption date.

On or after December 15, 2020, the 5.75% Senior Unsecured Notes are redeemable, in whole or in part, at the redemption prices (expressed as percentages of principal amount of the 5.75% Senior Unsecured Notes to be redeemed) set forth below, plus accrued and unpaid interest, if any, to, but not including, the redemption date, if redeemed on or after any of the dates below until the subsequent date below:

Year	Percentage
December 15, 2020	102.875%
December 15, 2021	101.438%
December 15, 2022 and thereafter	100.000%

Upon the occurrence of a change of control, as defined, each holder will have the right to require the Company to purchase all or any part of such holder’s Senior Secured Notes at a purchase price in cash equal to 101% of the principal amount, plus accrued and unpaid interest.

Fair Value of Debt

The fair value of a financial instrument is defined as the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants. As of December 31, 2020 and 2019, the fair value of the senior secured term loans and senior secured and unsecured notes was $1,427,123 and $1,905,822, respectively. The fair value is classified as Level 2 based upon the fair value hierarchy (see Note 6 to these consolidated financial statements for further information on fair value measurements).

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Aggregate Long-term Debt Maturities

The aggregate long-term debt maturities are:

Year	Amount
2021	$ —
2022	—
2023	—
2024	—
2025	295,000
Thereafter	1,131,363
	$ 1,426,363

18. Other Long-term Liabilities:

The following table summarizes the components of other long-term liabilities as follows:

	December 31,	
	2020	2019
Pension benefits	$ 40,812	$ 52,060
Other postretirement benefits	3,644	1,668
Supplemental retirement plans	11,376	10,632
Derivative liabilities	32,512	10,956
Deferred revenue	13,388	6,450
Reserve for uncertain tax positions	345	873
Asset retirement obligation	4,943	4,555
Other	3,995	4,110
	$ 111,015	$ 91,304

19. Financial Instruments:

The Company uses (1) interest rate related derivative instruments to manage its exposure related to changes in interest rates on its variable-rate debt instruments and (2) foreign currency related derivative instruments to manage its foreign currency exposure to its net investments in certain foreign operations. The Company does not speculate using derivative instruments.

By using derivative financial instruments to hedge exposures to changes in interest rates and foreign currency, the Company exposes itself to credit risk and market risk. Credit risk is the failure of the counterparty to perform under the terms of the derivative contract. When the fair value of a derivative contract is an asset, the counterparty owes the Company, which creates credit risk for the Company. When the fair value of a derivative contract is a liability, the Company owes the counterparty and, therefore, the Company is not exposed to the counterparty's credit risk in those circumstances. The Company minimizes counterparty credit risk in derivative instruments by entering into transactions with high quality counterparties. The derivative instruments entered into by the Company do not contain credit-risk-related contingent features.

Market risk is the adverse effect on the value of a derivative instrument that results from a change in interest rates or currency exchange rates. The market risk associated with interest rate contracts is managed by establishing and monitoring parameters that limit the types and degree of market risk that may be undertaken.

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Use of Derivative Financial Instruments to Manage Interest Rate Risk. The Company is exposed to fluctuations in interest rates on its senior secured credit facilities. Changes in interest rates will not affect the market value of such debt but will affect the amount of the Company’s interest payments over the term of the loans. Likewise, an increase in interest rates could have a material impact on the Company’s cash flow. The Company hedges the interest rate fluctuations on debt obligations through interest rate cap agreements. The Company records these agreements at fair value as assets or liabilities in its consolidated balance sheet. As the derivatives are designated and qualify as cash flow hedges, the gains or losses on the interest rate cap agreements are recorded in stockholders’ equity as a component of OCI, net of tax. Reclassifications of the gains and losses on the interest rate cap agreements into earnings are recorded as part of interest expense in the consolidated statements of income as the Company makes its interest payments on the hedged portion of its senior secured credit facilities. Fair value is determined based on estimated amounts that would be received or paid to terminate the contracts at the reporting date based on quoted market prices.

In July 2016, the Company entered into interest rate cap agreements, paying a premium of $1,551 to mitigate interest rate volatility from July 2016 through July 2020 by employing varying cap rates, ranging from 1.50% to 3.00% on $1,000,000 of notional variable-rate debt.

In November 2018, the Company entered into additional interest rate cap agreements to mitigate interest rate volatility from July 2020 through July 2022, with a cap rate of 3.50% on $500,000 of notional variable-rate debt and a $3,380 premium annuitized during the effective period. During the year ended December 31, 2020, the Company restructured its $500,000 of notional variable-rate debt interest rate cap agreements from July 2020 through July 2022, to lower the interest cap rate to 2.50% with an incremental $130 premium annuitized during the effective period. In March 2020, the Company again amended such interest rate cap agreements to lower the cap rate to 0.84% from 2.50% on $500,000 of notional variable-rate debt and paid an additional incremental $900 premium annuitized during the effective period. The term remains unchanged from July 2020 through July 2022. The total cumulative annuitized premium on the $500,000 of notional variable-rate debt is $4,410. The cap rate in effect at December 31, 2020 was 0.84% associated with the $500,000 of notional variable-rate debt.

In July 2020, the Company entered into additional interest rate cap agreements to mitigate interest rate volatility from August 2020 to August 2023, with a cap rate of 1.00% on $400,000 of notional variable-rate debt.

With the Company’s prepayments on its Term Loan Facility during 2019 (see Note 17 to these consolidated financial statements for additional information), the original forecasted interest rate payments associated with the dedesginated portion of the interest rate cap agreement are no longer probable of occurring. As a result of the discontinuance of cash flow hedge accounting on this portion of the interest rate cap agreement, the Company immediately reclassified into earnings the loss deferred in AOCI related to the dedesignated portion of the hedge, which was not material. Any future gains and losses associated with the dedesignated portion of the interest rate cap agreement through its maturity in July 2020 was recognized in earnings.

Use of Derivative Financial Instruments to Manage Foreign Currency Risk. The Company is exposed to risks related to its net investments in foreign operations due to fluctuations in foreign currency exchange rates, particularly between the United States dollar and the Euro. In connection with the February 2018 term loan refinancing (see Note 17 to these consolidated financial statements), the Company entered into multiple cross currency interest rate swap arrangements with an aggregate notional amount of €280,000 to hedge this exposure on the net investments of certain of its Euro-denominated subsidiaries. The Company records these swap agreements at fair value as assets or liabilities in its consolidated balance sheet.

In October 2019, the Company settled all of its February 2018 swaps and concurrently entered into the October 2019 swaps with the same notional amount of €280,000 ($344,403 as of December 31, 2020) and same maturity date of February 2023, which resulted in cash proceeds to the Company of $38,070. Consistent with the February 2018 swaps, the October 2019 swaps are designed to enable the Company to effectively convert a portion of its fixed-rate U.S. dollar-denominated debt obligations under the Term Loan Facility into a Euro-denominated equivalent. The October 2019 swaps have been designated and qualify as net investment hedges of the Company’s foreign currency exchange rate exposure on the net investments of certain of its Euro-denominated subsidiaries.

As the derivatives are designated and qualify as net investment hedges, changes in the fair value of the swaps attributable to changes in the spot exchange rates are recognized in cumulative translation adjustment (“CTA”) within

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OCI and are held there until the hedged net investments are sold or substantially liquidated. Changes in the fair value of the swaps attributable to the cross currency basis spread are excluded from the assessment of hedge effectiveness and are recorded in current period earnings. Upon such sale or liquidation, the amount recognized in CTA is reclassified to earnings and reported in the same line item as the gain or loss on the liquidation of the net investments.

The fair values of derivative instruments held as of December 31, 2020 and 2019 are shown below:

		December 31,	
	Balance sheet location	**2020**	**2019**
Derivative assets:			
Derivatives designed as net investment hedges:			
Cross currency swaps	Prepaid and other current assets	3,249	3,928
Total derivative assets		$ 3,249	$ 3,928
Derivative liabilities:			
Derivatives designated as cash flow hedges:			
Interest rate caps	Accrued liabilities	1,954	420
Interest rate caps	Other long-term liabilities	1,750	2,822
		3,704	3,242
Derivatives designated as net investment hedges:			
Cross currency swaps	Other long-term liabilities	30,762	8,134
Total derivative liabilities		$ 34,466	$ 11,376

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The following table shows the effect of the Company's derivative instruments designated as hedges on accumulated other comprehensive income (loss) ("AOCI") and the statements of income for the years ended December 31, 2020, 2019 and 2018:

		Years ended December 31,					
		2020		2019		2018	
	Location of gain (loss) reclassified from AOCI into income	Amount of gain (loss) recognized in OCI on derivatives	Amount of gain (loss) reclassified from AOCI into income	Amount of gain (loss) recognized in OCI on derivatives	Amount of gain (loss) reclassified from AOCI into income	Amount of gain (loss) recognized in OCI on derivatives	Amount of gain (loss) reclassified from AOCI into income
Interest rate caps	Interest (expense) income	$ (167)	$ (54)	$ (3,304)	$ (625)	$ (981)	$ (256)

The following table shows the effect of the Company's cash flow hedge accounting on the consolidated statements of income for the years ended December 31, 2020, 2019 and 2018:

	Location and amount of gain (loss) recognized in income on cash flow hedging relationships					
	Years ended December 31,					
	2020		2019		2018	
	Cost of goods sold	Interest (expense) income	Cost of goods sold	Interest (expense) income	Cost of goods sold	Interest (expense) income
Total amounts of income and expense line items presented in the statement of income in which the effects of cash flow hedges are recorded	$ (834,007)	$ (66,979)	$ (901,512)	$ (87,072)	$ (925,534)	$ (90,758)
The effects of cash flow hedging:						
Gain (loss) on cash flow hedging relationships:						
Interest contracts:						
Amount of gain (loss) reclassified from AOCI into income	—	(54)	—	(625)	—	(256)

The following table shows the effect of the Company's net investment hedges on AOCI and the consolidated statements of income for the years ended December 31, 2020, 2019 and 2018:

	Amount of gain (loss) recognized in OCI on derivative			Location of gain (loss) reclassified from AOCI into income	Amount of gain (loss) reclassified from AOCI into income			Location of gain (loss) recognized in income on derivative (amount excluded from effectiveness testing)	Amount of gain (loss) recognized in income on derivative (amount excluded from effectiveness testing)		
	Years ended December 31,				Years ended December 31,				Years ended December 31,		
	2020	2019	2018		2020	2019	2018		2020	2019	2018
Cross currency swaps	$ (23,622)	$ 17,077	$ 18,843	Net (loss) income from discontinued operations, net of tax	$ 1,967	$ —	$ —	Interest (expense) income	$ 5,090	$ 7,320	$ 6,752

There are $281 amounts of unrealized losses in AOCI that are expected to be reclassified to the consolidated statement of income over the next twelve months as of December 31, 2020.

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20. Income Taxes:

Income (loss) before income taxes and noncontrolling interest within or outside the United States are shown below:

	Years ended December 31, 2020	2019	2018
Domestic	$ (175,143)	$ 41,019	$ (1,559)
Foreign	(52,442)	64,411	85,579
Total	$ (227,585)	$ 105,430	$ 84,020

The provision (benefit) for income taxes as shown in the accompanying consolidated statements of income consists of the following:

	Years ended December 31, 2020	2019	2018
Current:			
Federal	$ —	$ (3)	$ —
State	1,087	1,381	2,507
Foreign	15,484	22,810	27,062
	16,571	24,188	29,569
Deferred:			
Federal	(58,744)	11,824	10,875
State	(2,910)	3,175	67
Foreign	(3,039)	490	(6,870)
	(64,693)	15,489	4,072
Provision (benefit) for income taxes	$ (48,122)	$ 39,677	$ 33,641

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A reconciliation of income tax expense (benefit) at the U.S. federal statutory income tax rate to actual income tax expense is as follows:

	Years ended December 31,		
	2020	2019	2018
Tax at statutory rate	$ (47,793)	$ 22,140	$ 17,644
State income taxes, net of federal income tax benefit	(2,324)	6,802	2,541
Tax on global intangible low-taxed income	7,820	8,741	14,465
Change in valuation allowances	135	1,415	5,070
Rate changes	4,274	1,054	(4,016)
Foreign withholding taxes	258	(6,116)	142
Foreign tax rate differential	1,240	3,278	6,439
Non-taxable interest	(5,353)	—	—
Non-deductible goodwill	53,342	—	—
Foreign tax credits	(56,359)	—	—
Permanent difference created by foreign exchange gain or loss	(1,324)	1,852	(4,839)
Other, net	(2,038)	511	(3,805)
Provision (benefit) for income taxes	$ (48,122)	$ 39,677	$ 33,641

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Deferred tax assets (liabilities) are comprised of the following:

	December 31,	
	2020	2019
Deferred tax assets:		
Net operating loss carryforwards	$ 28,145	$ 77,062
Section 163(j) interest disallowance carryforward	266	16,535
Pension	12,701	14,359
Operating lease liability	11,803	14,455
Other	36,545	29,298
State credits	12,733	12,280
Foreign tax credit	62,752	—
Valuation allowance	(37,880)	(39,379)
	$ 127,065	$ 124,610
Deferred tax liabilities:		
Depreciation	$ (107,805)	$ (103,796)
Inventory	(4,946)	(11,481)
Intangible assets	(162,301)	(184,764)
Operating lease right-of-use assets	(12,060)	(14,278)
Other	(15,348)	(22,619)
	$ (302,460)	$ (336,938)
Net deferred tax liabilities	$ (175,395)	$ (212,328)

The change in net deferred tax liabilities for the years ended December 31, 2020 and 2019 was primarily related to the usage of U.S. federal and state net operating losses reducing those deferred tax assets, activity related to book amortization of intangible assets with no corresponding tax basis reducing those deferred tax liabilities, activity with respect to tax deductible goodwill, as well as the election for full expensing on certain assets creating additional deferred tax liabilities for depreciable property. Further, the increase of the foreign tax credits on the deferred tax assets and the decrease of the Section 163(j) interest disallowance carryforward accounted for the change in net deferred tax liabilities for year ended December 31, 2020.

The net change in the total valuation allowance was a decrease of $1,499 in 2020. The valuation allowance at December 31, 2020 was primarily related to foreign and state net operating loss carryforwards and tax credits that, in the judgment of management, are not more likely than not to be realized. In assessing the ability to realize deferred tax assets, management considered whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences become deductible. Management considered the scheduled reversal of deferred tax liabilities (including the impact of available carryback and carryforward periods), projected future taxable income, and tax-planning strategies that are prudent in making this assessment. In order to fully realize deferred tax assets, the Company will need to generate future taxable income prior to the expiration of the net operating loss and credit carryforwards. The amount of the deferred tax assets considered realizable, however, could be reduced in the near term if estimates of future taxable income during the carryforward period are reduced.

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The cumulative unremitted earnings of foreign subsidiaries outside the United States are considered permanently reinvested, for which no withholding taxes have been provided. Such earnings are expected to be reinvested indefinitely and, as a result, no deferred tax liability has been recognized with regard to such earnings. Determination of the deferred withholding tax liability on these unremitted earnings is not practicable.

The following table summarizes the activity related to the Company’s gross unrecognized tax benefits:

	Years ended December 31,	
	2020	**2019**
Balance at beginning of period	$ 8,310	$ 9,434
Increases related to prior year tax positions	—	22
Decreases related to prior year tax positions	(14)	(1,046)
Increases related to current year tax positions	164	—
Decreases related to settlements with taxing authorities	(626)	(100)
Balance at end of period	$ 7,834	$ 8,310

The total unrecognized tax benefits of $7,834 and $8,310 as of December 31, 2020 and 2019, respectively. If these amounts are recognized in future periods, it would affect the effective tax rate on income from continuing operations for the years in which they are recognized.

Interest and penalties released related to uncertain tax positions amounted to $35 and $701 for the years ended December 31, 2020 and 2019, respectively. To the extent interest and penalties are not assessed with respect to uncertain tax positions, amounts accrued will be reduced and reflected as a reduction of the overall income tax provision in the period for which the event occurs requiring the adjustment. The $112 and $181 in accrued interest and penalties as of December 31, 2020 and 2019, respectively, is recorded in other long-term liabilities on the consolidated balance sheets.

The Company files numerous consolidated and separate income tax returns in the U.S. federal jurisdiction and in many state and foreign jurisdictions. The following describes the open tax years, by significant tax jurisdiction, as of December 31, 2020:

Jurisdiction	**Period**
United States-Federal	2007-Present
United States-State	2007-Present
Canada[(1)]	2012-Present
Netherlands	2014-Present
Mexico	2016-Present
United Kingdom	2014-Present
Brazil	2016-Present

(1) Includes federal as well as local jurisdictions

Given that the Company has utilized U.S. and state net operating loss in the current and prior years, the statute for examination by the U.S. and state taxing authorities will typically remain open for a period following the use of such net operating loss carryforwards, extending the period for examination beyond the years indicated above.

The Company has subsidiaries in various states, provinces and countries that are currently under audit for years ranging from 2014 through 2018. To date, no material adjustments have been proposed as a result of these audits. As of December 31, 2020, the Company does not believe that there are any positions for which it is reasonably possible that the total amount of unrecognized tax benefits will significantly increase or decrease within the next 12 months.

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As of December 31, 2020, the Company no longer has a federal NOL carryforward. As of December 31, 2020, the Company has foreign tax credit carryforwards of $62,752, which are net of $7,658 of uncertain tax position balances, which is permissible per ASU 2013-11. These carryforwards have a ten year carryforward, of which $13,241 are set to expire in 2021.

Cumulative state net operating losses carrying forward into December 31, 2020 are $24,467. A valuation allowance of $14,344 has been applied against the total state net operating loss deferred tax assets, leaving losses of $10,123 that have been recognized for financial accounting purposes for the portion of those losses that the Company believes, on a more likely than not basis, will be realized.

Foreign net operating losses of $3,678, of which $68 will begin to expire in 2028, $160 will begin to expire in 2036, with the remaining $3,450 carrying forward indefinitely, are available to reduce future foreign income taxes payable. A valuation allowance of $3,531 has been applied to deferred tax assets related to foreign net operating loss carry-forwards, leaving a net deferred tax asset relating to foreign net operating losses of $147 that has been recognized for financial accounting purposes.

Cash payments for income taxes, net of refunds, are as follows:

	Years ended December 31,		
	2020	2019	2018
Domestic	$ 2,198	$ 1,879	$ 2,154
Foreign	20,810	12,354	17,654
	$ 23,008	$ 14,233	$ 19,808

21. Benefit Plans:

The Company sponsors defined benefit pension plans covering employees in the United States and certain employees at its foreign subsidiaries. Benefits for a majority of the plans are based on average final pay and years of service. The Company's funding policy is to fund the minimum required contribution under local statutory requirements.

The Company sponsors unfunded plans to provide certain health care benefits to retired employees in the United States and Canada. The plans pay a stated percentage of medical expenses reduced by deductibles and other coverage. The plans are unfunded and obligations are paid out of the Company's operations.

The Company also has defined benefit supplementary retirement plans which provide benefits for certain U.S. employees in excess of qualified plan limitations. The obligations are paid out of the Company's general assets, including assets held in a Rabbi trust, or restoration plan assets.

The Company uses a December 31 measurement date for all of its defined benefit pension, postretirement medical and supplementary retirement plans. The following discussion includes information for the Eco Services benefit plans for all periods presented, and the acquired PQ Holdings benefit plans beginning on the date of a former business combination.

The Eco Services benefit plans include two defined benefit pension plans and one retiree health plan, all based in the U.S. The PQ Holdings benefit plans include a U.S. defined benefit pension plan as well as the defined benefit pension plans for all of the Company's foreign subsidiaries, two retiree health plans (one each in the U.S and Canada), and the Company's defined benefit supplementary retirement plans.

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Of the Company's three defined benefit pension plans covering employees in the U.S., only the Eco Services Hourly Pension Plan continues to accrue benefits for certain participants; however, this plan will be frozen to future accruals as of December 31, 2020. All future accruals were frozen for the PQ Corporation Retirement Plan as of December 31, 2006 and for the Eco Services Pension Equity Plan as of December 31, 2016. With respect to the Company's three retiree health plans, the PQ Holdings plans in the U.S. and Canada were closed to new retirees as of December 31, 2006. The Eco Services Postretirement Life and Dental Plan was closed to new retirees effective July 1, 2017. The Company's defined benefit supplementary retirement plans were frozen to future accruals as of December 31, 2006.

Defined Benefit Pension Plans

The following tables summarize changes in the benefit obligation, plan assets and funded status of the Company's significant defined benefit pension plans as well as the components of net periodic benefit cost, including key assumptions:

	U.S.		Foreign	
	December 31,		December 31,	
	2020	2019	2020	2019
Change in benefit obligation:				
Benefit obligation at beginning of period	$ 267,392	$ 246,311	$ 101,192	$ 84,435
Service cost	769	978	3,895	3,210
Interest cost	8,595	10,281	2,193	2,627
Participant contributions	—	—	574	550
Plan curtailments	—	(2,795)	(1,603)	—
Plan settlements	(1,455)	(1,669)	(105)	(102)
Benefits paid	(12,713)	(10,862)	(1,759)	(1,833)
Expenses paid	—	—	(353)	(328)
Actuarial (gains) losses	25,894	25,148	4,664	13,459
Translation adjustment	—	—	6,191	(826)
Benefit obligation at end of the period	$ 288,482	$ 267,392	$ 114,889	$ 101,192
Change in plan assets:				
Fair value of plan assets at beginning of period	$ 231,413	$ 195,755	$ 85,308	$ 74,050
Actual return on plan assets	41,405	43,116	6,646	10,564
Employer contributions	5,187	5,073	3,348	3,084
Employee contributions	—	—	574	550
Plan settlements	(1,455)	(1,669)	(105)	(102)
Benefits paid	(12,713)	(10,862)	(1,759)	(1,833)
Expenses paid	—	—	(353)	(328)
Translation adjustment	—	—	5,209	(677)
Fair value of plan assets at end of the period	$ 263,837	$ 231,413	$ 98,868	$ 85,308
Funded status of the plans (underfunded)	$ (24,645)	$ (35,979)	$ (16,021)	$ (15,884)

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The total actuarial losses for the year ended December 31, 2020 across the Company's U.S. plans was $25,894, which was driven by declines in the discount rates of $26,642 and declines in general demographic experience of $1,261, which was offset by favorable changes in mortality assumptions of $2,009. The total actuarial losses for the year ended December 31, 2020 across the Company's foreign plans was $4,664, which was driven by declines in the discount rates of $5,981 and declines in general demographic experience of $56 and favorable changes in mortality assumptions of $1,372.

The total actuarial losses for the year ended December 31, 2019 across the Company's U.S. was $25,148, which was driven by declines in the discount rates of $26,604 and declines in general demographic experience of $2,953, which was offset by favorable changes in mortality assumptions of $4,409. The total actuarial losses for the year ended December 31, 2019 across the Company's foreign plans was $13,459, which was driven by declines in the discount rates of $13,837, which was offset by favorable changes in general demographic experience of $312 and favorable changes in mortality assumptions of $66.

Amounts recognized in the consolidated balance sheets consist of:

	U.S. December 31,		Foreign December 31,	
	2020	2019	2020	2019
Current liability	—	—	(46)	(6)
Noncurrent liability	(24,645)	(35,979)	(15,975)	(15,878)
Accumulated other comprehensive income (loss)	(4,463)	8,687	1,075	(4,988)
Net amount recognized	$ (29,108)	$ (27,292)	$ (14,946)	$ (20,872)

Amounts recognized in accumulated other comprehensive income (loss) consist of:

	U.S. December 31,		Foreign December 31,	
	2020	2019	2020	2019
Net gain (loss)	13,964	10,922	(6,550)	(7,634)
Gross amount recognized	13,964	10,922	(6,550)	(7,634)
Deferred income taxes	(18,427)	(2,235)	7,625	2,646
Net amount recognized	$ (4,463)	$ 8,687	$ 1,075	$ (4,988)

Components of net periodic benefit cost consist of:

	U.S. Years ended December 31,			Foreign Years ended December 31,		
	2020	2019	2018	2020	2019	2018
Service cost	$ 769	$ 978	$ 1,019	$ 3,895	$ 3,210	$ 3,104
Interest cost	8,595	10,281	9,599	2,193	2,627	2,637
Expected return on plan assets	(12,547)	(11,508)	(12,851)	(2,270)	(2,427)	(2,490)
Amortization of prior service cost	—	—	—	—	24	—
Amortization of net (gain) loss	—	—	—	148	(29)	49
Curtailment gain recognized	—	—	(576)	—	—	—
Settlement (gain) loss recognized	78	49	—	(14)	(1)	—
Net periodic expense (benefit)	$ (3,105)	$ (200)	$ (2,809)	$ 3,952	$ 3,404	$ 3,300

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All components of net periodic benefit cost other than service cost are presented within other expense (income), net in the Company's consolidated statements of income.

The net amount of projected benefit obligation and plan assets for all underfunded and unfunded plans was $53,081 and $63,514 as of December 31, 2020 and 2019, respectively, and was classified as noncurrent liabilities. The total accumulated benefit obligation as of December 31, 2020 and 2019 for the Company's U.S. pension plans was $288,482 and $266,992, respectively. The total accumulated benefit obligation as of December 31, 2020 and 2019 for the Company's foreign pension plans was $110,605 and $96,891, respectively.

The following table presents selected information about the Company's pension plans with accumulated benefit obligations in excess of plan assets:

	U.S.		Foreign	
	December 31,		December 31,	
	2020	2019	2020	2019
Projected benefit obligation	$ 288,482	$ 267,392	$ 92,679	82,662
Accumulated benefit obligation	288,482	266,992	88,394	80,021
Fair value of plan assets	263,837	231,413	76,658	68,104

The following table presents selected information about the Company's pension plans with projected benefit obligations in excess of plan assets:

	U.S.		Foreign	
	December 31,		December 31,	
	2020	2019	2020	2019
Projected benefit obligation	$ 288,482	$ 267,392	$ 92,679	101,192
Fair value of plan assets	263,837	231,413	76,658	85,308

Significant weighted average assumptions used in determining the pension obligations include the following:

	U.S.		Foreign	
	December 31,		December 31,	
	2020	2019	2020	2019
Discount rate	2.42 %	3.32 %	1.78 %	2.34 %
Rate of compensation increase(1)	N/A	3.00 %	2.05 %	2.07 %

Significant weighted average assumptions used in determining net periodic benefit cost include the following:

	U.S.			Foreign		
	Years ended December 31,			Years ended December 31,		
	2020	2019	2018	2020	2019	2018
Discount rate	3.32 %	4.32 %	3.74 %	2.34 %	3.19 %	3.11 %
Rate of compensation increase(1)	3.00 %	3.00 %	3.00 %	2.07 %	2.08 %	2.22 %
Expected return on assets	5.55 %	6.00 %	6.00 %	2.82 %	3.30 %	3.37 %

(1) Includes only plans not frozen to benefit accruals for the respective periods.

The discount rate for each of the U.S. plans was determined by utilizing a yield curve model. The model develops a spot rate curve based on the yields available from a broad-based universe of high quality corporate bonds. The discount rate is then set as the weighted average spot rate, using the respective plan's expected benefit cash flows as the weights.

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The investment objective for the U.S. plans is to generate returns sufficient to meet future obligations. The strategy to meet the objective includes generating attractive returns using higher returning assets such as equity securities and balancing risk using less volatile assets such as fixed income securities. The U.S. plans invest in an allocation of assets across the two broadly-defined financial asset categories of equity and fixed income securities. The target allocations for the plan assets across the three U.S. plans are as follows: 45% equity securities and 55% fixed income investments for the PQ Corporation Retirement Plan; 40% equity securities and 60% fixed income investments for the Eco Services Pension Equity Plan; and 60% equity securities and 40% fixed income investments for the Eco Services Hourly Pension Plan.

Similar considerations are applied to the investment objectives of the non-U.S. plans as well as the asset classes available in each location and any legal restrictions on plan investments.

The Company classifies plan assets based upon a fair value hierarchy (see Note 6 to these consolidated financial statements for further information). The classification of each asset within the hierarchy is based on the lowest level input that is significant to its measurement. The fair value hierarchy consists of three levels as follows:

- Level 1—Values are unadjusted quoted prices for identical assets and liabilities in active markets accessible at the measurement date. Active markets provide pricing data for trades occurring at least weekly and include exchanges and dealer markets. Level 1 assets primarily include investments in publicly traded equity securities and mutual funds. These securities (or the underlying investments of the funds) are actively traded and valued using quoted prices for identical securities from the market exchanges.
- Level 2—Inputs include quoted prices for similar assets or liabilities in active markets, quoted prices from those willing to trade in markets that are not active, or other inputs that are observable or can be corroborated by market data for the term of the instrument. Such inputs include market interest rates and volatilities, spreads and yield curves. Level 2 assets primarily consist of fixed-income securities and commingled funds that are not actively traded or whose underlying investments are valued using observable marketplace inputs. The fair value of plan assets invested in fixed-income securities is generally determined using valuation models that use observable inputs such as interest rates, bond yields, low-volume market quotes and quoted prices for similar assets. Plan assets that are invested in commingled funds are valued using a unit price or net asset value ("NAV") that is based on the underlying investments of the fund.
- Level 3—Certain inputs are unobservable (supported by little or no market activity) and significant to the fair value measurement. Unobservable inputs reflect the Company's best estimate of what hypothetical market participants would use to determine a transaction price for the asset or liability at the reporting date. Level 3 assets include investments covered by insurance contracts and real estate funds valued using significant unobservable inputs.

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The following tables set forth by level, within the fair value hierarchy, plan assets at fair value:

	December 31, 2020			
	Total	Level 1	Level 2	Level 3
Cash and cash equivalents	$ 787	$ 787	$ —	$ —
Equity securities:				
U.S. investment funds	79,777	79,777	—	—
International investment funds	64,986	53,792	11,194	—
Fixed income securities:				
Government securities	39,541	33,505	6,036	—
Corporate bonds	16,771	16,668	103	—
Investment fund bonds	112,024	—	112,024	—
Other:				
Insurance contracts	48,819	—	42,983	5,836
Total	$ 362,705	$ 184,529	$ 172,340	$ 5,836

	December 31, 2019			
	Total	Level 1	Level 2	Level 3
Cash and cash equivalents	$ 950	$ 950	$ —	$ —
Equity securities:				
U.S. investment funds	67,374	67,374	—	—
International investment funds	54,908	44,905	10,003	—
Fixed income securities:				
Government securities	31,040	23,500	7,540	—
Corporate bonds	14,900	14,782	118	—
Investment fund bonds	106,198	1,170	105,028	—
Other:				
Insurance contracts	41,351	—	36,637	4,714
Total	$ 316,721	$ 152,681	$ 159,326	$ 4,714

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The changes in the Level 3 pension plan assets are as follows for the years ended December 31:

	Insurance Contracts	
	2020	**2019**
Beginning balance	$ 4,714	$ 4,322
Actual return on plan assets	113	111
Benefits paid	(78)	(69)
Contributions	577	441
Exchange rate changes and other	510	(91)
Ending balance	$ 5,836	$ 4,714

The Company expects to contribute $446 to the U.S. pension plans and $3,559 to the foreign pension plans in 2021.

The following benefit payments, which reflect expected future service, as appropriate, are expected to be paid:

Year	U.S.	Foreign
2021	$ 17,138	$ 2,204
2022	16,200	2,384
2023	16,278	2,610
2024	16,254	2,898
2025	15,968	3,144
Years 2026-2030	78,910	19,027

Certain of the Company’s foreign subsidiaries maintain other defined benefit plans that are consistent with statutory practices. These plans are not included in the disclosures above as they are not significant to the Company’s consolidated financial statements.

Supplemental Retirement Plans

The following tables summarize changes in the benefit obligation, plan assets and funded status of the Company’s defined benefit supplementary retirement plans, as well as the components of net periodic benefit cost, including key assumptions:

	December 31,	
	2020	**2019**
Change in benefit obligation:		
Benefit obligation at beginning of period	$ 11,652	$ 11,868
Interest cost	352	465
Benefits paid	(1,001)	(1,045)
Actuarial (gains) losses	1,412	364
Benefit obligation at end of period	$ 12,415	$ 11,652
Change in plan assets:		
Fair value of plan assets at beginning of period	$ —	$ —
Employer contributions	1,001	1,045
Benefits paid	(1,001)	(1,045)
Fair value of plan assets at end of period	$ —	$ —
Funded status of the plans (underfunded)	$ (12,415)	$ (11,652)

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The total actuarial losses for the year ended December 31, 2020 across the Company's supplemental retirement plans was $1,412, which was driven by declines in the discount rates of $871, declines in general demographic experience of $234 and declines in mortality assumptions of $307.

The total actuarial losses for the year ended December 31, 2019 across the Company's supplemental retirement plans was $364, which was driven by declines in the discount rates of $971, which was offset by favorable changes in general demographic experience of $281 and favorable changes in mortality assumptions of $326.

Amounts recognized in the consolidated balance sheets consist of:

	December 31, 2020	December 31, 2019
Current liability	$ (1,039)	$ (1,019)
Noncurrent liability	(11,376)	(10,633)
Accumulated other comprehensive income	633	253
Net amount recognized	$ (11,782)	$ (11,399)

Amounts recognized in accumulated other comprehensive income consist of:

	December 31, 2020	December 31, 2019
Net gain	$ (731)	$ 681
Gross amount recognized	(731)	681
Deferred income taxes	1,364	(428)
Net amount recognized	$ 633	$ 253

Components of net periodic benefit cost consist of:

	Years ended December 31, 2020	2019	2018
Interest cost	$ 352	$ 465	$ 450
Amortization of net (gain) loss	—	(10)	—
Net periodic expense	$ 352	$ 455	$ 450

Interest cost is presented within other expense (income), net in the Company's consolidated statements of income.

The accumulated benefit obligation of the Company's defined benefit supplemental retirement plans as of December 31, 2020 and 2019 was $12,415 and $11,652, respectively. The discount rate used in determining the defined benefit supplemental retirement plan obligation was 2.20% and 3.10% as of December 31, 2020 and 2019, respectively. The discount rate used in determining net periodic benefit cost was 3.10%, 4.20% and 3.60% for the years ended December 31, 2020, 2019 and 2018, respectively. There was no rate of compensation increase for any of the periods presented, as all future accruals were frozen for the defined benefit supplementary retirement plans as of December 31, 2006. There was no rate of interest crediting rate, as there are no cash balance accounts associated with these plans.

The Company expects to contribute $1,039 to the defined benefit supplementary retirement plans in 2021.

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The following benefit payments, which reflect expected future service, as appropriate, are expected to be paid:

Year	Amount
2021	$ 1,039
2022	1,010
2023	977
2024	944
2025	908
Years 2025-2029	3,944

Other Postretirement Benefit Plans

The following tables summarize changes in the benefit obligation, plan assets and funded status of the Company's other postretirement benefit plans as well as the components of net periodic benefit cost, including key assumptions:

	December 31,	
	2020	2019
Change in benefit obligation:		
Benefit obligation at beginning of period	$ 3,452	$ 3,814
Service cost	—	10
Interest cost	99	152
Employee contributions	241	253
Plan amendments	—	(460)
Benefits paid	(658)	(751)
Premiums paid	(7)	(7)
Actuarial (gains) losses	225	412
Translation adjustment	15	29
Benefit obligation at end of period	$ 3,367	$ 3,452
Change in plan assets:		
Fair value of plan assets at beginning of period	—	—
Employer contributions	424	505
Employee contributions	241	253
Benefits paid	(658)	(751)
Premiums paid	(7)	(7)
Fair value of plan assets at end of period	$ —	$ —
Funded status of the plans (underfunded)	$ (3,367)	$ (3,452)

The total actuarial losses for the year ended December 31, 2020 across the Company's U.S. plans was $225, which was driven by declines in the discount rates of $235, and offset by favorable declines in general demographic experience of $1, which was offset by favorable changes in mortality assumptions of $8.

The total actuarial losses for the year ended December 31, 2019 across the Company's U.S. plans was $412, which was driven by declines in the discount rates of $334 and declines in general demographic experience of $172, which was offset by favorable changes in mortality assumptions of $94.

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Amounts recognized in the consolidated balance sheets consist of:

	December 31, 2020	December 31, 2019
Current liability	$ (443)	$ (537)
Noncurrent liability	(2,924)	(2,915)
Accumulated other comprehensive income	680	524
Net amount recognized	$ (2,687)	$ (2,928)

Amounts recognized in accumulated other comprehensive income consist of:

	December 31, 2020	December 31, 2019
Prior service credit	$ 596	$ 828
Net gain	(182)	67
Gross amount recognized	414	895
Deferred income taxes	266	(371)
Net amount recognized	$ 680	$ 524

Components of net periodic benefit cost consist of:

	Years ended December 31, 2020	2019	2018
Service cost	$ —	$ 10	$ 16
Interest cost	99	152	150
Amortization of prior service credit	(232)	(157)	(112)
Amortization of net gain	(29)	(33)	(26)
Net periodic expense (benefit)	$ (162)	$ (28)	$ 28

All components of net periodic benefit cost other than service cost are presented within other expense (income), net in the Company's consolidated statements of income.

The discount rate used in determining the other postretirement benefit plan obligation was 2.18% and 3.06% as of December 31, 2020 and 2019, respectively. The discount rate used in determining net periodic benefit cost was 3.06%, 4.09% and 3.53% for the years ended December 31, 2020, 2019 and 2018, respectively. There was no rate of interest crediting rate, as there are no cash balance accounts associated with these plans.

Assumed health care cost trend rates were as follows:

	December 31, 2020	December 31, 2019
Immediate trend rate	5.67%	5.91%
Ultimate trend rate	4.38%	4.39%
Year that the rate reaches ultimate trend rate	2038	2038

The Company expects to contribute $443 to the retiree health plans in 2021.

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The following benefit payments, which reflect expected future service, as appropriate, are expected to be paid:

Year	Amount
2021	$ 443
2022	372
2023	297
2024	281
2025	163
Years 2025-2029	816

There are no expected Medicare subsidy receipts expected in future periods.

Certain of the Company's foreign subsidiaries maintain other postretirement benefit plans that are consistent with statutory practices. These plans are not included in the disclosures above as they are not significant to the Company's consolidated financial statements.

Defined Contribution Plans

The Company also has defined contribution plans covering domestic employees of the Company and certain subsidiaries. The Company recorded expenses of $11,490, $11,366 and $11,253 related to these plans for the years ended December 31, 2020, 2019 and 2018, respectively.

22. Stock-Based Compensation:

In May 2016, the Company adopted an equity incentive plan, namely the PQ Group Holdings Inc. Stock Incentive Plan ("2016 Plan"). Under the terms of the 2016 Plan, the Company was authorized to issue a total of 8,017,038 shares for common stock awards to employees, directors and affiliates of the Company. Immediately preceding the Company's initial public offering ("IPO") as of September 30, 2017, awards with respect to 7,644,518 shares of common stock had been issued under the 2016 Plan.

In connection with the IPO, the Company's board of directors adopted the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan (the "2017 Plan"). Subsequent to the IPO, all equity incentive awards have been granted under the 2017 Plan. The number of shares of common stock reserved for issuance under the 2017 Plan is 7,344,000 shares, which amount was increased by the 372,520 shares remaining available for grant under the 2016 Plan as of the 2017 Plan adoption. Shares that become available for issuance pursuant to the 2016 Plan as a result of forfeiture, cancellation or termination for no consideration will be available for future awards under the 2017 Plan. Shares underlying awards granted under the 2017 Plan that are forfeited, canceled, terminated for no consideration, settled in cash or are withheld for exercise, taxes, etc. will not be deemed as delivered and will also be available for future issuance under the 2017 Plan.

On April 30, 2020, the Company's stockholders approved an amendment and restatement of the 2017 Plan to increase the number of shares available under it by an additional 9,000,000 shares and include more limited share recycling provisions, resulting in fewer shares recycled subsequent to the change. At December 31, 2020, 12,405,315 shares of common stock were available for issuance under the 2017 Plan, after giving effect to the new grants, forfeitures and other activity during the year ended December 31, 2020.

2020 Modifications

As more fully described in Note 7 to these consolidated financial statements, the Company's Board of Directors declared a special cash dividend of $1.80 per share to stockholders of record as of the close of business on December 21, 2020. The dividend declaration also included a dividend equivalent for all unvested restricted stock units, performance stock units and restricted stock awards (collectively, the "awards") as of December 21, 2020 equal to $1.80 per award. Additionally, the Company's Board of Directors approved a reduction in the strike price on all outstanding vested and unvested stock options by the amount of the dividend payment.

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Further, with respect to stock options and awards held by employees of Performance Materials at the time of the sale (see Note 4 to these consolidated financial statements), the Company's Board of Directors approved modifications to the post-termination stock option exercise, and stock option and award vesting periods. The modifications provide that all stock options held by Performance Materials employees that were vested as of the date of the sale are eligible to be exercised for a period of one year from the date of the sale, through December 14, 2021. Additionally, modifications to unvested stock options and awards allow holders to continue to vest in those instruments under the original terms of the instruments for a period of one year from the date of sale, through December 14 ,2021. The terms of the modifications to the Performance Materials awards are contingent upon the employee providing continued service to the Purchaser.

The modifications impacted all holders of the Company's stock option and awards and resulted in additional stock-based compensation expense of $2,144 for the year ended December 31, 2020. Of this amount, $654 was included in loss from discontinued operations, net of tax on the Company's consolidated statements of income.

Stock Options

Under both the 2016 and 2017 Plans, the Company has issued stock options to purchase PQ Group Holdings Inc. common stock as part of its equity incentive compensation program. There are various vesting conditions associated with the stock options issued under the 2016 Plan, including satisfaction of certain service and/or performance based conditions. Under the 2017 Plan, the Company's stock option grants have been subject to graded vesting conditions based on service. The maximum contractual term of the Company's stock options is ten years.

The following table summarizes the activity of common stock options for the period from December 31, 2017 through the year ended December 31, 2020:

	Number of Options	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Outstanding at December 31, 2017	2,715,170	$ 10.18		
Granted	241,316	$ 17.50		
Exercised	(15,332)	$ 8.51		
Outstanding at December 31, 2018	2,941,154	$ 10.79		
Exercised	(492,498)	$ 8.07		
Forfeited	(74,299)	$ 8.16		
Outstanding at December 31, 2019	2,374,357	$ 11.44		
Exercised	(43,250)	$ 8.64		
Forfeited	(157,776)	$ 9.23		
Outstanding at December 31, 2020	2,173,331	$ 9.84 [1]	5.94	$ 10,452
Exercisable at December 31, 2020	1,796,519	$ 10.50 [1]	6.00	$ 7,611

(1) Reflects the impact of the reduction in the strike price on all outstanding vested and unvested stock options by $1.80 per share as described above.

The aggregate intrinsic value per the above table represents the difference between the fair value the Company's common stock on the last trading day of the reporting period (determined in accordance with the plan terms) and the exercise price of in-the-money stock options multiplied by the respective number of stock options as of that date. The total intrinsic value of stock options exercised during the year ended December 31, 2019 and the resulting tax benefits recognized by the Company were $3,615; the total intrinsic value of stock options exercised during the years ended December 31, 2020 and 2018 was not material for either year. Additionally, cash proceeds received by the Company from the exercise of stock options were $3,975 during the year ended December 31, 2019 and were not material for the years ended December 31, 2020 and 2018.

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There were no stock option awards granted during the years ended December 31, 2020 and 2019. The fair values of PQ Group Holdings common stock options granted during the year ended December 31, 2018 were determined on the respective grant dates using a Black-Scholes option pricing model with the following weighted-average assumptions:

	2018
Expected term (in years)	5.75
Expected volatility	26.38 %
Risk-free interest rate	2.86 %
Expected dividend yield	0.00 %
Weighted average grant date fair value of options granted	$ 5.47

With respect to the stock option awards granted during the year ended December 31, 2018, the Company used the simplified method for plain vanilla stock options to estimate the expected term assumption, since the Company lacked sufficient historical exercise data to provide a reasonable basis upon which to estimate the expected term due to the limited period of time its common stock has been publicly traded. The application of the simplified method involves calculating the average of the time-to-vesting period and the total contractual life of the options. The expected volatility assumption was compared to a range of the actual stock price volatility of a peer group of companies. The risk-free interest rate was based on U.S. Treasury rates in effect at the time of the grant commensurate with the expected term.

Restricted Stock Awards, Restricted Stock Units and Performance Stock Units

The Company has granted restricted stock awards subject to vesting conditions based on (1) service only, (2) performance only, or (3) a combination of service and performance conditions, dependent on which event occurs first. The vesting requirements for the majority of these awards were based upon the achievement of a performance condition. As defined in the award agreements, each award subject to the performance condition fully vests upon the occurrence of a defined liquidity event upon which certain investment funds affiliated with CCMP receive proceeds exceeding certain thresholds. Although achievement of the performance condition is subject to continued service with the Company, the terms of awards issued with performance conditions stipulate that the performance vesting condition can be attained for a period of six months following separation from service under certain circumstances, depending on the means of separation from the Company and subject to other factors such as individual separation agreements. The same performance vesting condition for the Company's restricted stock awards also governs the achievement of the performance vesting condition for the Company's stock options. As of December 31, 2020, all of the Company's outstanding unvested restricted stock awards were subject to the performance vesting condition.

In addition to restricted stock awards, the Company has granted restricted stock units and performance stock units as part of its equity incentive compensation program. Each restricted stock unit provides the recipient with the right to receive a share of common stock subject to graded vesting terms based on service, which generally requires one year of service for members of the Company's board of directors and three years of service for employees. The value of the restricted stock units granted by the Company is based on the average of the high and low trading prices of the Company's common stock on the NYSE on the preceding trading day, in accordance with the Company's policy for valuing such awards. Compensation expense related to the restricted stock units is recognized on a straight-line basis over the respective vesting period.

The Company granted performance stock units during the year ended December 31, 2019, which provide the recipients with the right to receive shares of common stock dependent on the achievement of two Company-specific financial performance targets and the provision of service through the vesting date. Attainment of the metrics is measured based on the average levels of achievement across the three-year period from January 1, 2019 through December 31, 2021. Depending on the Company's performance against the pre-determined thresholds for achievement, each performance stock unit award holder is eligible to earn a percentage of the target number of shares granted to the holder, ranging from zero to 200%. The performance stock units, to the extent earned, will vest on the date the Company's compensation and governance committee certifies the achievement of the performance metrics for the three-year period ending December 31, 2021, which will occur subsequent to the end of the performance period but before the Company files its annual consolidated financial statements for the year then ended.

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The Company also granted performance stock units during the year ended December 31, 2020. The performance stock units granted in 2020 provide the recipients with the right to receive shares of common stock dependent 50% on the achievement of a Company-specific financial performance target and 50% on a total shareholder return ("TSR") goal, and are generally subject to the provision of service through the vesting date of the award. The Company-specific financial performance target and the TSR goal are measured independently of each other, but achievement of both of the metrics is measured based on the same three-year performance period from January 1, 2020 through December 31, 2022. The TSR goal is based on the Company's relative TSR performance against the companies included in the Russell 2000 Index over the performance period. Achievement of the Company-specific financial performance target is measured based on the average levels of achievement across the performance period. Depending on the Company's performance against the predetermined thresholds for achievement, each performance stock unit award recipient is eligible to earn a percentage of the target number of shares granted to the recipient, ranging from zero to 200%. The performance stock units, to the extent earned, will vest on the date the Company's compensation and governance committee certifies the achievement of the performance metrics for the three-year period ending December 31, 2022, which will occur subsequent to the end of the performance period but before the Company files its annual consolidated financial statements for the year then ended.

The value of the portions of the performance stock units granted during the years ended December 31, 2020 and 2019 eligible to be earned based on the achievement of the Company-specific financial performance targets was measured on the same basis as that of the restricted stock units, and based on the target number of shares granted; because the performance vesting conditions affect the ability of the recipients to vest in the awards, they are not factored into the fair value measure of the award. Compensation expense related to such performance stock units is recognized ratably over the requisite service period, and the Company must assess the probability that the performance conditions will be met each reporting period and the level at which they are estimated to be attained. Should the probability assessment change during a given reporting period, the total compensation cost (both recognized and unrecognized) will be adjusted to reflect the revised assessment.

The TSR goal, which determines how much of the 50% of the performance stock units granted during 2020 may be earned, is considered a market condition as opposed to a vesting condition. Because a market condition is not considered a vesting condition, it is reflected in the grant date fair value of an award and the associated compensation cost based on the fair value of the award is recognized over the performance period, regardless of whether the Company actually achieves the market condition or the level of achievement, as long as service is provided by the recipient. The Company used a Monte Carlo simulation to estimate the fair value of the portion of the awards subject to the TSR goal. The following table provides the assumptions used to determine the grant date fair value of the market condition-dependent / TSR goal-based portion of the Company's performance stock units granted during 2020 using a Monte Carlo simulation:

Expected dividend yield		— %
Risk-free interest rate		1.56 %
Expected volatility		28.57 %
Expected term (in years)		2.95
Grant date fair value	$	24.11

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The following table summarizes the activity of restricted stock awards, restricted stock units and performance stock units for the period from December 31, 2017 through the year ended December 31, 2020:

	Restricted Stock Awards		Restricted Stock Units		Performance Stock Units	
	Number of Shares	Weighted Average Grant Date Fair Value (per share)	Number of Units	Weighted Average Grant Date Fair Value (per share)	Number of Units	Weighted Average Grant Date Fair Value (per share)
Nonvested as of December 31, 2017	2,096,637	$ 8.87	1,654,690	$ 16.97	—	$ —
Granted	14,498	$ 13.80	161,598	$ 16.12	—	$ —
Vested	(223,298)	$ 12.18	(797,859)	$ 16.97	—	$ —
Forfeited	(117,177)	$ 8.04	(19,643)	$ 16.97	—	$ —
Nonvested as of December 31, 2018	1,770,660	$ 8.39	998,786	$ 16.83	—	$ —
Granted	—	$ —	1,245,628	$ 15.42	550,676	$ 15.41
Vested	(97,140)	$ 12.32	(541,383)	$ 16.68	—	$ —
Forfeited	(127,390)	$ 8.04	(74,595)	$ 16.09	—	$ —
Nonvested as of December 31, 2019	1,546,130	$ 8.17	1,628,436	$ 15.83	550,676	$ 15.41
Granted	—	$ —	1,158,605	$ 16.60	456,311	$ 20.29
Vested	(29,760)	$ 12.32	(816,866)	$ 16.17	—	$ —
Forfeited	(619,355)	$ 8.04	(129,036)	$ 16.28	(41,251)	$ 15.95
Nonvested as of December 31, 2020	897,015	$ 13.80 (1)	1,841,139	$ 16.14	965,736	$ 17.69

(1) Reflects the impact of the modification on all unvested restricted stock awards as described above.

The total fair value of restricted stock awards that vested during the years ended December 31, 2020, 2019 and 2018 was $510, $1,543 and $3,493, respectively. The total fair value of restricted stock units that vested during the years ended December 31, 2020, 2019 and 2018 was $11,269, $8,493 and $13,628, respectively. None of the Company's performance stock units vested during the years ended December 31, 2020, 2019 and 2018.

Total Stock-Based Compensation Expense

For the years ended December 31, 2020, 2019 and 2018, total stock-based compensation expense for the Company was $21,527, $16,212 and $18,419, respectively. The income tax benefit recognized in the statements of income for the years ended December 31, 2020, 2019 and 2018 was $5,664, $3,543 and $4,671.

As of December 31, 2020, there was no unrecognized compensation cost related to nonvested stock options or nonvested restricted stock awards subject to service vesting conditions. As of December 31, 2020, there was $20,511 of total unrecognized compensation cost related to nonvested restricted stock units and $10,982 of total unrecognized compensation cost related to nonvested performance stock units considered probable of vesting. The weighted-average period over which these costs are expected to be recognized at December 31, 2020 is 1.59 years for the restricted stock units and 1.63 years for the performance stock units. No expense has been recognized for any restricted stock awards or stock options subject to the performance condition for the years ended December 31, 2020, 2019 and 2018, as the performance-based criteria was not achieved nor considered probable of achievement.

(Dollars in thousands, except share and per share amounts)

Restricted stock awards and stock options issued with performance conditions vest based on the occurrence of a defined liquidity event upon which certain investment funds affiliated with CCMP receive proceeds exceeding certain thresholds. All of the Company's equity incentive awards with performance-based vesting, whether in the form of stock options or restricted stock awards, are subject to achievement of the same performance condition. If an exit event occurs that exceeds the defined threshold, then all performance-based awards of the Company vest 100%, with no potential for partial vesting or excess achievement. If an exit event or events occur with no further possibility of meeting the defined threshold, then all of the Company's awards subject to the performance vesting condition will be forfeited. In addition to the defined liquidity event, subsequent to the Company's IPO, the performance vesting condition can also be achieved if the average closing trading price of the Company's common stock on the NYSE over any consecutive ten-day trading period equals or exceeds a price that would be equivalent to the achievement of the threshold proceeds to CCMP. See Note 23 to these consolidated financial statements for further information on the number of awards outstanding subject to performance-based vesting.

23. Earnings per Share:

Basic earnings per share is calculated as income (loss) available to common stockholders, divided by the weighted average number of common shares outstanding during the period. The weighted average number of common shares outstanding during the period for the computation of basic earnings per share excludes restricted stock awards that have legally been issued but are nonvested during the period, as the sale of these shares is prohibited pending satisfaction of certain vesting conditions by the award recipients in order to earn the rights to the shares (see Note 22 to these consolidated financial statements for further information regarding outstanding nonvested restricted stock awards).

Diluted earnings per share is calculated as income (loss) available to common stockholders, divided by the weighted average number of common and potential common shares outstanding during the period, if dilutive. Potential common shares reflect (1) unvested restricted stock awards and restricted stock units with service vesting conditions, (2) performance stock units with vesting conditions considered probable of achievement and (3) options to purchase common stock, all of which have been included in the diluted earnings per share calculation using the treasury stock method.

The reconciliation from basic to diluted weighted average shares outstanding is as follows:

	Years ended December 31,		
	2020	2019	2018
Weighted average shares outstanding – Basic	135,528,977	134,389,667	133,380,567
Dilutive effect of unvested common shares and restricted stock units with service conditions, performance stock units considered probable of vesting and assumed stock option exercises and conversions	—	1,159,027	1,304,364
Weighted average shares outstanding – Diluted	135,528,977	135,548,694	134,684,931

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
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Basic and diluted earnings per share are calculated as follows:

	Years ended December 31,		
	2020	**2019**	**2018**
Numerator:			
Net (loss) income attributable to PQ Group Holdings Inc.	$ (278,771)	$ 79,539	$ 58,300
Denominator:			
Weighted average shares outstanding – Basic	135,528,977	134,389,667	133,380,567
Weighted average shares outstanding – Diluted	135,528,977	135,548,694	134,684,931
Net (loss) income per share:			
Basic (loss) income per share	$ (2.06)	$ 0.59	$ 0.44
Diluted (loss) income per share	$ (2.06)	$ 0.59	$ 0.43

The table below presents the details of the Company's weighted average equity-based awards outstanding during each respective year that were excluded from the calculation of diluted earnings per share:

	Years ended December 31,		
	2020	**2019**	**2018**
Restricted stock awards with performance only targets not yet achieved	1,225,855	1,584,980	1,643,760
Stock options with performance only targets not yet achieved	507,461	558,283	586,253
Anti-dilutive restricted stock awards, restricted stock units and performance stock units	1,453,120	—	5,162
Anti-dilutive stock options	846,049	863,063	717,612

Restricted stock awards and stock options with performance only vesting conditions are not included in the dilution calculation, as the performance targets have not been achieved nor were probable of achievement as of the end of the respective periods. Certain stock options to purchase shares of common stock were excluded from the computation of diluted earnings per share for the respective periods, because the combination of the options' exercise price and remaining unamortized stock-based compensation expense was greater than the average market price of the common shares. Anti-dilutive awards are not included in the dilution calculation, as their inclusion would have the effect of increasing diluted income per share.

24. Commitments and Contingent Liabilities:

Environmental Contingencies

There is a risk of environmental impact in chemical manufacturing operations. The Company's environmental policies and practices are designed to comply with existing laws and regulations and to minimize the possibility of significant environmental impact. The Company is also subject to various other lawsuits and claims with respect to matters such as governmental regulations, labor and other actions arising out of the normal course of business. While management believes that the liabilities resulting from such lawsuits and claims are not probable or reasonably estimable, certain accruals have been reflected in the Company's consolidated financial statements, some of which are described in detail within this note.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
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In 2008, the Company sold property located in Tacoma, Washington to the local port authority. In 2009, the port authority commissioned an environmental investigation of portions of the property. In 2010, the port authority advised the Company of alleged soil and groundwater contamination on the property and alleged the Company liable for certain conditions. The Company received and reviewed the environmental investigation documentation and determined it may have liability with respect to some, but not all, of the alleged contamination. At this time, remedial plans are in the feasibility study stage and have not been agreed upon or presented to Washington State for consideration. As of December 31, 2020 and 2019, the Company has recorded reserves of $1,278 and $1,045, respectively, for costs related to this potential liability.

The Company has recorded a reserve of $510 and $770 as of December 31, 2020 and 2019, respectively, to address remaining subsurface remedial and wetlands/marsh management activities at the Company's Martinez, CA site. Although currently a sulfuric acid regeneration plant, the site originally was operated by Mountain Copper Company ("Mococo") as a copper smelter. Also, the site sold iron pyrite to various customers and allowed their customers to deposit waste iron pyrite cinder and slag on the site. The property is adjacent to Peyton Slough, where Mococo had a permitted discharge point from its process. In 1997, the San Francisco Bay Regional Water Quality Control Board ("RWQCB") required characterization and remediation of Peyton Slough for Copper, Zinc and Acidic Soils. Various remediation activities were undertaken and completed, and the site has received final concurrence from the Army Corps with respect to the completed work. The RWQCB has agreed that Eco Services has achieved the goals for vegetative cover. The current marsh condition is being sustained by the opening and subsequent closing of the tide gates on a once per year basis. The Company is continuing to indicate to the RWQCB a plan to involve Contra Costa County and work towards development of an alliance for operating, maintaining and funding the tide gates is appropriate. The Company is currently in the process of obtaining permits for the long-term maintenance of Peyton Slough.

As of December 31, 2020 and 2019, the Company has recorded a reserve of $427 and $709, respectively, for subsurface remediation and the Soil Vapor Extraction Project at the Company's Dominguez, CA site. In the 1980s and 1990s, the EPA and the Los Angeles Regional Water Quality Control Board conducted investigations of the site due to historic chlorinated pesticide and chlorinated solvent use. Soil and groundwater beneath the site were impacted by chlorinated solvents and associated breakdown products, petroleum hydrocarbons, chlorinated pesticides and metals. A Corrective Measures Plan approved in October 2011 requires (1) soil vapor extraction ("SVE") in affected areas, (2) covering of unpaved areas containing pesticide impacted soil, and (3) annual groundwater monitoring of the perched water-bearing zone. Annual groundwater sampling and soil vapor monitoring indicates that the SVE system has been effective in reducing subsurface contaminant levels. The Company is moving in the direction of rendering the SVE system dormant and potentially closing this matter within the next few years following rebound testing, including the preparation of an updated long-term Operations and Maintenance Plan as requested by the California Department of Toxic Substances Control.

Purchase Commitments

The Company has entered into short and long-term purchase commitments for various key raw materials and energy requirements. The purchase obligations include agreements with various suppliers to purchase goods that are enforceable and legally binding, and that specify all significant terms. Purchases under these agreements are expected to be as follows:

Year	Amount
2021	$ 13,695
2022	3,263
2023	1,654
2024	1,186
2025	1,183
Thereafter	995
	$ 21,976

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
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Letters of Credit

At December 31, 2020, the Company had outstanding letters of credit of $18,190. Letters of credit are guarantees of payment to third parties. The Company's letters of credit are used primarily as collateral for various items, including environmental, energy and insurance payments. The letters of credit are supported by the Company's ABL facility.

25. Long-term Supply Contract:

As part of Solvay's 2004 sale of its Specialty Phosphates business, Solvay agreed to continue to supply sulfuric acid to a customer in support of the phosphoric acid production for its specialty phosphates business under a preexisting supply agreement. This non-cancelable agreement extends to 2031, and was assumed by the Company in connection with the 2014 Acquisition.

The liability associated with this unfavorable supply agreement was recorded at a fair value of $27,300 in connection with the 2014 Acquisition. The fair value was determined using the income method based on the differential of the estimated margin over the cost of the sulfuric acid per the market as compared to the below market margin included in the supply agreement, and the application of this excess differential to the anticipated volumes over the term of the agreement using a commensurate discount rate. In December 2018, the customer to the supply agreement ceased production and closed the facility which utilized the Company's sulfuric acid under the agreement. As such, all orders for sulfuric acid under the agreement were discontinued in December 2018. Although the agreement is not cancelable, the likelihood is remote that the Company will be further obligated to supply the customer under the agreement since this is the only facility subject to the agreement, and there are no transfer or substitution rights under the agreement to another facility. As a result, the Company wrote-off the remaining supply contract liability of $20,612 at December 31, 2018 and recorded a corresponding gain to other operating expense, net for the year ended December 31, 2018.

26. Related Party Transactions:

The Company maintains certain policies and procedures for the review, approval and ratification of related party transactions to ensure that all transactions with selected parties are fair, reasonable and in the Company's best interests. All significant relationships and transactions are separately identified by management if they meet the definition of a related party or a related party transaction. Related party transactions include transactions that occurred during the year, or are currently proposed, in which the Company was or will be a participant, and for which any related person had or will have a direct or indirect material interest. All related party transactions are reviewed, approved and documented by the appropriate level of the Company's management in accordance with these policies and procedures.

Joint Venture Agreement

The Company entered into a joint venture agreement (the "ZI Partnership Agreement") in 1988 with Shell Catalysts & Technologies, an affiliate of Royal Dutch Shell plc, to form Zeolyst International, a 50/50 joint venture partnership (the "Partnership"). Under the terms of the ZI Partnership Agreement, the Partnership leases certain land used in its Kansas City production facilities from PQ Corporation. This lease, which has been recorded as an operating lease, provided for rental payments to the Company of $310, $305 and $295 during the years ended December 31, 2020, 2019 and 2018, respectively. The terms of this lease are evergreen as long as the ZI Partnership Agreement is in place. The Partnership recognized sales to the Company's former Performance Materials business of $861, $803 and $645 during the years ended December 31, 2020, 2019 and 2018, respectively.

The Partnership purchases certain of its raw materials from the Company and is charged for various manufacturing costs incurred at the Company's Kansas City production facility. The amount of these costs charged to the Partnership were $16,065, $19,976 and $16,869 for the years ended December 31, 2020, 2019 and 2018, respectively. Certain administrative, marketing, engineering, management-related, and research and development services are provided to the Partnership by the Company. During the years ended December 31, 2020, 2019 and 2018, the Partnership was charged $12,229, $12,871 and $12,727, respectively, for these services. In addition, the Partnership was charged certain product demonstration costs of $1,853, $2,204 and $1,768 during the years ended December 31, 2020, 2019 and 2018, respectively. These charges to the Partnership are recorded as reductions in either cost of goods sold or selling, general and administrative expenses in the consolidated statements of income, depending on the nature of the expenditures.

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Other

From time to time, the Company makes sales to and purchases raw materials from portfolio companies of funds that are affiliated with CCMP and companies that are affiliated with INEOS Capital Partners. The Company had sales of $12,672, $4,841 and $5,587 to companies affiliated with INEOS Capital Partners during the years ended December 31, 2020, 2019, and December 31, 2018 respectively. The Company purchased raw materials of $1,222, $1,203 and $1,495 to companies affiliated with INEOS Capital Partners during the years ended December 31, 2020, 2019, and December 31, 2018 respectively.

27. Quarterly Financial Summary (Unaudited):

The following tables summarize the Company's quarterly financial results during the years ended December 31, 2020 and 2019:

	2020			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Sales	$ 295,813	$ 254,896	$ 275,149	$ 281,505
Gross profit	72,295	63,662	70,172	67,227
Operating income	29,214	20,175	33,310	(245,623)
Net income (loss) from continuing operations	6,299	7,896	(6,956)	(186,702)
Net income (loss) from discontinued operations, net of tax	(5,790)	8,351	11,392	(116,194)
Net (loss) income	509	16,247	4,436	(302,896)
Less: Net (loss) income attributable to the noncontrolling interest - continuing operations	234	250	201	(3,883)
Less: Net income (loss) attributable to the noncontrolling interest - discontinued operations	51	71	97	46
Net income (loss) attributable to PQ Group Holdings Inc.	224	15,926	4,138	(299,059)
Earnings (loss) per common share - basic				
Continuing operations	$ 0.04	$ 0.06	$ (0.05)	$ (1.35)
Discontinued operations	$ (0.04)	$ 0.06	$ 0.08	$ (0.86)
Net earnings (loss) per share - basic	$ —	$ 0.12	$ 0.03	$ (2.21)
Earnings (loss) per common share - diluted:				
Continuing operations	$ 0.04	$ 0.06	$ (0.05)	$ (1.35)
Discontinued operations	$ (0.04)	$ 0.06	$ 0.08	$ (0.86)
Net earnings (loss) per share - diluted	$ —	$ 0.12	$ 0.03	$ (2.21)
Weighted average shares outstanding:				
Basic	135,240,897	135,083,126	135,106,969	135,406,081
Diluted	136,086,082	135,671,830	135,979,118	135,406,081

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PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(Dollars in thousands, except share and per share amounts)

	2019			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Sales	$ 297,468	$ 311,641	$ 307,271	$ 283,535
Gross profit	67,728	81,863	82,913	65,898
Operating income	28,995	48,840	41,191	28,482
Net income from continuing operations	6,055	19,404	11,888	28,406
Net income (loss) from discontinued operations, net of tax	(2,614)	11,315	6,863	(1,007)
Net income	3,441	30,719	18,751	27,399
Less: Net income attributable to the noncontrolling interest - continuing operations	231	101	82	203
Less: Net income attributable to the noncontrolling interest - discontinued operations	59	44	24	27
Net income attributable to PQ Group Holdings Inc.	3,151	30,574	18,645	27,169
Earnings (loss) per common share - basic:				
Continuing operations	$ 0.04	$ 0.14	$ 0.09	$ 0.21
Discontinued operations	$ (0.02)	$ 0.08	$ 0.05	$ (0.01)
Net earnings per share - basic	$ 0.02	$ 0.23	$ 0.14	$ 0.20
Earnings (loss) per common share - diluted:				
Continuing operations	$ 0.04	$ 0.14	$ 0.09	$ 0.21
Discontinued operations	$ (0.02)	$ 0.08	$ 0.05	$ (0.01)
Net earnings per share - diluted	$ 0.02	$ 0.23	$ 0.14	$ 0.20
Weighted average shares outstanding:				
Basic	133,946,308	134,142,552	134,511,819	134,912,212
Diluted	134,894,354	135,323,024	135,649,710	136,151,739

(Dollars in thousands, except share and per share amounts)

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28. Supplemental Cash Flow Information:

The following table presents supplemental cash flow information for the Company:

	Years ended December 31,		
	2020	**2019**	**2018**
Cash paid during the year for:			
Income taxes, net of refunds	$ 35,013	$ 17,406	$ 23,842
Interest[1]	90,291	117,775	110,834
Non-cash investing activity[2]:			
Capital expenditures acquired on account but unpaid as of the year end	11,630	22,562	23,498

(1) Cash paid for interest is shown net of capitalized interest for the periods presented and excludes $4,963 and $8,480 of net interest proceeds on swaps designated as net investment hedges for the years ended December 31, 2020 and 2019, respectively, which are included within cash flows from investing activities in the Company’s consolidated statements of cash flows.

(2) For the supplemental non-cash information on lease liabilities arising from obtaining right-of-use lease assets, see Note 13 to these consolidated financial statements for additional details.

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the consolidated balance sheets as of December 31, 2020, 2019 and 2018 to the total of the same amounts shown in the consolidated statements of cash flows for the years then ended:

	December 31,		
	2020	**2019**	**2018**
Cash and cash equivalents	$ 135,531	$ 53,861	$ 37,164
Restricted cash included in prepaid and other current assets	1,688	1,331	1,435
Total cash, cash equivalents and restricted cash shown in the consolidated statements of cash flows	$ 137,219	$ 55,192	$ 38,599

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(Dollars in thousands, except share and per share amounts)

29. Subsequent Events:

Definitive Agreement to Sell the Company's Performance Chemicals Business

On March 1, 2021, the Company announced that it entered into a definitive agreement to sell its Performance Chemicals business for a purchase price of $1,100,000, subject to customary purchase price adjustments as set forth in the agreement. The planned sale of the Performance Chemicals business reflects continued advancement by the Company on its **'Simpler + Stronger'** strategic path.

The Company expects to use the after-tax cash proceeds from the sale to reduce debt and return capital to its shareholders, subject to board approval and declaration. The transaction is expected to close by the end of 2021, subject to regulatory approvals and customary closing conditions. The Company is currently evaluating the impact of this transaction.

This transaction met the held for sale criteria in March 2021, and consequently the financial results of the Performance Chemicals business will be reported in discontinued operations beginning in the first quarter of 2021.

Chem32 Acquisition

On February 24, 2021, the Company completed the acquisition of Chem32, a leading supplier of catalyst pre-activation services, for a purchase price of $44,000, subject to customary purchase price adjustments as set forth in the agreement.

Other than these items, the Company has evaluated subsequent events since the balance sheet date and determined that there are no additional matters to disclose.

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SCHEDULE I
PQ GROUP HOLDINGS INC. AND SUBSIDIARIES (PARENT)
CONDENSED FINANCIAL INFORMATION
CONDENSED STATEMENTS OF INCOME
(in thousands)

	Years ended December 31,		
	2020	2019	2018
Stock compensation expense	$ 25,200	$ 16,212	$ 18,419
Equity in net loss (income) from subsidiaries	253,571	(95,751)	(76,719)
Net (loss) income	(278,771)	79,539	58,300
Other comprehensive income (loss), net of tax:			
Pension and postretirement benefits	1,938	2,430	(7,958)
Net (loss) gain from hedging activities	166	(2,665)	(330)
Foreign currency translation	(16,596)	22,117	(35,127)
Total other comprehensive income (loss)	(14,492)	21,882	(43,415)
Comprehensive (loss) income	$ (293,263)	$ 101,421	$ 14,885

See accompanying notes to condensed financial statements.

SCHEDULE I
PQ GROUP HOLDINGS INC. AND SUBSIDIARIES (PARENT)
CONDENSED FINANCIAL INFORMATION
CONDENSED BALANCE SHEETS
(in thousands, except share and per share amounts)

	December 31, 2020	December 31, 2019
ASSETS		
Investment in subsidiaries	$ 1,277,126	$ 1,779,450
Total assets	$ 1,277,126	$ 1,779,450
LIABILITIES		
Total liabilities	$ —	$ —
STOCKHOLDERS' EQUITY		
Common stock (0.01 par); authorized shares 450,000,000; issued shares 137,102,143 and 136,861,382 on December 31, 2020 and 2019, respectively; outstanding shares 136,318,557 and 136,464,961 on December 31, 2020 and 2019, respectively	1,371	1,369
Preferred stock (0.01 par); authorized shares 50,000,000; no shares issued or outstanding on December 31, 2020 and 2019, respectively	—	—
Additional paid-in capital	1,477,859	1,696,899
(Accumulated deficit) retained earnings	(175,758)	103,013
Treasury stock, at cost; shares 783,586 and 396,421 on December 31, 2020 and 2019, respectively	(11,081)	(6,483)
Accumulated other comprehensive loss	(15,265)	(15,348)
Total PQ Group Holdings Inc. equity	1,277,126	1,779,450
Total liabilities and equity	$ 1,277,126	$ 1,779,450

See accompanying notes to condensed financial statements.

SCHEDULE I
PQ GROUP HOLDINGS INC. AND SUBSIDIARIES (PARENT)
CONDENSED FINANCIAL INFORMATION
CONDENSED STATEMENTS OF CASH FLOWS
(in thousands)

	Years ended December 31,		
	2020	**2019**	**2018**
Cash flows from operating activities:			
Net (loss) income	$ (278,771)	$ 79,539	$ 58,300
Adjustments to reconcile net (loss) income to net cash provided by operating activities:			
Equity in net income from subsidiaries	253,571	(95,751)	(76,719)
Stock compensation expense	25,200	16,212	18,419
Net cash provided by operating activities	—	—	—
Cash flows from investing activities:			
Distribution from subsidiaries	243,779	—	—
Net cash provided by investing activities	243,779	—	—
Cash flows from financing activities:			
Dividends paid to stockholders	(243,779)	—	—
Net cash used in financing activities	(243,779)	—	—
Effect of exchange rate changes on cash, cash equivalents and restricted cash	—	—	—
Net change in cash, cash equivalents and restricted cash	—	—	—
Cash, cash equivalents and restricted cash at beginning of period	—	—	—
Cash, cash equivalents and restricted cash at end of period of continuing operations	$ —	$ —	$ —

See accompanying notes to condensed financial statements.

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SCHEDULE I
PQ GROUP HOLDINGS INC. AND SUBSIDIARIES (PARENT)
CONDENSED FINANCIAL INFORMATION
NOTES TO CONDENSED SCHEDULE I

1. Description of PQ Group Holdings Inc. and Subsidiaries

PQ Group Holdings Inc. (“PQ Group Holdings” or the “Parent Company”) is a holding company that conducts substantially all of its business operations through its wholly owned subsidiary, PQ Corporation. As specified in certain of PQ Corporation’s debt agreements entered into concurrently with a series of transactions to reorganize and combine the businesses of PQ Holdings Inc. and Eco Services Operations LLC in May 2016 (the “Business Combination”), as subsequently amended and restated, there are restrictions on the ability of PQ Corporation to make payments to its stockholder, PQ Group Holdings, on behalf of its equity interests (refer to Note 17 to the PQ Group Holdings consolidated financial statements for further information regarding PQ Corporation debt).

2. Basis of Presentation

The accompanying condensed Parent Company financial statements are required in accordance with Rule 4-08(e)(3) of Regulation S-X. These condensed financial statements have been presented on a “parent-only” basis. Under a parent-only presentation, the Parent Company’s investment in its consolidated subsidiary is presented under the equity method of accounting. Under the equity method, the investment in subsidiary is stated at cost plus contributions and equity in undistributed income (loss) of the subsidiary, less distributions received since the date of acquisition. For purposes of presenting net income, this presentation assumes that the Parent Company was in existence for the full year ended December 31, 2016, the year of the Business Combination. These parent-only financial statements should be read in conjunction with PQ Group Holdings’ audited consolidated financial statements.

3. Stock-Based Compensation

Refer to Note 22 of the notes to the PQ Group Holdings consolidated financial statements for a description of stock-based compensation.

4. Common Stock

Refer to Note 23 of the notes to the PQ Group Holdings consolidated financial statements for a description of common stock.

5. Dividends Paid

On December 14, 2020, the Company’s Board of Directors declared a special cash dividend of $1.80 per share, using after tax cash proceeds and cash on hand from the sale of the Performance Materials business. The dividend was paid to the Company’s stockholders of record at the close of business on December 21, 2020.

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Report of Independent Auditors

To the Management Committee of Zeolyst International:

We have audited the accompanying financial statements of Zeolyst International (the “Partnership”), which comprise the balance sheets as of December 31, 2020 and 2019, and the related statements of operations and accumulated earnings, changes in partners’ capital, and cash flows for the three years in the period ended December 31, 2020.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors’ Responsibility

Our responsibility is to express an opinion on the financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the Partnership’s preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Partnership’s internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Zeolyst International as of December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2020 in accordance with accounting principles generally accepted in the United States of America.

Emphasis of Matter

As discussed within Footnote 15 to the financial statements, the Partnership has significant related party transactions. Our opinion is not modified with respect to this matter.

/s/ PricewaterhouseCoopers LLP
Philadelphia, Pennsylvania
March 17, 2021

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ZEOLYST INTERNATIONAL
BALANCE SHEETS
(in thousands)

	December 31, 2020	December 31, 2019
ASSETS		
Cash	$ 47,837	$ 10,522
Trade receivables, net:		
Receivables from third parties	24,316	29,525
Receivables from affiliates	9,132	50,373
Inventories	98,241	127,864
Other current assets	576	573
Total current assets	180,102	218,857
Property, plant and equipment, net	142,871	144,615
Intangible assets	7,050	8,100
Right-of-use lease asset	5,968	6,077
Other long-term assets	480	694
Total assets	$ 336,471	$ 378,343
LIABILITIES		
Revolver	$ —	$ 15,000
Trade accounts payable	5,292	13,231
Accounts payable to affiliates	21,066	12,519
Operating lease liability—current	109	109
Other current liabilities	2,965	3,776
Total current liabilities	29,432	44,635
Operating lease liability—noncurrent	5,859	5,968
Total liabilities	35,291	50,603
Commitments and contingencies (Note 14)		
PARTNERS' CAPITAL		
Contributed capital	54,930	54,930
Accumulated earnings	246,250	272,810
Net partners' capital	301,180	327,740
Total liabilities and partners' capital	$ 336,471	$ 378,343

See accompanying notes to financial statements.

ZEOLYST INTERNATIONAL
STATEMENTS OF OPERATIONS AND ACCUMULATED EARNINGS
(in thousands)

	Years ended December 31,		
	2020	2019	2018
Sales	$ 129,708	$ 161,725	$ 209,083
Related party sales	127,538	178,950	104,291
Total sales	257,246	340,675	313,374
Cost of goods sold	85,392	84,566	88,551
Related party cost of goods sold	83,018	112,441	99,653
Total cost of goods sold	168,410	197,007	188,204
Gross profit	88,836	143,668	125,170
Selling, general and administrative expenses (SG&A)	3,146	3,857	1,476
Related party SG&A	32,204	37,085	35,635
Operating income	53,486	102,726	88,059
Interest expense, net	224	76	100
Other (income) expense, net	(178)	(1,712)	2,251
Net income	53,440	104,362	85,708
Accumulated earnings at beginning of year	272,810	248,448	242,740
Dividends paid	(80,000)	(80,000)	(80,000)
Accumulated earnings at end of year	$ 246,250	$ 272,810	$ 248,448

See accompanying notes to financial statements.

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ZEOLYST INTERNATIONAL
STATEMENTS OF CHANGES IN PARTNERS' CAPITAL
(in thousands)

	Contributed capital	Accumulated earnings	Net partners' capital
PQ Corporation:			
Balance, December 31, 2017	$ 27,465	$ 121,370	$ 148,835
Dividends paid		(40,000)	(40,000)
Net income		42,854	42,854
Balance, December 31, 2018	$ 27,465	$ 124,224	$ 151,689
Dividends paid		(40,000)	(40,000)
Net income		52,181	52,181
Balance, December 31, 2019	$ 27,465	$ 136,405	$ 163,870
Dividends paid		(40,000)	(40,000)
Net income		26,720	26,720
Balance, December 31, 2020	$ 27,465	$ 123,125	$ 150,590
CRI Zeolites Inc.:			
Balance, December 31, 2017	$ 27,465	$ 121,370	$ 148,835
Dividends paid		(40,000)	(40,000)
Net income		42,854	42,854
Balance, December 31, 2018	$ 27,465	$ 124,224	$ 151,689
Dividends paid		(40,000)	(40,000)
Net income		52,181	52,181
Balance, December 31, 2019	$ 27,465	$ 136,405	$ 163,870
Dividends paid		$ (40,000)	$ (40,000)
Net income		$ 26,720	$ 26,720
Balance, December 31, 2020	$ 27,465	$ 123,125	$ 150,590
Total partners' capital at December 31, 2017	$ 54,930	$ 242,740	$ 297,670
Total partners' capital at December 31, 2018	$ 54,930	$ 248,448	$ 303,378
Total partners' capital at December 31, 2019	$ 54,930	$ 272,810	$ 327,740
Total partners' capital at December 31, 2020	$ 54,930	$ 246,250	$ 301,180

See accompanying notes to financial statements.

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ZEOLYST INTERNATIONAL
STATEMENTS OF CASH FLOWS
(in thousands)

	Years ended December 31,		
	2020	**2019**	**2018**
Cash flows from operating activities:			
Net income	$ 53,440	$ 104,362	$ 85,708
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	17,397	17,845	15,954
Loss on sale or disposal of capital assets	25	47	101
Gain on sale of investment	(372)	(3,062)	—
Net change in returns allowance	(713)	856	(205)
Working capital changes that provided (used) cash:			
Receivables, including affiliates	47,163	(24,598)	15,663
Inventories	29,623	(34,975)	5,549
Other current assets	(2)	175	(459)
Accounts payable, including affiliates	5,298	844	3,186
Other current liabilities	(811)	(2,275)	1,178
Other long-term assets	—	—	6
Net cash provided by operating activities	151,048	59,219	126,681
Cash flows from investing activities:			
Purchases of property, plant and equipment	(19,105)	(26,388)	(16,356)
Purchase of license	—	—	(4,000)
Proceeds from sale of investment	372	3,062	—
Net cash used in investing activities	(18,733)	(23,326)	(20,356)
Cash flows from financing activities:			
Proceeds from revolver	—	25,000	7,000
Payments on revolver	(15,000)	(10,000)	(7,000)
Payments of cash dividends	(80,000)	(80,000)	(80,000)
Net cash used in financing activities	(95,000)	(65,000)	(80,000)
Net change in cash	37,315	(29,107)	26,325
Cash at beginning of period	10,522	39,629	13,304
Cash at end of period	$ 47,837	$ 10,522	$ 39,629
Non-cash investing activity:			
Capital expenditures acquired on account but unpaid	$ 1,816	$ 6,506	$ 5,461

See accompanying notes to financial statements.

ZEOLYST INTERNATIONAL
NOTES TO FINANCIAL STATEMENTS
(in thousands)

1. Organization:

Zeolyst International, a General Partnership ("Partnership") was formed in 1988 pursuant to a Joint Venture Agreement ("the Agreement") between PQ Corporation ("PQ") and CRI Zeolites Inc. ("CRI"), a Royal Dutch Shell affiliate (collectively, the "Partners"). The percentage interests as of December 31, 2020 and 2019 are as follows:

PQ	50%
CRI	50%

The Partnership was formed pursuant to the Kansas Uniform Partnership Act. The Agreement specifies that the partners share equally in capital contributions. The Agreement states that the profits and losses of the Partnership will be allocated in accordance with the partners' interests in the Partnership. The intent of the Partnership is to develop, manufacture, and sell zeolites and zeolite-containing catalysts.

The Partnership has significant transactions with its partners and related affiliates. Refer to the Related Party Transactions footnote for further disclosure.

2. Partnership Business:

The Partnership manufactures zeolites and zeolytic catalysts that are used by refiners to capture impurities in the processing of petroleum and other chemicals. The filtration ability of zeolites placed into a customer's chemical process generally extends two to three years. As a result, a significant portion of the Partnership's customer base tends to change on an annual basis. A significant percentage of the base materials purchased for the Partnership's manufacturing process is acquired from related parties. In addition, a significant portion of the Partnership's sales is transacted through Criterion Catalyst Company ("Criterion") which is a subsidiary of CRI. The Partnership compensates Criterion with a 2% sales commission on specific sales transactions.

3. Summary of Significant Accounting Policies:

These financial statements have been prepared in accordance with generally accepted accounting principles. These financial statements are accounted for on a historical cost basis and do not reflect the results of any purchase accounting adjustments recorded in the Partners' respective consolidated financial statements.

Cash and Cash Equivalents. Cash and cash equivalents include investments with original terms to maturity of 90 days or less from the time of purchase.

The Partnership corrected its 2019 and 2018 Statement of Cash Flows for a reclassification error of $5,444 and $3,915, respectively. The correction of this error resulted in an increase in the net cash provided by operating activities within Accounts payable, including affiliates and an increase in the net cash used for investing activity within Purchases of property, plant and equipment. The corrected balances conform to the current period presentation.

Trade Accounts Receivables and Allowance for Doubtful Accounts: Trade accounts receivables are recorded at the invoiced amount and do not bear interest. The Partnership maintains allowances for doubtful accounts for estimated losses resulting from the inability of its customers to make required payments. Allowances for doubtful accounts are based on historical experience and known factors regarding specific customers. If the financial condition of the Partnership's customers were to deteriorate, resulting in an impairment of their ability to make payments, additional allowances would be required. Account balances are charged off against the allowance when it is probable the receivable will not be recovered.

Inventories: Inventories are stated at the lower of cost or net realizable value, valued on the first-in, first-out ("FIFO") method. The Partnership establishes reserves for slow-moving and obsolete inventory.

Property, Plant and Equipment: Property, plant, and equipment are carried at cost and include expenditures for new facilities and major renewals and betterments. Interest is capitalized on capital projects as applicable. Maintenance, repairs and minor renewals are charged to expense as incurred. When assets are sold or otherwise disposed of, the related

ZEOLYST INTERNATIONAL
NOTES TO FINANCIAL STATEMENTS
(in thousands)

cost and accumulated depreciation are removed from the accounts, and any resulting gain or loss is included in the results of operations.

Depreciation is generally provided on the straight-line method based on estimated useful lives of the assets, ranging up to 33 years for buildings and improvements and 10 years for machinery and equipment.

We perform an impairment review of property, plant and equipment and other long-lived assets when events and circumstances indicate that those assets may be impaired by comparing the carrying amount of the assets to their fair value. Fair value is determined using quoted market prices where available, or other techniques including discounted cash flows. The Partnership's estimates of future cash flows involve assumptions concerning future operating performance, economic conditions, and technological changes that may affect the future useful lives of the assets.

Leases. The Partnership has an evergreen land lease agreement with a remaining lease term of 31 years as of December 31, 2020. Accounting Standards Codification Topic 842, Leases ("ASC 842"), does not provide definitive guidance as to determining the length of evergreen leasing arrangements. As such, the Partnership estimated the term of the lease agreement to be commensurate with the estimated useful life of the buildings located on the land that is being leased. Upon adoption of ASC 842 on January 1, 2019, the Partnership assigned a 33 year life to the land lease agreement.

When the Company enters into an arrangement, at inception, the Partnership determines if the arrangement contains a lease and whether that lease meets the classification criteria of a finance or operating lease. The Partnership's lease arrangement only contains lease components. The Partnership's lease agreement does not contain any material residual value guarantees or material restrictive covenants.

The Partnership recognizes a right-of-use lease asset and lease liability at the lease commencement date based on the present value of the remaining lease payments over the lease term. The Partnership was unable to readily determine the discount rate implicit in the lease agreement in accordance with the policy. As such, the Partnership utilized its incremental borrowing rate over the relevant lease term, which is the rate of interest that it would have to pay to borrow on a collateralized basis over a similar term an amount equal to the lease payments in a similar economic environment. Short-term leases, which have an initial term of twelve months or less, are not recorded on the Partnership's balance sheet.

Lease expense for the operating lease is recognized on a straight-line basis over the lease term. The amortization expense component of the right-of-use lease asset is included in cost of goods sold and in selling, general and administrative expenses on the consolidated statements of income.

Intangibles and Other Long-term Assets: Other long-term assets primarily include intangible assets, at cost and spare parts. In April 2018, the Partnership made a $4,000 strategic investment to buy down royalty obligations related to certain license agreements. On May 10, 2017, the Partnership made a $6,500 strategic investment for license of materials-based solutions for catalytic and separations processes. The Partnership amortizes these intangible assets over a ten-year period and includes the expense in selling, general and administrative expenses on its statements of operations. These investments are accounted for under the cost method of accounting.

In December 2017, the Partnership wrote down a $3,000 investment in a technology developer and licensor of materials-based solutions for catalytic and separations processes. During the year ended December 31, 2019, the Partnership sold its investment in the common stock of the technology developer and received $372 and $3,062 in proceeds, which was recorded in other (income) expense, net on the Partnership's statements of operations and accumulated earnings in 2020 and 2019, respectively.

Revenue Recognition: In determining the appropriate amount of revenue to be recognized as the Partnership fulfills its obligations under its agreements, the Partnership performs the following steps: (i) identification of the contract with the customer; (ii) determination of whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measurement of the transaction price; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) the Partnership satisfies each performance obligation.

ZEOLYST INTERNATIONAL
NOTES TO FINANCIAL STATEMENTS
(in thousands)

The Partnership identifies a contract when an agreement with a customer creates legally enforceable rights and obligations, which occurs when a contract has been approved by both parties, the parties are committed to perform their respective obligations, each party's rights and payment terms are clearly identified, commercial substance exists and it is probable that the Partnership will collect the consideration to which it is entitled.

The Partnership may offer rebates to customers who have reached a specified volume of optional purchases. The Partnership recognizes rebates given to customers as a reduction of revenue based on an allocation of the cost of honoring rebates earned and claimed to each of the underlying revenue transactions that result in progress by the customer toward earning the rebate. Rebates are recognized at the time revenue is recorded. The Partnership measures the rebate obligation based on the estimated amount of sales that will result in a rebate at the adjusted sales price per the respective sales agreement.

The Partnership recognizes revenue when all essential elements of the sales order have shipped and both title and risk of loss has passed to the customer. Hydrocracking and specialty catalyst orders are typically filled by a number of individual shipments, and those shipments may span the end of a fiscal quarter or year. If a portion of the order has not shipped and it is essential to the functionality of the customer's end use, revenue is recognized when the order is completed. A shipment is considered essential if each individual shipment has no value to the customer on a stand-alone basis and if the remaining shipment is not considered inconsequential and perfunctory.

The Partnership reserves 3% of the Hydrocracking Catalyst sales due to a clause in the contract that allows customers to return up to 5% of the unused products they purchase within 90 days, and based on historical experience. The total sales returns reserve as of December 31, 2020 and 2019 amounted to $677 and $1,389, respectively.

Shipping and Handling Costs: The Partnership classifies costs related to shipping and handling of products shipped to customers as cost of goods sold.

Research and Development: Research and development costs of $13,554, $17,468 and $17,566 for the years ended December 31, 2020, 2019 and 2018, respectively, were expensed as incurred and reported in selling, general and administrative expenses in the accompanying statements of operations.

Foreign Exchange Transactions: The functional currency of the Partnership is the U.S. Dollar. The Partnership enters into transactions that are denominated in other currencies. Gains and losses on foreign currency transactions are included in other (income) / expense, net on the statements of operations. Foreign exchange gain of $41, loss of $967 and gain of $1,726 were recognized for the years ended December 31, 2020, 2019 and 2018, respectively.

Fair Value Measurements: The Partnership's financial assets and liabilities are reflected in the financial statements at amortized cost which approximates fair market value. Fair value is defined as the price at which an asset could be exchanged in a current transaction between willing market participants. A liability's fair value is defined as the amount that would be paid to transfer the liability to a market participant, not the amount that would be paid to settle the liability with a creditor. The Partnership's cash balances approximate fair value due to their short-term maturity.

Use of Estimates: The preparation of the Partnership's financial statements in conformity with generally accepted accounting principles requires management to make estimates that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

4. Recently Issued Accounting Standards:

In February 2016, the FASB issued guidance (with subsequent targeted amendments) that modifies the accounting for leases. Under the new guidance, a lessee will recognize assets and liabilities for most leases (including those classified under existing GAAP as operating leases, which based on current standards are not reflected on the balance sheet), but will recognize expenses similar to current lease accounting. The new guidance also requires companies to provide expanded disclosures regarding leasing arrangements. The guidance is effective for fiscal years beginning after December 15, 2018, with early adoption permitted. The new guidance must be adopted using a modified retrospective transition method. The Partnership can choose to apply the new guidance at the beginning of the earliest period presented in the financial statements, or at the date of adoption, with a cumulative-effect adjustment to the opening balance of retained earnings and no recast of prior period results presented within the Partnership's financial

ZEOLYST INTERNATIONAL
NOTES TO FINANCIAL STATEMENTS
(in thousands)

statements. The Partnership adopted the new guidance as of January 1, 2019 (date of adoption) and has included all relevant disclosures within Note 3 and Note 9 to these financial statements.

In June 2016, the Financial Accounting Standards Board ("FASB") issued guidance that affects loans, trade receivables and any other financial assets that have the contractual right to receive cash. Under the new guidance, an entity is required to recognize expected credit losses rather than incurred losses for financial assets. The new guidance is effective for fiscal years beginning after December 15, 2019 and interim periods within those fiscal years. The Partnership adopted the new guidance effective January 1, 2020, with no material impact to the Partnership's consolidated financial position, results of operations or cash flows.

5. Revenue from Contracts with Customers:

The Partnership applies the five-step revenue recognition model to each contract with its customers. Evidence of a contract between the Partnership and its customers may take the form of a master service agreement ("MSA"), a MSA in combination with an underlying purchase order, a combination of a pricing quote with an underlying purchase order or an individual purchase order received from a customer. The Partnership and certain of its customers enter into MSAs that establish the terms, including prices, under which orders to purchase goods may be placed. In cases where the MSA contains a distinct order for goods or contains an enforceable minimum quantity to be purchased by the customer, the Partnership considers the MSA to be evidence of a contract between the Partnership and its customer as the MSA creates enforceable rights and obligations. In cases where the MSA does not contain a distinct order for goods, the Partnership's contract with a customer is the purchase order issued under the MSA. Customers of the Partnership may also negotiate orders via pricing quotes, which typically detail product pricing, delivery terms and payment information. When a customer procures goods under this method, the Partnership considers the combination of the pricing quote and the purchase order to create enforceable rights and obligations. Absent either a MSA or pricing quote, the Partnership considers an individual purchase order to create enforceable rights and obligations.

The Partnership identifies a performance obligation in a contract for each promised good that is separately identifiable from other promises in the contract and for which the customer can benefit from the good. The Partnership's contracts have a single performance obligation, which is the promise to transfer individual goods to the customer. Single performance obligations are satisfied according to the shipping terms noted within the MSA or purchase order.

As described above, the Partnership's MSAs with its customers may outline prices for individual products or contract provisions. Revenue from product sales are recorded at the sales price, which includes estimates of variable consideration for which reserves are established and which result from discounts, returns or other allowances that are offered within contracts between the Partnership and its customers.

The Partnership recognizes revenues when performance obligations under the terms of a contract with its customer are satisfied, which generally occurs at a point in time by transferring control of a product to the customer. The Partnership determines the point in time when a customer obtains control of a product and the Partnership satisfies the performance obligation by considering factors including when the Partnership has a right to payment for the product, the customer has legal title to the product, the Partnership has transferred possession of the product, the customer has assumed the risks and rewards of ownership of the product and the customer has accepted the product. Revenue is measured as the amount of consideration the Partnership expects to receive in exchange for transferring goods. The Partnership does not have any significant payment terms as payment is received at, or shortly after, the point of sale.

Contract Assets and Liabilities

A contract asset is a right to consideration in exchange for goods that the Partnership has transferred to a customer when that right is conditional on something other than the passage of time. A contract liability exists when the Partnership receives consideration in advance of performance obligations. The Partnership has not recorded any contract assets or contract liabilities on its balance sheet as of December 31, 2020.

ZEOLYST INTERNATIONAL
NOTES TO FINANCIAL STATEMENTS
(in thousands)

Practical Expedients and Accounting Policy Elections

The Partnership has elected to use certain practical expedients and has made certain accounting policy elections as permitted under the new revenue recognition guidance. Certain of the Partnership's contracts with customers are based on an individual purchase order; thus, the duration of these contracts are for one year or less. The Partnership has made an accounting policy election to omit certain disclosures related to remaining performance obligations for contracts which have an initial term of one year or less.

The Partnership uses an output method to recognize revenues related to performance obligations. These performance obligations, as described above, are satisfied within a calendar year. As such, the Partnership has elected to utilize the "as-invoiced" practical expedient, which permits the Partnership to recognize revenue in the amount to which it has a right to invoice the customer, provided that the amount corresponds directly with the value provided by the performance obligation as completed to date.

When the Partnership performs shipping and handling activities after the transfer of control to the customer (e.g. when control transfers prior to delivery), they are considered fulfillment activities as opposed to separate performance obligations, and the Partnership recognizes revenue upon the transfer of control to the customer. Accordingly, the costs associated with these shipping and handling activities are accrued when the related revenue is recognized under the Partnership's policy election. The Partnership expenses incremental costs of obtaining a contract as incurred if the expected amortization period of the asset that the Partnership would have recognized is one year or less. Sales, value added and other taxes the Partnership collects concurrent with revenue producing activities are excluded from revenues.

Disaggregated Revenue

The following table disaggregates the Partnership's sales by end use for the year ended December 31, 2020 and 2019:

	Years ended December 31, 2020	Years ended December 31, 2019
Fuels and Emission Controls	$ 185,722	$ 245,926
Packaging & Engineered Plastics	71,524	94,749
Total	$ 257,246	$ 340,675

6. Accounts Receivable and Allowance for Doubtful Accounts:

The components of accounts receivable are as follows:

	December 31, 2020	December 31, 2019
Trade accounts receivable	$ 34,124	$ 81,287
Allowance	(676)	(1,389)
	$ 33,448	$ 79,898

ZEOLYST INTERNATIONAL
NOTES TO FINANCIAL STATEMENTS
(in thousands)

7. Inventories:

Inventories were classified and valued as follows:

	December 31, 2020	December 31, 2019
Finished products and work in process	$ 92,128	$ 119,271
Raw materials and containers	6,113	8,593
	$ 98,241	$ 127,864

8. Property, Plant and Equipment:

A summary of property, plant and equipment, at cost, and related accumulated depreciation is as follows:

	December 31, 2020	December 31, 2019
Land and buildings	$ 49,831	$ 49,382
Machinery and equipment	176,401	177,804
Construction in progress	51,655	40,579
	277,887	267,765
Less: accumulated depreciation	(135,016)	(123,150)
	$ 142,871	$ 144,615

Depreciation expense was $16,134, $16,582 and $16,260 for the years ended December 31, 2020, 2019, and 2018, respectively. Disposal of assets reduced PP&E and accumulated depreciation by $4,268, $8,356, and $5,166, respectively with a $25, $47, and $101 reduction to earnings for the years ended December 31, 2020, 2019, and 2018, respectively.

9. Leases:

Operating lease costs of $310 are included in cost of goods sold on the consolidated statements of income for the year ended December 31, 2020. The weighted average lease term is 31 years with a weighted average discount rate of 3.25%. Cash payments on operating leases included in operating cash flows was $310 for the year ended December 31, 2020. The current portion of the lease liability is included on the Partnership's balance sheet in other current liabilities. Finance lease costs for the year ended December 31, 2020 is $0.

Maturities of lease liabilities as of December 31, 2020 are as follows:

	Operating Lease
2021	$ 310
2022	310
2023	310
2024	310
2025	310
Thereafter	8,060
Total lease payments	9,610
Less: Interest	(3,642)
Total lease liabilities	$ 5,968

ZEOLYST INTERNATIONAL
NOTES TO FINANCIAL STATEMENTS
(in thousands)

10. Other Current Liabilities:

A summary of other current liabilities is as follows:

	December 31,	
	2020	2019
Accrued royalties and license fees	$ 224	$ 1,968
Accrued commissions	713	1,228
Accrued other	2,137	689
	$ 3,074	$ 3,885

11. Revolver:

On March 2, 2016, the Partnership entered into a five-year revolving line of credit facility of $60,000, which carries an initial interest rate of LIBOR. The agreement expires on March 1, 2021. On May 26. 2020 this agreement was amended and extended to May 25, 2022. The interest rate on the facility is LIBOR plus an interest margin ranging from 0.75% to 1.00% per annum based on the Partnership's debt to EBITDA ratio. A commitment fee is paid to the bank for this agreement. As of December 31, 2020, availability under this agreement was $60,000.

The revolving credit agreement contains certain restrictions and covenants that require the Partnership to maintain a minimum partners' equity, as defined, of $200,000 plus 10% of net income, and a minimum EBITDA of $40,000 on a last twelve month basis measured quarterly. The Partnership was in compliance with all covenants during 2020.

Cash payments for interest were approximately $225, $134 and $101 for the years ended December 31, 2020, 2019 and 2018, respectively.

The fair value of a financial instrument is the amount at which the instrument could be exchanged in a current transaction. The carrying amount of the revolving line of credit approximates fair value because it is a short- term liquidity tool to fund operations, which is drawn down and paid back with cash generated from operations.

12. Partners' Contributions:

In accordance with the Agreement, in the event that cash flow from operations is insufficient to meet the Partnership's requirements, following a majority vote by the Management Committee of the Partnership to request capital from the partners, the partners will provide additional capital to enable the Partnership to meet its obligations. No such contributions were made during the years ended December 31, 2020, 2019, or 2018 as the Partnership had the ability to finance operations through cash flow from operations and borrowings under the Partnership's revolving line of credit facility.

13. Income Taxes:

As a partnership, Zeolyst International is not liable for the payment of taxes on income in the U.S. Net income and losses are allocated to the respective partners on an annual basis, and it is the partners' responsibility to pay income taxes, if any, thereon according to their respective tax positions.

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14. Commitments and Contingent Liabilities:

In 1998, the Partnership entered into a ten year tolling agreement ("the Tolling Agreement") with CRI Belgium, a related party, for the manufacture of specialty extruded products. Effective January 2004, the 1998 Tolling Agreement was replaced by a new evergreen ten-year tolling agreement with CRI Belgium. Both parties can terminate this agreement without cause with twenty-four months' notice. The Partnership pays CRI Belgium a daily charge rate based on the actual days of production. This charge is included in related party cost of goods sold and totaled $15,700, $27,811 and $23,381 for the years ended December 31, 2020, 2019 and 2018, respectively. In addition, for certain capital expenditures, that are beneficial to the Partnership, the parties will mutually agree on future adjustments to the daily charge rates or propose an alternative method of the Partnership's contribution to those costs.

During 2007, the Partnership entered into a License Agreement with a third party to obtain exclusive licensing rights to use the technology in the manufacturing, using and selling of Powder catalyst and Shaped catalyst. The consideration for the licensing rights includes (1) a down payment of $3,200 payable in six annual installments to acquire the product license, and (2) royalty payments at a rate of 10% of the Powder and Shaped Net Sale price during the royalty period. The $3,200 is payable as follows: $500 was paid at the date of the agreement, $500 at first, second, and third anniversaries of the agreement, and $600 at the fourth and fifth anniversary of the agreement. The product license intangible is being amortized over the life of the agreement on a straight-line basis, which is estimated to be 15 years. Amortization expense of $213 was recognized in 2020, 2019 and 2018. The royalty period of 10 years began in 2013, immediately after the date on which the Partnership had cumulatively produced the first 250 metric tons of Powder and Shaped catalyst. If at the end of the Royalty Period, the cumulative of running royalties actually paid by the Partnership is less than $3,000, the Partnership will be obligated to pay the difference between the $3,000 and the actual cumulative running royalty amount. As of December 31, 2020 and 2019 there were $200 and $240, respectively, liabilities recorded related to this agreement.

During 2013 the Partnership entered into a Sublicense Agreement with a third party to obtain patent and know-how licensing rights to make, use, import, and sell the Licensed Process and Products in the Licensed field. The consideration for the licensing rights includes a payment of $1,500 payable in three installments. The $1,500 is payable as follows: $500 will be paid at the date of the first successful sale of commercialized product, or 36 months from execution of the license agreement, $500 after sale of 0.5 million pounds of product, or 48 months from execution of the license agreement, and $500 after sale of 1.0 million pounds of product, or 60 months from execution of the license agreement. In October 2016, the agreement was amended to extend payment terms. The payment of $1,500 is payable as follows: $500 will be paid at the date of the first successful sale of commercialized product, or 69 months from execution of the license agreement, $500 after sale of 0.5 million pounds of product, or 81 months from execution of the license agreement, and $500 after sale of 1.0 million pounds of product, or 93 months from execution of the license agreement. The product license intangible will be amortized prospectively with this change in estimated life. Amortization expense of $0, $0 and $12 was recognized in the years ending December 31, 2020, 2019 and 2018, respectively. This agreement was terminated in 2018 with no payments due to third party. Amortization credit of $0 was recognized in the year ending December 31, 2018.

15. Related Party Transactions:

Policies and Procedures

The Partnership maintains certain policies and procedures for the review, approval, and ratification of related party transactions. All significant relationships and transactions are separately identified by management if they meet the definition of a related party or a related party transaction. Related party transactions include transactions that occurred during the year, in which the Partnership was or will be a participant and which any related person had or will have a direct or indirect material interest. Due to the nature of the Partnership, material related party transactions are identified on a transaction-based approach. The types of transactions identified and reviewed include, but are not limited to, sales of products, purchases of inventory, tolling costs, sales and marketing costs, research and development, and management-related fees. All related party transactions are reviewed, approved and documented by the appropriate level of the Partnership's management in accordance with these policies and procedures.

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PQ

Under the terms of the Agreement, the Partnership leases certain land used in its Kansas City production facilities from PQ. This lease, which has been recorded as an operating lease, provided for rental payments of $310, $305, and $295 for the years ended December 31, 2020, 2019 and 2018, respectively. The rent expense is included in the related party cost of goods sold line item in the accompanying statements of operations. The terms of this lease are evergreen as long as the Partnership agreement is in place. The Partnership purchases certain of its raw materials from PQ and is charged for various manufacturing costs incurred at the PQ Kansas City production facility. The amount of these costs charged to the Partnership during the years ended December 31, 2020, 2019 and 2018 were $16,065, $19,976 and $16,869, respectively. These costs are a component of production costs and are included in the related party cost of goods sold line item in the accompanying statements of operations when the inventory is sold. Certain administrative, marketing, engineering, management-related, and research and development services are provided to the Partnership by PQ. During the years ended December 31, 2020, 2019 and 2018, the Partnership was charged $12,229, $12,871 and $12,727, respectively, for these services. These amounts are included in the related party selling, general and administrative line item in the accompanying statements of operations. In addition, certain product demonstration costs of $1,853, $2,204 and $1,768 during the years ended December 31, 2020, 2019 and 2018, respectively, were recorded in the related party cost of goods sold line of the accompanying statements of operations.

The Partnership recognized sales to PQ of $861, $803, and $645 to a wholly owned subsidiary of PQ in the years ended December 31, 2020, 2019, and 2018, respectively. As of December 14, 2020 PQ divested its ownership of this subsidiary. The Partnership reported activity prior to the date of sale as related party. Subsequent to the date of sale, the Partnership includes this activity as third party.

At December 31, 2020 and 2019, the accounts payable to affiliates consisted of $2,166 and $3,020 due to PQ. Included in trade accounts receivable at December 31, 2020 and 2019 was $0 and $320, respectively due from PQ.

On December 18, 2013, PQ and ZI, entered into a real estate tax abatement agreement with the Unified Government of Wyandotte County and Kansas City, Kansas that will utilize an Industrial Revenue Bond financing structure to achieve a 75% real estate tax abatement on the value of the improvements that will be constructed during the expansion of PQ's and ZI's facilities at the jointly-operated Kansas City, Kansas plant.

During the year ended December 31, 2020, the original IRB financing structure from December 2013 was exhausted. In order to fund future plant expansions, the Company entered into an additional IRB financing structure with similar terms and conditions, which also provides for 75% real estate tax abatements on the value of future improvements. The financing obligations and the industrial bonds receivable have been presented net, as the financing obligations and the industrial bonds meet the criteria for right of setoff conditions under GAAP.

CRI and Royal Dutch Shell Affiliates

Royal Dutch Shell affiliates include CRI, Criterion, Shell Development Company, Shell Research and Technology Center-Amsterdam, CRI Center Marketing Asia Pacific, Shell International Oil Products, CRI Belgium and CRI Technology Services. As described in Note 2, a significant portion of the Partnership's sales are transacted through Criterion. During the years ended December 31, 2020, 2019 and 2018 the Partnership recognized sales transacted through Criterion of $126,677, $178,148 and $103,646, respectively. The Partnership purchases certain of its raw materials and is charged for tolling, customer distribution and packaging costs incurred by Criterion. The amount of these costs charged to the Partnership during the years ended December 31, 2020, 2019 and 2018 were $21,686, $38,988 and $31,383, respectively. These costs are a component of production costs and are included in the related party cost of goods sold line item in the accompanying statements of operations when the inventory is sold. Certain engineering, management-related, broker-related, and research and development services are provided to the Partnership by CRI and Royal Dutch Shell affiliates. During the years ended December 31, 2020, 2019 and 2018, the Partnership was charged $19,975, $24,214 and $22,908, respectively, for these services. These amounts are included in the related party selling, general and administrative line item in the accompanying statements of operations.

At December 31, 2020 and 2019, the accounts payable to affiliates balance consisted of $6,727 and $8,026, respectively, due to CRI and Shell affiliates. Included in trade accounts receivable at December 31, 2020 and 2019 was $9,132 and $50,053, respectively, of receivables related to sales transacted through Criterion, as described above.

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Zeolyst C.V.

Zeolyst C.V. is a limited partnership formed in 1993 pursuant to a joint venture agreement between PQ Zeolites B.V. and CRI for the purpose of the production of Zeolite powders. The Partnership entered into an agreement with Zeolyst C.V. to purchase Zeolite powders manufactured by Zeolyst C.V. Under the terms of the agreement, products manufactured by Zeolyst C.V. are supplied solely to the Partnership. The Partnership has performed a qualitative and quantitative analysis and concluded that for Zeolyst C.V. for which it holds a variable interest but will not absorb a majority of the expected losses or residual returns, the Partnership is not the primary beneficiary and therefore, this VIE was not consolidated in the Partnership's consolidated financial statements. The Partnership has no unfunded commitments or guarantees as a result of its involvement with Zeolyst C.V. The total carrying value of assets and liabilities for Zeolyst C.V was $135,717 and $6,688 as of December 31, 2020 and was $122,726 and $7,068 as of December 31, 2019, respectively. The Partnership currently does not have any exposure to any losses by Zeolyst C.V. The Partnership has purchased $43,104, $50,968 and $49,338 through the sales agreement during the years ended December 31, 2020, 2019 and 2018, respectively. These costs are a component of production costs and are included in the related party cost of goods sold line item in the accompanying statements of operations when the inventory is sold.

At December 31, 2020 and 2019, the accounts payable to affiliates balance consisted of $12,173 and $1,473, respectively, due to Zeolyst C.V.

16. Subsequent Events:

The Partnership has evaluated subsequent events from the balance sheet date through March 17, 2021 and determined there are no further items to disclose.