

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

FORM 10-K

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

For the fiscal year ended December 31, 2018
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 001-12019

QUAKER CHEMICAL CORPORATION

(Exact name of Registrant as specified in its charter)

A Pennsylvania Corporation
(State or other jurisdiction of incorporation or organization)

One Quaker Park, 901 E. Hector Street,
Conshohocken, Pennsylvania
(Address of principal executive offices)

No. 23-0993790
(I.R.S. Employer Identification No.)

19428-2380
(Zip Code)

Registrant's telephone number, including area code: (610) 832-4000

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

Title of each class
Common Stock, \$1.00 par value

Name of each Exchange on which registered
New York Stock Exchange

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

None

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 and post such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of Registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the Registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company or 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

Non-accelerated filer

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 is a shell company (as defined in Rule 12b-2 of the Act). Yes No

State the aggregate market value of the voting and non-voting common equity held by non-affiliates of the Registrant. (The aggregate market value is computed by reference to the last reported sale on the New York Stock Exchange on June 30, 2018): \$2,037,718,906

Indicate the number of shares outstanding of each of the Registrant's classes of common stock as of the latest practicable date: 13,337,601 shares of Common Stock, \$1.00 Par Value, as of January 31, 2019.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Registrant's definitive Proxy Statement relating to the 2019 Annual Meeting of Shareholders are incorporated by reference into Part III.

QUAKER CHEMICAL CORPORATION

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PART I

As used in this Report, the terms “Quaker,” the “Company,” “we” and “our” refer to Quaker Chemical Corporation, its subsidiaries, and associated companies, unless the context otherwise requires.

Item 1. Business.

General Description

Quaker develops, produces, and markets a broad range of formulated chemical specialty products and offers chemical management services (“CMS”) for various heavy industrial and manufacturing applications in a global portfolio throughout its four regions: the North America region, the Europe, Middle East and Africa (“EMEA”) region, the Asia/Pacific region and the South America region. The principal products and services in Quaker’s global portfolio include: (i) rolling lubricants (used by manufacturers of steel in the hot and cold rolling of steel and by manufacturers of aluminum in the hot rolling of aluminum); (ii) machining and grinding compounds (used by metalworking customers in cutting, shaping, and grinding metal parts which require special treatment to enable them to tolerate the manufacturing process, achieve closer tolerance, and improve tool life); (iii) corrosion preventives (used by steel and metalworking customers to protect metal during manufacture, storage, and shipment) (iv) hydraulic fluids (used by steel, metalworking, and other customers to operate hydraulic equipment); (v) specialty greases (used in automotive and aerospace production processes and applications, the manufacturing of steel, and various other applications); (vi) metal finishing compounds (used to prepare metal surfaces for special treatments such as galvanizing and tin plating and to prepare metal for further processing); (vii) forming compounds (used to facilitate the drawing and extrusion of metal products); (viii) chemical milling maskants for the aerospace industry; (ix) temporary and permanent coatings for metal and concrete products; (x) construction products such as flexible sealants and protective coatings, for various applications; (xi) bio-lubricants (that are mainly used in machinery in the forestry and construction industries); (xii) die casting lubricants; and (xiii) programs to provide CMS. The following are the respective contributions to consolidated net sales of each individual product line representing approximately 10% or more of consolidated net sales for any of the past three years:

	2018	2017	2016
Rolling lubricants	16.9 %	17.8 %	19.0 %
Machining and grinding compounds	16.1 %	15.8 %	14.9 %
Corrosion preventives	11.6 %	11.4 %	11.8 %
Hydraulic fluids	11.4 %	11.6 %	12.0 %
Specialty greases	9.7 %	10.0 %	10.1 %

Acquisition Activity

In April 2017, Quaker entered into a share purchase agreement with Gulf Houghton Lubricants, Ltd. (“Gulf”) to purchase the entire issued and outstanding share capital of Houghton International, Inc. (“Houghton”) (herein referred to as “the Combination”). The shares will be bought for aggregate purchase consideration consisting of: (i) \$172.5 million in cash; (ii) a number of shares of common stock, \$1.00 par value per share, of the Company comprising 24.5% of the common stock outstanding upon the closing of the Combination; and (iii) the Company’s assumption of Houghton’s net indebtedness as of the closing of the Combination, which was approximately \$690 million at signing. At closing, the total aggregate purchase consideration is dependent on the Company’s stock price and the level of Houghton’s indebtedness.

The Company secured \$1.15 billion in commitments from Bank of America Merrill Lynch and Deutsche Bank to fund the Combination and to provide additional liquidity, and has since replaced these commitments with a syndicated bank agreement (“the New Credit Facility”) with a group of lenders for \$1.15 billion. The New Credit Facility is contingent upon and will not be effective until the closing of the Combination. During the fourth quarter of 2018, the Company extended the bank commitment for the New Credit Facility through March 15, 2019. The New Credit Facility is comprised of a \$400.0 million multicurrency revolver, a \$600.0 million USD term loan and a \$150.0 million EUR equivalent term loan, each with a five-year term from the date the New Credit Facility becomes effective. The maximum amount available under the New Credit Facility can be increased by \$200.0 million at the Company’s option if the lenders agree and the Company satisfies certain conditions. Borrowings under the New Credit Facility will bear interest at a base rate, LIBOR rate plus a margin, or Euribor rate plus a margin. The Company currently estimates the annual floating rate cost will be in the 3.75% to 4.0% range based on current market interest rates. The New Credit Facility will be subject to certain financial and other covenants, including covenants that the Company’s consolidated net debt to adjusted EBITDA ratio cannot exceed 4.25 to 1 and the Company’s consolidated adjusted EBITDA to interest expense ratio cannot be less than 3.0 to 1. Both the USD and EUR equivalent term loans will have quarterly principal amortization during their respective five-year terms, with 5.0% amortization of the principal balance due in years 1 and 2, 7.5% in year 3, and 10.0% in years 4 and 5, with the remaining principal amounts due at maturity. Until closing, the Company will incur certain interest costs paid to maintain the bank commitment, which began to accrue on September 29, 2017 and bear an interest rate of 0.30% per annum.

The Company received regulatory approval for the Combination from China and Australia in 2017. In addition, at a shareholder meeting held during 2017, the Company’s shareholders overwhelmingly approved the issuance of the new shares of the Company’s common stock at closing of the Combination. The European Commission (“EC”) conditionally approved the Combination in December 2018, including the remedy proposed by Quaker and Houghton. Quaker expects final approval from the EC once the final

purchase agreement is in place between Quaker, Houghton, and the buyer of the divested product lines. Quaker continues to be in productive discussions with the U.S. Federal Trade Commission ("FTC"), although the process is taking longer than anticipated. Given the time lapse since Quaker's initial filing, the FTC requested updated information as part of their approval process late in the fourth quarter of 2018. In addition, the government shutdown in the U.S. during the first quarter of 2019 extended the timeline to receive the final approval. The proposed remedy being discussed with the FTC continues to be consistent with Quaker's previous guidance that the total divested product lines will be approximately 3% of the combined company's revenue. Given current information, the Company estimates that FTC and EC final approval and closing of the combination will occur within the next few months.

Sales Revenue

A substantial portion of Quaker's sales worldwide are made directly through its own employees and its CMS programs with the balance being handled through distributors and agents. Quaker employees visit the plants of customers regularly, some work on site, and through training and experience identify production issues which can be resolved or alleviated either by reformulating Quaker's existing products or by developing new formulations in Quaker's laboratories. Quaker's new business development relies heavily upon its reputation in the markets which it serves, and less on the use of advertising. Also, separate manufacturing facilities of a single customer are generally served by different personnel.

The Company recognizes revenue in an amount which reflects the consideration the Company expects to be entitled to in exchange for goods or services transferred to its customers. To do this, the Company applies a five-step model which requires the Company to: (i) identify the contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when, or as, the Company satisfies a performance obligation.

As part of the Company's CMS, certain third-party product sales to customers are managed by the Company. Where the Company acts as principal, revenues are recognized on a gross reporting basis at the selling price negotiated with its customers. Where the Company acts as an agent, such revenue is recorded using the net reporting method and generally is at the amount of the administrative fee earned by the Company for ordering the goods. The Company transferred third-party products under arrangements resulting in net reporting of \$47.1 million, \$44.5 million and \$43.5 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Competition

The chemical specialty industry comprises a number of companies of similar size as well as companies larger and smaller than Quaker. Quaker cannot readily determine its precise position in every industry it serves. Based on information available to Quaker, however, the Company estimates it holds a leading global position in the market for process fluids to produce sheet steel. The Company also believes it holds significant global positions in the markets for process fluids in portions of the automotive and industrial markets. The offerings of many of our competitors differ from those of Quaker; for example, some offer a broad portfolio of fluids, including general lubricants, while others have more specialized product ranges. All competitors provide different levels of technical services to individual customers. Competition in the industry is based primarily on the ability to provide products that meet the needs of the customer and render technical services and laboratory assistance to the customer, and to a lesser extent on price.

Major Customers and Markets

In 2018, Quaker's five largest customers (each composed of multiple subsidiaries or divisions with semi-autonomous purchasing authority) accounted for approximately 17% of consolidated net sales, with its largest customer accounting for approximately 8% of consolidated net sales. A significant portion of Quaker's revenues are realized from the sale of process fluids and services to manufacturers of steel, automobiles, aircraft, appliances, and durable goods, and, therefore, Quaker is subject to the same business cycles as those experienced by these manufacturers and their customers. Quaker's financial performance is generally correlated to the volume of global production within the industries it serves, rather than discretely related to the financial performance of such industries. Furthermore, steel customers typically have limited manufacturing locations compared to metalworking customers and generally use higher volumes of products at a single location.

Raw Materials

Quaker uses over 1,000 raw materials including mineral oils and derivatives, animal fats and derivatives, vegetable oils and derivatives, ethylene derivatives, solvents, surface active agents, various chemical compounds that act as additives to our base formulations ("additives") and a wide variety of other organic and inorganic compounds. The price of mineral oil and its derivatives can be affected by the price of crude oil and industry refining capacity. Animal fat and vegetable oil prices are impacted by their own unique supply and demand factors, as well as by biodiesel consumption which is also affected by the price of crude oil. In addition, other significant raw material purchases including ethylene derivatives, solvents, surface active agents and additives are also indirectly impacted by trends in mineral oil and derivatives and, therefore, crude oil trends. Accordingly, significant fluctuations in the price of crude oil could have a material impact on the cost of these raw materials. In addition, many of the raw materials used by Quaker are commodity chemicals which can experience significant price volatility. Accordingly, Quaker's earnings could be affected by market changes in raw material prices. Reference is made to the disclosure contained in Item 7A of this Report.

Patents and Trademarks

Quaker has a limited number of patents and patent applications, including patents issued, applied for, or acquired in the United States and in various foreign countries, some of which may prove to be material to its business. However, Quaker relies principally on its proprietary formulae and the application of its skills and experience to meet customer needs. Quaker's products are identified by trademarks that are registered throughout its marketing area.

Research and Development—Laboratories

Quaker's research and development laboratories are directed primarily toward applied research and development since the nature of Quaker's business requires continual modification and improvement of formulations to provide chemical specialties to satisfy customer requirements. Quaker maintains quality control laboratory facilities in each of its manufacturing locations. In addition, Quaker maintains laboratory facilities in Conshohocken, Pennsylvania; Santa Fe Springs, California; Batavia, New York; Aurora, Illinois; Dayton, Ohio; Uithoorn, The Netherlands; Navarra, Spain; Barcelona, Spain; Rio de Janeiro, Brazil; Qingpu, China; and Kolkata, India that, in addition to quality control, are devoted primarily to applied research and development. If problems are encountered which cannot be resolved by local laboratories, such problems are generally referred to the laboratory staff in Conshohocken, Aurora, Santa Fe Springs, Uithoorn or Qingpu.

Research and development costs are expensed as incurred. Research and development expenses during the years ended December 31, 2018, 2017 and 2016 were \$24.5 million, \$23.9 million and \$22.5 million, respectively.

Regulatory Matters

In order to facilitate compliance with applicable federal, state, and local statutes and regulations relating to occupational health and safety and protection of the environment, the Company has an ongoing program of site assessment for the purpose of identifying capital expenditures or other actions that may be necessary to comply with such requirements. The program includes periodic inspections of each facility by Quaker and/or independent experts, as well as ongoing inspections and training by on-site personnel. Such inspections address operational matters, record keeping, reporting requirements and capital improvements. Capital expenditures directed solely or primarily to regulatory compliance amounted to approximately \$1.5 million, \$1.6 million and \$0.9 million during the years ended December 31, 2018, 2017 and 2016, respectively.

Number of Employees

On December 31, 2018, Quaker had approximately 2,160 full-time employees globally of whom approximately 650 were employed by the parent company and its U.S. subsidiaries, and approximately 1,510 were employed by its non-U.S. subsidiaries. Associated companies of Quaker (in which it owns 50% or less and has significant influence) employed approximately 70 people on December 31, 2018.

Company Segmentation

The Company's reportable operating segments reflect the structure of the Company's internal organization, the method by which the Company's resources are allocated and the manner by which the Company assesses and manages its performance. The Company's reportable operating segments are organized by geography as follows: North America, EMEA, Asia/Pacific and South America. See Note 5 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report and is incorporated herein by this reference.

Non-U.S. Activities

Since significant revenues and earnings are generated by non-U.S. operations, Quaker's financial results are affected by currency fluctuations, particularly between the U.S. dollar and the euro, the Brazilian real, the Mexican peso, the Chinese renminbi and the Indian rupee, and the impact of those currency fluctuations on the underlying economies. Incorporated by reference is (i) the foreign exchange risk information contained in Item 7A of this Report, (ii) the geographic information in Note 5 of Notes to Consolidated Financial Statements included in Item 8 of this Report and (iii) information regarding risks attendant to foreign operations included in Item 1A of this Report.

Quaker on the Internet

Financial results, news and other information about Quaker can be accessed from the Company's website at <https://www.quakerchem.com>. This site includes important information on the Company's locations, products and services, financial reports, news releases and career opportunities. The Company's periodic and current reports on Forms 10-K, 10-Q, 8-K, and other filings, including exhibits and supplemental schedules filed therewith, and amendments to those reports, filed with the Securities and Exchange Commission ("SEC") are available on the Company's website, free of charge, as soon as reasonably practicable after they are electronically filed with or furnished to the SEC. Information contained on, or that may be accessed through, the Company's website is not incorporated by reference in this Report and, accordingly, you should not consider that information part of this Report.

(Cautionary Statements under the Private Securities Litigation Reform Act of 1995)

Certain information included in this Report and other materials filed or to be filed by Quaker with the SEC (as well as information included in oral statements or other written statements made or to be made by us) contain or may contain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. These statements can be identified by the fact that they do not relate strictly to historical or current facts. We have based these forward-looking statements on our current expectations about future events. These forward-looking statements include statements with respect to our beliefs, plans, objectives, goals, expectations, anticipations, intentions, financial condition, results of operations, future performance, and business, including:

- statements relating to our business strategy;
- our current and future results and plans; and
- statements that include the words “may,” “could,” “should,” “would,” “believe,” “expect,” “anticipate,” “estimate,” “intend,” “plan” or similar expressions.

Such statements include information relating to current and future business activities, operational matters, capital spending, and financing sources. From time to time, forward-looking statements are also included in Quaker’s other periodic reports on Forms 10-K, 10-Q and 8-K, press releases, and other materials released to, or statements made to, the public.

Any or all of the forward-looking statements in this Report, in Quaker’s Annual Report to Shareholders for 2018 and in any other public statements we make may turn out to be wrong. This can occur as a result of inaccurate assumptions or as a consequence of known or unknown risks and uncertainties. Many factors discussed in this Report will be important in determining our future performance. Consequently, actual results may differ materially from those that might be anticipated from our forward-looking statements.

We undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise. However, any further disclosures made on related subjects in Quaker’s subsequent reports on Forms 10-K, 10-Q, 8-K and other related filings should be consulted. Our forward-looking statements are subject to risks, uncertainties and assumptions about us and our operations that are subject to change based on various important factors, some of which are beyond our control. A major risk is that the demand for the Company’s products and services is largely derived from the demand for our customers’ products, which subjects the Company to uncertainties related to downturns in a customer’s business and unanticipated customer production shutdowns. Other major risks and uncertainties include, but are not limited to, significant increases in raw material costs, customer financial stability, worldwide economic and political conditions, foreign currency fluctuations, significant changes in applicable tax rates and regulations, future terrorist attacks and other acts of violence, each of which is discussed in greater detail in Item 1A of this Report. Other factors could also adversely affect us, including factors related to the previously announced pending Houghton combination and the risk that the transaction may not receive regulatory approval or that regulatory approval may include conditions or other terms not acceptable to us. Furthermore, the Company is subject to the same business cycles as those experienced by steel, automobile, aircraft, appliance, and durable goods manufacturers. These risks, uncertainties, and possible inaccurate assumptions relevant to our business could cause our actual results to differ materially from expected and historical results. Other factors beyond those discussed in this Report, could also adversely affect us including, but not limited to the following related to the Combination:

- the risk that a required regulatory approval will not be obtained or is subject to conditions that are not anticipated or acceptable to us;
- the potential that regulatory authorities may require that we make divestitures in connection with the Combination of a greater amount than we anticipated, which would result in a smaller than anticipated combined business;
- the risk that a closing condition to the Combination may not be satisfied in a timely manner;
- risks associated with the financing of the Combination;
- the occurrence of any event change or other circumstance that could give rise to a material change in the share purchase agreement;
- potential adverse effects on Quaker Chemical’s business, properties or operations caused by the implementation of the Combination;
- Quaker Chemical’s ability to promptly, efficiently and effectively integrate the operations of Houghton and Quaker Chemical;
- risks related to each company’s distraction from ongoing business operations due to the Combination; and,
- the outcome of any legal proceedings that may be instituted against the companies related to the Combination.

Therefore, we caution you not to place undue reliance on our forward-looking statements. For more information regarding these risks and uncertainties as well as certain additional risks that we face, refer to the Risk Factors section, which appears in Item 1A of this report, as well as the proxy statement the Company filed on July 31, 2017 and in our quarterly and other reports filed from time to time with the SEC. This discussion is provided as permitted by the Private Securities Litigation Reform Act of 1995.

Item 1A. Risk Factors.

Changes to the industries and markets that Quaker serves could have a material adverse effect on the Company's liquidity, financial position and results of operations.

The business environment in which the Company operates remains uncertain. The Company is subject to the same business cycles as those experienced by steel, automobile, aircraft, appliance, and durable goods manufacturers. A major risk is that demand for the Company's products and services is largely derived from the global demand for its customers' products, which subjects the Company to uncertainties related to downturns in our customers' business and unanticipated shutdowns or curtailments of our customers' production. The Company has limited ability to adjust its cost level contemporaneously with changes in sales and gross profit. Thus, a significant downturn in sales or gross profit due to reductions in global production within the industries the Company serves, and/or weak end-user markets could have a material adverse effect on the Company's liquidity, financial position, and results of operations.

Changes in competition in the industries and markets Quaker serves could have a material adverse effect on the Company's liquidity, financial position, and results of operations.

The specialty chemical industry comprises a number of companies of similar size as well as companies larger and smaller than Quaker. It is estimated that Quaker holds a leading and significant global position in the markets for process fluids to produce sheet steel, and significant global positions in portions of the automotive and industrial markets. These industries are highly competitive, and a number of companies with significant financial resources and/or customer relationships compete with us to provide similar products and services. Some competitors may be positioned to offer more favorable pricing and service terms, potentially resulting in reduced profitability and/or a loss of market share for us. In addition, several competitors could potentially consolidate their businesses to gain scale to better position their product offerings, which could have a negative impact on our profitability and market share. Competition in the industry has primarily been based on the ability to provide products that meet the needs of the customer and render technical services and laboratory assistance to the customer and, to a lesser extent, on price. Factors critical to the Company's business include successfully differentiating the Company's offerings from its competition, operating efficiently and profitably as a globally integrated Company, and increasing market share and customer penetration through internally developed business programs and strategic acquisitions. If the Company is unsuccessful with differentiation, it could have a material adverse effect on the Company's liquidity, financial position, and results of operations.

Our business depends on attracting and retaining qualified management and other key personnel.

The unanticipated departure of any key member of our management team or other key personnel could have an adverse effect on our business. Given the relative size of the Company and the breadth of its global operations, there are a limited number of qualified personnel to assume the responsibilities of our management or other key employees. In addition, because of the specialized and technical nature of our business, our future performance is dependent on our ability to attract, develop and retain qualified management, commercial, technical, and other key personnel. Competition for such personnel is intense, and we may be unable to continue to attract or retain such personnel. In an effort to mitigate such risks, the Company utilizes retention bonuses, offers competitive pay and maintains continuous succession planning, but there can be no assurance that these mitigating factors will be adequate to attract or retain qualified management or other key personnel.

Inability to obtain sufficient price increases or contract concessions to offset increases in the costs of raw materials could result in a loss of sales, gross profit, and/or market share and could have a material adverse effect on the Company's liquidity, financial position and results of operations. Conversely, an inability to implement timely price decreases to compensate for changes in raw material costs could also result in a loss of sales, gross profit, and/or market share and could have a material adverse effect on the Company's liquidity, financial position and results of operations.

Quaker uses over 1,000 raw materials, including mineral oils and derivatives, animal fats and derivatives, vegetable oils and derivatives, ethylene derivatives, solvents, surface active agents, various chemical compounds that act as additives to our base formulations and a wide variety of other organic and inorganic compounds. The price of mineral oils and its derivatives can be affected by the price of crude oil and industry refining capacity. Animal fat and vegetable oil prices are impacted by their own unique supply and demand factors, as well as by biodiesel consumption which is also affected by the price of crude oil. In addition, other significant raw material purchases including ethylene derivatives, solvents, surface active agents and additives are also indirectly impacted by trends in mineral oil and derivatives and, therefore, crude oil trends. Accordingly, significant fluctuations in the price of crude oil could have a material impact on the cost of these raw materials. In addition, many of the raw materials used by Quaker are commodity chemicals, which can experience significant price volatility.

Although the Company has been successful in the past in recovering a substantial amount of raw material cost increases while retaining its customers, there can be no assurance that the Company can continue to recover higher raw material costs or retain customers in the future. Conversely, the Company has been successful in maintaining acceptable levels of margin in periods of raw material price declines, but there can be no assurance that the Company can continue to maintain its margins through appropriate price and contract concessions while retaining its customers in the future. A significant change in margin or the loss of customers due to pricing actions could result in a material adverse effect on the Company's liquidity, financial position, and results of operations.

Lack of availability of raw materials and issues associated with sourcing from certain single suppliers and some suppliers in volatile economic environments could have a material adverse effect on the Company's liquidity, financial position and results of operations.

The chemical specialty industry can experience tightness of supply for certain raw materials. In addition, in some cases, we source from a single supplier and/or suppliers in economies that have experienced instability. Any significant disruption in supply could affect our ability to obtain raw materials, or increase the cost of such raw materials, which could have a material adverse effect on our liquidity, financial position and results of operations. In addition, certain raw materials that the Company uses are subject to various regulatory laws, and a change in the ability to legally use such raw materials may impact Quaker's liquidity, financial position and results of operations. Quaker seeks to mitigate these risks through developing multiple sources of supply for key raw materials.

Loss of a significant manufacturing facility could have a material adverse effect on the Company's liquidity, financial position and results of operations.

Quaker has multiple manufacturing facilities throughout the world. In certain countries, such as Brazil and China, there is only one such facility. If one of the Company's facilities is damaged to such an extent that production is halted for an extended period, the Company may not be able to timely supply its customers. This could result in a loss of sales over an extended period, or permanently. The Company does take steps to mitigate against this risk, including business continuity and contingency planning and procuring property and casualty insurance (including business interruption insurance). Nevertheless, the loss of sales in any one region over an extended period of time could have a material adverse effect on Quaker's liquidity, financial position and results of operations.

Loss of a significant customer, bankruptcy of a major customer, or the closure of a customer site could have a material adverse effect on the Company's liquidity, financial position and results of operations.

During 2018, the Company's five largest customers (each composed of multiple subsidiaries or divisions with semi-autonomous purchasing authority) together accounted for approximately 17% of the Company's consolidated net sales, with the largest customer accounting for approximately 8% of our consolidated net sales. The loss of a significant customer could have a material adverse effect on Quaker's liquidity, financial position and results of operation.

Also, a significant portion of Quaker's revenues is derived from sales to customers in the steel and automotive industries; including some of our larger customers, where bankruptcies have occurred in the past and where companies have experienced past financial difficulties. As part of a bankruptcy process, the Company's pre-petition receivables may not be collected, and customer manufacturing sites may be closed or contracts voided. The bankruptcy of a major customer could have a material adverse effect on the Company's liquidity, financial position and results of operations. Also, steel customers typically have limited manufacturing locations compared to metalworking customers and generally use higher volumes of products at a single location. The loss or closure of one or more steel mills or other major sites of a significant customer could have a material adverse effect on Quaker's business.

Impairment evaluations of goodwill, intangible assets, investments or other long-lived assets could result in a reduction in our recorded asset values, which could have a material adverse effect on the Company's liquidity, financial position and results of operation.

The Company performs reviews of goodwill and indefinite-lived intangible assets on an annual basis, or more frequently if triggering events indicate a possible impairment. The Company tests goodwill at the reporting unit level by comparing the carrying value of the net assets of the reporting unit, including goodwill, to the unit's fair value. Similarly, the Company tests indefinite-lived intangible assets by comparing the fair value of the assets to their carrying values. If the carrying values of goodwill or indefinite-lived intangible assets exceed their fair value, the goodwill or indefinite-lived intangible assets may be considered impaired. In addition, the Company will perform a review of a definite-lived intangible asset or other long-lived asset when changes in circumstances or events indicate a possible impairment. An estimate of undiscounted cash flows produced by the asset or appropriate group of assets is compared with its carrying value to determine if an impairment charge is warranted. If any impairment or related charge is warranted, then Quaker's liquidity, financial position and results of operations could be materially affected.

Changes in tax laws could result in fluctuations in our effective tax rate and could have a material effect on the Company's liquidity, financial position and results of operation.

The Company is subject to income taxes in the U.S. and various foreign jurisdictions; with our U.S. and international tax liabilities being subject to the allocation of income among these different jurisdictions. Our effective tax rate is derived from a combination of local tax rates and tax attributes, applicable to the Company, in the various countries, states and other jurisdictions in which we operate. Our effective tax rate and respective tax liabilities could, therefore, be materially affected by changes in the mix of earnings in countries with differing statutory tax rates, changes in tax rates, expiration or lapses of tax credits or incentives, changes in uncertain tax positions, changes in the valuation of deferred tax assets and liabilities, or changes in tax laws, including matters such as transfer pricing. One such example of the potential impact from changes in tax law is the impact of the U.S. Tax Cuts and Jobs Act ("U.S. Tax Reform"). The Company has made reasonable interpretations and assumptions with regard to various uncertainties and ambiguities in the application of certain provisions of U.S. Tax Reform. It is possible that the Internal Revenue Service ("IRS") could issue subsequent guidance or take positions on audit that differ from the Company's interpretations and assumptions. Incorporated by reference is further information regarding U.S. Tax Reform in Note 9 of Notes to Consolidated Financial Statements included in Item 8 of this Report. In addition, we are regularly under audit by tax authorities, and the final decisions of such audits could

materially affect our current tax estimates and tax positions. Any of these factors, or similar tax-related risks, could cause the Company to experience an effective tax rate and tax-related payments that significantly differ from previous periods and current or future expectations, which could have a material effect on Quaker's liquidity, financial position and results of operations.

Failure to comply with any material provision of our primary credit facility or other debt agreements could have a material adverse effect on our liquidity, financial position and results of operations.

The Company's current primary credit facility ("the Credit Facility") is a \$300.0 million syndicated multicurrency credit agreement with a group of lenders which matures in March 2020. The amount available under this facility can be increased to \$400.0 million at the Company's option if the lenders agree and the Company satisfies certain conditions. The Credit Facility provides the availability of revolving credit borrowings and bears interest at either a base rate or LIBOR plus a margin based on the Company's consolidated leverage ratio.

The Credit Facility contains covenants that impose certain restrictions, including limitations on investments, acquisitions and liens, as well as default provisions customary for facilities of its type. While these covenants and restrictions are not currently considered to be overly restrictive, they could become more difficult to comply with as our business or financial conditions change. In addition, deterioration in the Company's results of operations or financial position could significantly increase borrowing costs.

Quaker is exposed to market rate risk for changes in interest rates due to the variable interest rate applied to the Company's borrowings under the Credit Facility and certain other, similar, but smaller credit facilities. Accordingly, if interest rates rise significantly, the cost of debt to Quaker will increase, perhaps significantly, depending on the extent and timing of Quaker's borrowings under its credit facilities. As of December 31, 2018, the Company had \$24.0 million in outstanding borrowings under its credit facilities. Incorporated by reference is the interest rate risk information contained in Item 7A of this Report.

Pending and future legal proceedings, including environmental matters, could have a material adverse effect on the Company's liquidity, financial position, and results of operations, as well as its reputation in the markets it serves.

The Company is routinely party to proceedings, cases, and requests for information from, and negotiations with, various claimants and federal and state agencies relating to various matters, including environmental matters. An adverse result in one or more pending or on-going matters or any potential future matter of a similar nature could materially and adversely affect the Company's liquidity, financial position, and results of operations, as well as its reputation in the markets it serves. In addition, non-compliance with applicable laws and regulations, particularly the U.S. Foreign Corrupt Practices Act, the U.K. Bribery Act and other similar laws and regulations, could result in a negative impact to the Company's reputation, potential fines or ongoing monitoring, which could also have a material adverse effect on the Company's liquidity, financial position, and results of operations. Incorporated herein by reference is the information concerning pending asbestos-related litigation against an inactive subsidiary, amounts accrued associated with certain environmental, non-capital remediation costs and other potential commitments or contingencies highlighted in Note 25 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

Failure to comply with the complex global regulatory environment in which the Company operates could have an adverse impact on the Company's reputation and/or a material adverse effect on the Company's liquidity, financial position and results of operations.

Changes in the regulatory environment in which the Company operates, particularly, but not limited to, the United States, Mexico, Brazil, China, India and the European Union, could lead to heightened regulatory scrutiny, could adversely impact our ability to continue selling certain products in our U.S. or foreign markets, and/or could increase the cost of doing business. While the Company mitigates these risks through various actions, including receiving Responsible Care certification, on-going employee training and administering a comprehensive environmental, health and safety program, there is no guarantee these actions will prevent all potential regulatory compliance issues. For instance, failure to comply with the European Union's Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) or other similar laws and regulations, could result in the inability to sell certain non-compliant products, fines, ongoing monitoring and other future business consequences, which could have a material adverse effect on the Company's liquidity, financial position and results of operations.

Potential product, service or other related liability claims could have a material adverse effect on the Company's liquidity, financial position and results of operations.

The development, manufacture and sale of specialty chemical products and other related services involve inherent exposure to potential product liability claims, service level claims, product recalls and related adverse publicity. Any of these potential product or service risks could also result in substantial and unexpected expenditures and affect customer confidence in our products and services, which could have a material adverse effect on the Company's liquidity, financial position and results of operations. Although the Company maintains product and other general liability insurance, there can be no assurance that the types or levels of coverage maintained are adequate to cover these potential risks. In addition, the Company may not be able to continue to maintain its existing insurance coverage or obtain comparable or additional insurance coverage at a reasonable cost, if at all, in the event a significant product or service claim arises.

We may be unable to adequately protect our proprietary rights and trade brands, which may limit the Company's ability to compete in its markets and could adversely affect the Company's liquidity, financial position and results of operations.

Quaker has a limited number of patents and patent applications, including patents issued, applied for, or acquired in the United States and in various foreign countries, some of which may prove to be material to its business. However, Quaker relies principally on its proprietary formulae and the application of its skills and experience to meet customer needs. Also, Quaker's products are identified by trademarks that are registered throughout its marketing area. Despite our efforts to protect such proprietary information through patent and trademark filings, through the use of appropriate trade secret protections and through the inability of certain products to be effectively replicated by others, it is possible that competitors or other unauthorized third parties may obtain, copy, use or disclose our technologies, products, and processes. In addition, the laws and/or judicial systems of foreign countries in which we design, manufacture, market and sell our products may afford little or no effective protection of our proprietary technology or trade brands. Also, security over our global information technology structure is subject to increasing risks associated with cyber-crime and other related cyber-security threats. These potential risks to our proprietary information and trade brands could subject the Company to increased competition and negatively impact our liquidity, financial position and results of operations.

We might not be able to timely develop, manufacture and gain market acceptance of new and enhanced products required to maintain or expand our business, which could adversely affect the Company's liquidity, financial position and results of operations.

We believe that our continued success depends on our ability to continuously develop and manufacture new products and product enhancements on a timely and cost-effective basis in response to customers' demands for higher performance process chemicals and other product offerings. Our competitors may develop new products or enhancements to their products that offer performance, features and lower prices that may render our products less competitive or obsolete, and, as a consequence, we may lose business and/or significant market share. The development and commercialization of new products requires significant expenditures over an extended period of time, and some products that we seek to develop may never become profitable. In addition, we may not be able to develop and introduce products incorporating new technologies in a timely manner that will satisfy our customers' future needs or achieve market acceptance.

An inability to appropriately capitalize on growth, including organic growth, leveraging prior acquisitions, or integrating future acquisitions, could adversely affect the Company's liquidity, financial position and results of operations.

The Company continues to grow organically through increased end-market growth, incremental market share gains, and extending previously acquired technologies through its existing channels. Such growth is dependent on prevailing market conditions and the Company's ability to execute over time. In addition, the Company has completed multiple acquisitions over the past several years and expects to seek acquisitions to grow its business in the future. The success of the Company's growth depends on its ability to successfully integrate these acquisitions, including, but not limited to its ability to do the following:

- successfully execute the integration or consolidation of the acquired or additional business into existing processes and operations;
- develop or modify financial reporting, information systems and other related financial tools to ensure overall financial integrity and adequacy of internal control procedures;
- identify and take advantage of potential synergies, including cost reduction opportunities, while maintaining legacy business and other related attributes; and
- further penetrate existing, and expand into new, markets with the product capabilities acquired in acquisitions.

The Company may fail to derive significant benefits or may not create the appropriate infrastructure to support such additional growth from organic or acquired businesses, which could have a material adverse effect on Quaker's liquidity, financial position and results of operations.

The scope of our international operations subjects the Company to risks that could adversely affect the Company's liquidity, financial position and results of operations, including, but not limited to, risks from currency fluctuations, changes in trade regulations, political and economic instability, and complex local tax environments.

Since significant revenues and earnings are generated by non-U.S. operations, Quaker's financial results are affected by currency fluctuations, particularly between the U.S. dollar and the euro, the Brazilian real, the Mexican peso, the Chinese renminbi, and the Indian rupee, and the impact of those currency fluctuations on the underlying economies. During the past three years, sales by non-U.S. subsidiaries accounted for approximately 60% of our consolidated net sales. Generally, all of the Company's non-U.S. subsidiaries use their local currency as their functional currency. The Company generally does not use financial instruments that expose it to significant risk involving foreign currency transactions; however, the relative size of its non-U.S. activities has a significant impact on reported operating results and the Company's net assets. Therefore, as exchange rates change, Quaker's results can be materially affected. Incorporated by reference is the foreign exchange risk information contained in Item 7A of this Report and the geographic information in Note 5 of Notes to Consolidated Financial Statements included in Item 8 of this Report.

Also, the Company occasionally sources inventory in a different country than that of the intended sale. This practice can give rise to foreign exchange risk. The Company mitigates this risk through local sourcing of raw materials in the majority of its locations.

As of December 31, 2018, the Company held approximately \$99.5 million of its total cash and cash equivalents in its non-U.S. subsidiaries. The Company can access this cash without restriction, however, it is subject to possible risks including currency fluctuations and tax-related impacts.

Additional risks associated with the Company's international operations include, but are not limited to: instability in economic conditions in certain countries; changes in a country's political situation; trade protection measures; longer customer payment cycles; different payment practices such as the use of bankers acceptance drafts or other similar credit instruments; licensing and other legal requirements; the difficulties of staffing and managing dispersed international operations; less protective foreign intellectual property laws; legal systems that may be less developed and predictable than those in the United States; and complex and dynamic local tax regulations. Also, the Company could be adversely impacted by changes in the perceived or actual global economic climate, such as global or regional recessions, uncertainty resulting from the U.K.'s potential exit from the European Union, existing or future trade restrictions or imposed tariffs like those between the U.S. and China implemented during 2018, and heightened U.S. or global stock market volatility and potential changes in access to capital markets.

The pending Houghton Combination subjects the Company to new and heightened risks which could adversely affect the Company's liquidity, financial position and results of operations.

As previously described in the Business section, in Item 1 of this report, in April 2017, Quaker entered into a share purchase agreement with Gulf to purchase the entire issued and outstanding share capital of Houghton. In connection with the Combination, the Company secured \$1.15 billion in commitments and has since replaced these commitments with the New Credit Facility with a group of lenders for \$1.15 billion. There are several areas of risk related to the pending Houghton Combination which could negatively impact the Company's liquidity, financial position and results of operations, including, but not limited to:

- issuance of the Company's common stock as a part of the consideration paid for the Combination, equal to 24.5% of the common stock outstanding after the issuance, will have a dilutive effect on the existing holders of the Company's common stock and may result in a decline in the market price of the Company's common stock;
- the percentage of outstanding shares of the Company's common stock to be issued in connection with the Combination is not adjustable based on the market price of the Company's common stock and, as a result, the Combination consideration at closing may have greater or less implied value than at the time the share purchase agreement was signed;
- issuance of the Company's common stock to Gulf as part of the consideration paid for the Combination will provide Gulf with an almost 24.5% ownership interest in the Company, and Gulf will also have the contractual ability to nominate certain directors of the Company, which may enable Gulf to influence the direction of the Company's business, or could prevent the Company's other shareholders from determining significant corporate decisions without Gulf participation;
- the Combination will present the Company with integration and consolidation risks, and the Company may be unable to profitably operate the consolidated company, or may fail to achieve expected cost synergies or expand the Company's business into new markets and geographies;
- failure to retain key employees could diminish the benefits of the Combination and subject the Company to further integration risks;
- the Company has and will continue to incur significant transaction and integration costs in connection with the Combination, including, but not limited to, fees paid to legal, financial, tax and accounting advisors and filing fees;
- the potential for regulatory authorities to require divestitures in connection with the Combination of a greater amount than the Company anticipated, which would result in a smaller than anticipated combined business;
- the Company may fail to complete the Combination if required conditions, many of which are outside of the Company's control, are not satisfied, including various customary closing conditions as well as potential divestitures required in connection with obtaining regulatory approval;
- the Combination did not close by the one-year anniversary of the share purchase agreement, so the Company and Gulf each have the right to terminate the share purchase agreement. If the Combination is not completed, then the price of the Company's common stock could decline, and the Company's future business and operations could be harmed, including failing to realize the expected benefits of the Combination, incurring costs which must be paid even if the Combination is not completed, and exposing the Company to potential litigation relating to failure to complete the Combination;
- the Company will significantly increase its debt obligations upon closing of the Combination and execution of the New Credit Facility which requires the Company to comply with certain provisions and covenants, and, while the Company does not currently anticipate the New Credit Facility provisions and covenants to be overly restrictive, they could become more difficult to comply with as business or financial conditions change;
- the Company will be subject to interest rate risk due to the variable interest rates within the New Credit Facility and, if interest rates rise significantly, these interest costs will increase, perhaps significantly; and
- if the Combination has not closed by March 15, 2019, the New Credit Facility will expire; however, the Company expects to negotiate an extension of the New Credit Facility, if necessary, in a timely manner, but could be subject to additional fees or conditions as a result.

Incorporated herein by reference is information concerning the Combination included in Note 2 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report. For more information regarding certain of the risks and uncertainties related to the Combination, you should refer to the proxy statement the Company filed on July 31, 2017 with the SEC.

Disruption of critical information systems or material breaches in the security of our systems could adversely affect our business and our customer relationships, and subject us to fines or other regulatory actions.

Quaker relies on information technology systems to process, transmit, and store electronic information in our day-to-day operations. The Company also relies on its technology infrastructure, among other functions, to interact with customers and suppliers, fulfill orders and bill, collect and make payments, ship products, provide support to customers, fulfill contractual obligations and otherwise conduct business. Our information technology systems are subject to potential disruptions, including significant network or power outages, cyberattacks, computer viruses, other malicious codes, and/or unauthorized access attempts, any of which, if successful, could result in data leaks or otherwise compromise our confidential or proprietary information and disrupt our operations. Cybersecurity incidents, such as these, are becoming more sophisticated and frequent, and there can be no assurance that our protective measures will prevent security breaches that could have a significant impact on our business, reputation and financial results. Also, new laws and regulations governing data privacy and the unauthorized disclosure of confidential information, including the European Union General Data Protection Regulation and recent California legislation, pose increasingly complex compliance challenges and could potentially elevate our costs over time, as a failure to comply with such laws could subject us to fines or penalties issued by a regulatory agency. Therefore, a failure to monitor, maintain or protect our information technology systems and data integrity effectively or to anticipate, plan for and recover from significant disruptions to these systems could have a material adverse effect on our business, results of operations or financial condition.

Terrorist attacks, other acts of violence or war, natural disasters or other uncommon global events may affect the markets in which we operate and our profitability, which could adversely affect the Company's liquidity, financial position and results of operations.

Terrorist attacks, other acts of violence or war, natural disasters or other uncommon global events may negatively affect our operations. There can be no assurance that there will not be terrorist attacks against the U.S. or other locations where we do business. Also, other uncommon global events such as earthquakes, hurricanes, fires and tsunamis cannot be predicted. Terrorist attacks, other acts of violence or armed conflicts, and natural disasters may directly impact our physical facilities and/or those of our suppliers or customers. Additional terrorist attacks or natural disasters may disrupt the global insurance and reinsurance industries with the result that we may not be able to obtain insurance at historical terms and levels, if at all, for all of our facilities. Furthermore, any of these events may make travel and the transportation of our supplies and products more difficult and more expensive, and ultimately affect the sales of our products. The consequences of terrorist attacks, other acts of violence or armed conflicts, natural disasters or other uncommon global events can be unpredictable, and we may not be able to foresee or effectively plan for these events, resulting in a material adverse effect on our business, results of operations or financial condition.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Quaker's corporate headquarters and a laboratory facility are located in its North America segment's Conshohocken, Pennsylvania location. The Company's other principal facilities in its North America segment are located in Aurora, Illinois; Detroit, Michigan; Middletown, Ohio; Santa Fe Springs, California; Batavia, New York; Dayton, Ohio; Waterloo, Ontario; and Monterrey, N.L., Mexico. The Company's EMEA segment has principal facilities in Uithoorn, The Netherlands; Barcelona, Spain; Navarra, Spain; Karlshamn, Sweden; and Tradate, Italy. The Company's Asia/Pacific segment operates out of its principal facilities located in Qingpu, China; Kolkata, India; and Sydney, Australia, while its South America segment operates out of its principal facility in Rio de Janeiro, Brazil. With the exception of the Conshohocken, Santa Fe Springs, Aurora, Karlshamn, and Sydney sites, which are leased, the remaining principal facilities are owned by Quaker and, as of December 31, 2018, were mortgage free. Quaker also leases sales, laboratory, manufacturing, and warehouse facilities in other locations.

Quaker's principal facilities (excluding Conshohocken) consist of various manufacturing, administrative, warehouse, and laboratory buildings. Substantially all of the buildings (including Conshohocken) are of fire-resistant construction and are equipped with sprinkler systems. The Company has a program to identify needed capital improvements that are implemented as management considers necessary or desirable. Most locations have various numbers of raw material storage tanks, ranging from 2 to 58, at each location with a capacity ranging from 1,000 to 82,000 gallons, and processing or manufacturing vessels ranging in capacity from 8 to 16,000 gallons.

Each of Quaker's non-U.S. associated companies (in which it owns a 50% or less interest and has significant influence) owns or leases a plant and/or sales facilities in various locations, with the exception of Primex, Ltd.

Item 3. Legal Proceedings.

The Company is a party to proceedings, cases, and requests for information from, and negotiations with, various claimants and Federal and state agencies relating to various matters, including environmental matters. For information concerning pending asbestos-related litigation against an inactive subsidiary, certain environmental non-capital remediation costs and other legal-related matters, reference is made to Note 25 of Notes to Consolidated Financial Statements, included in Item 8 of this Report, which is incorporated herein by this reference. The Company is a party to other litigation which management currently believes will not have a material adverse effect on the Company's results of operations, cash flow or financial condition.

Item 4. Mine Safety Disclosures.

Not Applicable

Item 4(a). Executive Officers of the Registrant.

Set forth below is information regarding the executive officers of the Company, each of whom (with the exception of Ms. Hall) have been employed by the Company for more than five years, including the respective positions and offices with the Company held by each over the respective periods indicated. Each of the executive officers, with the exception of Mr. Hostetter, is elected annually to a one-year term. Mr. Hostetter is considered an executive officer in his capacity as principal accounting officer for purposes of this Item.

Name, Age, and Present**Business Experience During the Past Five**

Position with the Company	Years and Period Served as an Officer
Michael F. Barry, 60 Chairman of the Board, Chief Executive Officer and President and Director	Mr. Barry, who has been employed by the Company since 1998, has served as Chairman of the Board since May 2009, in addition to his position as Chief Executive Officer and President held since October 2008. He served as interim Chief Financial Officer from October through November 2015. He served as Senior Vice President and Managing Director – North America from January 2006 to October 2008. He served as Senior Vice President and Global Industry Leader – Metalworking and Coatings from July through December 2005. He served as Vice President and Global Industry Leader – Industrial Metalworking and Coatings from January 2004 through June 2005 and Vice President and Chief Financial Officer from 1998 to August 2004.
Joseph A. Berquist, 47 Vice President and Managing Director – North America	Mr. Berquist, who has been employed by the Company since 1997, has served as Vice President and Managing Director – North America since April 2010.
Mary Dean Hall, 61 Vice President, Chief Financial Officer and Treasurer	Ms. Hall has served as Vice President, Chief Financial Officer and Treasurer since she joined the Company in November 2015. Prior to joining the Company, Ms. Hall served as the Vice President and Treasurer of Eastman Chemical Company from April 2009 until October 2015. Prior to that role, she held various senior-level financial positions of increasing responsibility with Eastman from 1995 through 2009, including Treasurer, Vice President and Controller, and Vice President, Finance.
Shane W. Hostetter, 37 Global Controller and Principal Accounting Officer	Mr. Hostetter, who has been employed by the Company since July 2011, has served as Global Controller and Principal Accounting Officer since September 2014. He served as Corporate Controller and Principal Accounting Officer from May 2013 to August 2014.
Dieter Laininger, 55 Vice President and Managing Director – Asia / Pacific and South America and Global Leader – Primary Metals	Mr. Laininger, who has been employed by the Company since 1991, has served as Vice President and Managing Director – Asia / Pacific since April 1, 2018, in addition to his role as Vice President and Managing Director - South America, since January 2013, and his position as Vice President and Global Leader – Primary Metals, to which he was appointed in June 2011.
Joseph F. Matrange, 76 Vice President and Global Leader – Coatings	Mr. Matrange, who has been employed by the Company since 2000, has served as Vice President and Global Leader – Coatings since October 2008. He has also served as President of AC Products, Inc., a California subsidiary, since October 2000, and Epmar Corporation, a California subsidiary, since April 2002.
Jan F. Nieman, 57 Vice President and Global Leader – Grease and Fluid Power, Global Strategy and Marketing	Mr. Nieman, who has been employed by the Company since 1992, has served as Vice President – Global Strategy and Marketing since May 2014, in addition to his position as Global Leader – Grease and Fluid Power since August 2013. He also served as Global Leader – Mining from August 2013 through April 2014.

Name, Age, and Present

Business Experience During the Past Five

Position with the Company

Years and Period Served as an Officer

Wilbert Platzer, 57
Vice President Global Operations,
EHS and Procurement

Mr. Platzer, who has been employed by the Company since 1995, has served as Vice President Global Operations, EHS and Procurement since April 1, 2018. He served as Vice President and Managing Director – EMEA from January 2006 through March 2018.

Adrian Steeples, 58
Vice President and Managing
Director – EMEA

Mr. Steeples, who has been employed by the Company since 2010, has served as Vice President and Managing Director – EMEA since April 1, 2018. He served as Vice President and Managing Director - Asia/Pacific from July 2013 through March 2018.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities.

The Company's common stock is listed on the New York Stock Exchange ("NYSE") under the trading symbol KWR. The following table sets forth, for the calendar quarters during the two most recent fiscal years, the range of high and low sales prices for the common stock as reported on the NYSE composite tape (amounts rounded to the nearest penny), and the quarterly dividends declared and paid:

	Price Range				Dividends Declared		Dividends Paid	
	2018		2017		2018	2017	2018	2017
	High	Low	High	Low				
First quarter	\$ 164.10	\$ 139.26	\$ 138.95	\$ 124.92	\$ 0.355	\$ 0.345	\$ 0.355	\$ 0.345
Second quarter	163.64	137.95	153.90	127.70	0.37	0.355	0.355	0.345
Third quarter	203.78	152.40	154.38	129.98	0.37	0.355	0.37	0.355
Fourth quarter	217.15	165.40	165.93	146.48	0.37	0.355	0.37	0.355

There are no restrictions that currently limit the Company's ability to pay dividends or that the Company believes are likely to materially limit the payment of future dividends. If a default under the Company's Credit Facility were to occur and continue, the payment of dividends would be prohibited. Reference is made to the "Liquidity and Capital Resources" disclosure contained in Item 7 of this Report.

As of January 17, 2019, there were 789 shareholders of record of the Company's common stock, its only outstanding class of equity securities. As of January 17, 2019, 13,337,049 shares of Quaker common stock were issued, outstanding and entitled to one vote per share.

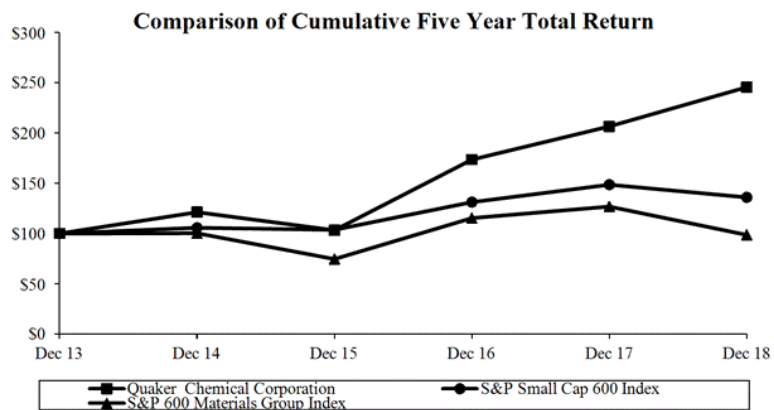
Reference is made to the information in Item 12 of this Report under the caption "Equity Compensation Plans," which is incorporated herein by this reference.

The following table sets forth information concerning shares of the Company's common stock acquired by the Company during the fourth quarter of the period covered by this report:

Period	<u>Issuer Purchases of Equity Securities</u>			
	(a) Total Number of Shares Purchased (1)	(b) Average Price Paid Per Share (2)	(c) Total Number of Shares Purchased as part of Publicly Announced Plans or Programs	(d) Approximate Dollar Value of Shares that May Yet be Purchased Under the Plans or Programs (3)
October 1 - October 31	16	\$ 190.54	—	\$ 86,865,026
November 1 - November 30	1,131	\$ 203.45	—	\$ 86,865,026
December 1 - December 31	—	\$ —	—	\$ 86,865,026
Total	1,147	\$ 203.27	—	\$ 86,865,026

- (1) All of these shares were acquired from employees upon their surrender of Quaker shares in payment of the exercise price of employee stock options exercised or for the payment of taxes upon exercise of employee stock options or the vesting of restricted stock.
- (2) The price paid for shares acquired from employees pursuant to employee benefit and share-based compensation plans, is, in each case, based on the closing price of the Company's common stock on the date of exercise or vesting, as specified by the plan pursuant to which the applicable option or restricted stock was granted.
- (3) On May 6, 2015, the Board of Directors of the Company approved, and the Company announced, a new share repurchase program, pursuant to which the Company is authorized to repurchase up to \$100,000,000 of Quaker Chemical Corporation common stock (the "2015 Share Repurchase Program"). The 2015 Share Repurchase Program, which replaced the Company's other share repurchase plans then in effect, has no expiration date. There were no shares acquired by the Company pursuant to the 2015 Share Repurchase Program during the quarter ended December 31, 2018.

The following graph compares the cumulative total return (assuming reinvestment of dividends) from December 31, 2013 to December 31, 2018 for (i) Quaker's common stock, (ii) the S&P SmallCap 600 Index (the "SmallCap Index"), and (iii) the S&P 600 Materials Group Index (the "Materials Group Index"). The graph assumes the investment of \$100 on December 31, 2013 in each of Quaker's common stock, the stocks comprising the SmallCap Index and the stocks comprising the Materials Group Index.



	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018
Quaker	\$ 100.00	\$ 121.21	\$ 103.27	\$ 173.53	\$ 206.55	\$ 245.59
SmallCap Index	100.00	105.76	103.67	131.20	148.56	135.96
Materials Group Index	100.00	100.30	74.58	115.37	126.81	98.59

Item 6. Selected Financial Data.

The following table sets forth selected financial data for the Company and its consolidated subsidiaries:

(in thousands, except dividends and per share data):	Year Ended December 31,				
	2018 (1)(6)	2017 (2)	2016 (3)	2015 (4)	2014 (5)
Summary of Operations:					
Net sales	\$ 867,520	\$ 820,082	\$ 746,665	\$ 737,555	\$ 765,860
Income before taxes and equity in net income of associated companies	83,098	60,668	84,009	70,230	78,293
Net income attributable to Quaker Chemical Corporation	59,473	20,278	61,403	51,180	56,492
Per share:					
Net income attributable to Quaker Chemical Corporation Common Shareholders - basic	\$ 4.46	\$ 1.53	\$ 4.64	\$ 3.84	\$ 4.27
Net income attributable to Quaker Chemical Corporation Common Shareholders - diluted	\$ 4.45	\$ 1.52	\$ 4.63	\$ 3.84	\$ 4.26
Dividends declared	1.465	1.41	1.355	1.26	1.15
Dividends paid	1.45	1.40	1.33	1.24	1.10
Financial Position					
Working capital (6)	\$ 267,040	\$ 251,843	\$ 249,057	\$ 233,517	\$ 218,982
Total assets (6)	709,665	722,126	692,028	680,727	664,376
Long-term debt	35,934	61,068	65,769	81,439	75,328
Total equity (6)	436,369	409,618	412,606	381,243	365,135

Notes to the above table:

- Net income attributable to Quaker Chemical Corporation in 2018 includes equity income from a captive insurance company of \$1.0 million after tax, a \$0.4 million foreign currency transaction gain related to the liquidation of an inactive legal entity and a \$0.1 million insurance insolvency recovery, offset by \$19.5 million of combination-related expenses, including approximately \$3.5 million of interest costs to maintain committed capital and a \$0.6 million gain on the sale of a held-for-sale asset, \$5.8 million of tax charges related to the U.S. Tax Cuts and Jobs Act, \$0.4 million of currency conversion impacts related to hyper-inflationary accounting at the Company's affiliate in Argentina, and \$0.3 million of after-tax currency conversion impacts related to hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela. See the Non-GAAP Measures section, which appears in Item 7 of this report.
- Net income attributable to Quaker Chemical Corporation in 2017 includes equity income from a captive insurance company of \$2.5 million after tax and a \$0.6 million insurance insolvency recovery, offset by \$30.8 million of combination-related expenses, including \$0.9 million of interest costs to maintain committed capital, \$22.2 million of tax charges related to the U.S. Tax Cuts and Jobs Act, a \$1.9 million U.S. pension plan settlement charge, \$0.3 million of charges related to cost streamlining initiatives in the Company's corporate group, a \$0.1 million loss on disposal of a held-for-sale asset, and \$0.4 million of after-tax currency conversion impacts related to hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela. See the Non-GAAP Measures section, which appears in Item 7 of this report.
- Net income attributable to Quaker Chemical Corporation in 2016 includes equity income from a captive insurance company of \$1.7 million after tax and a \$0.4 million credit related to the Company's 2015 global restructuring program, offset by \$1.5 million of combination-related expenses and \$0.1 million of after-tax currency conversion impacts related to hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela. See the Non-GAAP Measures section, which appears in Item 7 of this report.
- Net income attributable to Quaker Chemical Corporation in 2015 includes equity income from a captive insurance company of \$2.1 million after tax, offset by \$2.8 million of after-tax currency conversion impacts related to hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela, \$2.8 million of Verkol transaction-related expenses, \$0.2 million of charges related to cost streamlining initiatives in the Company's South America segment, \$0.3 million of charges related to certain U.S. customer bankruptcies and \$6.8 million of charges related to the Company's 2015 global restructuring program.
- Net income attributable to Quaker Chemical Corporation in 2014 includes equity income from a captive insurance company of \$2.4 million after tax, offset by \$0.3 million of after-tax currency conversion impacts related to hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela, \$1.2 million of charges related to cost streamlining initiatives in the Company's EMEA and South America segments, a \$0.9 million charge related to a U.K. pension plan amendment and \$0.8 million of charges related to certain customer bankruptcies.

(6) During the first quarter of 2018, the Company adopted the provisions of the Financial Accounting Standards Board's revenue recognition guidance, as required, electing to use a modified retrospective adoption approach applied to those contracts which were not completed as of January 1, 2018. Comparative information has not been restated and continues to be reported under the accounting standards in effect for those periods. As a result of the Company's adoption using the modified retrospective adoption approach, the Company recorded a cumulative effect of an accounting change as of January 1, 2018, to adjust the Company's estimate of variable consideration relating to customers' expected rights to return product. This adjustment resulted in a decrease to Working capital of \$1.0 million, an increase to Total assets of \$0.2 million and a decrease to Total equity of \$0.8 million, recorded during the first quarter of 2018. There were no other impacts recorded as a result of adopting the revenue recognition guidance. See Note 3 of Notes to Consolidated Financial Statements, which appears in Item 8 of this report.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.

Executive Summary

Quaker Chemical Corporation is a leading global provider of process fluids, chemical specialties, and technical expertise to a wide range of industries, including steel, aluminum, automotive, mining, aerospace, tube and pipe, cans, and others. For 100 years, Quaker has helped customers around the world achieve production efficiency, improve product quality, and lower costs through a combination of innovative technology, process knowledge, and customized services. Headquartered in Conshohocken, Pennsylvania USA, Quaker serves businesses worldwide with a network of dedicated and experienced professionals whose mission is to make a difference.

The Company delivered strong operating results in 2018 on solid net sales growth coupled with a higher gross margin year-over-year. Specifically, net sales increased 6% to \$867.5 million in 2018 compared to \$820.1 million in 2017 driven by volume growth of 3% and increases in selling price and product mix of 2%. This increase in net sales, coupled with a higher gross margin of 36.0% in 2018 compared to 35.5% in 2017, drove a 7% increase in the Company's gross profit year-over-year. The increase in the Company's current year gross margin was primarily driven by pricing initiatives and the mix of certain products sold which more than offset increases in raw material costs year-over-year. In addition, current year operating income as a percentage of sales benefited from the Company's continued discipline in managing its selling, general and administrative expenses ("SG&A").

The Company's 2018 net income and earnings per diluted share were \$59.5 million and \$4.45, respectively, compared to \$20.3 million and \$1.52 per diluted share, respectively, in 2017. During 2018, the Company incurred \$19.5 million or \$1.21 per diluted share of total costs associated with the Company's previously announced combination with Houghton International, Inc. ("Houghton") (herein referred to as "the Combination"), compared to \$30.8 million or \$1.90 per diluted share of total costs related to the Combination during 2017. The Company's 2018 and 2017 results were also impacted by the Company's initial fourth quarter of 2017 estimate of \$22.2 million or \$1.67 per diluted share and subsequent 2018 adjustments of \$5.8 million or \$0.43 per diluted share related to the 2017 U.S. Tax Cuts and Jobs Act ("U.S. Tax Reform"). Excluding expenses related to the Combination, charges related to U.S. Tax Reform and other non-core items in each period, the Company's strong current year operating performance coupled with a lower 2018 effective tax rate resulted in a 21% increase in its non-GAAP earnings per diluted share to \$6.04 in 2018 compared to \$5.01 in 2017. The Company's 2018 adjusted EBITDA was a record \$125.6 million, an increase of 9% compared to \$115.2 million in the prior year. These results were achieved despite a negative impact from foreign exchange on current year earnings of approximately \$0.08 per diluted share, or 1%. See the Non-GAAP Measures section of this Item below, as well as other items discussed in the Company's Consolidated Operations Review in the Operations section of this Item, below.

From a regional perspective, the Company's 2018 operating performance was highlighted by year-over-year operating earnings increases in its three largest regions. The Company's North America and Asia/Pacific regions had particularly strong operating earnings in 2018, increasing 14% and 16% year-over-year, respectively. North America's results were driven by net sales growth of 8% on higher volumes and selling price and product mix while Asia/Pacific had net sales growth of 7% primarily on higher volumes, with both regions also benefiting from higher gross margins year-over-year. The Company's Europe, Middle East and Africa ("EMEA") region benefited from the positive impact of foreign currency translation year-over-year and increases in selling price and product mix, as well as a higher gross margin in 2018 compared to 2017, which offset a decline in volume year-over-year primarily driven by an atypically high sales pattern in EMEA during the first quarter of 2017, a decrease in volume associated with a specific piece of business which the Company stopped selling during the middle of 2018 primarily due to its limited profitability, and a slowing of orders at the end of 2018 due to market challenges. The Company's smallest region, South America, had a relatively consistent level of operating earnings year-over-year as strong net sales growth from increases in volume and selling price and product mix as well as lower SG&A were offset by the significant negative impact of foreign currency translation. See the Reportable Operating Segments Review, in the Operations section of this Item, below.

The Company generated net operating cash flow of \$78.8 million in 2018 compared to \$64.8 million in 2017. The increase in net operating cash flow year-over-year was primarily due to the Company's solid current year operating performance. The key drivers of the Company's operating cash flow and overall liquidity are further discussed in the Company's Liquidity and Capital Resources section of this Item, below.

Overall, the Company is pleased to have delivered another strong year. While operating conditions were mixed throughout all of its regions and foreign exchange became a headwind in the second half of 2018, the Company's continued market share gains drove solid volume and net sales growth that exceeded the Company's estimate of year-over-year growth in its end markets. In addition, the

benefit of current year pricing initiatives and the mix of products sold continued to outpace higher raw material costs and contributed to the Company's gross margin improvement compared to the prior year. These increases in the Company's operating performance coupled with a continued discipline in managing SG&A drove a 9% increase in adjusted EBITDA and, coupled with a lower effective tax rate, resulted in a 21% increase in non-GAAP earnings per diluted share compared to 2017.

Looking forward to 2019, the Company estimates that it will receive final regulatory approval and close the Combination within the next few months. As previously disclosed, the Combination will approximately double the Company's annual sales and adjusted EBITDA, not including estimated synergies, which are expected to meet or exceed \$45 million once fully achieved by the third year. Depending upon the exact timing of the Combination's close, the Company anticipates it will realize a portion of the Houghton sales and adjusted EBITDA in 2019.

For Quaker's current business, the Company expects some headwinds particularly in the early months of 2019, such as the impacts from a strong U.S. dollar and some base market challenges due to global economic uncertainty. However, the Company also expects continued market share gains to help offset these headwinds. Overall, the Company remains confident in its future given its modestly growing global end markets and continued market share gains and expects 2019 to be another good year for the current Quaker business.

Critical Accounting Policies and Estimates

Quaker's discussion and analysis of its financial condition and results of operations are based upon Quaker's consolidated financial statements which have been prepared in accordance with accounting principles generally accepted in the United States ("U.S. GAAP"). The preparation of these financial statements requires Quaker to make estimates and judgments that affect the reported amounts of assets, liabilities, revenues and expenses, and related disclosure of contingent assets and liabilities. On an ongoing basis, Quaker evaluates its estimates, including those related to customer sales incentives, product returns, bad debts, inventories, property, plant and equipment, investments, goodwill, intangible assets, income taxes, business combinations, restructuring, incentive compensation plans (including equity-based compensation), pensions and other postretirement benefits, contingencies and litigation. Quaker bases its estimates on historical experience and on various other assumptions that are believed to be reasonable under such 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. However, actual results may differ from these estimates under different assumptions or conditions.

Quaker believes the following critical accounting policies describe the more significant judgments and estimates used in the preparation of its consolidated financial statements:

1. Accounts receivable and inventory exposures — Quaker establishes allowances for doubtful accounts for estimated losses resulting from the inability of its customers to make required payments. If the financial condition of Quaker's customers were to deteriorate, resulting in an impairment of their ability to make payments, additional allowances may be required. As part of its terms of trade, Quaker may custom manufacture products for certain large customers and/or may ship products on a consignment basis. Further, a significant portion of Quaker's revenues is derived from sales to customers in industries where companies have experienced past financial difficulties. If a customer bankruptcy occurs, then Quaker must judge the amount of proceeds, if any, that may ultimately be received through the bankruptcy or liquidation process. These matters may increase the Company's exposure, should a bankruptcy occur, and may require a write down or a disposal of certain inventory. Reserves for customers filing for bankruptcy protection are established based on a percentage of the amount outstanding at the bankruptcy filing date. However, initially establishing this reserve and the amount thereto is dependent on the Company's evaluation of likely proceeds to be received from the bankruptcy process, which could result in the Company recognizing minimal or no reserve at the date of bankruptcy. Large and/or financially distressed customers are generally reserved for on a specific review basis, while a general reserve is maintained for other customers based on historical experience. The Company's consolidated allowance for doubtful accounts was \$5.2 million and \$5.5 million as of December 31, 2018 and 2017, respectively. The Company recorded expense to increase its provision for doubtful accounts by \$0.5 million, \$0.1 million and \$1.4 million for the years ended December 31, 2018, 2017 and 2016, respectively. Changing the amount of expense recorded to the Company's provisions by 10% would have increased or decreased the Company's pre-tax earnings by \$0.1 million, less than \$0.1 million and \$0.1 million for the years ended December 31, 2018, 2017 and 2016, respectively. See Note 12 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

2. Environmental and litigation reserves — Accruals for environmental and litigation matters are recorded when it is probable that a liability has been incurred and the amount of the liability can be reasonably estimated. Accrued liabilities are exclusive of claims against third parties and are not discounted. Environmental costs and remediation costs are capitalized if the costs extend the life, increase the capacity or improve the safety or efficiency of the property from the date acquired or constructed, and/or mitigate or prevent contamination in the future. Estimates for accruals for environmental matters are based on a variety of potential technical solutions, governmental regulations and other factors, and are subject to a wide range of potential costs for remediation and other actions. A considerable amount of judgment is required in determining the most likely estimate within the range of total costs, and the factors determining this judgment may vary over time. Similarly, reserves for litigation and similar matters are based on a range of potential outcomes and require considerable judgment in determining the most probable outcome. If no amount within the range is considered more probable than any other amount, the Company accrues the lowest amount in that range in accordance with generally accepted accounting principles. See Note 25 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

3. Realizability of equity investments — Quaker holds equity investments in various foreign companies, where it has the ability to influence, but not control, the operations of the entity and its future results. Quaker would record an impairment charge to an investment if it believed a decline in value that was other than temporary occurred. Adverse changes in market conditions, poor operating results of underlying investments, devaluation of foreign currencies or other events or circumstances could result in losses or an inability to recover the carrying value of the investments, potentially leading to an impairment charge in the future. The carrying amount of the Company's equity investments as of December 31, 2018 was \$21.3 million, which included three investments: \$14.7 million for a 33% interest in Primex, Ltd. (Barbados); \$6.2 million for a 50% interest in Nippon Quaker Chemical, Ltd. (Japan); and \$0.4 million for a 50% interest in Kelko Quaker Chemical, S.A. (Panama), respectively. The Company also has a 50-50 joint venture in a Venezuelan affiliate, Kelko Quaker Chemical, S.A. ("Kelko Venezuela"). Due to heightened foreign exchange controls, current economic circumstances and other restrictions in Venezuela, during the third quarter of 2018 the Company concluded that it no longer had significant influence over this affiliate. Prior to this determination, the Company historically accounted for this affiliate under the equity method. As of December 31, 2018, the Company has no remaining carrying value for its investment in Kelko Venezuela. See Note 16 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

4. Tax exposures, uncertain tax positions and valuation allowances — Quaker records expenses and liabilities for taxes based on estimates of amounts that will be determined as deductible in tax returns filed in various jurisdictions. The filed tax returns are subject to audit, which often occur several years subsequent to the date of the financial statements. Disputes or disagreements may arise during audits over the timing or validity of certain items or deductions, which may not be resolved for extended periods of time. Quaker also evaluates for uncertain tax positions on all income tax positions taken on previously filed tax returns or expected to be taken on a future tax return, which prescribes the recognition threshold and measurement attributes for financial statement recognition and measurement of tax positions taken or expected to be taken on a tax return and, also, whether the benefits of tax positions are probable or if they will be more likely than not sustained upon audit based upon the technical merits of the tax position. For tax positions that are determined to be more likely than not sustained upon audit, the Company would recognize the largest amount of benefit that is greater than 50% likely of being realized upon ultimate settlement in the financial statements. For tax positions that are not determined to be more likely than not sustained upon audit, the Company would not recognize any portion of the benefit in its financial statements. In addition, the Company's continuing practice is to recognize interest and/or penalties related to income tax matters in income tax expense. Also, the Company would net its liability for unrecognized tax benefits against deferred tax assets related to net operating losses or other tax credit carryforwards if the uncertain tax position were settled for the presumed amount at the balance sheet date.

Quaker also records valuation allowances when necessary to reduce its deferred tax assets to the amount that is more likely than not to be realized. While Quaker has considered future taxable income and employs prudent and feasible tax planning strategies in assessing the need for a valuation allowance, in the event Quaker were to determine that it would be able to realize its deferred tax assets in the future in excess of its net recorded amount, an adjustment to the deferred tax asset would increase income in the period such determination was made. Likewise, should Quaker determine that it would not be able to realize all or part of its net deferred tax assets in the future, an adjustment to the deferred tax asset would be charged to income in the period such determination was made. Both determinations could have a material impact on the Company's financial statements.

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as U.S. Tax Reform. Among other provisions, U.S. Tax Reform reduced the U.S. corporate income tax rate from 35% to 21% effective January 1, 2018, implemented a new system of taxation for non-U.S. earnings which eliminates U.S. federal income taxes on dividends from certain foreign subsidiaries, and imposed a one-time tax on the deemed repatriation of undistributed earnings of certain foreign subsidiaries. The Securities and Exchange Commission issued guidance on accounting for the tax effects of U.S. Tax Reform and provided a one-year measurement period for companies to complete the accounting. Based on reasonable interpretations and assumptions with regard to various uncertainties and ambiguities in the application of certain provisions of U.S. Tax Reform and subsequent to numerous temporary regulations, notices, and other formal guidance published by the Internal Revenue Service ("IRS"), U.S. Treasury, and various state taxing authorities in 2018, the Company completed its accounting for the tax effects of U.S. Tax Reform as of December 22, 2018. It is possible that the IRS could issue subsequent guidance or take positions on audit that differ from the Company's interpretations and assumptions. The Company currently believes that subsequent guidance, or interpretations made by the IRS will not be materially different from the Company's application of the provisions of U.S. Tax Reform and would not have a material adverse effect on the Company's tax liabilities, earnings, or financial condition.

Pursuant to U.S. Tax Reform, specifically the one-time tax on deemed repatriation of foreign earnings, the Company has recorded a charge for U.S. income tax on its undistributed earnings of non-U.S. subsidiaries; however, the Company could be subject to other taxes, such as withholding taxes and dividend distribution taxes if these undistributed earnings are ultimately remitted to the U.S. As a result of the impacts from U.S. Tax reform, the Company re-evaluated its global cash strategy, resulting in a change to its indefinite reinvestment assertion attributable to a portion of its undistributed foreign earnings, and recognized a deferred tax liability and corresponding deferred tax expense of \$7.9 million as of December 31, 2018, which primarily represents the Company's estimate of the non-U.S. taxes the Company will incur to ultimately remit these earnings to the U.S. It is the Company's current intention to reinvest its additional undistributed earnings of non-U.S. subsidiaries to support working capital needs and certain other growth initiatives. The amount of such undistributed earnings at December 31, 2018 was approximately \$210.0 million. Any tax liability which might result from ultimate remittance of these earnings is expected to be substantially offset by foreign tax credits (subject to certain limitations). It is currently impractical to estimate any such incremental tax expense. See Note 9 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

5. Goodwill and other intangible assets — The Company accounts for business combinations under the acquisition method of accounting. This method requires the recording of acquired assets, including separately identifiable intangible assets, at their acquisition date fair values. Any excess of the purchase price over the estimated fair value of the identifiable net assets acquired is recorded as goodwill. The determination of the estimated fair value of assets acquired requires management’s judgment and often involves the use of significant estimates and assumptions, including assumptions with respect to future cash inflows and outflows, discount rates, royalty rates, asset lives and market multiples, among other items. When necessary, the Company consults with external advisors to help determine fair value. For non-observable market values, the Company may determine fair value using acceptable valuation principles, including the excess earnings, relief from royalty, lost profit or cost methods.

The Company amortizes definite-lived intangible assets on a straight-line basis over their useful lives. Goodwill and intangible assets which have indefinite lives are not amortized and are required to be assessed at least annually for impairment. The Company compares the assets’ fair value to their carrying value, primarily based on future discounted cash flows, in order to determine if an impairment charge is warranted. The estimates of future cash flows involve considerable management judgment and are based upon assumptions about expected future operating performance. Assumptions used in these forecasts are consistent with internal planning, but the actual cash flows could differ from management’s estimates due to changes in business conditions, operating performance, and economic conditions. The Company’s assumed weighted average cost of capital (“WACC”) and estimated future net operating profit after tax (“NOPAT”) by reporting unit are particularly important in determining estimated future cash flows.

The Company completed its annual impairment assessment during the fourth quarter of 2018, and no impairment charge was warranted. Furthermore, the estimated fair value of each of the Company’s reporting units substantially exceeded its carrying value, with none of the Company’s reporting units at risk for failing step one of the goodwill impairment test. The Company’s consolidated goodwill and indefinite-lived intangible assets at December 31, 2018 and 2017 were \$84.4 million and \$87.1 million, respectively. The Company used a WACC of approximately 9%, and at October 1, 2018, this assumption would have had to increase by more than 229% before any of the Company’s reporting units would fail step one of the impairment analysis. Further, at October 1, 2018, the Company’s estimate of future NOPAT by reporting unit would have had to decrease by more than 75% before any of the Company’s reporting units would be considered potentially impaired. See Note 15 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

6. Postretirement benefits — The Company provides certain defined benefit pension and other postretirement benefits to current employees, former employees and retirees. Independent actuaries, in accordance with U.S. GAAP, perform the required valuations to determine benefit expense and, if necessary, non-cash charges to equity for additional minimum pension liabilities. Critical assumptions used in the actuarial valuation include the weighted average discount rate, including the use of a split discount rate (spot-rate approach) for the U.S. plans and certain foreign plans, rates of increase in compensation levels, and expected long-term rates of return on assets. If different assumptions were used, additional pension expense or charges to equity might be required.

The Company’s primary noncontributory U.S. pension plan (the “U.S. Pension Plan”) has a November 30 year-end and a measurement date of December 31. In the fourth quarter of 2018, the Company began the process of terminating the U.S. Pension Plan after receiving Board of Director approval to do so. The Company expects to record a pension settlement charge at plan termination. This settlement charge will include the immediate recognition into expense of the unrecognized losses within accumulated other comprehensive loss (“AOCI”) on the balance sheet as of the plan termination date. The Company does not have a current estimate for this future settlement charge, however, the gross AOCI related to this plan was approximately \$19 million as of December 31, 2018. The Company currently estimates that the U.S. Pension Plan termination will be completed during 2020. See Note 20 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

The following table highlights the potential impact on the Company’s pre-tax earnings due to changes in assumptions with respect to the Company’s pension plans, based on assets and liabilities as of December 31, 2018:

<i>(dollars in millions)</i>	1/2 Percentage Point Increase			1/2 Percentage Point Decrease		
	Foreign	U.S.	Total	Foreign	U.S.	Total
Discount rate (1)	\$ 0.5	\$ 0.1	\$ 0.6	\$ (0.6)	\$ (0.1)	\$ (0.7)
Expected rate of return on plan assets (2)	0.4	0.3	0.7	(0.5)	(0.3)	(0.8)

(1) The weighted-average discount rate used to determine net periodic benefit costs for the year ended December 31, 2018 was 2.33% for Foreign plans and 3.44% for U.S. plans.

(2) The weighted average expected rate of return on plan assets used to determine net periodic benefit costs for the year ended December 31, 2018 was 2.22% for Foreign plans and 5.95% for U.S. plans.

7. Restructuring and other related liabilities – A restructuring related program may consist of charges for employee severance, rationalization of manufacturing facilities and other related expenses. To account for such, the Company applies the Financial Accounting Standards Board’s guidance regarding exit or disposal cost obligations. This guidance requires that a liability for a cost associated with an exit or disposal activity be recognized when the liability is incurred, is estimable, and payment is probable. See Note 6 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

Recently Issued Accounting Standards

See Note 3 of Notes to the Consolidated Financial Statements, which appears in Item 8 of this Report for a discussion regarding recently issued accounting standards.

Liquidity and Capital Resources

At December 31, 2018, Quaker had cash, cash equivalents and restricted cash of \$124.4 million, including \$20.3 million of restricted cash. Total cash, cash equivalents and restricted cash was approximately \$111.1 million at December 31, 2017, which included \$21.2 million of restricted cash. The inclusion of restricted cash in total cash on the Company’s Consolidated Statements of Cash Flows is the result of a change in presentation required by the Financial Accounting Standards Board. See Note 3 of Notes to Consolidated Financial Statements. The \$13.4 million increase was the net result of \$78.8 million of cash provided by operating activities offset by \$12.4 million of cash used in investing activities, \$46.9 million of cash used in financing activities and a \$6.1 million negative impact due to the effect of foreign exchange rate changes on cash.

Net cash provided by operating activities was \$78.8 million in 2018 compared to \$64.8 million in 2017. The \$14.0 million increase was primarily due to increased cash generation as a result of the Company’s strong year-over-year operating performance growth as well as a \$4.1 million second quarter of 2018 cash dividend received from its equity investment, Primex, Ltd (“Primex”), compared to no dividend received in the prior year. The Company’s level of cash invested in working capital was higher in 2018 compared to 2017, including increased accounts receivables related to higher net sales year-over-year. Also, the Company recorded a significant collection of receivables from a certain customer late in the fourth quarter of 2017 which was uncommon and did not recur in 2018. In addition, the Company recorded higher cash outflows from inventory in 2018 as the Company re-stocked inventory levels throughout 2018 to a level sufficient to address increased customer demand compared to lower inventory levels held at the end of 2017. Operating cash flow related to current and non-current estimated taxes on income were impacted by additional tax payments related to U.S. Tax Reform during 2018. The Company’s operating cash flows in 2018 and 2017 were also impacted by the timing and amount of combination-related expenses and associated cash payments, described below. Finally, 2017 included restructuring payments made as part of the Company’s global restructuring program initiated in the fourth quarter of 2015 and completed during the first half of 2017, described below.

Net cash used in investing activities decreased from \$14.6 million in 2017 to \$12.4 million in 2018, primarily due to lower payments for acquisitions in the current year. During 2017, the Company had cash outflows of \$5.4 million for the acquisition of assets associated with a business that markets, sells and manufactures certain metalworking fluids, whereas during 2018, the Company paid \$0.5 million for certain formulations and product technology in the mining industry. In accordance with the terms of that acquisition agreement, an additional \$0.5 million of the purchase price was paid during the first quarter of 2019. In addition, the Company had higher cash proceeds from dispositions of assets during 2017 as compared to 2018, primarily as a result of \$1.4 million of cash proceeds received during the fourth quarter of 2017 for the disposition of a held-for-sale asset compared to \$0.6 million of cash proceeds received during the second quarter of 2018. These lower investing cash flows were partially offset by slightly higher additions to property, plant and equipment during 2018 as compared to 2017, primarily due to an increase in spending related to a new manufacturing facility in India that is expected to be completed during the first quarter of 2019.

Net cash used in financing activities was \$46.9 million in 2018 compared to \$55.2 million in 2017. The \$8.3 million decrease in cash outflows was primarily due to \$31.8 million of cash used in the fourth quarter of 2017 to purchase the remaining noncontrolling interest in the Company’s India affiliate. These impacts of lower 2018 cash outflows were partially offset by higher repayments of long-term debt year-over-year, with repayments of \$26.8 million during 2018 compared to repayments of \$2.9 million during 2017. Also, during 2018, one of the Company’s less than 100% owned consolidated affiliates made a distribution to the noncontrolling affiliate shareholder of \$0.9 million. There were no similar distributions during 2017. In addition, the Company paid \$19.3 million in cash dividends during 2018, a \$0.7 million increase in cash dividends compared to the prior year.

The Company’s primary credit facility (“the Credit Facility”) is a \$300.0 million syndicated multicurrency credit agreement with a group of lenders. The maximum amount available under the Credit Facility can be increased to \$400.0 million at the Company’s option if the lenders agree and the Company satisfies certain conditions. Borrowings under the Credit Facility generally bear interest at a base rate or LIBOR rate plus a margin. The Credit Facility has certain financial and other covenants, with the key financial covenant requiring that the Company’s consolidated total debt to adjusted EBITDA ratio cannot exceed 3.50 to 1. As of December 31, 2018 and 2017, the Company’s consolidated total debt to adjusted EBITDA ratio was below 1.0 to 1, and the Company was also in compliance with all of its other covenants. During the fourth quarter of 2018, the Credit Facility was amended and restated to extend the maturity date to March 15, 2020. As of December 31, 2018 and 2017, the Company had total credit facility borrowings of \$24.0 million and \$48.5 million, respectively, primarily under the Credit Facility. The Company’s other debt obligations as of December 31, 2018 and 2017, respectively, were primarily industrial development bonds, including a \$5.0 million industrial development bond which matured and was paid off during the fourth quarter of 2018, and municipality-related loans.

Quaker's management approved a global restructuring plan in the fourth quarter of 2015 (the "2015 Program") to reduce its operating costs. The Company completed all of the initiatives under the 2015 Program during the first half of 2017. The Company did not incur related costs in 2018 and does not expect to incur any further restructuring charges under this program. During 2017, the company incurred \$0.7 million of cash payments utilizing operating cash flows for the settlement of these restructuring liabilities.

On April 4, 2017, Quaker entered into a share purchase agreement with Gulf Houghton Lubricants, Ltd. to purchase the entire issued and outstanding share capital of Houghton. The shares will be bought for aggregate purchase consideration consisting of: (i) \$172.5 million in cash; (ii) a number of shares of common stock, \$1.00 par value per share, of the Company comprising 24.5% of the common stock outstanding upon the closing of the Combination; and (iii) the Company's assumption of Houghton's net indebtedness as of the closing of the Combination, which was approximately \$690 million at signing. See Note 2 to Consolidated Financial Statements.

In connection with the Combination, the Company secured \$1.15 billion in commitments from Bank of America Merrill Lynch and Deutsche Bank to fund the purchase consideration and provide additional liquidity, and has since replaced these commitments with a syndicated bank agreement ("the New Credit Facility") with a group of lenders for \$1.15 billion. The New Credit Facility is contingent upon and will not be effective until the closing of the Combination. During the fourth quarter of 2018, the Company extended the bank commitment through March 15, 2019. The New Credit Facility is comprised of a \$400.0 million multicurrency revolver, a \$600.0 million USD term loan and a \$150.0 million EUR equivalent term loan, each with a five-year term from the date the New Credit Facility becomes effective. The maximum amount available under the New Credit Facility can be increased by \$200.0 million at the Company's option if the lenders agree and the Company satisfies certain conditions. Borrowings under the New Credit Facility will bear interest at a base rate, LIBOR rate plus a margin or Euribor rate plus a margin, and the Company currently estimates the annual floating rate cost will be in the 3.75% to 4.0% range based on current market interest rates. The New Credit Facility will be subject to certain financial and other covenants, including covenants that the Company's consolidated net debt to adjusted EBITDA ratio cannot exceed 4.25 to 1 and the Company's consolidated adjusted EBITDA to interest expense ratio cannot be less than 3.0 to 1. Both the USD and EUR equivalent term loans will have quarterly principal amortization during their respective five-year terms, with 5.0% amortization of the principal balance due in years 1 and 2, 7.5% in year 3, and 10.0% in years 4 and 5, with the remaining principal amounts due at maturity. Until closing, the Company will incur certain interest costs paid to maintain the bank commitment ("ticking fees"), which began to accrue on September 29, 2017. The ticking fees bear an interest rate of 0.30% per annum.

The Company incurred \$19.5 million of total combination-related expenses during 2018, which includes approximately \$3.5 million of ticking fees as well as a \$0.6 million gain on the sale of a held-for-sale asset, described in the Non-GAAP measures section of this Item below. The Company had net cash outflows related to these costs of approximately \$16.8 million during 2018. Comparatively, during 2017, combination-related expenses totaled \$30.8 million, including \$0.9 million of ticking fees, with cash outflows related to these costs of approximately \$25.9 million. The Company currently estimates it will incur additional costs and have associated cash outflows of approximately \$25 to \$30 million through closing of the Combination for similar combination-related expenses, including cash payments for bank fees which we expect to capitalize. In addition, post-closing of the combination, the Company expects it will incur additional costs and make associated cash payments to integrate the Company and Houghton and to begin realizing the Combination's total anticipated cost synergies, which we currently estimate to meet or exceed \$45 million. The timing and an accurate range of these additional costs and cash payments post-closing are not estimable at this time. However, based on market precedents, the Company currently projects these costs to approximate one times anticipated synergies, and the Company expects them to be incurred over a three-year period post-close.

The Company received regulatory approval for the Combination from China and Australia in 2017. In addition, at a shareholder meeting held during 2017, the Company's shareholders overwhelmingly approved the issuance of the new shares of the Company's common stock at closing of the Combination. The European Commission ("EC") conditionally approved the Combination in December 2018. Quaker expects final approval from the EC once the final purchase agreement is in place between Quaker, Houghton, and the buyer of the divested product lines. Quaker continues to be in productive discussions with the U.S. Federal Trade Commission ("FTC"), although the process is taking longer than anticipated. Given the time lapse since Quaker's initial filing, the FTC requested updated information as part of their approval process late in the fourth quarter of 2018. In addition, the government shutdown in the U.S. in the first quarter of 2019 extended the timeline to receive the final approval. The proposed remedy being discussed with the FTC continues to be consistent with Quaker's previous guidance that the total divested product lines will be approximately 3% of the combined company's revenue. Given current information, the Company estimates that FTC and EC final approval and closing of the combination will occur within the next few months. Given these contingencies and the overall timing of the Combination, the Company has not recorded any estimated costs for additional expenses that the Company expects, but had yet to incur as of December 31, 2018, related to the Combination.

As of December 31, 2018, the Company's gross liability for uncertain tax positions, including interest and penalties, was \$8.5 million. The Company cannot determine a reliable estimate of the timing of cash flows by period related to its uncertain tax position liability. However, should the entire liability be paid, the amount of the payment may be reduced by up to \$4.9 million as a result of offsetting benefits in other tax jurisdictions. Related to the impact of U.S. Tax Reform, as of December 31, 2018, the Company's remaining gross deemed repatriation transition tax ("Transition Tax") on previously untaxed accumulated and current earnings and profits of certain of the Company's foreign subsidiaries is \$8.9 million. The Company elected to pay the U.S. federal Transition Tax over 8 years, as allowed, \$7.6 million of which is considered a long-term tax payable due after 2019 with the remainder due during 2019, as presented in the contractual obligations table, below.

In the fourth quarter of 2018, the Company began the process of terminating the U.S. Pension Plan after receiving the Company's Board of Director approval to do so. Participants of the U.S. Pension Plan will have their benefits either converted into a lump sum cash payment or an annuity contract placed with an insurance carrier. The U.S. Pension Plan is fully-funded on a U.S. GAAP basis. In order to terminate the plan in accordance with IRS and pension benefit guaranty corporation requirements, the Company will be required to fully fund the plan on a termination basis and will commit to contribute the additional assets necessary, if any, to do so. The amount necessary to do so is not yet known but is currently estimated to be between \$0 and \$10 million. The Company currently estimates that the U.S. Pension Plan termination will be completed during 2020. See Note 20 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

The Company believes it is capable of supporting its operating requirements and funding its business objectives, including but not limited to, payments of dividends to shareholders, costs related to the Combination, pension plan contributions, capital expenditures, other business opportunities and other potential contingencies, through internally generated funds supplemented with debt or equity as needed.

The following table summarizes the Company's contractual obligations as of December 31, 2018, and the effect such obligations are expected to have on its liquidity and cash flows in future periods. Pension and other postretirement plan contributions beyond 2019 are not determinable since the amount of any contribution is heavily dependent on the future economic environment and investment returns on pension trust assets. The timing of payments related to other long-term liabilities which consists primarily of deferred compensation agreements, also cannot be readily determined due to their uncertainty. Interest obligations on the Company's long-term debt and capital leases assume the current debt levels will be outstanding for the entire respective period and apply the interest rates in effect as of December 31, 2018.

<i>(dollars in thousands)</i>	Payments due by period							2024 and Beyond
	Total	2019	2020	2021	2022	2023		
Contractual Obligations								
Long-term debt	\$ 36,694	\$ 670	\$ 24,714	\$ 393	\$ 270	\$ 240	\$ 10,407	
Interest obligations	5,230	787	586	526	526	526	2,279	
Capital lease obligations	21	8	8	5	-	-	-	
Operating leases	31,173	7,068	5,635	4,509	3,523	2,659	7,779	
Purchase obligations	1,664	1,664	-	-	-	-	-	
Transition Tax	8,917	1,273	1,273	1,273	1,273	2,386	1,439	
Pension and other postretirement plan contributions	5,675	5,675	-	-	-	-	-	
Other long-term liabilities (See Note 21 of Notes to Consolidated Financial Statements)	7,510	-	-	-	-	-	7,510	
Total contractual cash obligations	\$ 96,884	\$ 17,145	\$ 32,216	\$ 6,706	\$ 5,592	\$ 5,811	\$ 29,414	

Non-GAAP Measures

Included in this Form 10-K filing are two non-GAAP (unaudited) financial measures: non-GAAP earnings per diluted share and adjusted EBITDA. The Company believes these non-GAAP financial measures provide meaningful supplemental information as they enhance a reader's understanding of the financial performance of the Company, are more indicative of future operating performance of the Company, and facilitate a better comparison among fiscal periods, as the non-GAAP financial measures exclude items that are not considered core to the Company's operations. Non-GAAP results are presented for supplemental informational purposes only and should not be considered a substitute for the financial information presented in accordance with GAAP. The following tables reconcile non-GAAP earnings per diluted share (unaudited) and adjusted EBITDA (unaudited) to their most directly comparable GAAP financial measures:

	For the years ended December 31,		
	2018	2017	2016
GAAP earnings per diluted share attributable to Quaker Chemical Corporation Common Shareholders	\$ 4.45	\$ 1.52	\$ 4.63
Equity income in a captive insurance company per diluted share (a)	(0.07)	(0.19)	(0.13)
Restructuring credit per diluted share (b)	—	—	(0.02)
Houghton combination-related expenses per diluted share (c)	1.21	1.90	0.11
U.S. Tax Reform charges, net, per diluted share (d)	0.43	1.67	—
U.S. pension plan settlement charge per diluted share (e)	—	0.09	—
Cost streamlining initiative per diluted share (f)	—	0.01	—
Loss on disposal of held-for-sale asset per diluted share (g)	—	0.01	—
Insurance insolvency recovery per diluted share (h)	(0.01)	(0.03)	—
Gain on liquidation of an inactive legal entity per diluted share (i)	(0.03)	—	—
Currency conversion impacts of hyper-inflationary economies per diluted share (j)	0.06	0.03	0.01
Non-GAAP earnings per diluted share (k)	\$ 6.04	\$ 5.01	\$ 4.60

	For the years ended December 31,		
	2018	2017	2016
Net income attributable to Quaker Chemical Corporation	\$ 59,473	\$ 20,278	\$ 61,403
Depreciation and amortization	19,714	19,966	19,566
Interest expense (c)	6,158	3,892	2,889
Taxes on income before equity in net income of associated companies (d)	25,050	41,653	23,226
Equity income in a captive insurance company (a)	(966)	(2,547)	(1,688)
Restructuring credit (b)	—	—	(439)
Houghton combination-related expenses (c)	16,051	29,938	1,531
U.S. pension plan settlement charge (e)	—	1,860	—
Cost streamlining initiative (f)	—	286	—
Loss on disposal of held-for-sale asset (g)	—	125	—
Insurance insolvency recovery (h)	(90)	(600)	—
Gain on liquidation of an inactive legal entity (i)	(446)	—	—
Currency conversion impacts of hyper-inflationary economies (j)	664	388	88
Adjusted EBITDA	\$ 125,608	\$ 115,239	\$ 106,576
Adjusted EBITDA margin (%) (l)	14.5%	14.1%	14.3%

(a) Equity income in a captive insurance company represents the after-tax income attributable to the Company's interest in Primex, a captive insurance company. The Company holds a 33% investment in and has significant influence over Primex, and therefore accounts for this interest under the equity method of accounting. The income attributable to Primex is not indicative of the future operating performance of the Company and is not considered core to the Company's operations. See Note 16 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

(b) Restructuring credit represents the credit recorded by the Company as part of finalizing a global restructuring program which was initiated in the fourth quarter of 2015. This credit is not indicative of the future operating performance of the Company. See Note 6 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

- (c) Houghton combination-related expenses include certain legal, environmental, financial, and other advisory and consultant costs incurred in connection with the strategic evaluation of, diligence on, and execution of the definitive agreement to combine with Houghton, as well as regulatory and shareholder approvals and integration planning associated with the pending Combination. These costs are not indicative of the future operating performance of the Company. Certain of these costs were considered non-deductible for the purpose of determining the Company's effective tax rate and, therefore, the earnings per diluted share amount reflects this impact. Also, included in the caption Houghton combination-related expenses for 2018 is a \$0.6 million gain on the sale of a held-for-sale asset recorded in Other expense, net, in the Company's Consolidated Statements of Income. In addition, during 2018, the Company incurred approximately \$3.5 million of ticking fees to maintain the bank commitment related to the pending Combination. Comparatively, the Company began incurring ticking fees as of September 29, 2017 and recognized \$0.9 million during 2017. These interest costs are included in the caption Houghton combination-related expenses in the reconciliation of GAAP earnings per diluted share attributable to Quaker Chemical Corporation common shareholders to Non-GAAP earnings per diluted share above but are included in the caption Interest expense in the reconciliation of Net income attributable to Quaker Chemical Corporation to Adjusted EBITDA above. See Note 2 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.
- (d) U.S. Tax Reform charges, net, represent the tax expense incurred by the Company related to its initial 2017 estimates and subsequent 2018 adjustments to adopt U.S. Tax Reform. The 2017 tax expense includes the Company's estimated impact of the Transition Tax, net of eliminating U.S. federal income taxes on dividends from certain foreign subsidiaries in 2017, as well as the impact of revaluing certain of the Company's U.S. deferred tax balances from 35% to the new 21% U.S. corporate tax rate. The 2018 tax expense includes certain adjustments recorded by the Company as a result of changes to the Company's initial fourth quarter of 2017 estimates. Specifically, the Company has adjusted the initial amount estimated for the one-time charge on the gross deemed repatriation Transition Tax on previously untaxed accumulated and current earnings and profits of certain of the Company's foreign subsidiaries, as well as updated its assertion related to permanent reinvestment of accumulated earnings and profits of certain of these foreign subsidiaries. In addition, the Company has adjusted its initial estimate of the impact from certain internal revenue code changes associated with the deductibility of certain executive compensation. All of these adjustments were based on guidance issued during 2018 and 2017 by the IRS, the U.S. Treasury and various state taxing authorities and were the result of specific one-time events that are not indicative of future operating performance of the Company. U.S. Tax Reform charges, net, are included within Taxes on income before equity in net income of associated companies in the reconciliation of Net income attributable to Quaker Chemical Corporation to Adjusted EBITDA. See Note 9 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.
- (e) U.S. pension plan settlement charge represents the expense recorded for the settlement of one of the Company's U.S. pension plans vested terminated participants. This settlement charge represents the immediate recognition into expense of a portion of the unrecognized loss within AOCI on the balance sheet in proportion to the share of the projected benefit obligation that was settled by these payments. This charge was the result of a specific one-time event and is not indicative of the future operating performance of the Company. See Note 20 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.
- (f) Cost streamlining initiative represents expenses associated with certain actions taken to reorganize the Company's corporate staff. Overall, these costs are non-core and are indirect operating expenses that are not attributable to the product sales of any respective reportable operating segment, and, therefore, are not indicative of the future operating performance of the Company.
- (g) Loss on disposal of held-for-sale asset represents a one-time charge to write down the value of a held-for-sale asset at the Company's India affiliate to its fair value. This charge was the result of a specific one-time event and is not indicative of the future operating performance of the Company. See Note 8 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.
- (h) Insurance insolvency recovery represents income associated with cash receipts from an insolvent insurance carrier for previously submitted claims by an inactive subsidiary of the Company. This other income is not indicative of the future operating performance of the Company. See Notes 8 and 25 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.
- (i) Gain on liquidation of an inactive legal entity represents the decrease in historical cumulative currency translation adjustments associated with an inactive legal entity which was closed during the third quarter of 2018. These cumulative currency translation adjustments were the result of remeasuring the legal entity's monetary assets and liabilities to the applicable published exchange rates and were a component of AOCI, which was included in total shareholder's equity on the Company's Consolidated Balance Sheets. As required under U.S. GAAP, when a legal entity is liquidated, any amount attributable to that legal entity and accumulated in the currency translation adjustment component of equity is required to be removed from equity and reported as part of the gain or loss on liquidation of the legal entity during the period in which the liquidation occurs. This recognized gain is not indicative of the future operating performance of the Company. See Note 8 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

- (j) Currency conversion impacts of hyper-inflationary economies represents the foreign currency remeasurement impacts associated with the Company's Venezuelan and Argentina affiliates whose local economies are designated as hyper-inflationary under U.S. GAAP. An entity which operates within an economy deemed to be hyper-inflationary under U.S. GAAP is required to remeasure its monetary assets and liabilities to the applicable published exchange rates and record the associated gains or losses resulting from the remeasurement directly to the Consolidated Statements of Income. Venezuela's economy has been considered hyper-inflationary under U.S. GAAP since 2010 while Argentina's economy has been considered hyper-inflationary beginning July 1, 2018. The charges incurred related to the immediate recognition of foreign currency remeasurement in the Consolidated Statements of Income associated with these entities are not indicative of the future operating performance of the Company. See Notes 8 and 16 of Notes to Consolidated Financial Statements, which appear in Item 8 of this Report.
- (k) Within the Company's calculation of Non-GAAP earnings per diluted share above, each reconciling item includes the impact of any current and deferred income tax expense (benefit) as applicable. The income tax expense (benefit) related to these items was determined utilizing the applicable rates in the taxing jurisdictions in which these adjustments occurred.
- (l) The Company calculates Adjusted EBITDA margin as the percentage of Adjusted EBITDA to consolidated net sales.

Operations

Consolidated Operations Review – Comparison of 2018 with 2017

Net sales grew \$47.4 million or 6% in 2018, increasing to \$867.5 million compared to \$820.1 million in 2017. The Company's 2018 net sales benefited from increases in volume of 3%, selling price and product mix of 2%, as well as a positive impact from foreign currency translation of less than 1% or \$3.7 million.

Cost of goods sold ("COGS") in 2018 of \$555.2 million increased 5% from \$528.6 million in 2017. The increase in COGS was primarily due to the increase in product volumes, noted above, the impact of certain raw material cost increases, changes in product mix and the negative impact of foreign currency translation year-over-year.

Gross profit in 2018 increased \$20.8 million or 7% compared to 2017, primarily driven by the increase in net sales and product volumes, noted above, as well as a higher gross margin of 36.0% in 2018 compared to 35.5% in 2017. The increase in the Company's gross margin in 2018 was primarily driven by pricing initiatives and the mix of certain products sold which more than offset increases in raw material costs.

SG&A in 2018 increased \$9.1 million compared to 2017 due to higher labor-related costs, primarily from annual merit increases and incentive-based compensation due to the Company's strong operating performance, as well as the negative impact from foreign currency translation. These increases year-over-year were partially offset by a first quarter of 2017 cost streamlining initiative described in the Non-GAAP measures section of this Item, above.

During 2018, the Company incurred \$16.7 million of costs related to its previously announced pending Combination with Houghton, described in the Non-GAAP measures section of this Item, above. Comparatively, the Company incurred \$29.9 million of similar combination-related expenses in 2017 as well as certain due diligence-related costs.

Operating income in 2018 was \$87.8 million compared to \$62.7 million in 2017. The increase in operating income was due to strong net sales and gross profit increases as well as lower Houghton combination-related expenses, noted above, partially offset by an increase in SG&A not related to the pending Houghton combination.

The Company had other expense, net, of \$0.6 million in 2018 compared to \$0.7 million in 2017. The decrease in other expense, net, includes both a \$1.9 million settlement charge in one of the Company's U.S. pension plans and a \$0.1 million loss on the disposal of a held for sale asset in 2017, as well as a 2018 gain of \$0.6 million on the sale of a held-for-sale asset. The positive year-over-year impact of these items was partially offset by \$0.5 million lower year-over-year cash proceeds received from an insolvent insurance carrier with respect to previously filed recovery claims by an inactive subsidiary of the Company. In addition to all of these items, which are described in the Non-GAAP measures section of this Item, above, the Company also had foreign currency transaction losses in 2018 compared to foreign currency transaction gains in 2017. The Company's 2018 foreign currency transaction losses included both recurring transactional activity as well as foreign currency transaction losses of approximately \$0.4 million related to the Company's Argentina subsidiary and a foreign currency transaction gain of approximately \$0.4 million related to the liquidation of an inactive legal entity, both of which are described in the Non-GAAP measures section of this Item, above. Lastly, the Company had a decrease in receipts of local municipality-related grants in one of the Company's regions year-over-year.

Interest expense increased \$2.3 million year-over-year, primarily due to higher 2018 costs incurred to maintain the bank commitment for the pending Houghton Combination, partially offset by a decrease in interest expense due to lower average outstanding borrowings on the Company's existing credit facility during 2018 compared to 2017. Interest income was \$0.4 million lower in 2018 compared to 2017 primarily due to changes in the level of the Company's invested cash in certain regions with higher returns as well as a decrease in interest received on certain tax-related credits year-over-year.

The Company's effective tax rates for 2018 and 2017 were 30.1% and 68.7%, respectively. The Company's elevated 2018 and 2017 effective tax rates were impacted by its initial estimate and subsequent adjustments related to U.S. Tax Reform, as well as certain non-deductible Houghton combination-related expenses in both years, described in the Non-GAAP measures section of this Item, above. Excluding these items in each period, the Company estimates that its 2018 and 2017 effective tax rates would have been approximately 22% and 27%, respectively. The decrease in the Company's effective tax rate year-over-year was primarily due to a shift in earnings to lower tax jurisdictions and a lower U.S. statutory tax rate of 21% in 2018 compared to 35% in 2017. The Company has experienced and expects to continue to experience volatility in its effective tax rates due to several factors, including the timing of tax audits and the expiration of applicable statutes of limitations as they relate to uncertain tax positions, the unpredictability of the timing and amount of certain incentives in various tax jurisdictions, the treatment of certain acquisition-related costs and the timing and amount of certain share-based compensation-related tax benefits, among other factors.

Equity in net income of associated companies ("equity income") decreased \$1.5 million in 2018 compared to 2017. The decrease was primarily due to lower earnings from the Company's interest in a captive insurance company in 2018, partially offset by higher currency conversion charges in 2017 related to the Company's hyper-inflationary Venezuelan affiliate, both described in the Non-GAAP measures section of this Item, above.

The Company had a \$1.7 million decrease in net income attributable to noncontrolling interest in 2018 compared to 2017, primarily due to the Company's purchase of the remaining interest in its India joint venture during December 2017.

Foreign exchange negatively impacted the Company's 2018 earnings by approximately 1% or \$0.08 per diluted share, driven by the negative impact of net foreign currency transaction losses year-over-year, noted above, partially offset by a positive impact from foreign currency translation.

Consolidated Operations Review – Comparison of 2017 with 2016

Net sales in 2017 of \$820.1 million increased 10% compared to net sales of \$746.7 million in 2016. The \$73.4 million increase in net sales was the result of a 6% increase in organic volumes, a 1% or \$10.7 million increase from sales attributable to the Company's 2016 acquisition of Lubricor Inc. and its affiliate entities ("Lubricor"), a 2% increase due to changes in selling price and product mix and the positive impact of foreign currency translation of \$4.9 million or 1%.

COGS in 2017 of \$528.6 million increased 13% from \$466.6 million in 2016. The increase in COGS was primarily due to the increase in product volumes, noted above, as well as additional COGS attributed to the Company's 2016 acquisition of Lubricor, the impact of certain raw material cost increases, changes in product mix and the negative impact of foreign currency translation year-over-year.

Gross profit in 2017 increased \$11.4 million or 4% compared to 2016, primarily driven by the increase in sales volumes, noted above, partially offset by a lower gross margin of 35.5% in 2017 compared to 37.5% in 2016. The decrease in the Company's gross margin in 2017 was primarily due to higher raw material costs compared to 2016 and a change in the mix of certain products sold.

SG&A in 2017 increased \$5.1 million compared to 2016 primarily due to additional SG&A associated with the Company's 2016 Lubricor acquisition, an increase due to the impact of foreign currency translation, higher labor-related costs primarily due to annual compensation increases and incentive compensation, as well as a first quarter of 2017 cost streamlining initiative, described in the Non-GAAP measures section of this Item, above. These increases to SG&A were partially offset by decreases as a result of certain cost savings efforts, including the impact of the 2015 global restructuring program in 2017.

The Company substantially completed the 2015 global restructuring program during 2016 and recognized a restructuring credit of \$0.4 million during the fourth quarter of 2016 to update its initial estimates for employee separation costs. There were no comparable restructuring costs or credits during 2017.

During 2017, the Company incurred \$29.9 million of costs related to its previously announced Combination with Houghton, described in the Non-GAAP measures section of this Item, above. The Company incurred \$1.5 million of similar combination-related expenses in 2016.

Operating income in 2017 was \$62.7 million compared to \$85.4 million in 2016. The decrease in operating income was primarily due to the higher Houghton combination-related expenses along with slightly higher levels of SG&A not related to the Houghton Combination, which more than offset gross profit increases on strong volume growth, noted above.

The Company had other expense, net, of \$0.7 million in 2017 compared to \$0.5 million in 2016. The increase in other expense, net, was primarily driven by a second quarter of 2017 U.S. pension plan settlement charge and a fourth quarter of 2017 loss on the disposal of a held-for-sale asset, partially offset by income associated with an insurance insolvency recovery in the fourth quarter of 2017, all of which are described in the Non-GAAP measures section of this Item, above. In addition, the Company had higher foreign currency transaction gains realized in 2017 compared to 2016 and an increase in receipts of local municipality-related grants in one of the Company's regions year-over-year.

Interest expense increased \$1.0 million year-over-year, primarily due to costs incurred to maintain the committed capital for the pending Houghton Combination. Interest income increased \$0.5 million in 2017 compared to 2016, primarily due to an increase in the level of the Company's invested cash in certain regions with higher returns.

The Company's effective tax rates for 2017 and 2016 were 68.7% and 27.6%, respectively. The primary drivers of the increase in the Company's effective tax rate during 2017 were the impact of certain non-deductible Houghton combination-related expenses as well as \$22.2 million of charges related to U.S. Tax Reform, described in the Non-GAAP measures section of this Item, above. The Company estimates that its 2017 effective tax rate would have been approximately 27%, without the impact of U.S. Tax Reform and non-deductible Houghton combination-related expenses. These increases to the 2017 effective tax rate were partially offset by the favorable impact of tax benefits for deductions in excess of compensation cost associated with stock option exercises and restricted stock vesting in 2017. In 2016, there were minimal non-deductible Houghton combination-related expenses, no charges similar to those of the 2017 U.S. Tax Reform and no comparable share-based compensation-related tax benefits. Also, in both 2017 and 2016, the Company's mix of foreign earnings in jurisdictions with lower effective tax rates impacted each year's tax expense.

Equity income increased \$1.0 million in 2017 compared to 2016. The increase in equity income was primarily due to higher earnings from the Company's interest in a captive insurance company in 2017. In addition, the Company recorded hyper-inflationary accounting currency conversion charges in both 2017 and 2016, respectively, associated with the Company's Venezuela affiliate. The Company's interest in a captive insurance company and the currency conversion charges recorded are described in the Non-GAAP measures section of this Item, above.

The Company had a \$0.4 million increase in net income attributable to noncontrolling interest in 2017 compared to 2016, primarily due to an increase in performance from certain consolidated affiliates in the Company's Asia/Pacific region partially offset by the impact of the Company's purchase of the remaining interest in its India joint venture in December 2017.

Foreign exchange in total had minimal impact on the Company's 2017 earnings, as a negative impact from foreign currency translation of less than 1% or \$0.01 per diluted share and the Venezuela hyper-inflationary currency conversion charges, noted above, were offset by the positive impact of higher foreign currency transaction gains year-over-year.

Reportable Operating Segment Review – Comparison of 2018 with 2017

The Company sells its industrial process fluids, chemical specialties and technical expertise to a wide range of industries in a global product portfolio throughout its four segments: (i) North America, (ii) EMEA, (iii) Asia/Pacific and (iv) South America.

North America

North America represented approximately 44% of the Company's consolidated net sales in 2018. The segment's net sales were \$383.5 million, an increase of \$26.9 million or 8% compared to 2017. The increase in net sales was primarily due to higher volumes of 4% and an increase in selling price and product mix of 4%. This reportable segment's operating earnings, excluding indirect expenses, were \$88.3 million, an increase of \$10.6 million or 14% compared to 2017. The increase in operating earnings year-over-year was the result of higher gross profit on the higher net sales noted above, coupled with an increase in gross margin due to changes in product mix and the impact of pricing initiatives which more than offset raw material cost increases. These increases to the segment's 2018 operating earnings were partially offset by higher SG&A, primarily due to higher labor costs associated with annual merit increases and improved segment performance.

EMEA

EMEA represented approximately 27% of the Company's consolidated net sales in 2018. The segment's net sales were \$233.6 million, an increase of \$7.4 million or 3% compared to 2017. The increase in net sales was primarily due to the positive impact of foreign currency translation of 4% and increases in selling price and product mix of 3%, partially offset by lower volumes of 4%. The year-over-year volume comparison was impacted by an atypically high sales pattern in EMEA during the first quarter of 2017, a decrease in volume associated with a specific piece of business which the Company stopped selling during the second half of 2018 primarily due to its limited profitability, and a slowing of orders at the end of 2018 due to market challenges in Europe. The foreign exchange impact was primarily due to a strengthening of the euro against the U.S. dollar as this exchange rate averaged 1.18 in 2018 compared to 1.13 in 2017. This reportable segment's operating earnings, excluding indirect expenses, were \$36.0 million, an increase of \$0.6 million or 2% compared to 2017. The increase in operating earnings year-over-year was the result of higher gross profit on the higher net sales noted above, coupled with an increase in gross margin due to changes in product mix and the impact of pricing initiatives which more than offset raw material cost increases. These increases to the segment's 2018 operating earnings were partially offset by higher SG&A, primarily due to the impact of foreign currency translation as well as higher labor costs associated with annual merit increases.

Asia/Pacific

Asia/Pacific represented approximately 25% of the Company's consolidated net sales in 2018. The segment's net sales were \$214.2 million, an increase of \$13.1 million or 7% compared to 2017. The increase in net sales was primarily due to higher volumes of 8% partially offset by a decrease in selling price and product mix of 1%. This reportable segment's operating earnings, excluding indirect expenses, were \$56.1 million, an increase of \$7.7 million or 16% compared to 2017. The increase in operating earnings year-over-year was primarily driven by higher gross profit on the increase in net sales, noted above, coupled with an increase in gross margin due to changes in product mix and, to a lesser extent, a decrease in SG&A due to lower labor expenses.

South America

South America represented approximately 4% of the Company's consolidated net sales in 2018. The segment's net sales were \$36.3 million, an increase of \$0.1 million or less than 1% compared to 2017. The slight increase in net sales was primarily due to higher volumes of 8% and an increase in selling price and product mix of approximately 7%, offset by the negative impact of foreign currency translation of 15%. The foreign exchange impact was primarily due to a weakening of both the Brazilian real and Argentinian peso against the U.S. dollar as these exchange rates averaged 3.63 and 26.13 in 2018 compared to 3.19 and 16.50 in 2017, respectively. This reportable segment's operating earnings, excluding indirect expenses, were \$3.9 million in both 2018 and 2017. This flat year-over-year operating earnings in South America was the result of the slight increase in net sales, noted above, and lower SG&A largely due to foreign currency translation, partially offset by a lower gross margin on raw material changes and impacts due to foreign currency translation.

Reportable Operating Segment Review – Comparison of 2017 with 2016

North America

North America represented approximately 43% of the Company's consolidated net sales in 2017. The segment's net sales were \$356.6 million, an increase of \$20.4 million or 6% compared to 2016. The increase in net sales was primarily due to higher volumes of 3%, including acquisitions, and an increase in selling price and product mix of 3%. This reportable segment's operating earnings, excluding indirect expenses, were \$77.7 million, a decrease of \$0.1 million compared to 2016. North America's relatively consistent operating earnings were the net result of a decline in gross margin and higher levels of SG&A, which offset higher gross profit on the increase in net sales, noted above. The decline in gross margin was due to increases in certain raw material costs and changes in product mix. The higher SG&A was primarily due to increases in labor costs primarily associated with annual merit increases and additional SG&A associated with the Lubricor acquisition.

EMEA

EMEA represented approximately 28% of the Company's consolidated net sales in 2017. The segment's net sales were \$226.2 million, an increase of \$25.3 million or 13% compared to 2016. The increase in net sales was primarily due to higher volumes of 7%, an increase in selling price and product mix of 4% and the positive impact of foreign currency translation of 2%. Included in the 2017 volume increase was an atypically high sales pattern in the first quarter. The foreign exchange impact was primarily due to a strengthening of the euro against the U.S. dollar, as this exchange rate averaged approximately 1.13 in 2017 compared to approximately 1.10 in 2016. This reportable segment's operating earnings, excluding indirect expenses, were \$35.4 million, an increase of \$1.5 million or 5% compared to 2016. The increase in EMEA's operating earnings was driven by higher gross profit on the increase in net sales, noted above, partially offset by a lower gross margin due to increases in certain raw material costs and product mix and slightly higher SG&A year-over-year due to increases in labor costs primarily associated with annual merit increases and improved segment performance.

Asia/Pacific

Asia/Pacific represented approximately 25% of the Company's consolidated net sales in 2017. The segment's net sales were \$201.0 million, an increase of \$21.9 million or 12% compared to 2016. The increase in net sales was primarily due to higher volumes of 16% partially offset by a decrease in selling price and product mix of 4% and the negative impact of foreign currency translation of less than 1%. The foreign exchange impact was primarily due to a weakening of the Chinese renminbi against the U.S. dollar, which offset a strengthening of the Indian rupee against the U.S. dollar, year-over-year. These exchange rates averaged 6.75 and 65.1 in 2017 compared to 6.64 and 67.18 in 2016, respectively. This reportable segment's operating earnings, excluding indirect expenses, were \$48.3 million, an increase of \$2.5 million or 5% compared to 2016. The increase in Asia/Pacific's operating earnings was driven by higher gross profit on the increase in net sales, noted above, partially offset by a lower gross margin due to increases in certain raw material costs and product mix and slightly higher SG&A year-over-year due to increases in labor costs primarily associated with annual merit increases and improved segment performance.

South America

South America represented approximately 4% of the Company's consolidated net sales in 2017. The segment's net sales were \$36.2 million, an increase of \$5.8 million or 19% compared to 2016. The increase in net sales was primarily due to higher volumes of 6%, an increase in selling price and product mix of 7% and the positive impact of foreign currency translation of 6%. The foreign exchange impact was primarily due to a strengthening of the Brazilian real against the U.S. dollar, which offset a weakening of the Argentinian peso against the U.S. dollar, year-over-year. These exchange rates averaged 3.19 and 16.50 in 2017 compared 3.47 and 14.73 in 2016, respectively. This reportable segment's operating earnings, excluding indirect expenses, were \$3.9 million, an increase of \$2.5 million or 183% compared to 2016. The increase in South America's operating earnings was driven by higher gross profit on the increase in net sales, as well as a higher gross margin primarily due to pricing initiatives and lower raw material costs. These increases to operating earnings year-over-year were partially offset by slightly higher SG&A due to increases in labor costs primarily associated with annual merit increases and improved segment performance.

Environmental Clean-up Activities

The Company is involved in environmental clean-up activities in connection with an existing plant location and former waste disposal sites. In 1992, the Company identified certain soil and groundwater contamination at AC Products, Inc. ("ACP"), a wholly owned subsidiary. In voluntary coordination with the Santa Ana California Regional Water Quality Board, ACP has been remediating the contamination. In 2007, ACP agreed to operate two groundwater treatment systems, so as to hydraulically contain groundwater contamination emanating from ACP's site until such time as the concentrations of contaminants are below the current Federal maximum contaminant level for four consecutive quarterly sampling events. In 2014, ACP ceased operation at one of its two groundwater treatment systems, as it had met the above condition for closure. As of December 31, 2018, ACP believes it is close to meeting the conditions for closure of the remaining groundwater treatment system but continues to operate this system while in discussions with the relevant authorities and believes that the range of potential-known liabilities associated with the balance of ACP's water remediation program is approximately \$0.1 million to \$1.0 million. The low and high ends of the range are based on the length of operation of the treatment system as required by the conditions noted above, as determined by groundwater modeling. Notwithstanding the foregoing, the Company cannot be certain that future liabilities in the form of remediation expenses and damages will not be in excess of the high end of the range. See Note 25 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report.

General

See Item 7A of this Report, below, for further discussion of certain quantitative and qualitative disclosures about market risk.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk.

Quaker is exposed to the impact of interest rates, foreign currency fluctuations, changes in commodity prices, and credit risk.

Interest Rate Risk. Quaker's exposure to changes in interest rates relates primarily to its credit facilities. Interest rates for Quaker's credit facilities are generally based on a base rate or LIBOR plus a spread. Accordingly, if interest rates rise significantly, the cost of debt to Quaker will increase. This can have an adverse effect on Quaker, depending on the extent of Quaker's borrowings throughout a given year. As of December 31, 2018, Quaker had \$24.0 million outstanding under its credit facilities at a weighted average borrowing rate of approximately 1.0%. If interest rates had changed by 10%, the Company's interest expense on its credit facilities for the year ended December 31, 2018 would have correspondingly increased or decreased by less than \$0.1 million. Quaker's other long-term and short-term debt consists primarily of fixed rate bonds and loans which are not exposed to interest rate fluctuations. The Company has previously used derivative financial instruments primarily for the purposes of hedging exposures to fluctuations in interest rates. The Company did not use any similar instruments in 2018 or 2017 and has not entered into derivative contracts for trading or speculative purposes. See the information included under the caption "Derivatives" in Note 1 of Notes to Consolidated Financial Statements, which appears in Item 8 of this Report and is incorporated herein by reference.

Foreign Exchange Risk. A significant portion of Quaker's revenues and earnings are generated by its foreign operations. These foreign operations also represent a significant portion of Quaker's assets and liabilities. Generally, all of these foreign operations use the local currency as their functional currency. Accordingly, Quaker's financial results are affected by foreign currency fluctuations, particularly between the U.S. dollar and the euro, the Brazilian real, the Mexican peso, the Chinese renminbi and the Indian rupee. Quaker's results can be materially affected depending on the volatility and magnitude of foreign exchange rate changes. If the euro, the Brazilian real, the Mexican peso, the Chinese renminbi and the Indian rupee had all weakened or strengthened by 10% against the U.S. dollar, the Company's 2018 revenues and pre-tax earnings would have correspondingly increased or decreased approximately \$44.5 million and \$5.5 million, respectively.

The Company generally does not use financial instruments that expose it to significant risk involving foreign currency transactions. However, the size of its non-U.S. activities has a significant impact on reported operating results and the attendant net assets. During the past three years, sales by its non-U.S. subsidiaries accounted for approximately 60% of our consolidated net sales.

In addition, the Company occasionally sources inventory among its worldwide operations. This practice can give rise to foreign exchange risk resulting from the varying cost of inventory to the receiving location, as well as from the revaluation of intercompany balances. The Company primarily mitigates this risk through local sourcing efforts.

Commodity Price Risk. Many of the raw materials used by Quaker are commodity chemicals and derivatives of such, which can experience significant price volatility, and therefore Quaker's earnings can be materially affected by market changes in raw material prices. At times, Quaker has entered into fixed-price purchase contracts to manage this risk. These contracts provide protection to Quaker if the prices for the contracted raw materials rise; however, in certain circumstances, Quaker may not realize the benefit if such prices decline. A gross margin change of one percentage point, would correspondingly have increased or decreased the Company's pre-tax earnings by approximately \$8.7 million.

Credit Risk. Quaker establishes allowances for doubtful accounts for estimated losses resulting from the inability of its customers to make required payments. If the financial condition of Quaker's customers were to deteriorate, resulting in an impairment of their ability to make payments, additional allowances might be required. Downturns in the overall economic climate may also exacerbate specific customer financial issues. A significant portion of Quaker's revenues is derived from sales to customers in the steel and automotive industries, including some of our larger customers, where bankruptcies have occurred in the past and where companies have experienced past financial difficulties. When a bankruptcy occurs, Quaker must judge the amount of proceeds, if any, that may ultimately be received through the bankruptcy or liquidation process. In addition, as part of its terms of trade, Quaker may custom manufacture products for certain large customers and/or may ship product on a consignment basis. These practices may increase the Company's exposure should a bankruptcy occur and may require a write-down or disposal of certain inventory due to its estimated obsolescence or limited marketability. Customer returns of products or disputes may also result in similar issues related to the realizability of recorded accounts receivable or returned inventory. The Company recorded expense to increase its provision for doubtful accounts by \$0.5 million, \$0.1 million and \$1.4 million for the years ended December 31, 2018, 2017 and 2016, respectively. A change of 10% to the expense recorded to the Company's provision would have increased or decreased the Company's pre-tax earnings by \$0.1 million, less than \$0.1 million and \$0.1 million for the years ended December 31, 2018, 2017 and 2016, respectively.

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To the Shareholders and Board of Directors of Quaker Chemical Corporation:

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Quaker Chemical Corporation and its subsidiaries (the "Company") as of December 31, 2018 and 2017, and the related consolidated statements of income, comprehensive income, changes in equity and cash flows for each of the three years in the period ended December 31, 2018, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2018, 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, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018 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, 2018, 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 Report on Internal Control over Financial Reporting. 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.

/s/ PricewaterhouseCoopers LLP
Philadelphia, Pennsylvania
February 28, 2019

We have served as the Company's auditor since at least 1972. We have not been able to determine the specific year we began serving as auditor of the Company.

QUAKER CHEMICAL CORPORATION
CONSOLIDATED STATEMENTS OF INCOME
(Dollars in thousands, except per share data)

	Year Ended December 31,		
	2018	2017	2016
Net sales	\$ 867,520	\$ 820,082	\$ 746,665
Costs and expenses			
Cost of goods sold	555,206	528,587	466,555
Selling, general and administrative expenses	207,872	198,813	193,665
Restructuring and related activities	—	—	(439)
Combination-related expenses	16,661	29,938	1,531
	<u>779,739</u>	<u>757,338</u>	<u>661,312</u>
Operating income	87,781	62,744	85,353
Other expense, net	(642)	(718)	(492)
Interest expense	(6,158)	(3,892)	(2,889)
Interest income	2,117	2,534	2,037
Income before taxes and equity in net income of associated companies	83,098	60,668	84,009
Taxes on income before equity in net income of associated companies	25,050	41,653	23,226
Income before equity in net income of associated companies	58,048	19,015	60,783
Equity in net income of associated companies	1,763	3,285	2,256
Net income	59,811	22,300	63,039
Less: Net income attributable to noncontrolling interest	338	2,022	1,636
Net income attributable to Quaker Chemical Corporation	<u>\$ 59,473</u>	<u>\$ 20,278</u>	<u>\$ 61,403</u>
Earnings per common share data:			
Net income attributable to Quaker Chemical Corporation Common			
Shareholders – basic	\$ 4.46	\$ 1.53	\$ 4.64
Net income attributable to Quaker Chemical Corporation Common			
Shareholders – diluted	\$ 4.45	\$ 1.52	\$ 4.63

The accompanying notes are an integral part of these consolidated financial statements.

QUAKER CHEMICAL CORPORATION
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(Dollars in thousands)

	Year Ended December 31,		
	2018	2017	2016
Net income	\$ 59,811	\$ 22,300	\$ 63,039
Other comprehensive (loss) gain, net of tax			
Currency translation adjustments	(17,519)	21,076	(13,772)
Defined benefit retirement plans			
Net gain (loss) arising during the period, other	1,119	(96)	(2,990)
Amortization of actuarial loss	2,507	2,255	2,155
Amortization of prior service gain	(84)	(84)	(82)
Unrealized (loss) gain on available-for-sale securities	(1,728)	(130)	537
Other comprehensive (loss) gain	(15,705)	23,021	(14,152)
Comprehensive income	44,106	45,321	48,887
Less: Comprehensive income attributable to noncontrolling interest	(248)	(2,736)	(1,575)
Comprehensive income attributable to Quaker Chemical Corporation	\$ 43,858	\$ 42,585	\$ 47,312

The accompanying notes are an integral part of these consolidated financial statements.

QUAKER CHEMICAL CORPORATION
CONSOLIDATED BALANCE SHEETS
(Dollars in thousands, except par value and share amounts)

	December 31,	
	2018	2017
ASSETS		
Current assets		
Cash and cash equivalents	\$ 104,147	\$ 89,879
Accounts receivable, net	202,139	208,358
Inventories, net	94,090	87,221
Prepaid expenses and other current assets	18,134	21,128
Total current assets	<u>418,510</u>	<u>406,586</u>
Property, plant and equipment, net	83,923	86,704
Goodwill	83,333	86,034
Other intangible assets, net	63,582	71,603
Investments in associated companies	21,316	25,690
Non-current deferred tax assets	6,946	15,460
Other assets	32,055	30,049
Total assets	<u>\$ 709,665</u>	<u>\$ 722,126</u>
LIABILITIES AND EQUITY		
Current liabilities		
Short-term borrowings and current portion of long-term debt	\$ 670	\$ 5,736
Accounts payable	87,819	93,008
Dividends payable	4,935	4,724
Accrued compensation	25,727	22,846
Accrued pension and postretirement benefits	1,211	1,108
Other current liabilities	31,108	27,321
Total current liabilities	<u>151,470</u>	<u>154,743</u>
Long-term debt	35,934	61,068
Non-current deferred tax liabilities	10,003	9,653
Non-current accrued pension and postretirement benefits	32,360	35,548
Other non-current liabilities	43,529	51,496
Total liabilities	<u>273,296</u>	<u>312,508</u>
Commitments and contingencies (Note 25)		
Equity		
Common stock \$1 par value; authorized 30,000,000 shares; issued and outstanding		
2018 – 13,338,026 shares; 2017 – 13,307,976 shares	13,338	13,308
Capital in excess of par value	97,304	93,528
Retained earnings	405,125	365,936
Accumulated other comprehensive loss	(80,715)	(65,100)
Total Quaker shareholders' equity	<u>435,052</u>	<u>407,672</u>
Noncontrolling interest	1,317	1,946
Total equity	<u>436,369</u>	<u>409,618</u>
Total liabilities and equity	<u>\$ 709,665</u>	<u>\$ 722,126</u>

The accompanying notes are an integral part of these consolidated financial statements.

QUAKER CHEMICAL CORPORATION
CONSOLIDATED STATEMENTS OF CASH FLOWS
(Dollars in thousands)

	Year Ended December 31,		
	2018	2017	2016
Cash flows from operating activities			
Net income	\$ 59,811	\$ 22,300	\$ 63,039
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation	12,373	12,598	12,557
Amortization	7,341	7,368	7,009
Equity in undistributed earnings of associated companies, net of dividends	2,784	(2,895)	(1,969)
Deferred income taxes	8,197	3,754	5,488
Uncertain tax positions (non-deferred portion)	(89)	(817)	(3,206)
Non-current income taxes payable	(8,181)	15,825	—
Deferred compensation and other, net	2,984	1,074	(424)
Share-based compensation	3,724	4,190	6,349
Restructuring and related activities	—	—	(439)
(Gain) loss on disposal of property, plant and equipment and other assets	(657)	79	(18)
Insurance settlement realized	(1,055)	(762)	(1,023)
Combination-related expenses, net of payments	2,727	4,952	503
Pension and other postretirement benefits	(1,392)	(123)	(3,420)
(Decrease) increase in cash from changes in current assets and current liabilities, net of acquisitions:			
Accounts receivable	(2,822)	(1,941)	(11,705)
Inventories	(10,548)	(6,135)	(1,870)
Prepaid expenses and other current assets	(1,540)	(2,932)	(703)
Accounts payable and accrued liabilities	190	12,381	14,063
Restructuring liabilities	—	(675)	(5,252)
Estimated taxes on income	4,932	(3,479)	(5,226)
Net cash provided by operating activities	<u>78,779</u>	<u>64,762</u>	<u>73,753</u>
Cash flows from investing activities			
Investments in property, plant and equipment	(12,886)	(10,872)	(9,954)
Payments related to acquisitions, net of cash acquired	(500)	(5,363)	(15,024)
Proceeds from disposition of assets	866	1,577	186
Insurance settlement interest earned	162	50	32
Net cash used in investing activities	<u>(12,358)</u>	<u>(14,608)</u>	<u>(24,760)</u>
Cash flows from financing activities			
Repayments of long-term debt	(26,791)	(2,853)	(14,513)
Dividends paid	(19,319)	(18,613)	(17,625)
Stock options exercised, other	82	(1,956)	(811)
Payments for repurchase of common stock	—	—	(5,859)
Excess tax benefit related to stock option exercises	—	—	678
Purchase of noncontrolling interest in affiliates, net	—	(31,787)	—
Distributions to noncontrolling affiliate shareholders	(877)	—	—
Net cash used in financing activities	<u>(46,905)</u>	<u>(55,209)</u>	<u>(38,130)</u>
Effect of foreign exchange rate changes on cash	<u>(6,141)</u>	<u>5,404</u>	<u>(4,089)</u>
Net increase in cash, cash equivalents and restricted cash	13,375	349	6,774
Cash, cash equivalents and restricted cash at the beginning of the period	111,050	110,701	103,927
Cash, cash equivalents and restricted cash at the end of the period	<u>\$ 124,425</u>	<u>\$ 111,050</u>	<u>\$ 110,701</u>
Supplemental cash flow disclosures:			
Cash paid during the year for:			
Income taxes	\$ 19,617	\$ 21,544	\$ 25,043
Interest	2,417	2,767	2,481
Non-cash activities:			
Change in accrued purchases of property, plant and equipment, net	\$ 281	\$ (240)	\$ 363

The accompanying notes are an integral part of these consolidated financial statements.

QUAKER CHEMICAL CORPORATION
CONSOLIDATED STATEMENTS OF CHANGES IN EQUITY
(Dollars in thousands, except per share amounts)

	Common stock	Capital in excess of par value	Retained earnings	Accumulated other comprehensive loss	Noncontrolling interest	Total
Balance as of December 31, 2015	13,288	106,333	326,740	(73,316)	8,198	381,243
Net income	—	—	61,403	—	1,636	63,039
Amounts reported in other comprehensive loss	—	—	—	(14,091)	(61)	(14,152)
Repurchases of common stock	(84)	—	(5,775)	—	—	(5,859)
Dividends (\$1.355 per share)	—	—	(17,954)	—	—	(17,954)
Acquisition of noncontrolling interest	—	—	—	—	73	73
Shares issued upon exercise of stock options and other	11	(1,313)	—	—	—	(1,302)
Shares issued for employee stock purchase plan	6	485	—	—	—	491
Equity based compensation plans	57	6,292	—	—	—	6,349
Excess tax benefit from stock option exercises	—	678	—	—	—	678
Balance as of December 31, 2016	13,278	112,475	364,414	(87,407)	9,846	412,606
Net income	—	—	20,278	—	2,022	22,300
Amounts reported in other comprehensive loss	—	—	—	22,307	714	23,021
Dividends (\$1.41 per share)	—	—	(18,756)	—	—	(18,756)
Acquisition of noncontrolling interest	—	(21,151)	—	—	(10,636)	(31,787)
Shares issued upon exercise of stock options and other	5	(2,456)	—	—	—	(2,451)
Shares issued for employee stock purchase plan	4	491	—	—	—	495
Equity based compensation plans	21	4,169	—	—	—	4,190
Balance as of December 31, 2017	<u>\$ 13,308</u>	<u>\$ 93,528</u>	<u>\$ 365,936</u>	<u>\$ (65,100)</u>	<u>\$ 1,946</u>	<u>\$ 409,618</u>
Cumulative effect of an accounting change	—	—	(754)	—	—	(754)
Balance as of January 1, 2018	<u>\$ 13,308</u>	<u>\$ 93,528</u>	<u>\$ 365,182</u>	<u>\$ (65,100)</u>	<u>\$ 1,946</u>	<u>\$ 408,864</u>
Net income	—	—	59,473	—	338	59,811
Amounts reported in other comprehensive loss	—	—	—	(15,615)	(90)	(15,705)
Dividends (\$1.465 per share)	—	—	(19,530)	—	—	(19,530)
Distributions to noncontrolling affiliate shareholders	—	—	—	—	(877)	(877)
Shares issued upon exercise of stock options and other	9	(432)	—	—	—	(423)
Shares issued for employee stock purchase plan	3	502	—	—	—	505
Equity based compensation plans	18	3,706	—	—	—	3,724
Balance as of December 31, 2018	<u>\$ 13,338</u>	<u>\$ 97,304</u>	<u>\$ 405,125</u>	<u>\$ (80,715)</u>	<u>\$ 1,317</u>	<u>\$ 436,369</u>

The accompanying notes are an integral part of these consolidated financial statements.

Note 1 – Significant Accounting Policies

Principles of consolidation: All majority-owned subsidiaries are included in the Company's consolidated financial statements, with appropriate elimination of intercompany balances and transactions. Investments in associated companies (less than majority-owned and in which the Company has significant influence) are accounted for under the equity method. The Company's share of net income or losses in these investments in associated companies is included in the Consolidated Statements of Income. The Company periodically reviews these investments for impairments and, if necessary, would adjust these investments to their fair value when a decline in market value or other impairment indicators are deemed to be other than temporary. See Note 16 of Notes to Consolidated Financial Statements. The Company is not the primary beneficiary of any variable interest entities ("VIEs") and therefore the Company's consolidated financial statements do not include the accounts of any VIEs.

Translation of foreign currency: Assets and liabilities of non-U.S. subsidiaries and associated companies are translated into U.S. dollars at the respective rates of exchange prevailing at the end of the year. Income and expense accounts are translated at average exchange rates prevailing during the year. Translation adjustments resulting from this process are recorded directly in equity as accumulated other comprehensive (loss) income ("AOCI") and will be included as income or expense only upon sale or liquidation of the underlying entity or asset. Generally, all of the Company's non-U.S. subsidiaries use their local currency as their functional currency.

Cash and cash equivalents: The Company invests temporary and excess funds in money market securities and financial instruments having maturities within 90 days. The Company considers all highly liquid investments with original maturities of three months or less to be cash equivalents. The Company has not experienced losses from the aforementioned investments.

Inventories: Inventories are valued at the lower of cost or net realizable value, and are valued using the first-in, first-out method. See Note 13 of Notes to Consolidated Financial Statements.

Long-lived assets: Property, plant and equipment are stated at cost. Depreciation is computed using the straight-line method on an individual asset basis over the following estimated useful lives: buildings and improvements, 10 to 45 years; and machinery and equipment, 1 to 15 years. The carrying values of long-lived assets are evaluated whenever changes in circumstances or current events indicate the carrying amount of such assets may not be recoverable. An estimate of undiscounted cash flows produced by the asset, or the appropriate group of assets, is compared with the carrying value to determine whether an impairment exists. If necessary, the Company recognizes an impairment loss for the difference between the carrying amount of the assets and their estimated fair value. Fair value is based on current and anticipated future cash flows. Upon sale or other dispositions of long-lived assets, the applicable amounts of asset cost and accumulated depreciation are removed from the accounts and the net amount, less proceeds from disposals, is recorded in the Consolidated Statements of Income. Expenditures for renewals or improvements that increase the estimated useful life or capacity of the assets are capitalized, whereas expenditures for repairs and maintenance are expensed when incurred. See Notes 8 and 14 of Notes to Consolidated Financial Statements.

Capitalized software: The Company capitalizes certain costs in connection with developing or obtaining software for internal use, depending on the associated project. These costs are amortized over a period of 3 to 5 years once the assets are ready for their intended use. In connection with the implementations and upgrades to the Company's global transaction, consolidation and other related systems, approximately \$1.1 million and \$1.3 million of net costs were capitalized in property, plant and equipment on the Company's December 31, 2018 and 2017 Consolidated Balance Sheets, respectively.

Goodwill and other intangible assets: The Company records goodwill, definite-lived intangible assets and indefinite-lived intangible assets at fair value at the date of acquisition. Goodwill and indefinite-lived intangible assets are not amortized but tested for impairment at least annually. These tests will be performed more frequently if triggering events indicate potential impairment. Definite-lived intangible assets are amortized over their estimated useful lives, generally for periods ranging from 4 to 20 years. The Company continually evaluates the reasonableness of the useful lives of these assets, consistent with the discussion of long-lived assets, above. See Note 15 of Notes to Consolidated Financial Statements.

Revenue recognition: During the first quarter of 2018, the Company adopted the provisions of the Financial Accounting Standards Board's ("FASB's") revenue recognition guidance which required the Company to recognize revenue to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the Company expects to be entitled in exchange for those goods or services. To do this, the Company applies the five-step model in the FASB's guidance, which requires the Company to: (i) identify the contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when, or as, the Company satisfies a performance obligation. The Company adopted the new revenue recognition guidance electing to use a modified retrospective adoption approach applied to those contracts which were not completed as of January 1, 2018. Therefore,

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comparative information has not been restated and continues to be accounted for and reported under the historical revenue recognition accounting standards in effect for those periods. Prior to this adoption, the Company recognized revenue in accordance with the terms of the underlying agreements, when title and risk of loss had been transferred, when collectability was reasonably assured, and when pricing was fixed or determinable. This generally occurred when products were shipped or delivered to customers or, for consignment-type arrangements, upon usage by the customer and when services were performed. See Notes 3 and 4 of Notes to Consolidated Financial Statements.

Accounts receivable and allowance for doubtful accounts: Trade accounts receivable subject the Company to credit risk. Trade accounts receivable are recorded at the invoiced amount and generally do not bear interest. The allowance for doubtful accounts is the Company's best estimate of the amount of probable credit losses with its existing accounts receivable. Reserves for customers filing for bankruptcy protection are established based on a percentage of the amount outstanding at the bankruptcy filing date. However, initially establishing a reserve and the amount thereto is dependent on the Company's evaluation of likely proceeds to be received from the bankruptcy process, which could result in the Company recognizing minimal or no reserve at the date of bankruptcy. Large and/or financially distressed customers are generally reserved for on a specific review basis while a general reserve is established for other customers based on historical experience. The Company performs a formal review of its allowance for doubtful accounts quarterly. Account balances are charged off against the allowance when the Company deems it is probable the receivable will not be recovered. The Company does not have any off-balance-sheet credit exposure related to its customers. See Notes 4 and 12 of Notes to Consolidated Financial Statements.

Research and development costs: Research and development costs are expensed as incurred and are included in selling, general and administrative expenses ("SG&A"). Research and development expenses were \$24.5 million, \$23.9 million and \$22.5 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Environmental liabilities and expenditures: Accruals for environmental matters are recorded when it is probable that a liability has been incurred and the amount of the liability can be reasonably estimated. If there is a range of estimated liability and no amount in that range is considered more probable than another, then the Company records the lowest amount in the range in accordance with generally accepted accounting principles in the United States ("U.S. GAAP"). Accrued liabilities are exclusive of claims against third parties and are not discounted. Environmental costs and remediation costs are capitalized if the costs extend the life, increase the capacity or improve safety or efficiency of the property from the date acquired or constructed, and/or mitigate or prevent contamination in the future. See Note 25 of Notes to Consolidated Financial Statements.

Asset retirement obligations: The Company follows the FASB's guidance regarding asset retirement obligations, which addresses the accounting and reporting for obligations associated with the retirement of tangible long-lived assets and the associated retirement costs. Also, the Company follows the FASB's guidance for conditional asset retirement obligations ("CARO"), which relates to legal obligations to perform an asset retirement activity in which the timing and (or) method of settlement are conditional on a future event that may or may not be within the control of the entity. In accordance with this guidance, the Company records a liability when there is enough information regarding the timing of the CARO to perform a probability-weighted discounted cash flow analysis. As of December 31, 2018 and 2017, the Company had limited exposure to such obligations and had immaterial liabilities recorded for such on its Consolidated Balance Sheets.

Pension and other postretirement benefits: The Company maintains various noncontributory retirement plans, the largest of which is in the U.S., covering a portion of its employees in the U.S. and certain other countries. The plans of the Company's subsidiaries in the Netherlands, the United Kingdom, Mexico and Sweden are subject to the provisions of FASB's guidance regarding employers' accounting for defined benefit pension plans. The plans of the remaining non-U.S. subsidiaries are, for the most part, either fully insured or integrated with the local governments' plans and are not subject to the provisions of the guidance. The guidance requires that employers recognize on a prospective basis the funded status of their defined benefit pension and other postretirement plans on their consolidated balance sheet and, also, recognize as a component of AOCI, net of tax, the gains or losses and prior service costs or credits that arise during the period but are not recognized as components of net periodic benefit cost. In addition, the guidance requires that an employer recognize a settlement charge in their consolidated statement of income when certain events occur, including plan termination or the settlement of certain plan liabilities. A settlement charge represents the immediate recognition into expense of a portion of the unrecognized loss within AOCI on the balance sheet in proportion to the share of the projected benefit obligation that was settled. The Company's U.S. pension plan year ends on November 30 and the measurement date is December 31. The measurement date for the Company's other postretirement benefits plan is December 31.

The Company's global pension investment policies are designed to ensure that pension assets are invested in a manner consistent with meeting the future benefit obligations of the pension plans and maintaining compliance with various laws and regulations including the Employee Retirement Income Security Act of 1974. The Company establishes strategic asset allocation percentage targets and appropriate benchmarks for significant asset classes with the aim of achieving a prudent balance between return and risk.

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The Company's investment horizon is generally long term, and, accordingly, the target asset allocations encompass a long-term perspective of capital markets, expected risk and return and perceived future economic conditions while also considering the profile of plan liabilities. To the extent feasible, the short-term investment portfolio is managed to immunize the short-term obligations, the intermediate portfolio duration is immunized to reduce the risk of volatility in intermediate plan distributions, and the total return portfolio is expected to maximize the long-term real growth of plan assets. The critical investment principles of diversification, assessment of risk and targeting the optimal expected returns for given levels of risk are applied. The Company's investment guidelines prohibit the use of securities such as letter stock and other unregistered securities, commodities or commodity contracts, short sales, margin transactions, private placements (unless specifically addressed by addendum), or any derivatives, options or futures for the purpose of portfolio leveraging.

The target asset allocation is reviewed periodically and is determined based on a long-term projection of capital market outcomes, inflation rates, fixed income yields, returns, volatilities and correlation relationships. The interaction between plan assets and benefit obligations is periodically studied to assist in establishing such strategic asset allocation targets. Asset performance is monitored with an overall expectation that plan assets will meet or exceed benchmark performance over rolling five-year periods. The Company's pension committee, as authorized by the Company's Board of Directors, has discretion to manage the assets within established asset allocation ranges approved by senior management of the Company. As of December 31, 2018, the plan's investments were in compliance with all approved ranges of asset allocations. See Note 20 of Notes to Consolidated Financial Statements.

Comprehensive income (loss): The Company presents other comprehensive income (loss) in its Statements of Comprehensive Income. The Company follows the FASB's guidance regarding the disclosure of reclassifications from AOCI which requires the disclosure of significant amounts reclassified from each component of AOCI, the related tax amounts and the income statement line items affected by such reclassifications. See Note 22 of Notes to Consolidated Financial Statements.

Income taxes and uncertain tax positions: The provision for income taxes is determined using the asset and liability approach of accounting for income taxes. Under this approach, deferred taxes represent the future tax consequences expected to occur when the reported amounts of assets and liabilities are recovered or paid. The provision for income taxes represents income taxes paid or payable for the current year and the change in deferred taxes during the year. Deferred taxes result from differences between the financial and tax bases of the Company's assets and liabilities and are adjusted for changes in tax rates and tax laws when changes are enacted. Valuation allowances are recorded to reduce deferred tax assets when it is more likely than not that a tax benefit will not be realized. The FASB's guidance regarding accounting for uncertainty in income taxes prescribes the recognition threshold and measurement attributes for financial statement recognition and measurement of tax positions taken or expected to be taken on a tax return. The guidance further requires the determination of whether the benefits of tax positions are probable or more likely than not sustained upon audit based upon the technical merits of the tax position. For tax positions that are determined to be more likely than not sustained upon audit, a company recognizes the largest amount of benefit that is greater than 50% likely of being realized upon ultimate settlement in the financial statements. For tax positions that are not determined to be more likely than not sustained upon audit, a company does not recognize any portion of the benefit in the financial statements. Additionally, the Company monitors and adjusts for derecognition, classification, and penalties and interest in interim periods, with appropriate disclosure and transition thereto. Also, the amount of interest expense and income related to uncertain tax positions is computed by applying the applicable statutory rate of interest to the difference between the tax position recognized, including timing differences, and the amount previously taken or expected to be taken in a tax return. The Company's continuing practice is to recognize interest and/or penalties related to income tax matters in income tax expense. Finally, when applicable, the Company nets its liability for unrecognized tax benefits against deferred tax assets related to net operating losses or other tax credit carryforwards that would apply if the uncertain tax position were settled for the presumed amount at the balance sheet date.

Pursuant to the Tax Cuts and Jobs Act ("U.S. Tax Reform"), specifically the one-time tax on deemed repatriation (the "Transition Tax"), the Company has provided for U.S. income tax on its undistributed earnings of non-U.S. subsidiaries, however, the Company is subject to and will incur other taxes, such as withholding taxes and dividend distribution taxes, if these undistributed earnings were ultimately remitted to the U.S. It is the Company's current intention to reinvest its future undistributed earnings of non-U.S. subsidiaries to support working capital needs and certain other growth initiatives. However, in certain cases the Company has and may in the future change its indefinite reinvestment assertion for any or all of these undistributed earnings. In this case, the Company would estimate and record a tax liability and corresponding tax expense for the amount of non-U.S. income taxes it will incur to ultimately remit these earnings to the U.S. See Note 9 of Notes to Consolidated Financial Statements.

Derivatives: The Company is exposed to the impact of changes in interest rates, foreign currency fluctuations, changes in commodity prices and credit risk. The Company is currently not using derivative instruments to mitigate the risks associated with foreign currency fluctuations, changes in commodity prices or credit risk, but has used derivative financial instruments primarily for purposes of hedging exposures to fluctuations in interest rates in the past. If used in the future, the Company will recognize the entire

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change in the fair value of the hedging instrument in the same income statement line as the hedged item. The Company currently uses no derivative instruments designated as hedges and, also, has not entered into derivative contracts for trading or speculative purposes.

Fair value measurements: The Company utilizes the FASB's guidance regarding fair value measurements, which establishes a common definition for fair value to be applied to guidance requiring use of fair value, establishes a framework for measuring fair value and expands disclosure about such fair value measurements. Specifically, the guidance utilizes a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value into three broad levels. See Notes 20 and 24 of Notes to Consolidated Financial Statements. The following is a brief description of those three levels:

- Level 1: Observable inputs such as quoted prices (unadjusted) in active markets for identical assets or liabilities.
- Level 2: Inputs other than quoted prices that are observable for the asset or liability, either directly or indirectly. These include quoted prices for similar assets or liabilities in active markets and quoted prices for identical or similar assets or liabilities in markets that are not active.
- Level 3: Unobservable inputs that reflect the reporting entity's own assumptions.

Share-based compensation: The Company applies the FASB's guidance regarding share-based payments, which requires the recognition of the fair value of share-based compensation as a component of expense. The Company has a long-term incentive program ("LTIP") for key employees which provides for the granting of options to purchase stock at prices not less than its market value on the date of the grant. Most options become exercisable between one and three years after the date of the grant for a period of time determined by the Company, but not to exceed seven years from the date of grant. Restricted stock awards and restricted stock units issued under the LTIP program are generally subject to time vesting over a one to four-year period. In addition, as part of the Company's Global Annual Incentive Plan, nonvested shares may be issued to key employees, which generally vest over a two to five-year period. In addition, while the FASB's guidance permits the Company to make an accounting policy election to account for forfeitures as they occur for service condition aspects of certain share-based awards, the Company has decided not to elect this accounting policy and instead has elected to continue utilizing a forfeiture rate assumption. Based on historical experience, the Company has assumed a forfeiture rate of 13% on certain of its nonvested stock awards. The Company will record additional expense if the actual forfeiture rate is lower than estimated and will record a recovery of prior expense if the actual forfeiture is higher than estimated. See Note 7 of Notes to Consolidated Financial Statements.

Earnings per share: The Company follows the FASB's guidance regarding the calculation of earnings per share for nonvested stock awards with rights to non-forfeitable dividends. The guidance requires nonvested stock awards with rights to non-forfeitable dividends to be included as part of the basic weighted average share calculation under the two-class method. See Note 10 of Notes to Consolidated Financial Statements.

Segments: The Company's operating segments reflect the structure of the Company's internal organization, the method by which the Company's resources are allocated and the manner by which the Company assesses its performance. The Company's operating segments are organized by geography as follows: (i) North America, (ii) Europe, Middle East and Africa ("EMEA"), (iii) Asia/Pacific and (iv) South America. The Company's reportable segments are the same as the Company's operating segments. See Note 5 of Notes to Consolidated Financial Statements.

Hyper-inflationary accounting: Economies that have a cumulative three-year rate of inflation exceeding 100 percent are considered hyper-inflationary in accordance with U.S. GAAP. A legal entity which operates within an economy deemed to be hyper-inflationary is required to remeasure its monetary assets and liabilities to the applicable published exchange rates and record the associated gains or losses resulting from the remeasurement directly to the Consolidated Statements of Income.

Venezuela's economy has been considered hyper-inflationary under U.S. GAAP since 2010. The Company has a 50-50 joint venture in a Venezuelan affiliate, Kelko Quaker Chemical, S.A ("Kelko Venezuela"). Due to heightened foreign exchange controls, current economic circumstances and other restrictions in Venezuela, during the third quarter of 2018 the Company concluded that it no longer had significant influence over this affiliate. Prior to this determination, the Company historically accounted for this affiliate under the equity method. As of December 31, 2018, the Company has no remaining carrying value for its investment in Kelko Venezuela. See Note 16 of Notes to Consolidated Financial Statements.

Based on various indices or index compilations currently being used to monitor inflation in Argentina as well as recent economic instability, effective July 1, 2018, Argentina's economy was considered hyper-inflationary under U.S. GAAP. As a result, the Company began applying hyper-inflationary accounting with respect to the Company's wholly owned Argentina subsidiary beginning July 1, 2018. As of, and for the year ended December 31, 2018, the Company's Argentina subsidiary represented less than 1% of the Company's consolidated total assets and less than 1% of the Company's consolidated net sales. During the years ended December 31, 2018, 2017 and 2016, the Company recorded \$0.7 million, \$0.4 million, and \$0.1 million, respectively, of hyper-inflationary accounting remeasurement losses associated with the applicable currency conversions related to Venezuela and Argentina.

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Business combinations: The Company accounts for business combinations under the acquisition method of accounting. This method requires the recording of acquired assets, including separately identifiable intangible assets and assumed liabilities at their respective acquisition date estimated fair values. Any excess of the purchase price over the estimated fair value of the identifiable net assets acquired is recorded as goodwill. The determination of the estimated fair value of assets acquired and liabilities assumed requires significant estimates and assumptions. Based on the assessment of additional information during the measurement period, which may be up to one year from the acquisition date, the Company may record adjustments to the estimated fair value of assets acquired and liabilities assumed. See Note 23 of Notes to Consolidated Financial Statements.

Restructuring activities: Restructuring programs consist of employee severance, rationalization of manufacturing or other facilities and other related items. To account for such programs, the Company applies FASB's guidance regarding exit or disposal cost obligations. This guidance requires that a liability for a cost associated with an exit or disposal activity be recognized when the liability is incurred, is estimable, and payment is probable. See Note 6 of Notes to Consolidated Financial Statements.

Reclassifications: Certain information has been reclassified to conform to the current year presentation. During the first quarter of 2018, the Company adopted guidance regarding the accounting for and disclosure of net sales and revenue recognition. The Company's adoption, using the modified retrospective adoption approach, resulted in certain adjustments as of January 1, 2018. In addition, during the first quarter of 2018, the Company adopted an accounting standard update requiring that the statement of cash flows explain both the change in total cash and cash equivalents and also the amounts generally described as restricted cash or restricted cash equivalents. The guidance in this accounting standard update was required to be applied retrospectively which resulted in certain adjustments to the Company's Consolidated Statement of Cash Flows for the year ended December 31, 2017 and 2016. See Notes 3, 4 and 11 of Notes to Consolidated Financial Statements.

Accounting estimates: The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities and disclosure of contingencies at the date of the financial statements and the reported amounts of net sales and expenses during the reporting period. Actual results could differ from such estimates.

Note 2 – Houghton Combination

In April 2017, Quaker entered into a share purchase agreement with Gulf Houghton Lubricants, Ltd. to purchase the entire issued and outstanding share capital of Houghton International, Inc. ("Houghton") (herein referred to as "the Combination"). The shares will be bought for aggregate purchase consideration consisting of: (i) \$172.5 million in cash; (ii) a number of shares of common stock, \$1.00 par value per share, of the Company comprising 24.5% of the common stock outstanding upon the closing of the Combination; and (iii) the Company's assumption of Houghton's net indebtedness as of the closing of the Combination, which was approximately \$690 million at signing. At closing, the total aggregate purchase consideration is dependent on the Company's stock price and the level of Houghton's indebtedness.

The Company secured \$1.15 billion in commitments from Bank of America Merrill Lynch and Deutsche Bank to fund the Combination and to provide additional liquidity, and has since replaced these commitments with a syndicated bank agreement ("the New Credit Facility") with a group of lenders for \$1.15 billion. The New Credit Facility is contingent upon and will not be effective until the closing of the Combination. During the fourth quarter of 2018, the Company extended the bank commitment for the New Credit Facility through March 15, 2019. The New Credit Facility is comprised of a \$400.0 million multicurrency revolver, a \$600.0 million USD term loan and a \$150.0 million EUR equivalent term loan, each with a five-year term from the date the New Credit Facility becomes effective. The maximum amount available under the New Credit Facility can be increased by \$200.0 million at the Company's option if the lenders agree and the Company satisfies certain conditions. Borrowings under the New Credit Facility will bear interest at a base rate, LIBOR rate plus a margin, or Euribor rate plus a margin. The Company currently estimates the annual floating rate cost will be in the 3.75% to 4.0% range based on current market interest rates. The New Credit Facility will be subject to certain financial and other covenants, including covenants that the Company's consolidated net debt to adjusted EBITDA ratio cannot exceed 4.25 to 1 and the Company's consolidated adjusted EBITDA to interest expense ratio cannot be less than 3.0 to 1. Both the USD and EUR equivalent term loans will have quarterly principal amortization during their respective five-year terms, with 5.0% amortization of the principal balance due in years 1 and 2, 7.5% in year 3, and 10.0% in years 4 and 5, with the remaining principal amounts due at maturity. Until closing, the Company will incur certain interest costs paid to maintain the bank commitment ("ticking fees"), which began to accrue on September 29, 2017 and bear an interest rate of 0.30% per annum.

The Company received regulatory approval for the Combination from China and Australia in 2017. In addition, at a shareholder meeting held during 2017, the Company's shareholders overwhelmingly approved the issuance of the new shares of the Company's common stock at closing of the Combination. The European Commission ("EC") conditionally approved the Combination in December 2018, including the remedy proposed by Quaker and Houghton. The Company expects final approval from the EC once the final purchase agreement is in place between Quaker, Houghton, and the buyer of the divested product lines. The Company continues

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to be in productive discussions with the U.S. Federal Trade Commission ("FTC"), although the process is taking longer than anticipated. Given the time lapse since the Company's initial filing, the FTC requested updated information as part of their approval process late in the fourth quarter of 2018. In addition, the government shutdown in the U.S. during the first quarter of 2019 extended the timeline to receive the final approval. Given current information, the Company estimates that FTC and EC final approval and closing of the combination will occur within the next few months.

The Company incurred costs of \$19.5 million, \$30.8 million and \$1.5 million during the years ended December 31, 2018, 2017 and 2016, respectively, primarily for certain legal, environmental, financial, and other advisory and consultant costs related to due diligence, regulatory and shareholder approvals, integration planning associated with the Combination and ticking fees. As of December 31, 2018 and 2017, the Company had current liabilities related to the Combination of \$8.2 million and \$5.5 million, respectively, primarily recorded within other current liabilities on its Consolidated Balance Sheets.

Note 3 – Recently Issued Accounting Standards

The FASB issued an accounting standard update in October 2018 to provide guidance on the risks associated with financial assets and liabilities that are permitted to be hedged. The amendments in this update permit use of the Overnight Index Swap ("OIS") rate based on the Secured Overnight Financing Rate (SOFR) as a U.S. benchmark interest rate in addition to the other four rates: interest rates on direct Treasury obligations of the U.S. government (UST), the London Interbank Offered Rate (LIBOR) swap rate, the OIS rate based on the Fed Funds Effective Rate and the Securities Industry and Financial Markets Association (SIFMA) Municipal Swap Rate. The amendments in this update also apply to all entities that elect to apply hedge accounting to benchmark interest rate hedges. The guidance within this accounting standard update is effective for fiscal years beginning after December 15, 2018, and interim periods within those fiscal years. The amendments in this update should be adopted on a prospective basis for qualifying new or re-designated hedging relationships entered into on or after the date of adoption. Early adoption is permitted. The Company has elected to early adopt the guidance in this accounting standard update during the fourth quarter of 2018, with no impact to its financial statements. The Company does not currently use any derivative instruments designated as hedges but may choose to in the future.

The FASB issued an accounting standard update in August 2018 that modifies certain disclosure requirements for employers that sponsor defined benefit pension or other postretirement plans. The amendments in this accounting standard update remove disclosures that are no longer considered cost beneficial, clarify the specific requirements of certain disclosures, and add new disclosure requirements as relevant. The guidance within this accounting standard update is effective for annual periods beginning after December 15, 2020, and should be applied retrospectively to all periods presented. Early adoption is permitted. The Company has not early adopted the guidance and is currently evaluating its implementation.

The FASB issued an accounting standard update in August 2018 that clarifies the accounting for implementation costs incurred in a cloud computing arrangement under a service contract. This guidance generally aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement under a service contract with the requirements for capitalizing implementation costs related to internal-use software. The guidance within this accounting standard update is effective for annual periods beginning after December 15, 2019 and should be applied either retrospectively or prospectively to all implementation costs incurred after the date of adoption. Early adoption is permitted. The Company has not early adopted the guidance and is currently evaluating its implementation.

The FASB issued an accounting standard update in August 2018 that modifies certain disclosure requirements for fair value measurements. The guidance removes certain disclosure requirements regarding transfers between levels of the fair value hierarchy as well as the valuation processes for certain fair value measurements. Further, the guidance added certain disclosure requirements including unrealized gains and losses and significant unobservable inputs used to develop certain fair value measurements. The guidance within this accounting standard update is effective for annual and interim periods beginning after December 15, 2019, and should be applied prospectively in the initial year of adoption or prospectively to all periods presented, depending on the amended disclosure requirement. Early adoption is permitted. The Company has not early adopted the guidance and is currently evaluating its implementation.

The FASB issued an accounting standard update in June 2018 to simplify the accounting for share-based payment transactions with non-employees of the Company. The guidance within this accounting standard update generally requires that share-based payment transactions for acquiring goods or services from non-employees of the Company be accounted for under the same guidance and model as all other share-based payment transactions, including employees of the Company. The guidance within this accounting standard update is effective for annual and interim periods beginning after December 15, 2018. Early adoption is permitted. The Company elected to early adopt the guidance within this accounting standard updated in the second quarter of 2018 with no impact to its financial statements.

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The FASB issued an accounting standard update in February 2018 that allows a reclassification from AOCI to retained earnings for stranded tax effects resulting from U.S. Tax Reform enacted in December 2017. The guidance within this accounting standard update is effective for annual and interim periods beginning after December 15, 2018, and should be applied either in the period of adoption or retrospectively to each period in which the effect of the change in the U.S. federal corporate income tax rate in U.S. Tax Reform is recognized. Early adoption is permitted. The Company has not early adopted the guidance and is currently evaluating its implementation.

The FASB issued an accounting standard update in January 2017 to clarify the definition of a business with the objective of adding guidance to assist companies with evaluating whether transactions should be accounted for as acquisitions (or disposals) of assets or businesses. The amendments in this accounting standard update provided a more robust framework to use in determining when a set of assets and activities is a business. The guidance within this accounting standard update was effective for annual and interim periods beginning after December 15, 2017. Early adoption was permitted in limited circumstances, and the amendments in this accounting standard update were required to be applied prospectively, with no disclosures required at transition. The Company adopted the guidance in the first quarter of 2018, as required, with no impact to its financial statements.

The FASB issued an accounting standard update in November 2016 requiring that the statement of cash flows explain both the change in the total cash and cash equivalents, and also the amounts generally described as restricted cash or restricted cash equivalents. This required amounts generally described as restricted cash or restricted cash equivalents be included with cash and cash equivalents when reconciling the beginning and ending amounts shown on the statement of cash flows. The guidance within this accounting standard update was effective for annual and interim periods beginning after December 15, 2017. Early adoption was permitted, and the guidance required application using a retrospective transition method to each period presented when adopted. The Company adopted the guidance in the first quarter of 2018, as required. Adoption of the guidance did not have an impact on the Company's earnings or balance sheet but did result in changes to certain disclosures within the statement of cash flows, including cash flows from investing activities and total cash, cash equivalents and restricted cash. See Note 11 of Notes to Consolidated Financial Statements.

The FASB issued an accounting standard update in October 2016 to improve the accounting for the income tax consequences of intra-entity transfers of assets other than inventory. The provisions in this update allowed an entity to recognize current and deferred income taxes of an intra-entity transfer of an asset other than inventory when the transfer occurs rather than when the asset has been sold to an outside party. The guidance within this accounting standard update was effective for annual and interim periods beginning after December 15, 2017. Early adoption was permitted, and the guidance required application on a modified retrospective basis through a cumulative-effect adjustment directly to retained earnings as of the beginning of the period of adoption. The Company adopted the guidance in the first quarter of 2018, as required, with no impact to its financial statements.

The FASB issued an accounting standard update in August 2016 to standardize how certain transactions are classified in the statement of cash flows. Specific transactions covered by the accounting standard update include debt prepayment or debt extinguishment costs, settlement of zero-coupon debt instruments, contingent consideration payments made after a business combination, proceeds from the settlement of insurance claims, proceeds from the settlement of corporate and bank owned life insurance policies, distributions received from equity method investments and beneficial interest in securitization transactions. The guidance within this accounting standard update was effective for annual and interim periods beginning after December 15, 2017. Early adoption was permitted, provided that all of the amendments were adopted in the same period. The guidance required application using a retrospective transition method. The Company adopted the guidance in the first quarter of 2018 as required, with no impact to its financial statements.

The FASB issued an accounting standard update in February 2016 regarding the accounting and disclosure for leases. During 2018, the FASB issued a series of accounting standard updates to clarify and expand on the original 2016 implementation guidance, including providing an accounting policy election for lessors, certain targeted improvements around comparative reporting requirements and accounting for lease and non-lease components by lessors as well as other technical corrections and improvements. The amendments in these 2018 updates did not change the core principles of the guidance previously issued in February 2016. The guidance within all of the leasing accounting standard updates are effective for annual and interim periods beginning after December 15, 2018, and should be applied on a modified retrospective basis, applying the transition requirements either (a) at the beginning of the earliest period presented in the financial statements in the year of adoption (January 1, 2017) or (b) in the period of adoption (January 1, 2019). Early adoption is permitted, but the Company has not early adopted. The Company will adopt the guidance in the first quarter of 2019, as required, using a modified retrospective transition approach. The Company will apply the transition requirements in the period of adoption (as of January 1, 2019), as permitted. As such the Company will neither restate comparative periods for the effects of this lease accounting guidance or provide the disclosures requirements for comparative periods. The Company anticipates electing to apply certain of the permitted practical expedients within the new lease accounting

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guidance, and the Company also anticipates making certain accounting policy elections as a result of adopting the new lease accounting guidance.

As of December 31, 2018, the Company has substantially completed its implementation planning and its impact assessment related to the new lease accounting guidance. Work performed to date includes developing a detailed project plan, identifying and establishing a cross-functional implementation team and developing pre-adoption internal controls. In addition, the Company gathered an inventory of the Company's explicit outstanding leases globally, performed certain review procedures to ensure completeness of its lease population and abstracted critical lease information from the lease population for inclusion within the Company's leasing software. Also, the Company has begun preliminary considerations for how the new lease accounting guidance may impact Houghton, as it pertains to the potential Combination. The Company has calculated a preliminary transition adjustment which will be finalized and reflected in the Company's financial statements starting after the effective date of January 1, 2019. While the Company's implementation of this lease accounting guidance is still ongoing, the Company anticipates adoption of this guidance will have a material impact on its balance sheet as it expects the majority of its leases will be recorded on its balance sheet by establishing right of use assets and associated lease liabilities. Based on all current available information, the Company estimates that its right of use assets and associated lease liabilities will be approximately \$20 million to \$30 million as of January 1, 2019.

The FASB issued an accounting standard update in May 2014 regarding the accounting for and disclosure of revenue recognition. Specifically, the update outlined a single comprehensive model for entities to use in accounting for revenue arising from contracts with customers, which will be common to both U.S. GAAP and International Financial Reporting Standards. The guidance was effective for annual and interim periods beginning after December 15, 2016, and allowed for full retrospective adoption of prior period data or a modified retrospective adoption. Early adoption was not permitted. In August 2015, the FASB issued an accounting standard update to delay the effective date of the new revenue standard by one year, or, in other words, to be effective for annual and interim periods beginning after December 15, 2017. Entities were permitted to adopt the new revenue standard early but not before the original effective date. During 2016 and 2017, the FASB issued a series of accounting standard updates to clarify and expand on the implementation guidance, including principal versus agent considerations, identification of performance obligations, licensing, other technical corrections and adding certain practical expedients. The amendments in these 2016 and 2017 updates did not change the core principles of the guidance previously issued in May 2014.

As part of the Company's impact assessment for the implementation of the new revenue recognition guidance, the Company reviewed its historical accounting policies and practices to identify potential differences with the requirements of the new revenue recognition standard as it related to the Company's contracts and sales arrangements. In addition, the impact assessment and work performed included global and cross functional interviews and questionnaires, sales agreement and other sales document reviews, as well as technical considerations for the Company's future transactional accounting, financial reporting and disclosure requirements. The Company has also progressed its assessment of how the new revenue recognition guidance may impact Houghton, as it pertains to the pending Combination.

The Company adopted the guidance in the first quarter of 2018 as required, electing to use a modified retrospective adoption approach applied to those contracts which were not completed as of January 1, 2018. Comparative information has not been restated and continues to be reported under the accounting standards in effect for those periods. In addition, the Company elected to apply certain of the permitted practical expedients within the revenue recognition guidance and make certain accounting policy elections including those related to significant financing components, sales taxes and shipping and handling activities. Adoption of the revenue recognition guidance did not have a material impact on the Company's reported earnings or cash flows, however, adoption did increase the amount and level of disclosures concerning the Company's net sales and did result in one adjustment to the Company's balance sheet. As a result of the Company's impact assessment and adoption using the modified retrospective adoption approach, the Company recorded a cumulative effect of an accounting change as of January 1, 2018 to adjust the Company's estimate of variable consideration relating to customers' expected rights to return product. This adjustment resulted in an increase to other current liabilities of \$1.0 million, an increase to non-current deferred tax assets of \$0.2 million and a decrease to retained earnings of \$0.8 million. There were no other impacts recorded as a result of adopting the revenue recognition guidance in 2018 or prior years and the Company expects the impact to be immaterial on an ongoing basis. See Note 4 and 18 of Notes to Consolidated Financial Statements.

Note 4 – Net Sales and Revenue Recognition

Business Description

The Company develops, produces, and markets a broad range of formulated chemical specialty products and offers chemical management services (“CMS”) for various heavy industrial and manufacturing applications in a global portfolio throughout its four regions: North America, EMEA, Asia/Pacific and South America. The major product lines in the Company’s global portfolio include: (i) rolling lubricants (used by manufacturers of steel in the hot and cold rolling of steel and by manufacturers of aluminum in the hot rolling of aluminum); (ii) machining and grinding compounds (used by metalworking customers in cutting, shaping, and grinding metal parts which require special treatment to enable them to tolerate the manufacturing process, achieve closer tolerance, and improve tool life); (iii) corrosion preventives (used by steel and metalworking customers to protect metal during manufacture, storage, and shipment); (iv) hydraulic fluids (used by steel, metalworking, and other customers to operate hydraulic equipment); (v) specialty greases (used in automotive and aerospace production processes and applications, the manufacturing of steel, and various other applications); and (vi) metal finishing compounds (used to prepare metal surfaces for special treatments such as galvanizing and tin plating and to prepare metal for further processing).

A substantial portion of the Company’s sales worldwide are made directly through its own employees and its CMS programs, with the balance being handled through distributors and agents. The Company’s employees visit the plants of customers regularly, work on site, and, through training and experience, identify production needs which can be resolved or alleviated either by adapting the Company’s existing products or by applying new formulations developed in its laboratories. The chemical specialty industry comprises many companies of similar size as well as companies larger and smaller than Quaker. The offerings of many of the Company’s competitors differ from those of Quaker; some offer a broad portfolio of fluids, including general lubricants, while others have a more specialized product range. All competitors provide different levels of technical services to individual customers. Competition in the industry is based primarily on the ability to provide products that meet the needs of the customer, render technical services and laboratory assistance to the customer and, to a lesser extent, on price.

As part of the Company’s CMS, certain third-party product sales to customers are managed by the Company. Where the Company acts as a principal, revenues are recognized on a gross reporting basis at the selling price negotiated with its customers. Where the Company acts as an agent, revenue is generally recognized on a net reporting basis at the amount of the administrative fee earned by the Company for ordering the goods. In determining whether the Company is acting as a principal or an agent in each arrangement, the Company considers whether it is primarily responsible for fulfilling the promise to provide the specified good, has inventory risk before the specified good has been transferred to the customer and has discretion in establishing the prices for the specified goods. The Company transferred third-party products under arrangements resulting in net reporting of \$47.1 million, \$44.5 million and \$43.5 million for the years ended December 31, 2018, 2017 and 2016.

A significant portion of the Company’s revenues are realized from the sale of process fluids and services to manufacturers of steel, automobiles, aircraft, appliances, and durable goods, and, therefore, the Company is subject to the same business cycles as those experienced by these manufacturers and their customers. The Company’s financial performance is generally correlated to the volume of global production within the industries it serves, rather than discretely related to the financial performance of such industries. Furthermore, steel customers typically have limited manufacturing locations compared to other metalworking customers and generally use higher volumes of products at a single location. During the year ended December 31, 2018, the Company’s five largest customers accounted for approximately 17% of its consolidated net sales with the largest customer accounting for approximately 8% of the Company’s consolidated net sales.

Revenue Recognition Model

The Company applies the FASB’s guidance on revenue recognition which requires the Company to recognize revenue in an amount that reflects the consideration to which the Company expects to be entitled in exchange for goods or services transferred to its customers. To do this, the Company applies the five-step model in the FASB’s guidance, which requires the Company to: (i) identify the contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when, or as, the Company satisfies a performance obligation.

The Company identifies a contract with a customer when a sales agreement indicates approval and commitment of the parties; identifies the rights of the parties; identifies the payment terms; has commercial substance; and it is probable that the Company will collect the consideration to which it will be entitled in exchange for the goods or services that will be transferred to the customer. In most instances, the Company’s contract with a customer is the customer’s purchase order. For certain customers, the Company may also enter into a sales agreement which outlines a framework of terms and conditions which apply to all future and subsequent purchase orders for that customer. In these situations, the Company’s contract with the customer is both the sales agreement as well as

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the specific customer purchase order. Because the Company's contract with a customer is typically for a single transaction or customer purchase order, the duration of the contract is almost always one year or less. As a result, the Company has elected to apply certain practical expedients and omit certain disclosures of remaining performance obligations for contracts which have an initial term of one year or less as permitted by the FASB.

The Company identifies a performance obligation in a contract for each promised good or service that is separately identifiable from other promises in the contract and for which the customer can benefit from the good or service either on its own or together with other resources that are readily available to the customer. The Company determines the transaction price as the amount of consideration it expects to be entitled to in exchange for fulfilling the performance obligations, including the effects of any variable consideration, significant financing elements, amounts payable to the customer or noncash consideration. For any contracts that have more than one performance obligation, the Company allocates the transaction price to each performance obligation in an amount that depicts the amount of consideration to which the Company expects to be entitled in exchange for satisfying each performance obligation.

In accordance with the last step of the FASB's guidance, the Company recognizes revenue when, or as, it satisfies the performance obligation in a contract by transferring control of a promised good or service to the customer. The Company recognizes revenue over time whenever the customer simultaneously receives and consumes the benefits provided by the Company's performance; the Company's performance creates or enhances an asset that the customer controls as the asset is created or enhanced; or the Company's performance does not create an asset with an alternative use to the entity, and the entity has an enforceable right to payment, including a profit margin, for performance completed to date. For performance obligations not satisfied over time, the Company determines the point in time at which a customer obtains control of a promised asset and the Company satisfies a performance obligation by considering when the Company has a right to payment for the asset; the customer has legal title to the asset; the Company has transferred physical possession of the asset; the customer has the significant risks and rewards of ownership of the asset; or the customer has accepted the asset.

The Company typically satisfies its performance obligations and recognizes revenue at a point in time for product sales, generally when products are shipped or delivered to the customer, depending on the terms underlying each arrangement. In circumstances where the Company's products are on consignment, revenue is generally recognized upon usage or consumption by the customer. For any CMS or other services provided by the Company to the customer, the Company typically satisfies its performance obligations and recognizes revenue over time, as the promised services are performed. The Company uses input methods to recognize revenue over time related to these services, including labor costs and time incurred. The Company believes that these input methods represent the most indicative measure of the CMS or other service work performed by the Company.

Other Considerations

The Company does not have standard payment terms for all customers globally, however the Company's general payment terms require customers to pay for products or services provided after the performance obligation is satisfied. The Company does not have significant financing arrangements with its customers. The Company does not have significant amounts of variable consideration in its contracts with customers and where applicable, the Company's estimates of variable consideration are not constrained. The Company records certain third-party license fees in other expense, net, in its Consolidated Statement of Income, which generally include sales-based royalties in exchange for the license of intellectual property. These license fees are recognized in accordance with their agreed-upon terms and when performance obligations are satisfied, which is generally when the third party has a subsequent sale.

Practical Expedients and Accounting Policy Elections

The Company made certain accounting policy elections and elected to use certain practical expedients as permitted by the FASB in applying the guidance on revenue recognition. It is the Company's policy to not adjust the promised amount of consideration for the effects of a significant financing component as the Company expects, at contract inception, that the period between when the Company transfers a promised good or service to the customer and when the customer pays for that good or service will be one year or less. In addition, it is the Company's policy to expense costs to obtain a contract as incurred when the expected period of benefit, and therefore the amortization period, is one year or less. It is also the Company's accounting policy to exclude from the measurement of the transaction price all taxes assessed by a governmental authority that are both imposed on and concurrent with a specific revenue-producing transaction and collected by the entity from a customer, including sales, use, value added, excise and various other taxes. Lastly, the Company has elected to account for shipping and handling activities that occur after the customer has obtained control of a good as a fulfillment cost rather than an additional promised service.

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Contract Assets and Liabilities

The Company recognizes a contract asset or receivable on its Consolidated Balance Sheet when the Company performs a service or transfers a good in advance of receiving consideration. A receivable is the Company's right to consideration that is unconditional and only the passage of time is required before payment of that consideration is due. A contract asset is the Company's right to consideration in exchange for goods or services that the Company has transferred to a customer. The Company had no contract assets recorded on its Consolidated Balance Sheets as of December 31, 2018 or 2017.

A contract liability is recognized when the Company receives consideration, or if it has the unconditional right to receive consideration, in advance of performance. A contract liability is the Company's obligation to transfer goods or services to a customer for which the Company has received consideration, or a specified amount of consideration is due, from the customer. The Company's contract liabilities primarily represent deferred revenue recorded for customer payments received by the Company prior to the Company satisfying the associated performance obligation. Deferred revenues are presented within other current liabilities in the Company's Consolidated Balance Sheets. The Company had approximately \$1.3 million and \$1.5 million of deferred revenue as of December 31, 2018 and 2017, respectively. During the year ended December 31, 2018, the Company satisfied all of the associated performance obligations and recognized into revenue the advance customer payments received and recorded as of December 31, 2017.

Disaggregated Revenue

The Company sells its various industrial process fluids, its chemical specialties and its technical expertise as a global product portfolio. The Company generally manages and evaluates its performance by geography first, and then by customer industry, rather than by individual product lines. Also, net sales of each of the Company's major product lines are generally spread throughout all four of the Company's regions, and, in most cases, are relatively proportionate to the level of total sales in each region.

The following tables present disaggregated information regarding the Company's net sales, first by product lines that represent approximately 10% of consolidated net sales for any of the years ended December 31, 2018, 2017 and 2016, and followed then by a disaggregation of the Company's net sales by region, customer industry, and timing of revenue recognized for the year ended December 31, 2018.

	2018	2017	2016
Rolling lubricants	16.9 %	17.8 %	19.0 %
Machining and grinding compounds	16.1 %	15.8 %	14.9 %
Corrosion preventives	11.6 %	11.4 %	11.8 %
Hydraulic fluids	11.4 %	11.6 %	12.0 %
Specialty greases	9.7 %	10.0 %	10.1 %

	2018				Consolidated Total
	North America	EMEA	Asia/Pacific	South America	
Net sales	\$ 383,471	\$ 233,597	\$ 214,157	\$ 36,295	\$ 867,520

Customer Industries					
Primary metals	\$ 156,906	\$ 102,417	\$ 134,395	\$ 19,818	\$ 413,536
Metalworking	167,829	116,076	74,867	14,827	373,599
Coatings and other	58,736	15,104	4,895	1,650	80,385
	<u>\$ 383,471</u>	<u>\$ 233,597</u>	<u>\$ 214,157</u>	<u>\$ 36,295</u>	<u>\$ 867,520</u>

Timing of Revenue Recognized					
Product sales at a point in time	\$ 372,392	\$ 233,372	\$ 206,112	\$ 36,010	\$ 847,886
Services transferred over time	11,079	225	8,045	285	19,634
	<u>\$ 383,471</u>	<u>\$ 233,597</u>	<u>\$ 214,157</u>	<u>\$ 36,295</u>	<u>\$ 867,520</u>

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Note 5 – Business Segments

The Company's reportable operating segments are organized by geography as follows: (i) North America, (ii) EMEA, (iii) Asia/Pacific and (iv) South America. Operating earnings, excluding indirect operating expenses, for the Company's reportable operating segments is comprised of revenues less cost of goods sold ("COGS") and SG&A directly related to the respective region's product sales. The indirect operating expenses consist of SG&A not directly attributable to the product sales of each respective reportable operating segment. Other items not specifically identified with the Company's reportable operating segments include interest expense, interest income, license fees from non-consolidated affiliates, amortization expense and other expense, net.

The following tables present information about the performance of the Company's reportable operating segments for the years ended December 31, 2018, 2017 and 2016:

	2018	2017	2016
Net sales			
North America	\$ 383,471	\$ 356,598	\$ 336,174
EMEA	233,597	226,243	200,917
Asia/Pacific	214,157	201,008	179,131
South America	36,295	36,233	30,443
Total net sales	\$ 867,520	\$ 820,082	\$ 746,665
	2018	2017	2016
Operating earnings, excluding indirect operating expenses			
North America	\$ 88,276	\$ 77,694	\$ 77,833
EMEA	35,970	35,350	33,810
Asia/Pacific	56,056	48,342	45,866
South America	3,881	3,927	1,386
Total operating earnings, excluding indirect operating expenses	184,183	165,313	158,895
Non-operating charges	(72,223)	(65,142)	(65,316)
Restructuring and related activities	—	—	439
Combination-related expenses	(16,661)	(29,938)	(1,531)
Depreciation of corporate assets and amortization	(7,518)	(7,489)	(7,134)
Operating income	87,781	62,744	85,353
Other expense, net	(642)	(718)	(492)
Interest expense	(6,158)	(3,892)	(2,889)
Interest income	2,117	2,534	2,037
Income before taxes and equity in net income of associated companies	\$ 83,098	\$ 60,668	\$ 84,009

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The following tables present information regarding the Company's reportable operating segments' assets and long-lived assets as of December 31, 2018, 2017 and 2016:

	2018	2017	2016
Segment assets			
North America (including Corporate)	\$ 317,934	\$ 324,260	\$ 321,404
EMEA	157,111	177,267	147,021
Asia/Pacific	212,545	196,891	200,218
South America	22,075	23,708	23,385
Total segment assets	<u>\$ 709,665</u>	<u>\$ 722,126</u>	<u>\$ 692,028</u>

	2018	2017	2016
Segment long-lived assets			
North America (including Corporate)	\$ 84,876	\$ 88,818	\$ 86,775
EMEA	26,239	28,507	25,630
Asia/Pacific	23,650	22,427	22,040
South America	2,529	2,691	2,858
Total segment long-lived assets	<u>\$ 137,294</u>	<u>\$ 142,443</u>	<u>\$ 137,303</u>

The following tables present information regarding the Company's reportable operating segments' capital expenditures and depreciation for the years ended December 31, 2018, 2017 and 2016:

	2018	2017	2016
Capital expenditures			
North America (including Corporate)	\$ 4,574	\$ 3,919	\$ 2,918
EMEA	2,081	3,936	3,263
Asia/Pacific	6,059	2,458	3,269
South America	172	559	504
Total segment capital expenditures	<u>\$ 12,886</u>	<u>\$ 10,872</u>	<u>\$ 9,954</u>

	2018	2017	2016
Depreciation			
North America	\$ 5,770	\$ 5,791	\$ 5,672
EMEA	3,434	3,368	3,323
Asia/Pacific	2,552	2,669	2,765
South America	440	649	672
Total segment depreciation	<u>\$ 12,196</u>	<u>\$ 12,477</u>	<u>\$ 12,432</u>

During the years ended December 31, 2018, 2017 and 2016, the North America segment had approximately \$50.8 million, \$49.2 million and \$35.8 million of net sales, respectively, which were attributable to non-U.S. operations. As of December 31, 2018, 2017 and 2016, the North America segment had approximately \$4.5 million, \$4.9 million and \$4.9 million of long-lived assets, respectively, which were attributable to non-U.S. operations.

Inter-segment revenue for the years ended December 31, 2018, 2017 and 2016 was \$9.7 million, \$9.4 million and \$8.3 million for North America, \$22.0 million, \$22.0 million and \$18.1 million for EMEA, \$0.5 million, \$0.4 million and \$0.7 million for Asia/Pacific and less than \$0.1 million for the years ended December 31, 2018, 2017 and 2016 for South America, respectively. However, all inter-segment transactions have been eliminated from each reportable operating segment's net sales and earnings for all periods presented in the above tables.

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Note 6 – Restructuring and Related Activities

In response to weak economic conditions and market declines in many regions, Quaker’s management approved a global restructuring plan (the “2015 Program”) in the fourth quarter of 2015 to reduce its operating costs. The 2015 Program included provisions for the reduction of total headcount by approximately 65 employees globally. The Company substantially completed all of the initiatives under the 2015 Program in 2016 and settlement of these charges occurred primarily in 2016 as well. During the fourth quarter of 2016, the Company recognized a restructuring credit of \$0.4 million in connection with the 2015 Program, due to customary and routine adjustments to initial estimates for employee separation costs. The Company completed all of the remaining initiatives under the 2015 Program during the first half of 2017 and does not expect to incur further restructuring charges under this program.

There were no accrued restructuring liabilities as of December 31, 2017 and no associated cash payments or other restructuring activity during the year ended December 31, 2018. Restructuring activity recognized in each reportable operating segment in connection with the 2015 Program during the years ended December 31, 2017 and 2016 is as follows:

	North America	EMEA	Asia/Pacific	South America	Total
Accrued restructuring as of					
December 31, 2015	\$ 1,867	\$ 4,265	\$ 135	\$ 36	\$ 6,303
Restructuring credits	—	(439)	—	—	(439)
Cash payments	(1,671)	(3,404)	(138)	(39)	(5,252)
Currency translation adjustments	—	52	3	3	58
Accrued restructuring as of					
December 31, 2016	196	474	—	—	670
Restructuring charges and adjustments	(126)	126	—	—	—
Cash payments	(70)	(605)	—	—	(675)
Currency translation adjustments	—	5	—	—	5
Accrued restructuring as of					
December 31, 2017	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>

Note 7 – Share-Based Compensation

The Company recognized the following share-based compensation expense in SG&A in its Consolidated Statements of Income for the years ended December 31, 2018, 2017 and 2016:

	2018	2017	2016
Stock options	\$ 1,053	\$ 958	\$ 848
Nonvested restricted stock awards and restricted stock units	2,459	2,935	3,121
Employee stock purchase plan	89	88	87
Non-elective and elective 401(k) matching contribution in stock	—	72	2,124
Director stock ownership plan	123	137	169
Total share-based compensation expense	<u>\$ 3,724</u>	<u>\$ 4,190</u>	<u>\$ 6,349</u>

During the first quarter of 2017, the Company began matching non-elective and elective 401(k) contributions in cash rather than stock. Also, the Company’s estimated tax payable as of December 31, 2016, was sufficient to fully recognize \$0.7 million of excess tax benefits related to stock option exercises as cash inflows from financing activities in its Consolidated Statements of Cash Flows.

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Stock option activity under all plans is as follows:

	Number of Options	Weighted Average Exercise Price (per option)	Weighted Average Remaining Contractual Term (years)	Aggregate Intrinsic Value
Options outstanding as of January 1, 2018	111,255	\$ 97.71		
Options granted	35,842	151.75		
Options exercised	(25,025)	83.96		
Options outstanding as of December 31, 2018	122,072	\$ 116.39	5.0	\$ 7,185
Options expected to vest after December 31, 2018	86,635	\$ 125.48	5.3	\$ 4,312
Options exercisable as of December 31, 2018	35,437	\$ 94.17	4.2	\$ 2,873

The total intrinsic value of options exercised during the years ended December 31, 2018, 2017 and 2016 was approximately \$2.0 million, \$3.4 million and \$2.9 million, respectively. Intrinsic value is calculated as the difference between the current market price of the underlying security and the strike price of a related option.

A summary of the Company's outstanding stock options as of December 31, 2018 is as follows:

Range of Exercise Prices	Number of Options Outstanding	Weighted Average Remaining Contractual Term (years)	Weighted Average Exercise Price (per option)	Number of Options Exercisable	Weighted Average Exercise Price (per option)
\$ 50.01 - \$ 60.00	874	1.2	58.26	874	58.26
\$ 60.01 - \$ 70.00	—	—	—	—	—
\$ 70.01 - \$ 80.00	42,272	4.1	72.19	19,791	72.26
\$ 80.01 - \$ 90.00	2,797	3.2	87.30	2,797	87.30
\$ 90.01 - \$ 130.00	—	—	—	—	—
\$ 130.01 - \$ 140.00	40,287	5.2	134.60	11,975	134.60
\$ 140.01 - \$ 150.00	—	—	—	—	—
\$ 150.01 - \$ 160.00	35,842	6.2	151.75	—	—
	122,072	5.0	116.39	35,437	94.17

As of December 31, 2018, unrecognized compensation expense related to options granted in 2018, 2017 and 2016 was \$0.8 million, \$0.4 million and less than \$0.1 million, respectively, to be recognized over a weighted average period of 1.8 years.

The Company granted stock options under its LTIP plan that are subject only to time vesting over a three-year period in the first quarters of 2018, 2017, 2016 and 2015. For the purposes of determining the fair value of stock option awards, the Company uses the Black-Scholes option pricing model and the assumptions set forth in the table below:

	2018	2017	2016	2015
Number of stock options granted	35,842	42,477	67,444	38,698
Dividend yield	1.37 %	1.49 %	1.49 %	1.55 %
Expected volatility	24.73 %	25.52 %	28.39 %	36.32 %
Risk-free interest rate	2.54 %	1.67 %	1.08 %	1.22 %
Expected term (years)	4.0	4.0	4.0	4.0

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These awards are being amortized on a straight-line basis over the respective vesting period of each award. The compensation expense recorded on each award during the years ended December 31, 2018, 2017 and 2016, respectively, is as follows:

	2018		2017		2016
2018 Stock option awards	\$ 310	\$	—	\$	—
2017 Stock option awards	\$ 367	\$	308	\$	—
2016 Stock option awards	\$ 332	\$	332	\$	282
2015 Stock option awards	\$ 44	\$	276	\$	276

Activity of nonvested restricted stock awards granted under the Company's LTIP plan is shown below:

	Number of Shares		Weighted Average Grant Date Fair Value (per share)
Nonvested awards, December 31, 2017	72,164	\$	91.03
Granted	16,166	\$	152.38
Vested	(34,954)	\$	87.08
Forfeited	(591)	\$	121.43
Nonvested awards, December 31, 2018	52,785	\$	112.09

The fair value of the nonvested stock is based on the trading price of the Company's common stock on the date of grant. The Company adjusts the grant date fair value for expected forfeitures based on historical experience for similar awards. As of December 31, 2018, unrecognized compensation expense related to these awards was \$2.1 million, to be recognized over a weighted average remaining period of 1.7 years.

Activity of nonvested restricted stock units granted under the Company's LTIP plan is shown below:

	Number of Units		Weighted Average Grant Date Fair Value (per unit)
Nonvested awards, December 31, 2017	4,277	\$	95.53
Granted	1,549	\$	153.84
Vested	(1,176)	\$	87.30
Nonvested awards, December 31, 2018	4,650	\$	117.03

The fair value of the nonvested restricted stock units is based on the trading price of the Company's common stock on the date of grant. The Company adjusts the grant date fair value for expected forfeitures based on historical experience for similar awards. As of December 31, 2018, unrecognized compensation expense related to these awards was \$0.2 million, to be recognized over a weighted average remaining period of 1.8 years.

Employee Stock Purchase Plan

In 2000, the Board adopted an Employee Stock Purchase Plan ("ESPP") whereby employees may purchase Company stock through a payroll deduction plan. Purchases are made from the plan and credited to each participant's account at the end of each month (the "Investment Date"). The purchase price of the stock is 85% of the fair market value on the Investment Date. The plan is compensatory, and the 15% discount is expensed on the Investment Date. All employees, including officers, are eligible to participate in this plan. A participant may withdraw all unvested payment balances credited to a participant's account at any time. An employee whose stock ownership of the Company exceeds five percent of the outstanding common stock is not eligible to participate in this plan.

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2013 Director Stock Ownership Plan

In 2013, the Company adopted the 2013 Director Stock Ownership Plan (the "Plan"), to encourage the Directors to increase their investment in the Company, which was approved at the Company's May 2013 shareholders' meeting. The Plan authorizes the issuance of up to 75,000 shares of Quaker common stock in accordance with the terms of the Plan in payment of all or a portion of the annual cash retainer payable to each of the Company's non-employee directors in 2013 and subsequent years during the term of the Plan. Under the Plan, each director who, on May 1 of the applicable calendar year, owns less than 400% of the annual cash retainer for the applicable calendar year, divided by the average of the closing price of a share of Quaker Common Stock as reported by the composite tape of the New York Stock Exchange for the previous calendar year (the "Threshold Amount"), is required to receive 75% of the annual cash retainer in Quaker common stock and 25% of the retainer in cash, unless the director elects to receive a greater percentage of Quaker common stock, up to 100% of the annual cash retainer for the applicable year. Each director who owns more than the Threshold Amount may elect to receive common stock in payment of a percentage (up to 100%) of the annual cash retainer. The annual retainer is \$0.1 million and the retainer payment date is June 1.

Note 8 – Other Expense, net

Other expense, net, for the years ended December 31, 2018, 2017 and 2016 are as follows:

	2018	2017	2016
Income from third party license fees	\$ 862	\$ 861	\$ 978
Foreign exchange (losses) gains, net	(807)	891	172
Gain (loss) on fixed asset disposals, net	657	(79)	50
Non-income tax refunds and other related credits	668	1,015	398
Pension and postretirement benefit costs, non-service components	(2,285)	(4,234)	(2,302)
Insurance insolvency recovery	90	600	—
Other non-operating income	425	380	338
Other non-operating expense	(252)	(152)	(126)
Total other expense, net	\$ (642)	\$ (718)	\$ (492)

Foreign exchange (losses) gains, net, during the year ended December 31, 2018 include both a foreign currency transaction loss of approximately \$0.4 million related to hyper-inflationary accounting for the Company's Argentina subsidiary effective July 1, 2018 and a foreign currency transaction gain of approximately \$0.4 million related to the liquidation of an inactive legal entity. In addition, gain (loss) on fixed asset disposals, net, during the year ended December 31, 2018 and 2017 includes a \$0.6 million gain and a \$0.1 million loss, respectively, on the sale of held-for-sale assets in each period. Pension and postretirement benefit costs, non-service components during the year ended December 31, 2017 includes a \$1.9 million pension settlement charge. See Note 20 of Notes to Consolidated Financial Statements. Insurance insolvency recovery during the years ended December 31, 2018 and 2017 represents cash proceeds from an insolvent insurance carrier with respect to a previously filed recovery claim by an inactive subsidiary of the Company.

Note 9 – Taxes on Income

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as U.S. Tax Reform. U.S. Tax Reform included multiple changes to the U.S. tax code with varying effects on the Company's 2017 results, including, but not limited to, (i) a revaluation of the Company's U.S. deferred tax assets and liabilities based upon the reduction of the U.S. federal statutory corporate income tax rate from 35% to 21% and (ii) implementation of a new system of taxation for non-U.S. earnings which eliminates U.S. federal income taxes on dividends from certain foreign subsidiaries and imposes a one-time transition tax on the deemed repatriation of undistributed earnings of certain foreign subsidiaries that is payable over eight years. U.S. Tax Reform also made changes to the U.S. tax code that have impacted 2018 and will impact future years, including, but not limited to, (i) reduction of the U.S. federal statutory corporate tax rate; (ii) elimination of the corporate alternative minimum tax; (iii) the creation of the base erosion anti-abuse tax, a new minimum tax; (iv) a general elimination of U.S. federal income taxes on dividends from foreign subsidiaries; (v) a new provision designed to tax global intangible low-taxed income ("GILTI"), which allows for the possibility of using foreign tax credits and a deduction of up to 50 percent to offset the income tax liability (subject to some limitations); (vi) a new limitation on deductible interest expense; (vii) the repeal of the U.S. production activity deduction; (viii) limitations on the deductibility of certain executive compensation; (ix) limitations on the use of foreign tax credits to reduce the U.S. income tax liability; (x) a reduction in the dividends received deduction from 70% to 50% (in the case of less-than-20%-owned subsidiaries) and from 80% to 65% (in the case of less-than-80%-owned subsidiaries); and (xi) limitations on net operating losses generated after December 31, 2017 to 80 percent of taxable income.

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Also, in 2017, the Securities and Exchange Commission issued guidance on accounting for the tax effects of U.S. Tax Reform and provided a one-year measurement period for companies to complete the accounting. The Company's initial analysis of the impact of U.S. Tax Reform resulted in an incremental tax expense of \$22.2 million recorded during the fourth quarter of 2017. U.S. Tax Reform reduced the U.S. federal statutory corporate tax rate from 35% to 21% effective January 1, 2018. Consequently, the Company recorded a decrease in U.S. net deferred tax assets of approximately \$4.5 million with a corresponding net adjustment to deferred income tax expense during the fourth quarter of 2017. This initial estimate was not adjusted during 2018. The Transition Tax is a tax on previously untaxed accumulated and current earnings and profits of certain of the Company's foreign subsidiaries as of either the November 2, 2017 or December 31, 2017 measurement date provided within U.S. Tax Reform. The Company made a reasonable estimate of its Transition Tax and recorded a gross provisional Transition Tax obligation during the fourth quarter of 2017 of \$18.4 million, or \$17.8 million, net of the impact of eliminating U.S. Federal income taxes on dividends from certain foreign subsidiaries received during 2017.

Subsequent to numerous temporary regulations, notices, and other formal guidance published by the Internal Revenue Service ("IRS"), U.S. Treasury, and various state taxing authorities in 2018, the Company completed its accounting for the tax effects of U.S. Tax Reform as of December 22, 2018 and refined the total incremental tax expense related to U.S. Tax Reform to approximately \$28.0 million. Based on proposed regulations published by the U.S. federal and state taxing authorities, the Company recorded a \$2.5 million tax benefit to adjust its net Transition Tax to \$15.3 million. The Company elected to pay its Transition Tax in installments over eight years as provided for in U.S. Tax Reform. In addition, the Company recorded deferred income tax expense of \$0.3 million in 2018 related to the deductibility of certain executive compensation based on formal guidance issued by the IRS in 2018. As a result of the impacts from U.S. Tax Reform, the Company re-evaluated its global cash strategy resulting in a change to its indefinite reinvestment assertion attributable to a portion of its undistributed foreign earnings and recognized a deferred tax liability and corresponding deferred tax expense of \$7.9 million, which primarily represents the Company's estimate of the non-U.S. income taxes the Company will incur to ultimately remit those earnings to the U.S. The Company's reinvestment assertions are further explained below.

Taxes on income before equity in net income of associated companies for the years ended December 31, 2018, 2017 and 2016 are as follows:

	2018	2017	2016
Current:			
Federal	\$ 6,583	\$ 21,265	\$ 4,680
State	(1,844)	2,529	518
Foreign	12,114	14,105	12,540
	<u>16,853</u>	<u>37,899</u>	<u>17,738</u>
Deferred:			
Federal	7,859	6,889	4,601
State	(173)	(36)	104
Foreign	511	(3,099)	783
Total	<u>\$ 25,050</u>	<u>\$ 41,653</u>	<u>\$ 23,226</u>

The components of earnings before income taxes for the years ended December 31, 2018, 2017 and 2016 are as follows:

	2018	2017	2016
U.S.	\$ 27,387	\$ 10,468	\$ 31,175
Foreign	55,711	50,200	52,834
Total	<u>\$ 83,098</u>	<u>\$ 60,668</u>	<u>\$ 84,009</u>

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - Continued
(Dollars in thousands, except share and per share amounts, unless otherwise stated)

Total deferred tax assets and liabilities are composed of the following as of December 31, 2018 and 2017:

	2018	2017
Retirement benefits	\$ 3,532	\$ 5,472
Allowance for doubtful accounts	1,160	1,134
Insurance and litigation reserves	396	497
Postretirement benefits	896	1,056
Supplemental retirement benefits	2,862	2,679
Performance incentives	4,347	3,779
Equity-based compensation	753	1,071
Insurance settlement	4,374	4,581
Operating loss carryforward	8,434	8,602
Foreign tax credit and other credits	1,929	3,043
Uncertain tax positions	(400)	(410)
Other	2,645	2,816
	<u>30,928</u>	<u>34,320</u>
Valuation allowance	(7,520)	(7,401)
Total deferred tax assets, net	<u>\$ 23,408</u>	<u>\$ 26,919</u>
Depreciation	4,049	4,444
Foreign pension and other	1,062	1,295
Amortization and other	13,497	15,373
Unremitted Earnings	7,857	—
Total deferred tax liabilities	<u>\$ 26,465</u>	<u>\$ 21,112</u>

The following are the changes in the Company's deferred tax asset valuation allowance for the years ended December 31, 2018, 2017 and 2016:

	Balance at Beginning of Period	Additional Valuation Allowance	Allowance Utilization and Other	Effect of Exchange Rate Changes	Balance at End of Period
Valuation Allowance					
Year ended December 31, 2018	\$ 7,401	\$ 650	\$ (471)	\$ (60)	\$ 7,520
Year ended December 31, 2017	\$ 6,344	\$ 1,127	\$ (61)	\$ (9)	\$ 7,401
Year ended December 31, 2016	\$ 6,259	\$ 294	\$ (187)	\$ (22)	\$ 6,344

The Company's net deferred tax assets and liabilities are classified in the Consolidated Balance Sheets as of December 31, 2018 and 2017 as follows:

	2018	2017
Non-current deferred tax assets	\$ 6,946	\$ 15,460
Non-current deferred tax liabilities	10,003	9,653
Net deferred tax (liability) asset	<u>\$ (3,057)</u>	<u>\$ 5,807</u>

QUAKER CHEMICAL CORPORATION
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The following is a reconciliation of income taxes at the Federal statutory rate with income taxes recorded by the Company for the years ended December 31, 2018, 2017 and 2016:

	2018	2017	2016
Income tax provision at the Federal statutory tax rate	\$ 17,458	\$ 21,229	\$ 29,403
Unremitted Earnings	7,857	—	—
Transition Tax	(3,118)	18,388	—
Revaluation of U.S. deferred tax assets and liabilities	—	4,470	—
Global intangible low taxed income	1,211	—	—
Foreign derived intangible income	(1,034)	—	—
Non-deductible acquisition expenses	1,019	4,779	696
Share-based compensation	259	(1,419)	—
Differences in tax rates on foreign earnings and remittances	1,081	(2,663)	(2,862)
Foreign dividends	—	—	2,939
Excess foreign tax credit utilization	—	(2,761)	(5,493)
Research and development activities credit utilization	(230)	(235)	(238)
Uncertain tax positions	(79)	(651)	(833)
U.S. domestic production activities deduction	—	(1,155)	(875)
State income tax provisions, net	196	569	357
Non-deductible entertainment and business meals expense	415	248	238
Miscellaneous items, net	15	854	(106)
Taxes on income before equity in net income of associated companies	\$ 25,050	\$ 41,653	\$ 23,226

As of December 31, 2018, the Company had a net deferred tax liability of \$2.0 million in the U.S. In addition, the Company has foreign tax loss carryforwards of \$6.6 million of which none will expire through 2023, and \$0.6 million expires thereafter. The remaining foreign tax losses have no expiration dates. A partial valuation allowance has been established with respect to the tax benefit of these losses for \$0.4 million.

Pursuant to U.S. Tax Reform, specifically the Transition Tax, the Company has recorded a charge for U.S. income taxes on its undistributed earnings of non-U.S. subsidiaries; however, the Company could be subject to other taxes, such as withholding taxes and dividend distribution taxes if these undistributed earnings are ultimately remitted to the U.S. As a result of the impacts from U.S. Tax reform, the Company re-evaluated its global cash strategy, resulting in a change to its indefinite reinvestment assertion attributable to a portion of its undistributed foreign earnings, and recognized a deferred tax liability and corresponding deferred tax expense of \$7.9 million as of December 31, 2018, which primarily represents the Company's estimate of the non-U.S. taxes the Company will incur to ultimately remit these earnings to the U.S. It is the Company's current intention to reinvest its additional undistributed earnings of non-U.S. subsidiaries to support working capital needs and certain other growth initiatives. The amount of such undistributed earnings at December 31, 2018 was approximately \$210.0 million. Any tax liability which might result from ultimate remittance of these earnings is expected to be substantially offset by foreign tax credits (subject to certain limitations). It is currently impractical to estimate any such incremental tax expense.

As of December 31, 2018, the Company's cumulative liability for gross unrecognized tax benefits was \$7.1 million. The Company had accrued approximately \$0.8 million for cumulative penalties and \$0.6 million for cumulative interest as of December 31, 2018. As of December 31, 2017, the Company's cumulative liability for gross unrecognized tax benefits was \$6.8 million. The Company had accrued approximately \$1.0 million for cumulative penalties and \$0.6 million for cumulative interest as of December 31, 2017.

The Company continues to recognize interest and penalties associated with uncertain tax positions as a component of tax expense on income before equity in net income of associated companies in its Consolidated Statements of Income. The Company recognized a credit of \$0.2 million for penalties and an expense of \$0.1 million for interest (net of expirations and settlements) in its Consolidated Statement of Income for the year ended December 31, 2018, a credit of \$0.7 million for penalties and a credit of \$0.2 million for interest (net of expirations and settlements) in its Consolidated Statement of Income for the year ended December 31, 2017, and a credit of \$0.2 million for penalties and a credit of \$0.7 million for interest (net of expirations and settlements) in its Consolidated Statement of Income for the year ended December 31, 2016.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - Continued
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The Company estimates that during the year ending December 31, 2019, it will reduce its cumulative liability for gross unrecognized tax benefits by approximately \$0.9 million due to the expiration of the statute of limitations with regard to certain tax positions. This estimated reduction in the cumulative liability for unrecognized tax benefits does not consider any increase in liability for unrecognized tax benefits with regard to existing tax positions or any increase in cumulative liability for unrecognized tax benefits with regard to new tax positions for the year ending December 31, 2019. A reconciliation of the beginning and ending amounts of unrecognized tax benefits for the years ended December 31, 2018, 2017 and 2016, respectively, is as follows:

	2018	2017	2016
Unrecognized tax benefits as of January 1	\$ 6,761	\$ 6,240	\$ 11,032
Decrease in unrecognized tax benefits taken in prior periods	(183)	(308)	(869)
Increase in unrecognized tax benefits taken in current period	2,023	2,347	1,921
Decrease in unrecognized tax benefits due to lapse of statute of limitations	(1,292)	(2,116)	(5,744)
(Decrease) increase due to foreign exchange rates	(259)	598	(100)
Unrecognized tax benefits as of December 31	\$ 7,050	\$ 6,761	\$ 6,240

The amount of unrecognized tax benefits above that, if recognized, would impact the Company's tax expense and effective tax rate is \$2.2 million, \$2.2 million and \$1.8 million for the years ended December 31, 2018, 2017 and 2016, respectively.

The Company and its subsidiaries are subject to U.S. Federal income tax, as well as the income tax of various state and foreign tax jurisdictions. Tax years that remain subject to examination by major tax jurisdictions include Brazil from 2000, Italy from 2007, the Netherlands from 2012, the United Kingdom and Mexico from 2013, Spain and China from 2014, India from fiscal year beginning April 1, 2016 and ending March 31, 2017, the U.S. from 2015, and various U.S. state tax jurisdictions from 2009.

As previously reported, the Italian tax authorities have assessed additional tax due from the Company's subsidiary, Quaker Italia S.r.l., relating to the tax years 2007 through 2013. The Company has filed for competent authority relief from these assessments under the Mutual Agreement Procedures ("MAP") of the Organization for Economic Co-Operation and Development for all years except 2007. During the second quarter of 2018, the Italian tax authorities assessed additional tax due from Quaker Italia, S.r.l., relating to the tax years 2014 and 2015. The Company met with the Italian tax authorities in the fourth quarter of 2018 to discuss these assessments and no resolution was agreed upon, so the Company filed an appeal with the first level of tax court in Italy. If the appeal is not successful in materially reducing the assessed tax, then the Company will further evaluate its options including potentially filing for competent authority relief from these assessments under MAP, consistent with the Company's previous filings for 2008 through 2013. As of December 31, 2018, the Company believes it has adequate reserves for uncertain tax positions with respect to these and all other audits.

Note 10 – Earnings Per Share

The following table summarizes earnings per share calculations for the years ended December 31, 2018, 2017 and 2016:

	2018	2017	2016
Basic earnings per common share			
Net income attributable to Quaker Chemical Corporation	\$ 59,473	\$ 20,278	\$ 61,403
Less: income allocated to participating securities	(253)	(137)	(515)
Net income available to common shareholders	\$ 59,220	\$ 20,141	\$ 60,888
Basic weighted average common shares outstanding	13,268,047	13,204,872	13,136,138
Basic earnings per common share	\$ 4.46	\$ 1.53	\$ 4.64
Diluted earnings per common share			
Net income attributable to Quaker Chemical Corporation	\$ 59,473	\$ 20,278	\$ 61,403
Less: income allocated to participating securities	(252)	(137)	(514)
Net income available to common shareholders	\$ 59,221	\$ 20,141	\$ 60,889
Basic weighted average common shares outstanding	13,268,047	13,204,872	13,136,138
Effect of dilutive securities	36,685	41,074	24,331
Diluted weighted average common shares outstanding	13,304,732	13,245,946	13,160,469
Diluted earnings per common share	\$ 4.45	\$ 1.52	\$ 4.63

Certain stock options and restricted stock units are not included in the diluted earnings per share calculation since the effect would have been anti-dilutive. The calculated amount of anti-diluted shares not included were 1,808 in 2018, 3,671 in 2017 and 678 in 2016.

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Note 11 – Restricted Cash

The Company has restricted cash recorded in Other assets related to proceeds from an inactive subsidiary of the Company which previously executed separate settlement and release agreements with two of its insurance carriers for an original total value of \$35.0 million. The proceeds of both settlements are restricted and can only be used to pay claims and costs of defense associated with the subsidiary's asbestos litigation. The proceeds of the settlement and release agreements have been deposited into interest bearing accounts which earned \$0.2 million and less than \$0.1 million in the years ended December 31, 2018 and 2017, respectively, offset by \$1.1 million and \$0.8 million of net payments in 2018 and 2017, respectively. Due to the restricted nature of the proceeds, a corresponding deferred credit was established in Other non-current liabilities for an equal and offsetting amount, and will remain until the restrictions lapse or the funds are exhausted via payments of claims and costs of defense. See also Notes 17, 21 and 25 of Notes to Consolidated Financial Statements.

The following table provides a reconciliation of cash, cash equivalents and restricted cash as December 31, 2018, 2017, 2016 and 2015:

	2018	2017	2016	2015
Cash and cash equivalents	\$ 104,147	\$ 89,879	\$ 88,818	\$ 81,053
Restricted cash included in other assets	20,278	21,171	21,883	22,874
Cash, cash equivalents and restricted cash	<u>\$ 124,425</u>	<u>\$ 111,050</u>	<u>\$ 110,701</u>	<u>\$ 103,927</u>

Note 12 – Accounts Receivable and Allowance for Doubtful Accounts

As of December 31, 2018 and 2017, the Company had gross trade accounts receivable totaling \$207.3 million and \$213.8 million with trade accounts receivable greater than 90 days past due of \$13.2 million and \$15.2 million, respectively. The following are changes in the allowance for doubtful accounts during the years ended December 31, 2018, 2017 and 2016:

	Balance at Beginning of Period	Changes to Costs and Expenses	Write-Offs Charged to Allowance	Exchange Rate Changes and Other Adjustments	Balance at End of Period
Allowance for Doubtful Accounts					
Year ended December 31, 2018	\$ 5,457	\$ 493	\$ (295)	\$ (468)	\$ 5,187
Year ended December 31, 2017	\$ 7,220	\$ 137	\$ (2,206)	\$ 306	\$ 5,457
Year ended December 31, 2016	\$ 7,818	\$ 1,375	\$ (1,949)	\$ (24)	\$ 7,220

Included in exchange rate changes and other adjustments for the year ended December 31, 2018 is a reclassification of \$0.3 million to Other assets related to certain customer receivables due greater than a year. There were no similar adjustments in 2017 or 2016. Included in write-offs charged to allowance during the years ended December 31, 2017 and 2016 were outstanding receivables related to certain prior year customer bankruptcies, which the Company previously reserved for, but settled during 2017 and 2016, respectively. Included in December 31, 2016 is an allowance for doubtful accounts of less than \$0.1 million acquired in 2017 business acquisitions. There were no similar adjustments in 2018 or 2017.

Note 13 – Inventories

Inventories, net, as of December 31, 2018 and 2017 were as follows:

	2018	2017
Raw materials and supplies	\$ 48,134	\$ 44,439
Work in process, finished goods and reserves	45,956	42,782
Total inventories, net	<u>\$ 94,090</u>	<u>\$ 87,221</u>

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Note 14 – Property, Plant and Equipment

Property, plant and equipment as of December 31, 2018 and 2017 were as follows:

	2018	2017
Land	\$ 10,170	\$ 10,635
Building and improvements	84,980	87,111
Machinery and equipment	151,180	153,312
Construction in progress	7,907	4,932
Property, Plant and Equipment, at cost	254,237	255,990
Less accumulated depreciation	(170,314)	(169,286)
Total Property, Plant and Equipment, net	\$ 83,923	\$ 86,704

As of December 31, 2018, property, plant and equipment include less than \$0.1 million of a capital lease asset and future minimum lease payments in the Company's Asia/Pacific segment.

Note 15 – Goodwill and Other Intangible Assets

The Company completes its annual goodwill impairment test during the fourth quarter of each year, or more frequently if triggering events indicate a possible impairment in one or more of its reporting units. The Company continually evaluates financial performance, economic conditions and other relevant developments in assessing if an interim period impairment test for one or more of its reporting units is necessary. The Company completed its annual impairment assessment during the fourth quarter of 2018 and no impairment charge was warranted. In addition, the Company has recorded no impairment charges in its past.

Changes in the carrying amount of goodwill for the years ended December 31, 2018 and 2017 were as follows:

	North America	EMEA	Asia/Pacific	South America	Total
Balance as of December 31, 2016	\$ 45,490	\$ 18,189	\$ 14,566	\$ 2,559	\$ 80,804
Goodwill additions	1,832	—	—	—	1,832
Currency translation adjustments	249	2,315	890	(56)	3,398
Balance as of December 31, 2017	47,571	20,504	15,456	2,503	86,034
Currency translation adjustments	(268)	(1,169)	(869)	(395)	(2,701)
Balance as of December 31, 2018	<u>\$ 47,303</u>	<u>\$ 19,335</u>	<u>\$ 14,587</u>	<u>\$ 2,108</u>	<u>\$ 83,333</u>

Gross carrying amounts and accumulated amortization for definite-lived intangible assets as of December 31, 2018 and 2017 were as follows:

	Gross Carrying Amount		Accumulated Amortization	
	2018	2017	2018	2017
Customer lists and rights to sell	\$ 74,989	\$ 76,581	\$ 29,587	\$ 25,394
Trademarks, formulations and product technology	33,275	33,025	16,469	14,309
Other	5,840	6,114	5,566	5,514
Total definite-lived intangible assets	<u>\$ 114,104</u>	<u>\$ 115,720</u>	<u>\$ 51,622</u>	<u>\$ 45,217</u>

The Company recorded \$7.3 million, \$7.4 million and \$7.0 million of amortization expense during the years ended December 31, 2018, 2017 and 2016, respectively. Estimated annual aggregate amortization expense for the subsequent five years is as follows:

For the year ended December 31, 2019	\$ 7,160
For the year ended December 31, 2020	6,879
For the year ended December 31, 2021	6,529
For the year ended December 31, 2022	6,374
For the year ended December 31, 2023	6,155

The Company has two indefinite-lived intangible assets totaling \$1.1 million for trademarks as of December 31, 2018 and 2017.

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Note 16 – Investments in Associated Companies

As of December 31, 2018, the Company held a 50% investment in and had significant influence over Nippon Quaker Chemical, Ltd. (Japan) and Kelko Quaker Chemical, S.A. (Panama) and held a 33% investment in and had significant influence over Primex, Ltd. (Barbados). The carrying amount of the Company's equity investments as of December 31, 2018 was \$21.3 million, which includes its investments of \$14.7 million in Primex, Ltd. (Barbados); \$6.2 million in Nippon Quaker Chemical, Ltd. (Japan); and \$0.4 million in Kelko Quaker Chemical, S.A. (Panama).

The Company has a 50-50 joint venture in a Venezuelan affiliate, Kelko Venezuela. Due to heightened foreign exchange controls, current economic circumstances and other restrictions in Venezuela, during the third quarter of 2018 the Company concluded that it no longer had significant influence over this affiliate. Prior to this determination, the Company historically accounted for this affiliate under the equity method. As of December 31, 2018, the Company has no remaining carrying value for its investment in Kelko Venezuela.

Summarized financial information of Nippon Quaker Chemical, Ltd. (Japan) and Kelko Quaker Chemical, S.A. (Panama) for 2018 and Nippon Quaker Chemical, Ltd. (Japan), Kelko Quaker Chemical, S.A. (Panama) and Kelko Quaker Chemical, S.A. (Venezuela) for 2017 and 2016, in the aggregate, is as follows:

	As of December 31,		
	2018	2017	2017
Current assets	\$ 43,581	\$ 37,683	37,683
Noncurrent assets	990	936	936
Current liabilities	29,632	24,858	24,858
Noncurrent liabilities	1,685	1,457	1,457

	Year Ended December 31,		
	2018	2017	2016
Net sales	\$ 43,875	\$ 42,555	\$ 41,448
Gross margin	12,983	13,440	13,082
Income before income taxes	2,494	2,900	2,289
Net income	1,874	1,471	1,210

Summarized financial information of Primex, Ltd. is as follows:

	As of December 31,		
	2018	2017	2017
Total assets	\$ 103,705	\$ 120,154	120,154
Total liabilities	53,049	54,258	54,258

	Year Ended December 31,		
	2018	2017	2016
Revenue	\$ 5,841	\$ 14,042	\$ 5,632
Income before income taxes	3,688	11,705	5,622
Net income	2,954	7,788	5,148

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Note 17 – Other Assets

Other assets as of December 31, 2018 and 2017 were as follows:

	2018	2017
Restricted insurance settlement	\$ 20,278	\$ 21,171
Uncertain tax positions	4,861	4,543
Supplemental retirement income program	1,491	1,594
Pension assets	3,656	1,184
Other	1,769	1,557
Total other assets	<u>\$ 32,055</u>	<u>\$ 30,049</u>

As of December 31, 2018 and 2017, one of the Company's U.S. pension plan's fair value of plan assets exceeded its gross benefit obligation and was therefore over-funded, which is represented by the line Pension assets in the table above. See also Note 20 of Notes to Consolidated Financial Statements.

Note 18 – Other Current Liabilities

Other current liabilities as of December 31, 2018 and 2017 were as follows:

	2018	2017
Non-income taxes	\$ 8,462	\$ 9,196
Accrued interest	4,340	884
Professional fees	3,831	5,019
Selling expenses	3,582	2,846
Freight	2,188	1,780
Customer advances and sales return reserves	2,187	1,507
Current income taxes payable	1,358	841
Legal	1,067	1,169
Accrued rent and facilities	763	775
Other	3,330	3,304
Total other current liabilities	<u>\$ 31,108</u>	<u>\$ 27,321</u>

Note 19 – Debt

Debt as of December 31, 2018 and 2017 includes the following:

	2018	2017
Credit facilities	\$ 24,034	\$ 48,514
Industrial development bonds	10,000	15,000
Municipality-related loans	2,549	3,290
Other debt obligations (including capital leases)	21	—
Total debt	36,604	66,804
Current portion of long-term debt	(670)	(5,736)
Long-term debt	<u>\$ 35,934</u>	<u>\$ 61,068</u>

Credit facilities

The Company's primary credit facility ("the Credit Facility") is a \$300.0 million syndicated multicurrency credit agreement with a group of lenders. The maximum amount available under the Credit Facility can be increased to \$400.0 million at the Company's option if the lenders agree and the Company satisfies certain conditions. Borrowings under the Credit Facility generally bear interest at a base rate or LIBOR rate plus a margin. The Credit Facility has certain financial and other covenants, with the key financial covenant requiring that the Company's consolidated total debt to adjusted EBITDA ratio cannot exceed 3.50 to 1. As of December 31, 2018 and 2017, the Company's consolidated total debt to adjusted EBITDA ratio was below 1.0 to 1, and the Company was also in compliance with all of its other covenants. During the fourth quarter of 2018, the Credit Facility was amended and restated to extend the maturity date to March 15, 2020. As of December 31, 2018 and 2017, the Company had total credit facility borrowings of \$24.0 million and \$48.5 million, primarily under the Credit Facility, at weighted average borrowing rates of 1.00% and 1.88%, respectively.

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Industrial development bonds

As of December 31, 2018 and 2017, the Company had a fixed rate, industrial development authority bond for \$10.0 million due in 2028 and bearing interest at a rate of 5.26%. As of December 31, 2017, the Company also had a \$5.0 million industrial development authority bond bearing interest at a rate of 5.60%, which matured and was paid off during the fourth quarter of 2018. These bonds have similar covenants to the Credit Facility, noted above.

Municipality-related loans

As part of a past expansion project at the Company's Middletown, Ohio facility, it agreed to a low interest rate \$3.5 million loan with the Ohio Department of Development. Principal repayment on this loan began in September 2010 with its final maturity being in February 2021. The current interest rate of 2% will rise to 3% beginning March 2019 until final maturity. As of December 31, 2018 and 2017, there was \$0.8 million and \$1.1 million, respectively, outstanding on this loan.

The Company's Verkol S.A.U. ("Verkol") subsidiary has certain loans issued by the local government which are either interest-free or bear interest at a subsidized rate. These loans mature periodically, with the last maturity occurring in 2028. The Company records these loans at fair value based on market interest rates on the date of acquisition and continues to measure the loans at amortized cost, recognizing the implicit interest incurred. As of December 31, 2018 and 2017, there was \$1.8 million and \$2.2 million, respectively, outstanding for these loans.

During the next five years, payments on the Company's debt are due as follows:

2019	\$	670
2020		24,730
2021		398
2022		270
2023		240

As of December 31, 2018 and 2017, the amounts at which the Company's debt is recorded are not materially different from their fair market value.

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Note 20 – Pension and Other Postretirement Benefits

The following table shows the Company's plans' funded status reconciled with amounts reported in the Consolidated Balance Sheets as of December 31, 2018 and 2017:

	Pension Benefits						Other Post-Retirement Benefits	
	2018			2017			2018	2017
	Foreign	U.S.	Total	Foreign	U.S.	Total	U.S.	U.S.
Change in benefit obligation								
Gross benefit obligation at beginning of year	\$ 118,352	\$ 62,977	\$ 181,329	\$ 103,491	\$ 67,254	\$ 170,745	\$ 4,729	\$ 4,730
Service cost	3,426	383	3,809	3,219	337	3,556	7	8
Interest cost	2,254	1,847	4,101	2,066	1,932	3,998	130	144
Employee contributions	73	—	73	68	—	68	—	—
Plan settlements	(10)	—	(10)	—	(4,341)	(4,341)	—	—
Benefits paid	(1,639)	(4,330)	(5,969)	(2,503)	(4,031)	(6,534)	(317)	(448)
Plan expenses and premiums paid	(161)	—	(161)	(210)	—	(210)	—	—
Actuarial (gain) loss	(5,561)	(2,143)	(7,704)	(1,164)	1,826	662	(443)	295
Translation differences and other	(5,418)	—	(5,418)	13,385	—	13,385	—	—
Gross benefit obligation at end of year	\$ 111,316	\$ 58,734	\$ 170,050	\$ 118,352	\$ 62,977	\$ 181,329	\$ 4,106	\$ 4,729
Change in plan assets								
Fair value of plan assets at year beginning of year	\$ 98,622	\$ 51,964	\$ 150,586	\$ 86,844	\$ 49,197	\$ 136,041	\$ —	\$ —
Actual return on plan assets	(2,670)	457	(2,213)	116	6,865	6,981	—	—
Employer contributions	5,269	1,574	6,843	2,867	4,574	7,441	317	448
Employee contributions	73	—	73	68	—	68	—	—
Plan settlements	(10)	—	(10)	—	(4,341)	(4,341)	—	—
Benefits paid	(1,639)	(4,330)	(5,969)	(2,503)	(4,031)	(6,534)	(317)	(448)
Plan expenses and premiums paid	(161)	(250)	(411)	(210)	(300)	(510)	—	—
Translation differences	(4,658)	—	(4,658)	11,440	—	11,440	—	—
Fair value of plan assets at end of year	\$ 94,826	\$ 49,415	\$ 144,241	\$ 98,622	\$ 51,964	\$ 150,586	\$ —	\$ —
Net benefit obligation recognized	\$ (16,490)	\$ (9,319)	\$ (25,809)	\$ (19,730)	\$ (11,013)	\$ (30,743)	\$ (4,106)	\$ (4,729)
Amounts recognized in the balance sheet consist of:								
Non-current assets	\$ —	\$ 3,656	\$ 3,656	\$ —	\$ 1,184	\$ 1,184	\$ —	\$ —
Current liabilities	(206)	(559)	(765)	(89)	(560)	(649)	(446)	(459)
Non-current liabilities	(16,284)	(12,416)	(28,700)	(19,641)	(11,637)	(31,278)	(3,660)	(4,270)
Net benefit obligation recognized	\$ (16,490)	\$ (9,319)	\$ (25,809)	\$ (19,730)	\$ (11,013)	\$ (30,743)	\$ (4,106)	\$ (4,729)
Amounts not yet reflected in net periodic benefit costs and included in accumulated other comprehensive loss:								
Prior service credit (cost)	\$ 1,497	\$ —	\$ 1,497	\$ 1,744	\$ (59)	\$ 1,685	\$ —	\$ —
Accumulated loss	(20,089)	(25,310)	(45,399)	(22,598)	(27,133)	(49,731)	(338)	(823)
AOCI	(18,592)	(25,310)	(43,902)	(20,854)	(27,192)	(48,046)	(338)	(823)
Cumulative employer contributions in excess of or (below) net periodic benefit cost	2,102	15,991	18,093	1,124	16,179	17,303	(3,768)	(3,906)
Net benefit obligation recognized	\$ (16,490)	\$ (9,319)	\$ (25,809)	\$ (19,730)	\$ (11,013)	\$ (30,743)	\$ (4,106)	\$ (4,729)

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The accumulated benefit obligation for all defined benefit pension plans was \$165.3 million (\$57.6 million U.S. and \$107.7 million Foreign) and \$176.3 million (\$62.2 million U.S. and approximately \$114.1 million Foreign) as of December 31, 2018 and 2017, respectively.

Information for pension plans with an accumulated benefit obligation in excess of plan assets:

	2018			2017		
	Foreign	U.S.	Total	Foreign	U.S.	Total
Projected benefit obligation	\$ 111,316	\$ 12,975	\$ 124,291	\$ 118,352	\$ 12,197	\$ 130,549
Accumulated benefit obligation	107,685	11,808	119,493	114,069	11,456	125,525
Fair value of plan assets	94,826	—	94,826	98,622	—	98,622

Information for pension plans with a projected benefit obligation in excess of plan assets:

	2018			2017		
	Foreign	U.S.	Total	Foreign	U.S.	Total
Projected benefit obligation	\$ 111,316	\$ 12,975	\$ 124,291	\$ 118,352	\$ 12,197	\$ 130,549
Fair value of plan assets	94,826	—	94,826	98,622	—	98,622

Components of net periodic benefit costs – pension plans:

	2018			2017		
	Foreign	U.S.	Total	Foreign	U.S.	Total
Service cost	\$ 3,426	\$ 383	\$ 3,809	\$ 3,219	\$ 337	\$ 3,556
Interest cost	2,254	1,847	4,101	2,066	1,932	3,998
Expected return on plan assets	(2,228)	(2,803)	(5,031)	(1,994)	(3,067)	(5,061)
Settlement loss	2	—	2	—	1,946	1,946
Actuarial loss amortization	881	2,276	3,157	862	2,396	3,258
Prior service (credit) cost amortization	(175)	59	(116)	(167)	63	(104)
Net periodic benefit cost	\$ 4,160	\$ 1,762	\$ 5,922	\$ 3,986	\$ 3,607	\$ 7,593

	2016		
	Foreign	U.S.	Total
Service cost	\$ 2,378	\$ 298	\$ 2,676
Interest cost	2,314	2,114	4,428
Expected return on plan assets	(2,026)	(3,316)	(5,342)
Actuarial loss amortization	839	2,336	3,175
Prior service (credit) cost amortization	(164)	63	(101)
Net periodic benefit cost	\$ 3,341	\$ 1,495	\$ 4,836

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Other changes recognized in other comprehensive income – pension plans:

	2018			2017		
	Foreign	U.S.	Total	Foreign	U.S.	Total
Net (gain) loss arising during the period	\$ (663)	\$ 453	\$ (210)	\$ 715	\$ (1,672)	\$ (957)
Recognition of amortization in net periodic benefit cost						
Prior service credit (cost)	175	(59)	116	167	(63)	104
Actuarial loss	(883)	(2,276)	(3,159)	(862)	(4,342)	(5,204)
Effect of exchange rates on amounts included in AOCI	(890)	—	(890)	2,308	—	2,308
Total recognized in other comprehensive (income) loss	(2,261)	(1,882)	(4,143)	2,328	(6,077)	(3,749)
Total recognized in net periodic benefit cost and other comprehensive loss (income)	\$ 1,899	\$ (120)	\$ 1,779	\$ 6,314	\$ (2,470)	\$ 3,844

	2016		
	Foreign	U.S.	Total
Net gain arising during period	\$ 2,401	\$ 3,576	\$ 5,977
Recognition of amortization in net periodic benefit cost			
Prior service credit (cost)	164	(63)	101
Actuarial loss	(839)	(2,336)	(3,175)
Effect of exchange rates on amounts included in AOCI	(1,347)	—	(1,347)
Total recognized in other comprehensive loss	379	1,177	1,556
Total recognized in net periodic benefit cost and other comprehensive loss	\$ 3,720	\$ 2,672	\$ 6,392

Components of net periodic benefit costs – other postretirement plan:

	2018	2017	2016
Service cost	\$ 7	\$ 8	\$ 10
Interest cost	130	144	142
Actuarial loss amortization	42	54	—
Net periodic benefit costs	\$ 179	\$ 206	\$ 152

Other changes recognized in other comprehensive income – other postretirement benefit plans:

	2018	2017	2016
Net (gain) loss arising during period	\$ (443)	\$ 295	\$ (401)
Amortization of actuarial loss in net periodic benefit costs	(42)	(54)	—
Total recognized in other comprehensive (income) loss	(485)	241	(401)
Total recognized in net periodic benefit cost and other comprehensive (income) loss	\$ (306)	\$ 447	\$ (249)

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Estimated amounts that will be amortized from accumulated other comprehensive loss over the next fiscal year:

	Pension Plans			Total	Other Post-Retirement Benefits
	Foreign	U.S.	Total		
Actuarial loss	\$ 769	\$ 2,330	\$ 3,099	\$ —	
Prior service credit	(169)	—	(169)	—	
	<u>\$ 600</u>	<u>\$ 2,330</u>	<u>\$ 2,930</u>	<u>\$ —</u>	

Weighted-average assumptions used to determine benefit obligations as of December 31, 2018 and 2017:

	Pension Benefits		Other Postretirement Benefits	
	2018	2017	2018	2017
U.S. Plans:				
Discount rate	4.07 %	3.44 %	4.03 %	3.39 %
Rate of compensation increase	3.63 %	3.63 %	N/A	N/A
Foreign Plans:				
Discount rate	2.47 %	2.31 %	N/A	N/A
Rate of compensation increase	2.89 %	2.89 %	N/A	N/A

Weighted-average assumptions used to determine net periodic benefit costs for the years ended December 31, 2018 and 2017:

	Pension Benefits		Other Postretirement Benefits	
	2018	2017	2018	2017
U.S. Plans:				
Discount rate	3.44 %	3.88 %	3.39 %	3.73 %
Expected long-term return on plan assets	5.95 %	7.00 %	N/A	N/A
Rate of compensation increase	3.63 %	3.63 %	N/A	N/A
Foreign Plans:				
Discount rate	2.33 %	2.17 %	N/A	N/A
Expected long-term return on plan assets	2.22 %	2.12 %	N/A	N/A
Rate of compensation increase	2.89 %	2.48 %	N/A	N/A

The long-term rates of return on assets were selected from within the reasonable range of rates determined by (a) historical real returns for the asset classes covered by the investment policy and (b) projections of inflation over the long-term period during which benefits are payable to plan participants. See Note 1 of Notes to Consolidated Financial Statements for further information.

Assumed health care cost trend rates as of December 31, 2018 and 2017:

	2018	2017
Health care cost trend rate for next year	6.20 %	6.40 %
Rate to which the cost trend rate is assumed to decline (the ultimate trend rate)	4.50 %	4.50 %
Year that the rate reaches the ultimate trend rate	2037	2037

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Assumed health care cost trend rates could have a significant effect on the amounts reported for the health care plans. A one-percentage-point change in assumed health care cost trend rates would have the following effects:

	1% Point Increase	1% Point Decrease
Effect on total service and interest cost	\$ 11	\$ (9)
Effect on postretirement benefit obligations	299	(311)

Plan Assets and Fair Value

The Company's pension plan target asset allocation and the weighted-average asset allocations as of December 31, 2018 and 2017 by asset category were as follows:

<i>Asset Category</i>	Target	2018	2017
U.S. Plans			
Equity securities	10%	9%	59%
Debt securities	89%	90%	40%
Other	1%	1%	1%
Total	<u>100%</u>	<u>100%</u>	<u>100%</u>
Foreign Plans			
Equity securities and other	24%	24%	25%
Debt securities	76%	76%	75%
Total	<u>100%</u>	<u>100%</u>	<u>100%</u>

During the year ended December 31, 2018, the Company elected to adjust its U.S. Plans' asset allocation along a glide path based on the funded status of the U.S. Plan. As funded status improved, the assets were allocated more heavily to debt securities with lengthened duration to match projected liability movements.

As of December 31, 2018 and 2017, "Other" consisted principally of cash and cash equivalents (approximately 1% of plan assets in each respective period).

The following is a description of the valuation methodologies used for the investments measured at fair value, including the general classification of such instruments pursuant to the valuation hierarchy, where applicable:

Cash and Cash Equivalents

Cash and cash equivalents consist of cash and money market funds and are classified as Level 1 investments.

Common Stock

Common stock is valued based on quoted market prices on an exchange in an active market and is classified as Level 1 investments.

Commingled Funds

Investments in the U.S. pension plan and foreign pension plan commingled funds represent pooled institutional investments, including primarily collective investment trusts. These commingled funds are not available on an exchange or in an active market and these investments are valued using their net asset value ("NAV"), which is generally based on the underlying asset values of the pooled investments held in the trusts.

As of December 31, 2018, the U.S. pension plan commingled funds included approximately 10 percent of investments in equity securities and 90 percent of investments in fixed income securities. As of December 31, 2018, foreign pension plan commingled funds included approximately 30 percent of investments in equity securities, 60 percent of investments in fixed income securities, and 10 percent of other non-related investments, primarily real estate.

Pooled Separate Accounts

Investments in the U.S. pension plan pooled separate accounts consist of insurance annuity contracts and are valued based on the reported unit value at year end. Units of the pooled separate account are not traded on an exchange or in an active market and these investments are valued using their NAV.

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Insurance Contract

Investments in the foreign pension plan insurance contract are valued at the highest value available for the Company at year end, either the reported cash surrender value of the contract or the vested benefit obligation. Both the cash surrender value and the vested benefit obligation are determined based on unobservable inputs, which are contractually or actuarially determined, regarding returns, fees, the present value of the future cash flows of the contract and benefit obligations. The contract is classified as a Level 3 investment.

Diversified Equity Securities - Registered Investment Companies

Investments in the foreign pension plans diversified equity securities of registered investment companies are based upon the quoted redemption value of shares in the fund owned by the plan at year end. The shares of the fund are not available on an exchange or in an active market; however, the fair value is determined based on the underlying investments in the fund as traded on an exchange in an active market and are classified as Level 2 investments.

Fixed Income - Foreign Registered Investment Companies

Investments in the foreign pension plans fixed income securities of foreign registered investment companies are based upon the quoted redemption value of shares in the fund owned by the plan at year end. The shares of the fund are not available on an exchange or in an active market; however, the fair value is determined based on the underlying investments in the fund as traded on an exchange in an active market and are classified as Level 2 investments.

Real Estate

The foreign pension plan's investment in real estate consists of an investment in a property fund. The fund's underlying investments consist of real property, which are valued using unobservable inputs. The property fund is classified as a Level 3 investment.

As of December 31, 2018 and 2017, the U.S. and foreign plans' investments measured at fair value on a recurring basis were as follows:

	Total Fair Value	Fair Value Measurements at December 31, 2018 Using Fair Value Hierarchy			
		Level 1	Level 2	Level 3	
U.S. Pension Assets					
Cash and cash equivalents	\$ 450	\$ 450	\$ —	\$ —	
Subtotal U.S. pension plan assets in fair value hierarchy	\$ 450	\$ 450	\$ —	\$ —	
Commingled funds measured at NAV	48,965				
Total U.S. pension plan assets	\$ 49,415				
Foreign Pension Assets					
Cash and cash equivalents	\$ 209	\$ 209	\$ —	\$ —	
Insurance contract	79,873	—	—	79,873	
Diversified equity securities - registered investment companies	7,701	—	7,701	—	
Fixed income - foreign registered investment companies	2,658	—	2,658	—	
Real estate - registered investment companies	2,382	—	—	2,382	
Sub-total of foreign pension assets in fair value hierarchy	\$ 92,823	\$ 209	\$ 10,359	\$ 82,255	
Commingled funds measured at NAV	2,003				
Total foreign pension assets	\$ 94,826				
Total pension assets in fair value hierarchy	\$ 93,273	\$ 659	\$ 10,359	\$ 82,255	
Total pension assets measured at NAV	50,968				
Total pension assets	\$ 144,241				

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	Total Fair Value	Fair Value Measurements at December 31, 2017		
		Using Fair Value Hierarchy		
		Level 1	Level 2	Level 3
U.S. Pension Assets				
Cash and cash equivalents	\$ 449	\$ 449	\$ —	\$ —
Small capitalization common stock	1,508	1,508	—	—
Subtotal U.S. pension plan assets in fair value hierarchy	\$ 1,957	\$ 1,957	\$ —	\$ —
Commingled funds measured at NAV	48,527			
Pooled separate accounts measured at NAV	1,480			
Total U.S. pension plan assets	\$ 51,964			
Foreign Pension Assets				
Cash and cash equivalents	\$ 26	\$ 26	\$ —	\$ —
Insurance contract	82,092	—	—	82,092
Diversified equity securities - registered investment companies	9,002	—	9,002	—
Fixed income - foreign registered investment companies	2,951	—	2,951	—
Real estate - registered investment companies	2,428	—	—	2,428
Subtotal foreign pension assets in fair value hierarchy	\$ 96,499	\$ 26	\$ 11,953	\$ 84,520
Commingled funds measured at NAV	2,123			
Total foreign pension plan assets	\$ 98,622			
Total pension assets in fair value hierarchy	\$ 98,456	\$ 1,983	\$ 11,953	\$ 84,520
Total pension assets measured at NAV	52,130			
Total pension assets	\$ 150,586			

Certain investments that are measured at fair value using the NAV per share (or its equivalent) have not been classified in the fair value hierarchy. The fair value amounts presented for these investments in the preceding tables are intended to permit reconciliation of the fair value hierarchies to the line items presented in the statements of net assets available for benefits.

Changes in the fair value of the foreign plans' Level 3 investments during the years ended December 31, 2018 and 2017 were as follows:

	Insurance		Real Estate		Total
	Contract	Fund	Fund		
Balance as of December 31, 2016	\$ 72,778	\$ 2,041		\$ 74,819	
Purchases	2,350	—		2,350	
Settlements	(1,661)	—		(1,661)	
Unrealized (losses) gains	(1,425)	188		(1,237)	
Currency translation adjustment	10,050	199		10,249	
Balance as of December 31, 2017	82,092	2,428		84,520	
Purchases	4,707	—		4,707	
Settlements	(1,399)	—		(1,399)	
Unrealized (losses) gains	(1,817)	94		(1,723)	
Currency translation adjustment	(3,710)	(140)		(3,850)	
Balance as of December 31, 2018	\$ 79,873	\$ 2,382		\$ 82,255	

U.S. pension assets include Company common stock in the amount of \$1.5 million (3% of total U.S. plan assets) as of December 31, 2017. There was no Company common stock held in U.S. pension assets as of December 31, 2018.

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During the second quarter of 2017, the Company's primary noncontributory U.S. pension plan (the "U.S. Pension Plan") offered a cash settlement to its vested terminated participants, which allowed them to receive the value of their pension benefits as a single lump sum payment. As payments from the U.S. Pension Plan for this cash out offering exceeded the service and interest cost components of the U.S. Pension Plan expense for the year ended December 31, 2017, the Company recorded a settlement charge of approximately \$1.9 million. This settlement charge represented the immediate recognition into expense of a portion of the unrecognized loss within AOCI on the balance sheet in proportion to the share of the projected benefit obligation that was settled by these payments. The gross pension benefit obligation was reduced by approximately \$4.0 million as a result of these payments. The settlement charge was recognized through other expense, net, on the Company's Consolidated Statements of Income.

In the fourth quarter of 2018, the Company began the process of terminating the U.S. Pension Plan after receiving Board of Director approval to do so. Prior to December 31, 2005, the U.S. Pension Plan covered substantially all employees of the Company's U.S. subsidiary who had at least one year of eligible service and had attained age 21. Effective December 31, 2005, the U.S. Pension Plan was amended to freeze benefit accruals with respect to participants who were not part of a collective bargaining unit and effective after November 30, 2013, the U.S. Pension Plan was further amended to freeze benefit accruals for the remaining members of a collective bargaining unit. U.S. Pension Plan participants will have their benefits either converted into a lump sum cash payment or an annuity contract placed with an insurance carrier. The U.S. Pension Plan is fully-funded on a U.S. GAAP basis. In order to terminate the plan in accordance with IRS and pension benefit guaranty corporation requirements, the Company will be required to fully fund the plan on a termination basis and will commit to contribute the additional assets necessary, if any, to do so. The amount necessary to do so is not yet known but is currently estimated to be between \$0 and \$10 million. In addition, the Company expects to record a pension settlement charge at plan termination. This settlement charge will include the immediate recognition into expense of the unrecognized losses within AOCI on the balance sheet as of the plan termination date. The Company does not have a current estimate for this future settlement charge, however, the gross AOCI related to this plan was approximately \$19 million as of December 31, 2018. The Company currently estimates that the U.S. Pension Plan termination will be completed during 2020.

Cash Flows

Contributions

The Company expects to make minimum cash contributions of approximately \$5.2 million to its pension plans (approximately \$0.5 million U.S. and \$4.7 million Foreign) and approximately \$0.4 million to its other postretirement benefit plan in 2019.

Estimated Future Benefit Payments

Excluding any impact related to the U.S. Pension Plan termination process noted above, the following benefit payments, which reflect expected future service, as appropriate, are expected to be paid:

	Pension Benefits			Other Post-Retirement Benefits
	Foreign	U.S.	Total	
2019	\$ 2,240	\$ 4,515	\$ 6,755	\$ 446
2020	2,443	4,286	6,729	422
2021	3,166	4,220	7,386	393
2022	3,124	4,237	7,361	367
2023	3,336	4,860	8,196	349
2024 to 2028	19,212	22,107	41,319	1,380

The Company maintains a plan under which supplemental retirement benefits are provided to certain officers. Benefits payable under the plan are based on a combination of years of service and existing postretirement benefits. Included in total pension costs are charges of \$1.6 million, \$1.4 million and \$0.9 million for the years ended December 31, 2018, 2017 and 2016, respectively, representing the annual accrued benefits under this plan.

Defined Contribution Plan

The Company has a 401(k) plan with an employer match covering a majority of its U.S. employees. The plan allows for and the Company previously paid a nonelective contribution on behalf of participants who have completed one year of service equal to 3% of the eligible participants' compensation in the form of Company common stock. During the first quarter of 2017, the Company began matching both non-elective and elective 401(k) contributions in cash, rather than stock. Total Company contributions were \$3.1 million, \$2.9 million and \$2.7 million for the years ended December 31, 2018, 2017 and 2016, respectively.

QUAKER CHEMICAL CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - Continued
(Dollars in thousands, except share and per share amounts, unless otherwise stated)

Note 21 – Other Non-Current Liabilities

Other non-current liabilities as of December 31, 2018 and 2017 were as follows:

	2018	2017
Restricted insurance settlement	\$ 20,278	\$ 21,171
Non-current income taxes payable	7,644	15,825
Uncertain tax positions (includes interest and penalties)	8,097	7,970
Deferred and other long-term compensation	6,886	5,905
Other	624	625
Total other non-current liabilities	<u>\$ 43,529</u>	<u>\$ 51,496</u>

Note 22 – Equity and Accumulated Other Comprehensive Loss

In May 2015, the Company's Board of Directors authorized a share repurchase program for the repurchase of up to \$100.0 million of Quaker Chemical Corporation common stock (the "2015 Share Repurchase Program"). The 2015 Share Repurchase Program has no expiration date. The 2015 Share Repurchase Program provides a framework of conditions under which management can repurchase shares of the Company's common stock. These purchases may be made in the open market or in private and negotiated transactions and will be in accordance with applicable laws, rules and regulations.

In connection with the 2015 Share Repurchase Program, the Company acquired 83,879 shares of common stock for \$5.9 million, during the year ended December 31, 2016. There were no share repurchases under the 2015 Share Repurchase Program during the years ended December 31, 2018 and 2017. The Company has elected not to hold treasury shares and therefore has retired the shares as they are repurchased. It is the Company's accounting policy to record the excess paid over par value as a reduction in retained earnings for all shares repurchased.

The Company has 30,000,000 shares of common stock authorized with a par value of \$1, and 13,338,026 and 13,307,976 shares issued and outstanding as of December 31, 2018 and 2017, respectively. The change in shares issued and outstanding during 2018 was primarily related to 17,596 shares issued for equity-based compensation plans, 3,574 shares issued for the ESPP and 8,880 shares issued for the exercise of stock options and other employee and director-related share activity.

The Company is authorized to issue 10,000,000 shares of preferred stock with \$1 par value, subject to approval by the Board of Directors. The Board of Directors may designate one or more series of preferred stock and the number of shares, rights, preferences, and limitations of each series. As of December 31, 2018, no preferred stock had been issued.

The following table shows the reclassifications from and resulting balances of AOCI for the years ended December 31, 2018, 2017 and 2016:

	Currency Translation Adjustments	Defined Benefit Pension Plans	Unrealized Gain (Loss) in Available-for- Sale Securities	Total
Balance as of December 31, 2015	\$ (38,544)	\$ (35,251)	\$ 479	\$ (73,316)
Other comprehensive (loss) income before reclassifications	(13,711)	(4,229)	834	(17,106)
Amounts reclassified from AOCI	—	3,075	(17)	3,058
Related tax amounts	—	237	(280)	(43)
Balance as of December 31, 2016	(52,255)	(36,168)	1,016	(87,407)
Other comprehensive income (loss) before reclassifications	20,362	(1,646)	2,299	21,015
Amounts reclassified from AOCI	—	5,154	(2,494)	2,660
Related tax amounts	—	(1,433)	65	(1,368)
Balance as of December 31, 2017	(31,893)	(34,093)	886	(65,100)
Other comprehensive (loss) income before reclassifications	(17,429)	1,543	(2,622)	(18,508)
Amounts reclassified from AOCI	—	3,085	435	3,520
Related tax amounts	—	(1,086)	459	(627)
Balance as of December 31, 2018	<u>\$ (49,322)</u>	<u>\$ (30,551)</u>	<u>\$ (842)</u>	<u>\$ (80,715)</u>

QUAKER CHEMICAL CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - Continued
(Dollars in thousands, except share and per share amounts, unless otherwise stated)

Approximately 30% and 70% of the amounts reclassified from AOCI to the Consolidated Statements of Income for defined benefit retirement plans during the years ended December 31, 2018, 2017 and 2016 were recorded in COGS and SG&A, respectively. See Note 20 of Notes to Consolidated Financial Statements for further information. All reclassifications related to unrealized gain (loss) in available-for-sale securities relate to the Company's equity interest in a captive insurance company and are recorded in equity in net income of associated companies. The amounts reported on the Consolidated Statements of Changes in Equity for non-controlling interest are related to currency translation adjustments.

Note 23 – Business Acquisitions

In March 2018, the Company purchased certain formulations and product technology for the mining industry for its North America reportable operating segment for \$1.0 million. The Company allocated the entire purchase price to intangible assets representing formulations and product technology, to be amortized over 10 years. In accordance with the terms of the agreement, \$0.5 million of the purchase price was paid at signing, with the remaining \$0.5 million of the purchase price being paid during the first quarter of 2019. As of December 31, 2018, the remaining \$0.5 million was recorded in Other current liabilities on the Company's Consolidated Balance Sheet.

In December 2017, the Company acquired the remaining 45% ownership interest in its India affiliate, Quaker Chemical India Private Limited ("QCIL") for 2,025.0 million INR, or approximately \$31.8 million. QCIL is a part of the Company's Asia/Pacific reportable operating segment. As this acquisition was a change in an existing controlling ownership, the Company recorded \$21.2 million of excess purchase price over the carrying value of the noncontrolling interest in Capital in excess of par value. In May 2017, the Company acquired assets associated with a business that markets, sells and manufactures certain metalworking fluids for its North America reportable operating segment for 7.3 million CAD, or approximately \$5.4 million. As of December 31, 2018, the allocation of the purchase price for all of the Company's 2017 acquisitions have been finalized.

In November 2016, the Company acquired Lubricor Inc. and its affiliated entities ("Lubricor"), a metalworking fluids manufacturer headquartered in Waterloo, Ontario for its North America reportable operating segment for 16.0 million CAD, or approximately \$12.0 million. During the first quarter of 2017, the Company identified and recorded an adjustment of less than \$0.1 million to the allocation of the purchase price for the Lubricor acquisition. The adjustment was the result of finalizing a post-closing settlement based on the Company's assessment of additional information related to assets acquired and liabilities assumed. In May 2016, the Company acquired assets of a business that is associated with dust control products for the mining industry for its North America reportable operating segment for \$1.9 million. As of December 31, 2017, the allocation of the purchase price for all of the Company's 2016 acquisitions have been finalized.

In July 2015, the Company acquired Verkol, a leading specialty grease and other lubricants manufacturer based in northern Spain, included in its EMEA reportable operating segment, for 37.7 million EUR, or approximately \$41.4 million. This includes a post-closing adjustment of 1.3 million EUR, or approximately \$1.4 million that was accrued as of December 31, 2015 and paid during the first quarter of 2016.

The results of operations of the acquired businesses and assets are included in the Consolidated Statements of Income from their respective acquisition dates. Transaction expenses associated with these acquisitions are included in SG&A in the Company's Consolidated Statements of Income. Certain pro forma and other information is not presented, as the operations of the acquired businesses are not material to the overall operations of the Company for the periods presented.

QUAKER CHEMICAL CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - Continued
(Dollars in thousands, except share and per share amounts, unless otherwise stated)

Note 24 – Fair Value Measures

The Company has valued its company-owned life insurance policies at fair value. These assets are subject to fair value measurement as follows:

Assets	Total Fair Value	Fair Value Measurements at December 31, 2018 Using Fair Value Hierarchy		
		Level 1	Level 2	Level 3
		\$ 1,491	\$ —	\$ 1,491
Company-owned life insurance				
Total	\$ 1,491	\$ —	\$ 1,491	\$ —

Assets	Total Fair Value	Fair Value Measurements at December 31, 2017 Using Fair Value Hierarchy		
		Level 1	Level 2	Level 3
		\$ 1,594	\$ —	\$ 1,594
Company-owned life insurance				
Total	\$ 1,594	\$ —	\$ 1,594	\$ —

The fair values of Company-owned life insurance are based on quotes for like instruments with similar credit ratings and terms. The Company did not have liabilities subject to fair value measurement and did not hold Level 3 investments as of December 31, 2018 or 2017, respectively, so related disclosures have not been included.

Note 25 – Commitments and Contingencies

In 1992, the Company identified certain soil and groundwater contamination at AC Products, Inc. (“ACP”), a wholly owned subsidiary. In voluntary coordination with the Santa Ana California Regional Water Quality Board, ACP has been remediating the contamination, the principal contaminant of which is perchloroethylene (“PERC”). In 2004, the Orange County Water District (“OCWD”) filed a civil complaint against ACP and other parties seeking to recover compensatory and other damages related to the investigation and remediation of the contamination in the groundwater. Pursuant to a settlement agreement with OCWD, ACP agreed, among other things, to operate the two groundwater treatment systems to hydraulically contain groundwater contamination emanating from ACP’s site until the concentrations of PERC released by ACP fell below the current Federal maximum contaminant level for four consecutive quarterly sampling events. In 2014, ACP ceased operation at one of its two groundwater treatment systems, as it had met the above condition for closure. As of December 31, 2018, ACP believes it is close to meeting the conditions for closure of the remaining groundwater treatment system but continues to operate this system while in discussions with the relevant authorities.

As of December 31, 2018, the Company believes that the range of potential-known liabilities associated with the balance of ACP water remediation program is approximately \$0.1 million to \$1.0 million. The low and high ends of the range are based on the length of operation of the treatment system as required by the conditions noted above, as determined by groundwater modeling. Costs of operation include the operation and maintenance of the extraction well, groundwater monitoring and program management.

The Company believes, although there can be no assurance regarding the outcome of other unrelated environmental matters, that it has made adequate accruals for costs associated with other environmental problems of which it is aware. Approximately \$0.2 million was accrued as of December 31, 2018 and 2017, respectively, to provide for such anticipated future environmental assessments and remediation costs.

An inactive subsidiary of the Company that was acquired in 1978 sold certain products containing asbestos, primarily on an installed basis, and is among the defendants in numerous lawsuits alleging injury due to exposure to asbestos. The subsidiary discontinued operations in 1991 and has no remaining assets other than proceeds received from insurance settlements. To date, the overwhelming majority of these claims have been disposed of without payment and there have been no adverse judgments against the subsidiary. Based on a continued analysis of the existing and anticipated future claims against this subsidiary, it is currently projected that the subsidiary’s total liability over the next 50 years for these claims is approximately \$1.7 million (excluding costs of defense). Although the Company has also been named as a defendant in certain of these cases, no claims have been actively pursued against the Company, and the Company has not contributed to the defense or settlement of any of these cases pursued against the subsidiary. These cases were handled by the subsidiary’s primary and excess insurers who had agreed in 1997 to pay all defense costs and be responsible for all damages assessed against the subsidiary arising out of existing and future asbestos claims up to the aggregate limits of their policies. A significant portion of this primary insurance coverage was provided by an insurer that is insolvent, and the other primary insurers asserted that the aggregate limits of their policies had been exhausted. The subsidiary challenged the applicability of these limits to the claims being brought against the subsidiary. In response, two of the three carriers entered into separate settlement and release agreements with the subsidiary in 2005 and 2007 for \$15.0 million and \$20.0 million, respectively. The proceeds of both settlements are restricted and can only be used to pay claims and costs of defense associated with the subsidiary’s asbestos litigation.

QUAKER CHEMICAL CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - Continued
(Dollars in thousands, except share and per share amounts, unless otherwise stated)

In 2007, the subsidiary and the remaining primary insurance carrier entered into a Claim Handling and Funding Agreement, under which the carrier is paying 27% of defense and indemnity costs incurred by or on behalf of the subsidiary in connection with asbestos bodily injury claims. The agreement continues until terminated and can only be terminated by either party by providing a minimum of two years prior written notice. As of December 31, 2018, no notice of termination has been given under this agreement. At the end of the term of the agreement, the subsidiary may choose to again pursue its claim against this insurer regarding the application of the policy limits. The Company believes that, if the coverage issues under the primary policies with the remaining carrier are resolved adversely to the subsidiary and all settlement proceeds were used, the subsidiary may have limited additional coverage from a state guarantee fund established following the insolvency of one of the subsidiary's primary insurers. Nevertheless, liabilities in respect of claims may exceed the assets and coverage available to the subsidiary.

If the subsidiary's assets and insurance coverage were to be exhausted, claimants of the subsidiary may actively pursue claims against the Company because of the parent-subsidary relationship. The Company does not believe that such claims would have merit or that the Company would be held to have liability for any unsatisfied obligations of the subsidiary as a result of such claims. After evaluating the nature of the claims filed against the subsidiary and the small number of such claims that have resulted in any payment, the potential availability of additional insurance coverage at the subsidiary level, the additional availability of the Company's own insurance and the Company's strong defenses to claims that it should be held responsible for the subsidiary's obligations because of the parent-subsidary relationship, the Company believes it is not probable that the Company will incur losses. The Company has been successful to date having any claims naming it dismissed during initial proceedings. Since the Company may be in this stage of litigation for some time, it is not possible to estimate additional losses or range of loss, if any.

The Company is party to other litigation which management currently believes will not have a material adverse effect on the Company's results of operations, cash flows or financial condition.

The Company leases certain manufacturing and office facilities and equipment under non-cancelable operating leases with various terms from 1 to 15 years expiring in 2027. Rent expense for the years ended December 31, 2018, 2017 and 2016 was \$7.2 million, \$6.4 million, and \$5.6 million, respectively.

The Company's minimum rental commitments under operating leases as of December 31, 2018 for future years were approximately:

2019	\$	7,068
2020		5,635
2021		4,509
2022		3,523
2023		2,659
2024 and beyond		7,779

QUAKER CHEMICAL CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS - Continued
(Dollars in thousands, except share and per share amounts, unless otherwise stated)

Note 26 – Quarterly Results (unaudited)

	First Quarter (1)	Second Quarter (2)	Third Quarter (3)	Fourth Quarter (4)
2018				
Net sales	\$ 212,055	\$ 221,962	\$ 222,022	\$ 211,481
Gross profit	75,447	80,937	81,093	74,838
Operating income	20,231	22,563	24,919	20,068
Net income attributable to Quaker Chemical Corporation	12,732	19,246	19,690	7,805
Net income attributable to Quaker Chemical Corporation Common Shareholders - Basic (5)	\$ 0.96	\$ 1.44	\$ 1.48	\$ 0.59
Net income attributable to Quaker Chemical Corporation Common Shareholders - Diluted (5)	\$ 0.95	\$ 1.44	\$ 1.47	\$ 0.58
2017				
Net sales	\$ 194,909	\$ 201,183	\$ 212,918	\$ 211,072
Gross profit	70,887	71,835	74,776	73,997
Operating income	13,758	17,903	14,009	17,074
Net income (loss) attributable to Quaker Chemical Corporation	6,992	11,906	11,142	(9,762)
Net income (loss) attributable to Quaker Chemical Corporation Common Shareholders - Basic (5)	\$ 0.53	\$ 0.90	\$ 0.84	\$ (0.73)
Net income (loss) attributable to Quaker Chemical Corporation Common Shareholders - Diluted (5)	\$ 0.52	\$ 0.89	\$ 0.83	\$ (0.73)

- (1) Net income attributable to Quaker Chemical Corporation for both the first quarters of 2018 and 2017 includes a loss of \$0.4 million and earnings of \$0.6 million, respectively, from the Company's equity interest in a captive insurance company. Net income attributable to Quaker Chemical Corporation for both the first quarters of 2018 and 2017 includes Houghton combination-related expenses of \$6.1 million and \$9.1 million, respectively. Net income attributable to Quaker Chemical Corporation for the first quarter of 2018 includes a currency conversion charge of \$0.2 million related to the impacts of hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela. Net income attributable to Quaker Chemical Corporation for the first quarter of 2017 also includes \$0.3 million of cost streamlining expenses associated with certain actions taken to reorganize the Company's corporate staff.
- (2) Net income attributable to Quaker Chemical Corporation for both the second quarters of 2018 and 2017 includes earnings from the Company's equity interest in a captive insurance company of \$1.0 million and \$0.4 million, respectively. Net income attributable to Quaker Chemical Corporation for both the second quarters of 2018 and 2017 includes Houghton combination-related expenses of \$4.5 million and \$4.3 million, respectively. Net income attributable to Quaker Chemical Corporation for both the second quarters of 2018 and 2017 includes currency conversion charges of less than \$0.1 million and \$0.3 million, respectively, related to the impacts of hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela. Net income attributable to Quaker Chemical Corporation for the second quarter of 2018 includes a tax adjustment of \$1.2 million related to U.S. Tax Reform. Net income attributable to Quaker Chemical Corporation for the second quarter of 2017 includes a \$1.9 million charge for the Company's U.S. pension plan settlement of its vested terminated participants.
- (3) Net income attributable to Quaker Chemical Corporation for both the third quarters of 2018 and 2017 includes earnings from the Company's equity interest in a captive insurance company of \$0.4 million, respectively, in both periods. Net income attributable to Quaker Chemical Corporation for both the third quarters of 2018 and 2017 includes Houghton combination-related expenses of \$3.8 million and \$9.7 million, respectively. Net income attributable to Quaker Chemical Corporation for both the third quarters of 2018 and 2017 includes currency conversion charges of \$0.5 million and less than \$0.1 million, respectively, related to the impacts of hyper-inflationary accounting at the Company's 50% owned affiliate in Venezuela and wholly owned Argentina subsidiary. Net income attributable to Quaker Chemical Corporation for the third quarter of 2018 also includes a \$0.4 million foreign currency transaction gain related to the liquidation of an inactive legal entity and a tax adjustment of \$1.1 million related to U.S. Tax Reform.
- (4) Net income (loss) attributable to Quaker Chemical Corporation for both the fourth quarters of 2018 and 2017 includes a loss of \$0.1 million and earnings of \$1.1 million, respectively, from the Company's equity interest in a captive insurance company. Net income (loss) attributable to Quaker Chemical Corporation for both the fourth quarters of 2018 and 2017 includes Houghton

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combination-related expenses of \$5.1 million and \$7.7 million, respectively. Net income (loss) attributable to Quaker Chemical Corporation for both the fourth quarters of 2018 and 2017 includes other income of \$0.1 million and \$0.6 million, respectively, related to cash proceeds from an insolvent insurance carrier with respect to previously filed recovery claims by an inactive subsidiary of the Company. Net income (loss) attributable to Quaker Chemical Corporation for both the fourth quarters of 2018 and 2017 includes currency conversion impacts related to hyper-inflationary accounting, with the 2017 impact of a charge of \$0.1 million at the Company's 50% owned affiliate in Venezuela and the 2018 impact of income of less than \$0.1 million at the Company's wholly owned Argentina subsidiary. Net income (loss) attributable to Quaker Chemical Corporation for both the fourth quarters of 2018 and 2017 includes charges of \$8.1 million and \$22.2 million, respectively, related to U.S. Tax Reform. Net income (loss) attributable to Quaker Chemical Corporation for the fourth quarter of 2017 also includes a charge of \$0.1 million related to a loss on disposal of a held-for-sale asset.

- (5) Basic and diluted per share amounts of net income (loss) attributable to Quaker Chemical Corporation common shareholders for all four quarters above may not total to the full year amounts presented in the Company's consolidated financial statements for the years ended December 31, 2018 and 2017, respectively, due to rounding.

Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosure.

Not Applicable.

Item 9A. Controls and Procedures.

Conclusion Regarding the Effectiveness of Disclosure Controls and Procedures

As required by Rule 13a-15(b) under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), our management, including our principal executive officer and principal financial officer, has evaluated the effectiveness of our disclosure controls and procedures as of the end of the period covered by this report. Based on that evaluation, our principal executive officer and our principal financial officer have concluded that as of the end of the period covered by this report our disclosure controls and procedures (as defined in Rule 13a-15(e) under the Exchange Act) were effective.

Management's Report on Internal Control over Financial Reporting

The management of Quaker is responsible for establishing and maintaining adequate internal control over financial reporting as such term is defined in Rule 13a-15(f) promulgated under the Exchange Act. 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.

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, with the participation of our principal executive officer and principal financial officer, assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2018. In making this assessment, our management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission in *Internal Control—Integrated Framework (2013)*. Based on its assessment, Quaker's management has concluded that as of December 31, 2018, the Company's internal control over financial reporting is effective based on those criteria.

The effectiveness of the Company's internal control over financial reporting as of December 31, 2018 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report which is included in "Item 8. Financial Statements and Supplementary Data."

Changes in Internal Controls Over Financial Reporting

As required by Rule 13a-15(d) under the Exchange Act, our management, including our principal executive officer and principal financial officer, has evaluated our internal control over financial reporting to determine whether any changes to our internal control over financial reporting occurred during the fourth quarter of the year ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting. Based on that evaluation, no such changes to our internal control over financial reporting occurred during the fourth quarter of the year ended December 31, 2018.

Item 9B. Other Information.

Following mutually agreeable discussions with Mr. Jeffrey Benoliel (Vice President and Global Leader of Metalworking, Can and Mining) during 2017, it was decided that as part of the Company's integration planning for its combination with Houghton International, Inc., Mr. Benoliel's current position would be restructured. After subsequent discussions, Mr. Benoliel has chosen to leave the Company effective March 1, 2019. Mr. Benoliel will receive severance and other benefits that will be substantially similar to those he would have received in connection with a termination of employment following a change in control of the Company pursuant to his existing Change in Control Agreement with the Company, dated November 19, 2008 (the "Agreement"). Separately, the amounts due to Mr. Benoliel under his existing supplemental retirement income program will be paid in accordance with the terms of that program. As contemplated by the Agreement, payment to Mr. Benoliel of severance and other benefits is subject to his execution and non-revocation of a Release in a form satisfactory to the Company. For additional information, see "Severance and Change in Control Benefits" and "Potential Payments Upon Termination or Change in Control", in the Company's definitive proxy statement on Schedule 14A filed with the Securities and Exchange Commission on March 29, 2018.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

Incorporated by reference is (i) the information beginning with and including the caption “Proposal 1—Election of Directors and Nominee Biographies” in Quaker’s definitive Proxy Statement relating to the 2019 Annual Meeting of Shareholders, to be filed with the Securities and Exchange Commission no later than 120 days after the close of its fiscal year ended December 31, 2018 (the “2019 Proxy Statement”) to, but not including, the sub-caption “Governance Committee Procedures for Selecting Director Nominees,” (ii) the information appearing in Item 4(a) of this Report, (iii) the information in the 2019 Proxy Statement beginning with and including the caption, “Section 16(a) Beneficial Ownership Reporting Compliance” to, but not including, the caption “Certain Relationships and Related Transactions,” (iv) the information in the 2019 Proxy Statement beginning with and including the sub-caption “Code of Conduct” to, but not including, the caption “Compensation Committee Interlocks and Insider Participation,” and (v) the information in the 2019 Proxy Statement beginning with and including the sub-caption “Shareholder Nominations and Recommendations” to, but not including, the sub-caption “Board Oversight of Risk.”

Item 11. Executive Compensation.

Incorporated by reference is (i) the information in the 2019 Proxy Statement beginning with and including the caption “Compensation Committee Interlocks and Insider Participation” to, but not including the caption “Proposal 2 – Approval of an Amendment to the Company’s Articles of Incorporation, as amended” and (ii) the information in the 2019 Proxy Statement beginning with and including the caption “Executive Compensation” to, but not including, the caption, “Stock Ownership of Certain Beneficial Owners and Management.”

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

Incorporated by reference is the information in the 2019 Proxy Statement beginning with and including the caption “Stock Ownership of Certain Beneficial Owners and Management” to, but not including, the caption “Section 16(a) Beneficial Ownership Reporting Compliance.”

Equity Compensation Plans

The following table sets forth certain information relating to the Company’s equity compensation plans as of December 31, 2018. Each number of securities reflected in the table is a reference to shares of Quaker common stock.

Plan Category	Equity Compensation Plan Information		
	Number of securities to be issued upon exercise of outstanding options, warrants and rights (a)	Weighted-average exercise price of outstanding options, warrants and rights (b)	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a)) (c)
Equity compensation plans approved by security holders	122,072	\$ 116.39	851,949 (1)
Equity compensation plans not approved by security holders	—	—	—
Total	122,072	\$ 116.39	851,949 (1)

(1) As of December 31, 2018, 304,900 of these shares were available for issuance as restricted stock awards under the Company’s 2001 Global Annual Incentive Plan, 479,892 shares were available for issuance upon the exercise of stock options and/or as restricted stock awards and/or restricted stock unit awards under the Company’s 2016 Long-Term Performance Incentive Plan, and 67,157 shares were available for issuance under the 2013 Director Stock Ownership Plan.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

Incorporated by reference is (i) the information in the 2019 Proxy Statement beginning with and including the caption “Certain Relationships and Related Transactions” to, but not including, the caption “Proposal 2—Ratification of Appointment of Independent Registered Public Accounting Firm,” (ii) the information in the 2019 Proxy Statement beginning with and including the sub-caption “Director Independence” to, but not including, the sub-caption “Governance Committee Procedures for Selecting Director Nominees,” and (iii) the information in the 2019 Proxy Statement beginning with and including the caption “Meetings and Committees of the Board” to, but not including, the caption “Compensation Committee Interlocks and Insider Participation.”

Item 14. *Principal Accountant Fees and Services.*

Incorporated by reference is the information in the 2019 Proxy Statement beginning with and including the sub-caption "Audit Fees" to, but not including, the statement recommending a vote for ratification of the appointment of PricewaterhouseCoopers LLP as the Company's independent registered public accounting firm for the year ending December 31, 2019.

Item 15. Exhibits and Financial Statement Schedules.

(a) Exhibits and Financial Statement Schedules

1. Financial Statements and Supplementary Data

Financial Statements:

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2. Financial Statement Schedules

All schedules are omitted because they are not applicable or the required information is shown in the financial statements or notes thereto. Financial statements of 50% or less owned companies have been omitted because none of the companies meets the criteria requiring inclusion of such statements.

3. Exhibits - filed pursuant to, and numbered in accordance with Item 601 of Regulation S-K (all of which are under Commission File number 001-12019, except as otherwise noted):

3(i)(a) —	Articles of Incorporation (as amended through July 31, 2013), Incorporated by reference to Exhibit 3.1 as filed by Registrant with Form 8-K filed on July 31, 2013.
3(i)(b) —	Articles of Amendment dated September 7, 2017, to the Articles of Incorporation. Incorporated by reference to Exhibit 3.1 as filed by Registrant with Form 8-K filed on September 11, 2017.
3(ii) —	By-laws (as amended and restated, effective May 6, 2015), Incorporated by reference to Exhibit 3.2 as filed by Registrant with Form 8-K filed on May 8, 2015.
10.1 —	Settlement Agreement and Release between Registrant, an inactive subsidiary of the Registrant, and Hartford Accident and Indemnity Company dated December 12, 2005. Incorporated by reference to Exhibit 10 (nnn) as filed by the Registrant with Form 10-K for the year 2005.
10.2 —	Employment Agreement by and between L. Willem Platzer and Quaker Chemical B.V., a Netherlands corporation and a subsidiary of Registrant, dated August 21, 2006. Incorporated by reference to Exhibit 10 as filed by the Registrant with Form 8-K filed on August 22, 2006. *
10.3 —	Settlement Agreement and Release between Registrant, an inactive subsidiary of Registrant and Federal Insurance Company dated March 26, 2007. Incorporated by reference to Exhibit 10 (zzz) as filed by the Registrant with Form 10-Q for the quarter ended March 31, 2007.
10.4 —	Change in Control Agreement by and between Registrant and L. Willem Platzer dated April 2, 2007, effective January 1, 2007. Incorporated by reference to Exhibit 10 (aaa) as filed by the Registrant with Form 10-Q for the quarter ended March 31, 2007. *
10.5 —	Change in Control Agreement by and between Registrant and Jan F. Nieman dated June 27, 2007, effective January 1, 2007. Incorporated by reference to Exhibit 10 (ccc) as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2007. *

- 10.6 — [Claim Handling and Funding Agreement between SB Decking, Inc., an inactive subsidiary of Registrant, and Employers Insurance Company of Wausau dated September 25, 2007. Incorporated by reference to Exhibit 10\(f\)\(ff\) as filed by the Registrant with Form 10-Q for the quarter ended September 30, 2007.](#)
- 10.7 — [Settlement Agreement and Mutual Release entered into between AC Products, Inc., wholly owned subsidiary of Registrant, and Orange County Water District, effective November 8, 2007. Incorporated by reference to Exhibit 10.47 as filed by the Registrant with Form 10-K for the year ended 2007.](#)
- 10.8 — [Financing Agreement by and among Butler County Port Authority and Registrant and Brown Brothers Harriman & Co. dated May 15, 2008. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2008. *](#)
- 10.9 — [Employment Agreement by and between Registrant and Michael F. Barry dated July 1, 2008. Incorporated by reference to Exhibit 10.5 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2008. *](#)
- 10.10 — [Change in Control Agreement by and between Registrant and Michael F. Barry dated July 1, 2008. Incorporated by reference to Exhibit 10.6 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2008. *](#)
- 10.11 — [Butler County Port Authority Industrial Development Revenue Bond dated May 15, 2008. Incorporated by reference to Exhibit 10.7 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2008.](#)
- 10.12 — [Memorandum of Employment by and between Registrant and Joseph F. Matrange dated September 30, 2008. Incorporated by reference to Exhibit 10.48 as filed by the Registrant with Form 10-K for the year ended 2008. *](#)
- 10.13 — [Memorandum of Employment by and between Registrant and D. Jeffrey Benoiel dated October 1, 2008. Incorporated by reference to Exhibit 10.49 as filed by the Registrant with Form 10-K for the year ended 2008. *](#)
- 10.14 — [Change in Control Agreement by and between Registrant and D. Jeffrey Benoiel dated November 19, 2008, effective January 1, 2008. Incorporated by reference to Exhibit 10.54 as filed by the Registrant with Form 10-K for the year ended 2008. *](#)
- 10.15 — [Change in Control Agreement by and between Registrant and Joseph F. Matrange dated November 19, 2008, effective October 1, 2008. Incorporated by reference to Exhibit 10.55 as filed by the Registrant with Form 10-K for the year ended 2008. *](#)
- 10.16 — [Change in Control Agreement by and between Registrant and Ronald S. Ettinger dated November 19, 2008, effective October 1, 2008. Incorporated by reference to Exhibit 10.56 as filed by the Registrant with Form 10-K for the year ended 2008. *](#)
- 10.17 — [Supplemental Retirement Income Program \(as amended and restated effective January 1, 2008\), approved November 19, 2008. Incorporated by reference to Exhibit 10.58 as filed by the Registrant with Form 10-K for the year ended 2008. *](#)
- 10.18 — [Memorandum of Employment by and between Registrant and Joseph Berquist dated April 1, 2010. Incorporated by reference to Exhibit 10.2 as filed by the Registrant with Form 10-Q for the quarter ended March 31, 2010. *](#)
- 10.19 — [Change in Control Agreement by and between Registrant and Joseph Berquist dated April 1, 2010. Incorporated by reference to Exhibit 10.3 as filed by the Registrant with Form 10-Q for the quarter ended March 31, 2010. *](#)
- 10.20 — [Employment Agreement by and between Dieter Laininger and Quaker Chemical B.V., a subsidiary of the registrant, dated June 1, 2011, effective June 15, 2011. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2011. *](#)
- 10.21 — [Change in Control Agreement by and between Registrant and Dieter Laininger dated May 31, 2011, effective June 15, 2011. Incorporated by reference to Exhibit 10.2 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2011. *](#)

- 10.22 — [2011 Long-Term Performance Incentive Plan. Incorporated by reference to Appendix C to the Registrant's definitive proxy statement filed on March 31, 2011. *](#)
- 10.23 — [Form of Restricted Stock Unit Agreement for executive officers and other employees under Registrant's 2011 Long-Term Performance Incentive Plan. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 10-Q for the quarter ended March 31, 2012. *](#)
- 10.24 — [Expatriate Agreement by and between the Registrant and Adrian Steeples, dated January 29, 2013, effective July 1, 2013. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 10-Q for the quarter ended March 31, 2013. *](#)
- 10.25 — [2013 Director Stock Ownership Plan as approved May 8, 2013. Incorporated by reference to Appendix B to the Registrant's definitive proxy statement filed on March 28, 2013. *](#)
- 10.26 — [Amended and Restated Multicurrency Credit Agreement by and between Registrant and Bank of America, N.A. and certain other lenders dated June 14, 2013. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2013.](#)
- 10.27 — [Memorandum of Employment and Addendum by and between Registrant and Jan E. Nieman, effective August 1, 2013. Incorporated by reference to Exhibit 10.2 as filed by the Registrant with Form 10-Q for the quarter ended June 30, 2013. *](#)
- 10.28 — [Expatriate Agreement by and between the Registrant and Dieter Laininger, dated and effective February 27, 2014. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 10-Q for the quarter ended March 31, 2014. *](#)
- 10.29 — [Memorandum of Employment by and between Registrant and Mary Dean Hall, dated and effective November 30, 2015. Incorporated by reference to Exhibit 10.60 as filed by the Registrant with Form 10-K for the year ended 2015. *](#)
- 10.30 — [Change in control agreement by and between Registrant and Mary Dean Hall, dated and effective November 30, 2015. Incorporated by reference to Exhibit 10.61 as filed by the Registrant with Form 10-K for the year ended 2015. *](#)
- 10.31 — [Retirement Savings Plan, as amended and restated effective January 1, 2016. Incorporated by reference to Exhibit 10.62 as filed by the Registrant with Form 10-K for the year ended 2015. *](#)
- 10.32 — [Global Annual Incentive Plan \(as amended and restated effective February 24, 2016\). Incorporated by reference to Appendix B to the Registrant's definitive proxy statement filed on March 28, 2016. *](#)
- 10.33 — [2016 Long-Term Performance Incentive Plan. Incorporated by reference to Appendix C to the Registrant's definitive proxy statement filed on March 28, 2016. *](#)
- 10.34 — [Form of Restricted Stock Award Agreement for executive officers and other employees under Registrant's 2016 Long-Term Performance Incentive Plan. Incorporated by reference to Exhibit 10.3 as filed by Registrant with Form 8-K filed on May 6, 2016. *](#)
- 10.35 — [Form of Restricted Stock Unit Agreement for executive officers and other employees under Registrant's 2016 Long-Term Performance Incentive Plan. Incorporated by reference to Exhibit 10.4 as filed by Registrant with Form 8-K filed on May 6, 2016. *](#)
- 10.36 — [Share Purchase Agreement, dated April 4, 2017, by and among Quaker Chemical Corporation, a Pennsylvania corporation, Gulf Houghton Lubricants, Ltd., an exempted company incorporated under the laws of the Cayman Islands, Global Houghton Ltd., an exempted company incorporated under the laws of the Cayman Islands, and certain members of the management of Global Houghton Ltd. and Gulf Houghton Lubricants, Ltd., as agent for the Sellers. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 8-K, filed on April 5, 2017. **](#)
- 10.37 — [Senior Secured Credit Facilities Commitment Letter, dated April 4, 2017, by and among Quaker Chemical Corporation, Bank of America, N.A., Merrill Lynch, Pierce, Fenner & Smith Incorporated, Deutsche Bank AG New York Branch and Deutsche Bank Securities Inc. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 8-K, filed on April 7, 2017.](#)

10.38—	Amendment No. 1, dated as of May 23, 2017, to the Amended and Restated Multicurrency Credit Agreement, dated as of June 14, 2013. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 8-K, filed on May 25, 2017.
10.39—	Amendment No. 2, dated as of May 29, 2018, to the Amended and Restated Multicurrency Credit Agreement, dated as of June 14, 2013. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 8-K, filed on May 30, 2018.
10.40—	Amendment No. 3, dated as of August 1, 2018, to the Amended and Restated Multicurrency Credit Agreement, dated as of June 14, 2013. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 8-K, filed on August 3, 2018.
10.41—	Amendment No. 4, dated as of December 14, 2018, to the Amended and Restated Multicurrency Credit Agreement, dated as of June 14, 2013. Incorporated by reference to Exhibit 10.1 as filed by the Registrant with Form 8-K, filed on December 18, 2018.
21 —	Subsidiaries and Affiliates of the Registrant
23 —	Consent of Independent Registered Public Accounting Firm
31.1 —	Certification of Chief Executive Officer of the Company pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934.
31.2 —	Certification of Chief Financial Officer of the Company pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934.
32.1 —	Certification of Michael F. Barry pursuant to 18 U.S.C. Section 1350.
32.2 —	Certification of Mary Dean Hall pursuant to 18 U.S.C. Section 1350.
101.INS —	XBRL Instance Document
101.SCH—	XBRL Extension Schema Document
101.CAL—	XBRL Calculation Linkbase Document
101.DEF —	XBRL Definition Linkbase Document
101.LAB—	XBRL Label Linkbase Document
101.PRE—	XBRL Presentation Linkbase Document

Item 16. Form 10-K Summary.

The Company has elected not to include a Form 10-K summary under this Item 16.

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.

QUAKER CHEMICAL CORPORATION
Registrant

By: _____

/s/ MICHAEL F. BARRY

Michael F. Barry
Chairman of the Board, Chief Executive Officer and President

Date: February 28, 2019

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.

<u>Signatures</u>	<u>Capacity</u>	<u>Date</u>
_____ /s/ MICHAEL F. BARRY Michael F. Barry Chairman of the Board, Chief Executive Officer and President	Principal Executive Officer and Director	February 28, 2019
_____ /s/ MARY DEAN HALL Mary Dean Hall Vice President, Chief Financial Officer and Treasurer	Principal Financial Officer	February 28, 2019
_____ /s/ SHANE W. HOSTETTER Shane W. Hostetter Global Controller	Principal Accounting Officer	February 28, 2019
_____ /s/ DONALD R. CALDWELL Donald R. Caldwell	Director	February 28, 2019
_____ /s/ ROBERT E. CHAPPELL Robert E. Chappell	Director	February 28, 2019
_____ /s/ MARK A. DOUGLAS Mark A. Douglas	Director	February 28, 2019
_____ /s/ JEFFRY D. FRISBY Jeffry D. Frisby	Director	February 28, 2019
_____ /s/ WILLIAM H. OSBORNE William H. Osborne	Director	February 28, 2019
_____ /s/ ROBERT H. ROCK Robert H. Rock	Director	February 28, 2019
_____ /s/ FAY WEST Fay West	Director	February 28, 2019

SUBSIDIARIES AND AFFILIATES OF THE REGISTRANT

Name	Jurisdiction of Incorporation	Percentage of Voting Securities Owned Directly or Indirectly by Quaker
* Quaker Chemical Corporation	Delaware, U.S.A.	100%
+* SB Decking, Inc. (formerly Selby, Battersby & Co.)	Delaware, U.S.A.	100%
* AC Products, Inc.	California, U.S.A.	100%
* Epmar Corporation	California, U.S.A.	100%
* Summit Lubricants, Inc.	New York, U.S.A.	100%
* Tecniquimia Mexicana S.A. de C.V.	Mexico	100%
* Unitek Servicios De Asesoría Especializad S.A de C.V.	Mexico	100%
+* Quaker Chemical Europe B.V.	Holland	100%
* Quaker Chemical B.V.	Holland	100%
+* Quaker Russia B.V. (formerly KWR Holdings B.V.)	Holland	100%
* Quaker Chemical (China) Co. Ltd.	China	100%
+* Quaker China Holdings B.V.	Holland	100%
* Quaker Chemical Canada Limited	Ontario, Canada	100%
* Quaker Chemical Limited	United Kingdom	100%
* Quaker Chemical, S.A.	France	100%
* Quaker Chemical, S.A.	Spain	100%
+* Quaker Denmark ApS	Denmark	100%
* Quaker Chemical, S.A.	Argentina	100%
+* Quaker Chemical Participacoes, Ltda.	Brazil	100%
* Quaker Chemical Limited	Hong Kong	100%
+* Quaker Chemical Holdings South Africa (Pty) Limited	Republic of South Africa	100%
* Quaker Italia S.r.l.	Italy	100%
* Quaker Chemical S.r.l.	Italy	100%
+* Quaker Australia Holdings Pty. Limited	Victoria, Australia	100%
* Quaker Shanghai Trading Company Limited	China	100%
* Quaker Chemical Industria e Comercio Ltda.	Brazil	100%
* Quaker Chemical Operacoes, Ltda.	Brazil	100%
* Quaker Chemical India Private Limited	India	100%
* Quaker Chemical (Australasia) Pty. Limited	New South Wales, Australia	100%
* Quaker (Thailand) Ltd.	Thailand	100%
* Quaker Chemical South Africa (Pty.) Limited	Republic of South Africa	51%
* ECLI Products, LLC	Illinois, U.S.A.	100%
* Engineered Custom Lubricants GmbH	Germany	100%
* Binol AB	Sweden	100%
* Binol Biosafe OY	Finland	100%
* Quaker Chemical MEA FZE	Dubai	100%
* Verkol S.A.U.	Spain	100%
+* Quaker Spain Holding, SLU	Spain	100%
+* Quaker Chemical Investment Management (Shanghai) Co., Ltd.	China	100%
* Wuhan Quaker Technology Co., Ltd	China	60%
* Lubricor USA, Inc.	Ohio, U.S.A	100%
+* Quaker Chemical Canada Holdings, Inc.	Canada	100%
* Lubricor, Inc.	Canada	100%

SUBSIDIARIES AND AFFILIATES OF THE REGISTRANT, *continued*

Name	Jurisdiction of Incorporation	Percentage of Voting Securities Owned Directly or Indirectly by Quaker
* Lubricor Mexicana S.A. de C.V.	Mexico	100%
* Quaker Sales Europe, BV	Netherlands	100%
+* Quaker International Holdings, LLC	Delaware, U.S.A.	100%
+* Quaker Chemical, CV	Netherlands	100%
+* Quaker Chemical Services EURL	France	100%
+* MIH Acquisition Company, LLC	Delaware, U.S.A.	100%
** Nippon Quaker Chemical, Ltd.	Japan	50%
** Kelko Quaker Chemical, S.A.	Panama	50%
** Primex, Ltd.	Barbados	33%
Kelko Quaker Chemical, S.A.	Venezuela	50%

+ A non-operating company

* Included in the consolidated financial statements

** Accounted for in the consolidated financial statements under the equity method



CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-3 (Registration No. 333-155607) and on Forms S-8 (Registration Nos. 333-48130, 033-54158, 333-58676, 333-115713, 333-159513, 333-174145, 333-208188, 333-188594 and 333-211238) of Quaker Chemical Corporation of our report dated February 28, 2019 relating to the financial statements and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP
Philadelphia, Pennsylvania
February 28, 2019

CERTIFICATION OF CHIEF EXECUTIVE OFFICER OF THE COMPANY PURSUANT TO RULE 13a-14(a) OF THE SECURITIES EXCHANGE ACT OF 1934

I, Michael F. Barry, certify that:

1. I have reviewed this Annual Report on Form 10-K of Quaker Chemical Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;
 - (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2019

/s/ MICHAEL F. BARRY

Michael F. Barry
Chief Executive Officer

CERTIFICATION OF CHIEF FINANCIAL OFFICER OF THE COMPANY PURSUANT TO RULE 13a-14(a) OF THE SECURITIES EXCHANGE ACT OF 1934

I, Mary Dean Hall, certify that:

1. I have reviewed this Annual Report on Form 10-K of Quaker Chemical Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;
 - (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2019

/s/ MARY DEAN HALL

Mary Dean Hall
Chief Financial Officer

CERTIFICATION PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned hereby certifies that the Form 10-K Annual Report of Quaker Chemical Corporation (the "Company") for the annual period ended December 31, 2018 filed with the Securities and Exchange Commission (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: February 28, 2019

/s/ MICHAEL F. BARRY

Michael F. Barry

Chief Executive Officer of Quaker Chemical Corporation

CERTIFICATION PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned hereby certifies that the Form 10-K Annual Report of Quaker Chemical Corporation (the "Company") for the annual period ended December 31, 2018 filed with the Securities and Exchange Commission (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: February 28, 2019

/s/ MARY DEAN HALL

Mary Dean Hall

Chief Financial Officer of Quaker Chemical Corporation
