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

FORM 10-Q

(Mark One)

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

For the quarterly period ended March 31, 2019

OR

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

For the transition period from to

Commission File Number: 001-38221

PQ Group Holdings Inc.

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

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

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

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

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

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

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

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

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

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

The number of shares of common stock outstanding as of May 6, 2019 was 135,732,810.

PQ GROUP HOLDINGS INC.

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March 31, 2019

PART I—FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS (UNAUDITED).

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

	Three months ended March 31,	
	2019	2018
Sales	$ 359,221	$ 366,197
Cost of goods sold	278,311	288,076
Gross profit	80,910	78,121
Selling, general and administrative expenses	40,708	40,618
Other operating expense, net	10,739	9,314
Operating income	29,463	28,189
Equity in net (income) from affiliated companies	(2,064)	(11,852)
Interest expense, net	28,618	29,163
Debt extinguishment costs	—	5,879
Other (income) expense, net	(2,979)	4,972
Income before income taxes and noncontrolling interest	5,888	27
Provision (benefit) for income taxes	2,447	(529)
Net income	3,441	556
Less: Net income attributable to the noncontrolling interest	290	342
Net income attributable to PQ Group Holdings Inc.	$ 3,151	$ 214
Net income per share:		
Basic income per share	$ 0.02	$ —
Diluted income per share	$ 0.02	$ —
Weighted average shares outstanding:		
Basic	133,946,308	133,154,144
Diluted	134,894,354	133,884,983

See accompanying notes to condensed consolidated financial statements.

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

	Three months ended March 31,	
	2019	**2018**
Net income	$ 3,441	$ 556
Other comprehensive income (loss), net of tax:		
Pension and postretirement benefits	(30)	(18)
Net (loss) gain from hedging activities	(1,552)	2,183
Foreign currency translation	7,167	8,671
Total other comprehensive income	5,585	10,836
Comprehensive income	9,026	11,392
Less: Comprehensive income attributable to noncontrolling interests	605	1,646
Comprehensive income attributable to PQ Group Holdings Inc.	$ 8,421	$ 9,746

See accompanying notes to condensed consolidated financial statements.

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

	March 31, 2019	December 31, 2018
ASSETS		
Cash and cash equivalents	$ 52,341	$ 57,854
Receivables, net	195,662	196,770
Inventories	283,549	264,748
Prepaid and other current assets	38,780	39,244
Total current assets	570,332	558,616
Investments in affiliated companies	464,128	468,211
Property, plant and equipment, net	1,201,962	1,208,979
Goodwill	1,257,034	1,254,929
Other intangible assets, net	714,113	728,436
Right-of-use lease asset	57,173	—
Other long-term assets	117,534	108,254
Total assets	$ 4,382,276	$ 4,327,425
LIABILITIES		
Notes payable and current maturities of long-term debt	$ 10,712	$ 7,237
Accounts payable	136,356	148,365
Operating lease liabilities—current	14,482	—
Accrued liabilities	101,259	100,009
Total current liabilities	262,809	255,611
Long-term debt, excluding current portion	2,103,070	2,106,720
Deferred income taxes	197,552	196,124
Operating lease liabilities—noncurrent	40,971	—
Other long-term liabilities	102,602	104,825
Total liabilities	2,707,004	2,663,280
Commitments and contingencies (Note 16)		
EQUITY		
Common stock ($0.01 par); authorized shares 450,000,000; issued shares 135,982,601 and 135,758,269 on March 31, 2019 and December 31, 2018, respectively; outstanding shares 135,727,810 and 135,592,045 on March 31, 2019 and December 31, 2018, respectively	1,360	1,358
Preferred stock ($0.01 par); authorized shares 50,000,000; no shares issued or outstanding on March 31, 2019 and December 31, 2018	—	—
Additional paid-in capital	1,678,316	1,674,703
Retained earnings	26,625	25,523
Treasury stock, at cost; shares 254,791 and 166,224 on March 31, 2019 and December 31, 2018, respectively	(4,259)	(2,920)
Accumulated other comprehensive loss	(31,960)	(39,104)
Total PQ Group Holdings Inc. equity	1,670,082	1,659,560
Noncontrolling interest	5,190	4,585
Total equity	1,675,272	1,664,145
Total liabilities and equity	$ 4,382,276	$ 4,327,425

See accompanying notes to condensed consolidated financial statements.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
CONDENSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands)
(unaudited)

	Common stock	Additional paid-in capital	Retained earnings	Treasury stock, at cost	Accumulated other comprehensive income (loss)	Non-controlling interest	Total
Balance, December 31, 2018, as previously reported	$ 1,358	$ 1,674,703	$ 25,523	$ (2,920)	$ (39,104)	$ 4,585	$ 1,664,145
Cumulative effect adjustment from adoption of new accounting standards	—	—	(2,049)	—	1,874	—	(175)
Balance, December 31, 2018, as adjusted	1,358	1,674,703	23,474	(2,920)	(37,230)	4,585	1,663,970
Net income	—	—	3,151	—	—	290	3,441
Other comprehensive income	—	—	—	—	5,270	315	5,585
Repurchases of common shares	—	—	—	(1,339)	—	—	(1,339)
Stock compensation expense	—	3,400	—	—	—	—	3,400
Shares issued under equity incentive plan, net of forfeitures	2	213	—	—	—	—	215
Balance, March 31, 2019	$ 1,360	$ 1,678,316	$ 26,625	$ (4,259)	$ (31,960)	$ 5,190	$ 1,675,272

	Common stock	Additional paid-in capital	Accumulated deficit	Treasury stock, at cost	Accumulated other comprehensive income (loss)	Non-controlling interest	Total
Balance, December 31, 2017	$ 1,352	$ 1,655,114	$ (32,777)	$ —	$ 4,311	$ 3,919	$ 1,631,919
Net income	—	—	214	—	—	342	556
Other comprehensive income	—	—	—	—	9,532	1,304	10,836
Repurchases of common shares	—	—	—	(58)	—	—	(58)
Stock compensation expense	—	3,831	—	—	—	—	3,831
Balance, March 31, 2018	$ 1,352	$ 1,658,945	$ (32,563)	$ (58)	$ 13,843	$ 5,565	$ 1,647,084

See accompanying notes to condensed consolidated financial statements.

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

	Three months ended March 31,	
	2019	**2018**
Cash flows from operating activities:		
Net income	$ 3,441	$ 556
Adjustments to reconcile net income to net cash provided by operating activities:		
Depreciation	33,154	34,903
Amortization	12,740	13,585
Amortization of inventory step-up	—	1,603
Amortization of deferred financing costs and original issue discount	1,401	1,559
Debt extinguishment costs	—	3,755
Foreign currency exchange (gain) loss	(2,689)	5,063
Pension and postretirement healthcare benefit expense	1,176	816
Pension and postretirement healthcare benefit funding	(3,372)	(3,406)
Deferred income tax provision (benefit)	1,181	(2,607)
Net loss on asset disposals	820	1,152
Stock compensation	3,400	3,831
Equity in net (income) from affiliated companies	(2,064)	(11,852)
Dividends received from affiliated companies	5,000	10,819
Net interest income on swaps designated as net investment hedges	(3,890)	—
Other, net	(3,644)	(2,928)
Working capital changes that provided (used) cash:		
Receivables	1,121	(11,065)
Inventories	(19,152)	(19,539)
Prepaids and other current assets	2,890	(4,712)
Accounts payable	(3,898)	(7,044)
Accrued liabilities	(777)	7,546
Net cash provided by operating activities	26,838	22,035
Cash flows from investing activities:		
Purchases of property, plant and equipment	(33,627)	(33,344)
Net interest proceeds on swaps designated as net investment hedges	3,890	—
Other, net	470	209
Net cash used in investing activities	(29,267)	(33,135)
Cash flows from financing activities:		
Draw down of revolving credit facilities	32,381	38,570
Repayments of revolving credit facilities	(28,888)	(32,109)
Issuance of long-term debt	—	1,267,000
Debt issuance costs	—	(6,395)
Repayments of long-term debt	(5,000)	(1,261,624)
Stock repurchases	(1,339)	(58)
Other, net	294	—
Net cash (used in) provided by financing activities	(2,552)	5,384
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(660)	(1,511)
Net change in cash, cash equivalents and restricted cash	(5,641)	(7,227)
Cash, cash equivalents and restricted cash at beginning of period	59,726	67,243
Cash, cash equivalents and restricted cash at end of period	$ 54,085	$ 60,016

For supplemental cash flow disclosures, see Note 20.

See accompanying notes to condensed consolidated financial statements.

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

1. Background and Basis of Presentation:

Description of Business

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

The Company has four uniquely positioned specialty businesses: Refining Services provides sulfuric acid recycling to the North American refining industry; Catalysts serves the global refining, petrochemical and emissions control industries; Performance Materials produces transportation reflective safety markings for roads and airports; and Performance Chemicals supplies diverse product end uses, including personal and industrial cleaning products, fuel-efficient tires, surface coatings, and food and beverage products.

Effective March 1, 2019, the Company changed the structure of its internal organization to create the four independent businesses described above in order to promote increased visibility to business unit performance, optimize the Company's product portfolio and create efficiencies. Previously, the Company had two reportable segments, namely the Environmental Catalysts and Services segment and the Performance Materials and Chemicals segment. Beginning with the quarter ended March 31, 2019, the segment results and disclosures included in the Company's consolidated financial statements reflect the new segment structure for all periods presented. The changes tothe Company's segment structure affect only the manner in which the results of the Company's reportable segments were previously reported; there are no changes to the Company's consolidated balance sheet, statement of income or cash flows for the prior periods. For the purposes of the Company's goodwill impairment testing, the four new operating segments align with the Company's reporting units at which level goodwill has been assigned and historically tested for impairment.

Seasonal changes and weather conditions typically affect the Company's Performance Materials and Refining Services segments. In particular, the Company's Performance Materials segment generally experiences lower sales and profit in the first and fourth quarters of the year because highway striping projects typically occur during warmer weather months. Additionally, the Company's Refining Services segment typically experiences similar seasonal fluctuations as a result of higher demand for gasoline products in the summer months. As a result, working capital requirements tend to be higher in the first and second quarters of the year, which can adversely affect the Company's liquidity and cash flows. Because of this seasonality associated with certain ofthe Company's segments, results for any one quarter are not necessarily indicative of the results that may be achieved for any other quarter or for the full year.

Basis of Presentation

The condensed consolidated financial statements included herein are unaudited. Certain information and footnote disclosures normally included in annual financial statements prepared in accordance with accounting principles generally accepted in the United States ("GAAP") have been condensed or omitted pursuant to such rules and regulations for interim reporting. In the opinion of management, all adjustments of a normal and recurring nature necessary to state fairly the financial position and results of operations have been included. The results of operations are not necessarily indicative of the results to be expected for the full year. The accompanying unaudited condensed consolidated financial statements should be read in conjunction with the audited consolidated financial statements and related notes included in the Company's Annual Report on Form 10-K for the year ended December 31, 2018. Other than the update to our lease accounting policies described inNote 11, the Company has continued to follow the accounting policies set forth in those consolidated financial statements.

2. New Accounting Standards:

Recently Adopted Accounting Standards

In February 2016, the Financial Accounting Standards Board ("FASB") issued guidance (with subsequent targeted amendments) that modifies the accounting for leases. Under the new guidance, a lessee will recognize right-of-use lease assets and lease liabilities for most leases (including those classified under existing GAAP as operating leases, which based on previous standards are not reflected on the balance sheet), but will recognize expenses in a manner that is generally consistent with existing practices. The new guidance also requires companies to provide expanded disclosures regarding leasing arrangements. For public companies, the new guidance is effective for fiscal years beginning after December 15, 2018, including interim periods within those years. The new guidance must be adopted using a modified retrospective transition method.

The Company adopted the new lease guidance effective January 1, 2019 as required using the modified retrospective transition method and applied the provisions of the guidance at the effective date with a cumulative-effect adjustment to the opening balance of retained earnings without adjusting the comparative periods presented. The new guidance provides practical expedients and allows for certain policy elections with regard to the Company's lease population. The Company has elected the short term lease accounting policy and will not record right-of-use lease assets or lease liabilities for leases with an initial term of twelve months or less. Additionally, the Company has elected to utilize the portfolio approach to apply incremental borrowing rates to its leases. The Company has elected the package of practical expedients which provides the Company with the ability to bypass reassessment of the following for leases existing at the date of adoption: (1) whether any existing contracts are, or contain, leases; (2) the lease classification for any existing leases; and (3) initial direct costs for any existing leases. The Company also elected the land easement practical expedient to carry forward existing accounting treatment on existing land easements.

Adoption of the new lease guidance resulted in the recognition of right-of-use lease assets of$60,726, which included $57,832 of right-of-use lease assets related to lease commitments and $2,895 related to the reclassification of favorable lease contracts, and lease liabilities of$58,929. The new guidance had no impact on the Company's operating results or liquidity upon adoption. Disclosures related to the Company's leases are included in Note 11 to these condensed consolidated financial statements.

In February 2018, the FASB issued guidance which permits entities to make a one-time election to reclassify the residual ("stranded") income tax effects included in accumulated other comprehensive income ("AOCI") to beginning retained earnings as a result of tax reform legislation enacted by the U.S. government on December 22, 2017. The standard is effective for fiscal years beginning after December 15, 2018 and interim periods within those fiscal years. Prior to the enactment of the tax reform legislation on December 22, 2017, the Company had amounts recorded in AOCI related to its domestic pension, postretirement and supplementary benefit plans and cash flow hedging relationships that were based on pre-enactment tax rates, which were included in AOCI at the adoption date of the new guidance. The Company adopted the new guidance effective January 1, 2019 as required, and reclassified the income tax effects stranded in AOCI of $1,874 from AOCI to beginning retained earnings.

In June 2018, the FASB issued guidance which conforms the accounting for the issuance of all share-based payments using the same accounting model. Previously, the accounting for share-based payments to non-employees was covered under a different framework than those made to employees. Under the new guidance, awards to both employees and non-employees will essentially follow the same model, with small variations related to determining the term assumption when valuing a non-employee award as well as a different expense attribution model for non-employee awards. The new guidance is effective for fiscal years beginning after December 15, 2018 and interim periods within those fiscal years. The Company adopted the new guidance on January 1, 2019 as required, with no material impact on its consolidated financial statements upon adoption.

Accounting Standards Not Yet Adopted

In August 2018, the FASB issued guidance which modifies the disclosure requirements for employers that sponsor defined benefit pension or other postretirement plans. The guidance eliminates certain disclosure requirements, including the amounts in accumulated other comprehensive income expected to be recognized as components of net periodic benefit cost over the next fiscal year and the effects of a one-percentage point change in assumed health care cost trend rates. The guidance also requires additional disclosure of the reasons for significant gains and losses related to changes in the benefit obligation for the period. The guidance is effective for fiscal years ending after December 15, 2020 with early adoption permitted, and is required to be applied on a retrospective basis to all periods presented. The Company will modify its benefit plan disclosures in accordance with the new guidance upon adoption, and the guidance will not have a material impact on its consolidated financial statements.

In August 2018, the FASB issued guidance which modifies certain disclosure requirements over fair value measurements. The guidance is effective for fiscal years beginning after December 15, 2019, including all interim periods within that fiscal year. The Company believes that the new guidance will not have a material impact on its consolidated financial statements.

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

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

In June 2016, the FASB issued guidance that affects loans, trade receivables and any other financial assets that have the contractual right to receive cash. Under the new guidance, an entity is required to recognize expected credit losses rather than incurred losses for financial assets. The new guidance is effective for fiscal years beginning after December 15, 2019 and interim periods within those fiscal years. The Company believes that the new guidance will not have a material impact on its consolidated financial statements.

3. Revenue from Contracts with Customers:

Disaggregated Revenue

The Company's primary means of disaggregating revenues is by reportable segments, which can be found inNote 17 to these condensed consolidated financial statements.

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

Key End Uses	Key Products
Industrial & process chemicals	• Silicate precursors for the tire industry
	• Glass beads, or microspheres, for metal finishing end uses
Fuels & emission control	• Refinery catalysts
	• Emission control catalysts
	• Catalyst recycling services
	• Silicate for catalyst manufacturing
Packaging & engineered plastics	• Catalysts for high-density polyethlene and chemicals syntheses
	• Antiblocks for film packaging
	• Solid and hollow microspheres for composite plastics
	• Sulfur derivatives for nylon production
Highway safety & construction	• Reflective markings for roadways and airports
	• Silica gels for surface coatings
Consumer products	• Silica gels for edible oil and beer clarification
	• Precipitated silicas, silicates and zeolites for the dentifrice and
	dishwasher and laundry detergent applications
Natural resources	• Silicates for drilling muds
	• Hollow glass beads, or microspheres, for oil well cements
	• Silicates and alum for water treatment mining
	• Bleaching aids for paper

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

The following tables disaggregate the Company's sales, by segment and end use, for thethree months ended March 31, 2019 and 2018:

	Three months ended March 31, 2019				
	Refining Services	Catalysts	Performance Materials	Performance Chemicals	Total
Industrial & process chemicals	$ 18,402	$ 276	$ 13,028	$ 59,652	$ 91,358
Fuels & emission control (1)	57,690	—	—	—	57,690
Packaging & engineered plastics	12,689	15,590	17,382	14,730	60,391
Highway safety & construction (1)	—	—	27,360	21,938	49,298
Consumer products	—	—	—	68,509	68,509
Natural resources	17,063	—	3,319	15,633	36,015
Total segment sales	105,844	15,866	61,089	180,462	363,261
Eliminations	(887)	(276)	(48)	(2,829)	(4,040)
Total	$ 104,957	$ 15,590	$ 61,041	$ 177,633	$ 359,221

	Three months ended March 31, 2018				
	Refining Services	Catalysts	Performance Materials	Performance Chemicals	Total
Industrial & process chemicals	$ 17,039	$ —	$ 12,518	$ 65,636	$ 95,193
Fuels & emission control (1)	55,997	—	—	—	55,997
Packaging & engineered plastics	11,770	16,473	19,892	11,916	60,051
Highway safety & construction (1)	—	—	26,659	20,486	47,145
Consumer products	—	—	—	76,730	76,730
Natural resources	15,908	—	3,673	15,195	34,776
Total segment sales	100,714	16,473	62,742	189,963	369,892
Eliminations	(812)	—	(72)	(2,811)	(3,695)
Total	$ 99,902	$ 16,473	$ 62,670	$ 187,152	$ 366,197

(1) As described in Note 1, the Company experiences seasonal sales fluctuations to customers in the fuels & emission control and highway safety & construction end uses.

Contract Assets and Liabilities

A contract asset is a right to consideration in exchange for goods that the Company has transferred to a customer when that right is conditional on something other than the passage of time. A contract liability exists when the Company receives consideration in advance of performance obligations. The Company has not recorded any contract assets or contract liabilities on its condensed consolidated balance sheets as of March 31, 2019 and December 31, 2018.

4. Fair Value Measurements:

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

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

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

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

The following table presents information about the Company’s assets and liabilities that were measured at fair value on a recurring basis as ofMarch 31, 2019 and December 31, 2018, and indicates the fair value hierarchy of the valuation techniques the Company utilized to determine such fair value.

	March 31, 2019	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Derivative contracts (Note 13)	$ 27,994	$ —	$ 27,994	$ —
Restoration plan assets	4,422	4,422	—	—
Total	$ 32,416	$ 4,422	$ 27,994	$ —
Liabilities:				
Derivative contracts (Note 13)	$ 2,892	$ —	$ 2,892	$ —

	December 31, 2018	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Derivative contracts (Note 13)	$ 20,768	$ —	$ 20,768	$ —
Restoration plan assets	4,244	4,244	—	—
Total	$ 25,012	$ 4,244	$ 20,768	$ —
Liabilities:				
Derivative contracts (Note 13)	$ 2,026	$ —	$ 2,026	$ —

(Dollars in thousands, except share and per share amounts)

Restoration plan assets

The fair values of the Company's restoration plan assets are determined through quoted prices in active markets. Restoration plan assets are assets held in a Rabbi trust to fund the obligations of the Company's defined benefit supplementary retirement plans and include various stock and fixed income mutual funds. See Note 15 to these condensed consolidated financial statements regarding defined supplementary retirement plans. The Company's restoration plan assets are included in other long-term assets on its condensed consolidated balance sheets. Gains and losses related to these investments are included in other expense, net in the Company's condensed consolidated statements of income. Unrealized gains and losses associated with the underlying stock and fixed income mutual funds were immaterial as of March 31, 2019 and December 31, 2018, respectively.

Derivative contracts

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

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

5. Accumulated Other Comprehensive Income:

The following tables present the tax effects of each component of other comprehensive income for the three months ended March 31, 2019 and 2018:

	Three months ended March 31,					
	2019			2018		
	Pre-tax amount	Tax benefit/(expense)	After-tax amount	Pre-tax amount	Tax benefit/(expense)	After-tax amount
Defined benefit and other postretirement plans:						
Amortization and unrealized losses	$ (40)	$ 10	$ (30)	$ (24)	$ 6	$ (18)
Benefit plans, net	(40)	10	(30)	(24)	6	(18)
Net (loss) gain from hedging activities	(2,070)	518	(1,552)	2,912	(729)	2,183
Foreign currency translation	9,282	(2,115)	7,167	10,114	(1,443)	8,671
Other comprehensive income	$ 7,172	$ (1,587)	$ 5,585	$ 13,002	$ (2,166)	$ 10,836

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The following table presents the change in accumulated other comprehensive income (loss), net of tax, by component for thethree months ended March 31, 2019 and 2018:

	Defined benefit and other postretirement plans	Net gain (loss) from hedging activities	Foreign currency translation	Total
December 31, 2018	$ (546)	$ 637	$ (39,195)	$ (39,104)
Other comprehensive income (loss) before reclassifications	1	(1,501)	6,852	5,352
Amounts reclassified from accumulated other comprehensive income[1]	(31)	(51)	—	(82)
Net current period other comprehensive income (loss)	(30)	(1,552)	6,852	5,270
Cumulative adjustment from adoption of stranded OCI standard	1,684	190	—	1,874
March 31, 2019	$ 1,108	$ (725)	$ (32,343)	$ (31,960)
December 31, 2017	$ 7,412	$ 967	$ (4,068)	$ 4,311
Other comprehensive income (loss) before reclassifications	(4)	2,178	7,367	9,541
Amounts reclassified from accumulated other comprehensive income[1]	(14)	5	—	(9)
Net current period other comprehensive income (loss)	(18)	2,183	7,367	9,532
March 31, 2018	$ 7,394	$ 3,150	$ 3,299	$ 13,843

(1) See the following table for details about these reclassifications. Amounts in parentheses indicate credits to profit/loss.

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The following table presents the reclassifications out of accumulated other comprehensive income for the three months ended March 31, 2019 and 2018:

Details about Accumulated Other Comprehensive Income (Loss) Components	Amounts Reclassified from Accumulated Other Comprehensive Income(a)		Affected Line Item in the Statements of Income
	Three months ended March 31,		
	2019	2018	
Defined benefit and other postretirement plans			
Amortization of prior service credit	$ (33)	$ (19)	(b)
Amortization of net (gain) loss	(8)	2	(b)
	(41)	(17)	Total before tax
	10	3	Tax expense (benefit)
	$ (31)	$ (14)	Net of tax
Net (gain) loss from hedging activities			
Interest rate caps	$ 123	$ 35	Interest expense
Natural gas swaps	(191)	(28)	Cost of goods sold
	(68)	7	Total before tax
	17	(2)	Tax expense (benefit)
	$ (51)	$ 5	Net of tax
Total reclassifications for the period	$ (82)	$ (9)	Net of tax

(a) Amounts in parentheses indicate credits to profit/loss.

(b) These accumulated other comprehensive income (loss) components are included in the computation of net periodic pension and other postretirement cost (see Note 15 to these condensed consolidated financial statements for additional details).

6. Goodwill:

The change in the carrying amount of goodwill for the three months ended March 31, 2019 is summarized as follows:

	Refining Services	Catalysts	Performance Materials	Performance Chemicals	Total
Balance as of December 31, 2018	$ 311,892	$ 77,759	$ 274,947	$ 590,331	$ 1,254,929
Foreign exchange impact	—	693	418	994	2,105
Balance as of March 31, 2019	$ 311,892	$ 78,452	$ 275,365	$ 591,325	$ 1,257,034

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7. Other Operating Expense, Net:

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

	Three months ended March 31,	
	2019	2018
Amortization expense	$ 8,664	$ 8,949
Net loss on asset disposals(1)	820	1,152
Insurance recoveries(1)	—	(1,244)
Environmental related costs	479	89
Other, net	776	368
	$ 10,739	$ 9,314

(1) During the three months ended March 31, 2018, the Company recognized $1,500 of insurance recoveries in its condensed consolidated statement of income related to the Company's claim for losses sustained during Hurricane Harvey in August 2017. Of this amount, $1,244 was recorded as a gain in other operating expense, net, as reimbursement of expenses, $207 was recorded as a gain in net loss on asset disposals within other operating expense, net, for the Company's previously recognized property losses, and $49 represented recoveries in excess of the Company's property losses which was recorded as a non-operating gain in other expense, net, in the Company's condensed consolidated statement of income.

8. Inventories:

Inventories are classified and valued as follows:

	March 31, 2019	December 31, 2018
Finished products and work in process	$ 228,874	$ 206,188
Raw materials	54,675	58,560
	$ 283,549	$ 264,748
Valued at lower of cost or market:		
LIFO basis	$ 171,967	$ 160,863
Valued at lower of cost and net realizable value:		
FIFO or average cost basis	111,582	103,885
	$ 283,549	$ 264,748

9. Investments in Affiliated Companies:

The Company accounts for investments in affiliated companies under the equity method. Affiliated companies accounted for on the equity basis as ofMarch 31, 2019 are as follows:

Company	Country	Percent Ownership
PQ Silicates Ltd.	Taiwan	50%
Zeolyst International	USA	50%
Zeolyst C.V.	Netherlands	50%
Quaker Holdings	South Africa	49%
Asociacion para el Estudio de las Tecnologias de Equipamiento de Carreteras, S.A. (“Aetec”)	Spain	20%

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

	Three months ended March 31,	
	2019	2018
Sales	$ 68,094	$ 88,576
Gross profit	19,414	35,522
Operating income	9,207	26,041
Net income	9,240	27,022

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

The Company's investments in affiliated companies balance as of March 31, 2019 and December 31, 2018 includes net purchase accounting fair value adjustments of 255,508 and $258,066, respectively, related to the series of transactions consummated on May 4, 2016 to reorganize and combine the businesses of PQ Holdings Inc. and Eco Services Operations LLC, consisting primarily of goodwill and intangible assets such as customer relationships, technical know-how and trade names. Consolidated equity in net income from affiliates is net of $2,558 and $1,658 of amortization expense related to purchase accounting fair value adjustments for thethree months ended March 31, 2019 and 2018, respectively.

10. Property, Plant and Equipment:

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

	March 31, 2019	December 31, 2018
Land	$ 190,948	$ 190,772
Buildings	213,810	212,284
Machinery and equipment	1,140,732	1,125,117
Construction in progress	105,830	102,185
	1,651,320	1,630,358
Less: accumulated depreciation	(449,358)	(421,379)
	$ 1,201,962	$ 1,208,979

Depreciation expense was $33,154 and $34,903 for the three months ended March 31, 2019 and 2018, respectively.

11. Leases:

The Company has operating and finance lease agreements with remaining lease terms as ofMarch 31, 2019 up to 28 years, including leases of land, buildings, railcars, vehicles, manufacturing equipment and general office equipment. Some leases include options to terminate or extend for one or more years. These options are incorporated in the Company's lease term when it is reasonably certain that the option will be exercised. Some leases include options to purchase, which the Company assesses under the guidance to determine if these leases should be classified as finance lease agreements.

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

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The Company recognizes a right-of-use lease asset and lease liability at the lease commencement date based on the present value of the remaining lease payments over the lease term using the Company's incremental borrowing rate. The Company is required to use the rate of interest that it would have to pay to borrow on a collateralized basis over a similar term an amount equal to the lease payments in a similar economic environment. When the Company is unable to readily determine the discount rate implicit in the lease agreement, the Company utilizes its incremental borrowing rate over the relevant lease term. Short-term leases, which have an initial term of twelve months or less, are not recorded on the Company's balance sheet.

Lease expense for operating leases and financing leases is recognized on a straight-line basis over the lease term and is included in cost of goods sold or selling, general, and administrative expense on the condensed consolidated statements of income.

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

	Classification		March 31, 2019
Assets			
Operating lease assets	Right-of-use lease assets	$	57,173
Finance lease assets	Property, plant and equipment, net		1,632
Total leased assets		$	58,805
Liabilities			
Current:			
Operating lease liabilities	Operating lease liabilities - current	$	14,482
Finance lease liabilities	Accrued liabilities		162
Noncurrent:			
Operating lease liabilities	Operating lease liabilities - noncurrent		40,971
Finance lease liabilities	Other long-term liabilities		474
Total lease liabilities		$	56,089

The Company's weighted average remaining lease term and weighted average discount rate for operating leases as ofMarch 31, 2019 are as follows:

	March 31, 2019
Weighted average remaining lease term (in years):	
Operating leases	5.62
Finance leases	3.39
Weighted average discount rate:	
Operating leases	5.73 %
Finance leases	4.67 %

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Maturities of lease liabilities as of March 31, 2019 are as follows:

	Operating Leases	Finance Leases	Total
Remainder of 2019	$ 13,262	$ 152	$ 13,414
2020	14,492	202	14,694
2021	11,501	202	11,703
2022	8,366	124	8,490
2023	6,153	5	6,158
Thereafter	11,947	—	11,947
Total lease payments	65,721	685	66,406
Less: Interest	(10,268)	(49)	(10,317)
Present value of lease liabilities	$ 55,453	$ 636	$ 56,089

At December 31, 2018, future minimum payments under non-cancelable operating leases under previous lease guidance was as follows:

Year	Amount
2019	$ 18,457
2020	14,344
2021	11,432
2022	8,354
2023	6,198
Thereafter	17,477
	$ 76,262

Operating lease costs of $4,679 are included in cost of goods sold and in selling, general and administrative expenses for the three months ended March 31, 2019. Finance lease, short-term lease and variable lease costs for the three months ended March 31, 2019 were not material. Lease income is not material to the results of operations for the three months ended March 31, 2019.

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

	Three months ended March 31, 2019
Cash paid for amounts included in the measurement of lease liabilities:	
Payments on operating leases included in operating cash flows	$ 3,978
Interest payments under finance lease obligations included in operating cash flows	$ 9
Principal payments under finance lease obligations included in financing cash flows	$ 48
Right-of-use assets obtained in exchange for new lease liabilities (non-cash):	
Operating leases	$ 508
Finance leases	$ —

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12. Long-term Debt:

The summary of long-term debt is as follows:

	March 31, 2019	December 31, 2018
Term Loan Facility	$ 1,157,498	$ 1,157,498
6.75% Senior Secured Notes due 2022	625,000	625,000
5.75% Senior Unsecured Notes due 2025	295,000	300,000
ABL Facility	2,000	—
Other	67,266	65,925
Total debt	2,146,764	2,148,423
Original issue discount	(17,915)	(18,584)
Deferred financing costs	(15,067)	(15,882)
Total debt, net of original issue discount and deferred financing costs	2,113,782	2,113,957
Less: current portion	(10,712)	(7,237)
Total long-term debt, excluding current portion	$ 2,103,070	$ 2,106,720

The fair value of a financial instrument is defined as the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants. As of March 31, 2019 and December 31, 2018, the fair value of the term loan facility and senior secured and unsecured notes was $2,077,276 and $2,010,023, respectively. The fair value is classified as Level 2 based upon the fair value hierarchy (see Note 4 to these condensed consolidated financial statements for further information on fair value measurements).

13. Financial Instruments:

The Company uses (1) interest rate related derivative instruments to manage its exposure to changes in interest rates on its variable-rate debt instruments, (2) commodity derivatives to manage its exposure to commodity price fluctuations, and (3) foreign currency related derivative instruments to manage its foreign currency exposure to its net investments in certain foreign operations. The Company does not speculate using derivative instruments.

By using derivative financial instruments to hedge exposures to changes in interest rates, commodity prices and foreign currency, the Company exposes itself to credit risk and market risk. Credit risk is the failure of the counterparty to perform under the terms of the derivative contract. When the fair value of a derivative contract is an asset, the counterparty owes the Company, which creates credit risk for the Company. When the fair value of a derivative contract is a liability, the Company owes the counterparty and therefore, the Company is not exposed to the counterparty's credit risk in those circumstances. The Company minimizes counterparty credit risk in derivative instruments by entering into transactions with high quality counterparties. The derivative instruments entered into by the Company do not contain credit-risk-related contingent features.

Market risk is the adverse effect on the value of a derivative instrument that results from a change in interest rates, currency exchange rates or commodity prices. The market risk associated with the Company's derivative instruments is managed by establishing and monitoring parameters that limit the types and degree of market risk that may be undertaken.

Use of Derivative Financial Instruments to Manage Commodity Price Risk. The Company is exposed to risks in energy costs due to fluctuations in energy prices, particularly natural gas. The Company has a hedging program in the United States which allows the Company to mitigate exposure to natural gas volatility with natural gas swap agreements. Fair value is determined based on estimated amounts that would be received or paid to terminate the contracts at the reporting date based on quoted market prices of comparable contracts. The respective current and non-current liabilities are recorded in accrued liabilities and other long-term liabilities and the respective current and non-current assets are recorded in prepaid and other current assets and other long-term assets, as applicable, in the Company's consolidated balance sheet. As the derivatives are designated and qualify as cash flow hedges, the gains or losses on the natural gas swaps are recorded in stockholders' equity as a component of other comprehensive income (loss) ("OCI"), net of tax. Reclassifications of the gains and losses on natural gas hedges into earnings are recorded in production costs and subsequently charged to cost of goods sold in the condensed consolidated statements of income in the period in which the associated inventory is sold. As of March 31, 2019, the Company's natural gas swaps had a remaining notional quantity of 3.3 million MMBTU to mitigate commodity price volatility through December 2021.

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Use of Derivative Financial Instruments to Manage Interest Rate Risk. The Company is exposed to fluctuations in interest rates on its senior secured credit facilities. Changes in interest rates will not affect the market value of such debt but will affect the Company's interest payments over the term of the loans. Likewise, an increase in interest rates could have a material impact on the Company's cash flow. The Company hedges the interest rate fluctuations on debt obligations through interest rate cap agreements. The Company records these agreements at fair value as assets or liabilities in its consolidated balance sheet. As the derivatives are designated and qualify as cash flow hedges, the gains or losses on the interest rate cap agreements are recorded in stockholders' equity as a component of OCI, net of tax. Reclassifications of the gains and losses on the interest rate cap agreements into earnings are recorded as part of interest expense in the condensed consolidated statements of income as the Company makes its interest payments on the hedged portion of its senior secured credit facilities. Fair value is determined based on estimated amounts that would be received or paid to terminate the contracts at the reporting date based on quoted market prices.

In July 2016, the Company entered into interest rate cap agreements, paying a premium of $1,551 to mitigate interest rate volatility from July 2016 through July 2020 by employing varying cap rates, ranging from 1.50% to 3.00%, on $1,000,000 of notional variable-rate debt. The cap rate currently in effect at March 31, 2019 is 2.50%. In November 2018, the Company entered into additional interest rate cap agreements to mitigate interest rate volatility from July 2020 through July 2022, with a cap rate of 3.50% on $500,000 of notional variable-rate debt.

Use of Derivative Financial Instruments to Manage Foreign Currency Risk. The Company is exposed to risks related to its net investments in foreign operations due to fluctuations in foreign currency exchange rates, particularly between the United States dollar and the Euro. In February 2018, the Company entered into multiple cross currency interest rate swap arrangements with an aggregate notional amount of €280,000 ($314,112 as of March 31, 2019) to hedge this exposure on the net investments of certain of its Euro-denominated subsidiaries. The Company records these swap agreements at fair value as assets or liabilities in its consolidated balance sheet. As the derivatives are designated and qualify as net investment hedges, changes in the fair value of the swaps attributable to changes in the spot exchange rates are recognized in cumulative translation adjustment ("CTA") within OCI and are held there until the hedged net investments are sold or substantially liquidated. Changes in the fair value of the swaps attributable to the cross currency basis spread are excluded from the assessment of hedge effectiveness and are recorded in current period earnings. Upon such sale or liquidation, the amount recognized in CTA is reclassified to earnings and reported in the same line item as the gain or loss on the liquidation of the net investments.

The fair values of derivative instruments held as of March 31, 2019 and December 31, 2018 are shown below:

	Balance sheet location	March 31, 2019	December 31, 2018
Derivative assets:			
Derivatives designated as cash flow hedges:			
Natural gas swaps	Prepaid and other current assets	$ 88	$ 21
Interest rate caps	Prepaid and other current assets	442	$ 1,358
Interest rate caps	Other long-term assets	68	546
		598	1,925
Derivatives designed as net investment hedges:			
Cross currency swaps	Prepaid and other current assets	7,224	5,499
Cross currency swaps	Other long-term assets	20,172	13,344
		27,396	18,843
Total derivative assets		$ 27,994	$ 20,768
Derivative liabilities:			
Derivatives designated as cash flow hedges:			
Natural gas swaps	Accrued liabilities	$ —	$ 36
Natural gas swaps	Other long-term liabilities	72	148
Interest rate caps	Other long-term liabilities	2,820	1,842
Total derivative liabilities		$ 2,892	$ 2,026

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The following table shows the effect of the Company's derivative instruments designated as cash flow hedges on accumulated other comprehensive income ("AOCI") for the three months ended March 31, 2019 and 2018:

		Three months ended March 31,			
		2019		2018	
	Location of gain (loss) reclassified from AOCI into income	Amount of gain (loss) recognized in OCI on derivatives	Amount of gain (loss) reclassified from AOCI into income	Amount of gain (loss) recognized in OCI on derivatives	Amount of gain (loss) reclassified from AOCI into income
Interest rate caps	Interest (expense) income	$ (2,373)	$ (123)	$ 2,852	$ (35)
Natural gas swaps	Cost of goods sold	371	191	53	28
		$ (2,002)	$ 68	$ 2,905	$ (7)

The following table shows the effect of the Company's cash flow hedge accounting on the condensed consolidated statements of income for the three months ended March 31, 2019 and 2018:

	Location and amount of gain (loss) recognized in income on cash flow hedging relationships			
	Three months ended March 31,			
	2019		2018	
	Cost of goods sold	Interest (expense) income	Cost of goods sold	Interest (expense) income
Total amounts of income and expense line items presented in the statement of income in which the effects of cash flow hedges are recorded	(278,311)	(28,618)	(288,076)	(29,163)
The effects of cash flow hedging:				
Gain (loss) on cash flow hedging relationships:				
Interest contracts:				
Amount of gain (loss) reclassified from AOCI into income	—	(123)	—	(35)
Commodity contracts:				
Amount of gain (loss) reclassified from AOCI into income	191	—	28	—

The following table shows the effect of the Company's net investment hedges on AOCI and the condensed consolidated statements of income for the three months ended March 31, 2019 and 2018:

	Amount of gain (loss) recognized in OCI on derivative		Location of gain (loss) reclassified from AOCI into income	Amount of gain (loss) reclassified from AOCI into income		Location of gain (loss) recognized in income on derivative (amount excluded from effectiveness testing)	Amount of gain (loss) recognized in income on derivative (amount excluded from effectiveness testing)	
	Three months ended March 31,			Three months ended March 31,			Three months ended March 31,	
	2019	2018		2019	2018		2019	2018
Cross currency swaps	$ 8,553	$ (9,276)	Gain (loss) on sale of subsidiary	$ —	$ —	Interest (expense) income	$ 1,446	$ 1,167

The amount of unrealized losses in AOCI that are expected to be reclassified to the condensed consolidated statement of income over the next twelve months is $591 as of March 31, 2019.

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14. Income Taxes:

The effective income tax rate for the three months ended March 31, 2019 was 41.6% compared to (1,959.3)% for the three months ended March 31, 2018. The Company's effective income tax rate has fluctuated primarily because of changes in income mix (including the effect of loss companies), the impact of including foreign earnings in U.S. taxable income and changes in foreign exchange gains and losses, which create permanent differences in certain jurisdictions.

The difference between the U.S. federal statutory income tax rate and the Company's effective income tax rate for the three months ended March 31, 2019 was mainly due to the tax effect of permanent differences related to foreign currency exchange gain or loss, inclusion of foreign earnings in the U.S. as a result of recently enacted tax law, pre-tax losses with no associated tax benefit, prior year tax refunds not previously accrued for and state taxes.

The difference between the U.S. federal statutory income tax rate and the Company's effective income tax rate for the three months ended March 31, 2018 was mainly due to the tax effect of repatriating foreign earnings back to the United States as dividends offset by lower tax rates in foreign jurisdictions as compared to the U.S. tax rate, foreign withholdings taxes, state taxes and non-deductible transaction costs.

The Tax Cuts and Jobs Act of 2017 ("TCJA") enacted certain provisions that became effective on January 1, 2018. These provisions include, but are not limited to, the new Global Intangible Low-Taxed Income ("GILTI") tax rules. Due to the complexity of the new GILTI tax, the Company is continuing to evaluate the GILTI provision of the TCJA and its impact on the financial statements, which remains uncertain. Per guidance issued by the FASB, the Company is permitted to make an accounting policy election to either (1) treat the taxes incurred as a result of the GILTI provision as a current-period expense when incurred or (2) factor such amounts into its measurement of deferred taxes. At this time, the Company is electing to treat any tax expense incurred as a result of GILTI as a current-period expense. Additionally, in regards to GILTI's impact in assessing the ability to realize deferred tax assets, the Company has made a policy election to use the tax law ordering approach.

With respect to operating results for the three months ended March 31, 2019, the Company has continued to incorporate an estimate of the GILTI income inclusion when estimating annual effective tax rate used for U.S. GAAP purposes. The Company expects this amount to be included in its 2019 U.S. taxable income. However, the estimated 2019 GILTI income inclusion may change materially as the Company continues to evaluate future legislative or administrative guidance that is put forth, any updates to assumptions and figures used for the current estimate, or as a result of future changes to the Company's current structure and business.

15. Benefit Plans:

The following information is provided for (1) the Company-sponsored defined benefit pension plans covering employees in the U.S. and certain employees at its foreign subsidiaries, (2) the Company-sponsored unfunded plans to provide certain health care benefits to retired employees in the U.S. and Canada, and (3) the Company's defined benefit supplementary retirement plans which provide benefits for certain U.S. employees in excess of qualified plan limitations.

Components of net periodic expense (benefit) are as follows:

Defined Benefit Pension Plans

	U.S.		Foreign	
	Three months ended March 31,		Three months ended March 31,	
	2019	2018	2019	2018
Service cost	$ 219	$ 310	$ 806	$ 887
Interest cost	2,507	2,372	833	1,505
Expected return on plan assets	(2,757)	(3,174)	(603)	(1,319)
Amortization of net loss	—	—	—	13
Net periodic expense (benefit)	$ (31)	$ (492)	$ 1,036	$ 1,086

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Supplemental Retirement Plans

	Three months ended March 31,	
	2019	2018
Interest cost	$ 121	$ 110
Net periodic expense	$ 121	$ 110

Other Postretirement Benefit Plans

	Three months ended March 31,	
	2019	2018
Service cost	$ 3	$ 6
Interest cost	38	38
Amortization of prior service credit	(33)	(19)
Amortization of net gain	(8)	(11)
Net periodic expense	$ —	$ 14

16. Commitments and Contingent Liabilities:

There is a risk of environmental impact in chemical manufacturing operations. The Company's environmental policies and practices are designed to comply with existing laws and regulations and to minimize the possibility of significant environmental impact. The Company is also subject to various other lawsuits and claims with respect to matters such as governmental regulations, labor and other actions arising out of the normal course of business. While management believes that the liabilities resulting from such lawsuits and claims are not probable or reasonably estimable, certain accruals have been reflected in the Company's condensed consolidated financial statements. When these matters are ultimately concluded and determined, the Company believes that there will be no material adverse effect on its consolidated financial position, results of operations or liquidity.

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(Dollars in thousands, except share and per share amounts)
(unaudited)

17. Reportable Segments:

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

	Three months ended March 31,	
	2019	2018
Sales:		
Refining Services	$ 105,844	$ 100,714
Catalysts[1]	15,866	16,473
Performance Materials	61,089	62,742
Performance Chemicals	180,462	189,963
Eliminations[2]	(4,040)	(3,695)
Total	$ 359,221	$ 366,197
Segment Adjusted EBITDA:[3]		
Refining Services	$ 39,731	$ 35,532
Catalysts[4]	18,127	22,889
Performance Materials	10,515	12,058
Performance Chemicals	42,673	45,094
Total Segment Adjusted EBITDA[5]	$ 111,046	$ 115,573

(1) Excludes the Company's proportionate share of sales from the Zeolyst International and Zeolyst C.V. joint ventures (collectively, the "Zeolyst Joint Venture") accounted for using the equity method (see Note 9 to these condensed consolidated financial statements for further information). The proportionate share of sales is $29,478 and $38,349 for the three months ended March 31, 2019 and 2018, respectively.

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

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

(4) The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $8,357 for the three months ended March 31, 2019, which includes $2,036 of equity in net income plus $2,558 of amortization of investment in affiliate step-up and $3,763 of joint venture depreciation, amortization and interest. The Adjusted EBITDA from the Zeolyst Joint Venture included in the Catalysts segment is $16,807 for the three months ended March 31, 2018, which includes $11,826 of equity in net income plus $1,658 of amortization of investment in affiliate step-up and $3,323 of joint venture depreciation, amortization and interest.

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

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

	Three months ended March 31,	
	2019	2018
Reconciliation of net income attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA		
Net income attributable to PQ Group Holdings Inc.	$ 3,151	$ 214
Provision (benefit) for income taxes	2,447	(529)
Interest expense, net	28,618	29,163
Depreciation and amortization	45,894	48,488
Segment EBITDA	80,110	77,336
Unallocated corporate expenses	10,005	7,688
Joint venture depreciation, amortization and interest	3,763	3,323
Amortization of investment in affiliate step-up	2,558	1,658
Amortization of inventory step-up	—	1,603
Debt extinguishment costs	—	5,879
Net loss on asset disposals	820	1,152
Foreign currency exchange (gain) loss	(2,689)	5,063
LIFO expense	10,158	4,926
Transaction and other related costs	80	428
Equity-based compensation	3,400	3,831
Restructuring, integration and business optimization expenses	732	1,079
Defined benefit pension plan cost	993	550
Other	1,116	1,057
Segment Adjusted EBITDA	$ 111,046	$ 115,573

18. Stock-Based Compensation:

The Company is authorized to issue shares for common stock awards to employees, directors and affiliates of the Company in connection with the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan (the "2017 Plan"). During the three months ended March 31, 2019, the Company granted 1,196,141 restricted stock units and 539,431 performance stock units at target under the 2017 Plan as part of its equity incentive compensation program. Each restricted stock unit provides the recipient with the right to receive a share of common stock subject to graded vesting terms based on service, which for the awards granted during the three months ended March 31, 2019, require approximately one year of service for members of the Company's board of directors and approximately three years of service for employees.

The performance stock units granted during the three months ended March 31, 2019 provide the recipients with the right to receive shares of common stock dependent on the achievement of two Company-specific financial performance targets and the provision of service through the vesting date. Achievement of the metrics is measured based on the average levels of achievement across the three-year period from January 1, 2019 through December 31, 2021. Depending on the Company's performance against the pre-determined thresholds for achievement, each performance stock unit award holder is eligible to earn a percentage of the target number of shares granted to the holder, ranging from zero to 200%. The performance stock units, to the extend earned, will vest on the date the Company's compensation and governance committee certifies the achievement of the performance metrics for the three-year period ending December 31, 2021, which will not occur later than March 1, 2022.

The value of the restricted stock units granted during the three months ended March 31, 2019 was based on the average of the high and low trading prices of the Company's common stock on the NYSE on the preceding trading day, in accordance with the Company's policy for valuing such awards. Compensation expense related to the restricted stock units is recognized on a straight-line basis over the respective vesting period. The value of the performance stock units granted during the three months ended March 31, 2019 was measured on the same basis as that of the restricted stock units, and based on the target number of shares granted; because the performance vesting conditions affect the ability of the recipients to vest in the awards, they are not factored into the fair value measure of the award.

(Dollars in thousands, except share and per share amounts)

Compensation expense related to the performance stock units is recognized ratably over the requisite service period, and the Company must assess the probability that the performance conditions will be met each reporting period, and the level at which they are estimated to be attained. Should the probability assessment change during a given reporting period, the total compensation cost (both recognized and unrecognized) will be adjusted to reflect the revised assessment.

The following table summarizes the activity for the Company's restricted stock units and performance stock units for the three months ended March 31, 2019:

	Restricted Stock Units		Performance Stock Units	
	Number of Units	Weighted Average Grant Date Fair Value (per share)	Number of Units	Weighted Average Grant Date Fair Value (per share)
Nonvested as of December 31, 2018	998,786	$ 16.83	—	$ —
Granted	1,196,141	$ 15.41	539,431	$ 15.41
Vested	(6,037)	$ 16.54	—	$ —
Nonvested as of March 31, 2019	2,188,890	$ 16.06	539,431	$ 15.41

Total stock-based compensation expense for all of the Company's equity incentive awards for the three months ended March 31, 2019 and 2018 was $3,400 and $3,831, respectively. With the new grants of restricted stock units and performance stock units during the three months ended March 31, 2019, unrecognized compensation cost at March 31, 2019 related to nonvested awards was $29,715 and $8,159 for restricted stock units and performance stock units, respectively. The weighted-average period over which these costs are expected to be recognized at March 31, 2019 is 2.09 years for the restricted stock units and 2.92 years for the performance stock units.

At March 31, 2019, 3,666,886 shares of common stock were available for issuance under the 2017 Plan, after giving effect to the new grants as well as other minor activity during the three months ended March 31, 2019. Activity related to the Company's stock options and restricted stock awards was not material for the three months ended March 31, 2019.

19. Earnings per Share:

Basic earnings per share is calculated as income (loss) available to common stockholders, divided by the weighted average number of common shares outstanding during the period. The weighted average number of common shares outstanding during the period for the computation of basic earnings per share excludes restricted stock awards that have legally been issued but are nonvested during the period, as the sale of these shares is prohibited pending satisfaction of certain vesting conditions by the award recipients in order to earn the rights to the shares.

Diluted earnings per share is calculated as income (loss) available to common stockholders, divided by the weighted average number of common and potential common shares outstanding during the period, if dilutive. Potential common shares reflect (1) unvested restricted stock awards and restricted stock units with service vesting conditions, (2) performance stock units with vesting conditions considered probable of achievement and (3) options to purchase common stock, all of which have been included in the diluted earnings per share calculation using the treasury stock method.

The reconciliation from basic to diluted weighted average shares outstanding is as follows:

	Three months ended March 31,	
	2019	2018
Weighted average shares outstanding – Basic	133,946,308	133,154,144
Dilutive effect of unvested common shares and restricted stock units with service conditions, performance stock units considered probable of vesting and assumed stock option exercises and conversions	948,046	730,839
Weighted average shares outstanding – Diluted	134,894,354	133,884,983

(Dollars in thousands, except share and per share amounts)

Basic and diluted earnings per share are calculated as follows:

	Three months ended March 31,	
	2019	2018
Numerator:		
Net income attributable to PQ Group Holdings Inc.	$ 3,151	$ 214
Denominator:		
Weighted average shares outstanding – Basic	133,946,308	133,154,144
Weighted average shares outstanding – Diluted	134,894,354	133,884,983
Net income per share:		
Basic income per share	$ 0.02	$ —
Diluted income per share	$ 0.02	$ —

The table below presents the details of the Company's weighted average equity-based awards outstanding during each respective period that were excluded from the calculation of diluted earnings per share:

	Three months ended March 31,	
	2019	2018
Restricted stock awards with performance only targets not yet achieved	1,639,514	1,751,022
Stock options with performance only targets not yet achieved	586,253	586,253
Anti-dilutive restricted stock awards, restricted stock units and performance stock units	—	—
Anti-dilutive stock options	863,063	621,747

Restricted stock awards and stock options with performance only vesting conditions were not included in the dilution calculation, as the performance targets have not been achieved nor were probable of achievement as of the end of the respective periods. On a weighted average basis, options to purchase 621,747 shares of common stock at $16.97 per share for the three months ended March 31, 2019 and 2018, and 241,316 shares of common stock at$17.50 per share for the three months ended March 31, 2019 were excluded from the computation of diluted earnings per share for the respective periods, because the combination of the options' exercise price and remaining unamortized stock-based compensation expense was greater than the average market price of the common shares. The 621,747 stock options expire on October 2, 2027 while the241,316 stock options expire on August 9, 2028. All of the options were outstanding as of March 31, 2019. Anti-dilutive awards are not included in the dilution calculation, as their inclusion would have the effect of increasing diluted income per share.

20. Supplemental Cash Flow Information:

The following table presents supplemental cash flow information for the Company:

	Three months ended March 31,	
	2019	2018
Cash paid during the period for:		
Income taxes, net of refunds	$ 4,387	$ 4,433
Interest[(1)]	23,740	16,557
Non-cash investing activity[(2)]:		
Capital expenditures acquired on account but unpaid as of the period end	15,391	10,680

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(1) Excludes capitalized interest and $3,890 of net interest proceeds on swaps designated as net investment hedges, which are included within cash flows from investing activities in the Company's condensed consolidated statements of cash flows.

(2) For the supplemental non-cash information on lease liabilities arising from obtaining right-of-use lease assets, see Note 11 to these condensed consolidated financial statements for additional details.

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the condensed consolidated balance sheets as of March 31, 2019 and 2018 to the total of the same amounts shown in the condensed consolidated statements of cash flows for the three months then ended:

	March 31,	
	2019	2018
Cash and cash equivalents	$ 52,341	$ 58,834
Restricted cash included in prepaid and other current assets	1,744	1,182
Total cash, cash equivalents and restricted cash shown in the condensed consolidated statements of cash flows	$ 54,085	$ 60,016

21. Subsequent Events:

The Company has evaluated subsequent events since the balance sheet date and determined that there are no additional items to disclose.

ITEM 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS.

Unless the context requires otherwise, references in this report to "PQ Group Holdings," "the company," "we," "us" or "our" refer to PQ Group Holdings Inc. and its consolidated subsidiaries.

Forward-looking Statements

This periodic report on Form 10-Q ("Form 10-Q") includes statements that express our opinions, expectations, beliefs, plans, objectives, assumptions or projections regarding future events or future results and therefore are, or may be deemed to be, "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995 (the "Act"). The following cautionary statements are being made pursuant to the provisions of the Act and with the intention of obtaining the benefits of the "safe harbor" provisions of the Act. The words "believe," "may," "will," "estimate," "continue," "anticipate," "intend," "expect," "should" and similar expressions are intended to identify forward-looking statements. We have based these forward-looking statements largely on our current expectations and projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy, short- and long-term business operations and objectives, and financial needs. Examples of forward-looking statements include, but are not limited to, statements we make regarding our liquidity, including our belief that our current level of operations, cash and cash equivalents, cash flow from operations and borrowings under our credit facilities and other lines of credit will provide us adequate cash to fund the working capital, capital expenditure, debt service and other requirements for our business for the foreseeable future. These forward-looking statements are subject to a number of risks, uncertainties and assumptions. Moreover, we operate in a very competitive and rapidly changing environment and new risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. In light of these risks, uncertainties and assumptions, the forward-looking events and circumstances discussed herein may not occur and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements. Some of the key factors that could cause actual results to differ from our expectations include risks related to:

- our exposure to local business risks and regulations in different countries;
- general economic conditions;
- exchange rate fluctuations;
- legal and regulatory compliance;
- significant developments relating to the U.S. administration, U.S. courts' or the United Kingdom's referendum on membership in the European Union;
- technological or other changes in our customers' products;
- our and our competitors' research and development;
- fluctuations in prices of raw materials and relationships with our key suppliers;
- substantial competition;
- non-payment or non-performance by our customers;
- reliance on a small number of customers;
- potential early termination or non-renewal of customer contracts in our Refining Services segment;
- reductions in highway safety spending or taxes earmarked for highway safety spending;
- seasonal fluctuations in demand for some of our products;
- retention of certain key personnel;
- realization of our growth projects;
- potential product liability claims;
- existing and potential future government regulation;
- the extensive environmental, health and safety regulations to which we are subject;
- disruption of production and distribution of our products;
- risk of loss beyond our available insurance coverage;
- product quality;

- successful integration of acquisitions;
- our joint venture investments;
- our failure to protect our intellectual property and infringement on the intellectual property rights of third parties;
- information technology risks;
- potential labor disruptions;
- litigation and other administrative and regulatory proceedings;
- our substantial indebtedness; and
- other factors set forth in Part I, "Item 1A. Risk Factors" in our Annual Report on Form 10-K for the year ended December 31, 2018.

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

Overview

We are a leading integrated and innovative global provider of specialty catalysts, materials and chemicals, and services. We support customers globally through our strategically located network of manufacturing facilities. We believe that our products, which are predominantly inorganic, and services contribute to improving the sustainability of the environment.

We conduct operations through four reporting segments: (1) Refining Services, (2) Catalysts (including the Zeolyst Joint Venture), (3) Performance Materials, and (4) Performance Chemicals.

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

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

Performance Materials: We are an industry leader in North America, Europe, and South America in transportation safety. Our products are used to delineate roads and runways with highly reflective markings, improving safety by enhancing visibility at night and in poor weather. Our microspheres also serve as functional additives in industrial applications, including polymers and plastics, and in abrasive applications for metal surfaces.

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

Effective March 1, 2019, we changed the structure of our internal organization to create the four independent businesses described above in order to promote increased visibility to business unit performance, optimize our product portfolio and create efficiencies. Previously, we had two reportable segments, namely the Environmental Catalysts and Services segment and the Performance Materials and Chemicals segment. Beginning with the quarter ended March 31, 2019, the segment results and disclosures included in our consolidated financial statements reflect the new segment structure for all periods presented. The changes to our segment structure affect only the manner in which the results of our reportable segments were previously reported; there are no changes to our consolidated balance sheet, statement of income or cash flows for the prior periods.

Key Performance Indicators

Adjusted EBITDA and Adjusted Net Income

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

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

Key Factors and Trends Affecting Operating Results and Financial Condition

Sales

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

Historically, our Performance Materials and Performance Chemicals segments have experienced relatively stable demand throughout economic cycles due to the diverse consumer and industrial end uses that our products serve. Expansions into new applications, including personal care and consumer cleaning, as well as share gains in existing end uses, have added to our sales growth. Product sales from our Performance Chemicals segment are made on both a purchase order basis and pursuant to long-term contracts. In the Performance Materials segment, sales have been driven by the growth of spending on repair, maintenance and upgrade of existing highways and the construction of new highways and roads by governments around the world. Product sales in our Performance Materials segment are made principally on a purchase order basis. There may be modest fluctuations in timing of orders, but orders are mainly driven by demand and general economic conditions.

Cost of Goods Sold

Cost of goods sold consists of variable product costs, fixed manufacturing expenses, depreciation expense and freight expenses. Variable product costs include all raw materials, energy and packaging costs that are directly related to the manufacturing process. Fixed manufacturing expenses include all plant employment costs, manufacturing overhead and periodic maintenance costs. The primary raw materials for our Refining Services segment include spent sulfuric acid, sulfur, sodium silicates, acids, bases, and certain metals. Most of our Refining Services contracts feature take-or-pay volume protection and/or price adjustments for commodity inputs, labor, the Chemical Engineering Index (U.S. chemical plant construction cost index) and natural gas. Spent acid for our Refining Services segment is supplied by customers for a nominal charge as part of their contracts. Over 80% of our Refining Services segment sales for the year ended December 31, 2018 were under contracts featuring price adjustments. The price adjustments generally reflect actual costs for producing acid and tend to protect us from volatility in labor, fixed costs and raw material pricing.

The primary raw materials used in the manufacture of products in our Performance Materials, Performance Chemicals and Catalysts segments include soda ash, industrial sand, aluminum trihydrate, sodium hydroxide, and cullet. For the year ended December 31, 2018, approximately 40% of sales with our largest sodium silicate customers in North America were made under contracts that include price adjustments for changes in the price of raw materials and natural gas. Under these contracts, there generally is a time lag of three to nine months for price changes to pass through, depending on the magnitude of the change in cost and other market dynamics. Freight expenses are generally passed through directly to customers.

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

Joint Ventures

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

Seasonality

Seasonal changes and weather conditions typically affect our Performance Materials and Refining Services segments. In particular, our Performance Materials segment generally experiences lower sales and profit in the first and fourth quarters of the year because highway striping projects typically occur during warmer weather months. Additionally, our Refining Services segment typically experiences similar seasonal fluctuations as a result of higher demand for gasoline products in the summer months. As a result, working capital requirements tend to be higher in the first and second quarters of the year, which can adversely affect our liquidity and cash flows. Because of this seasonality associated with certain of our segments, results for any one quarter are not necessarily indicative of the results that may be achieved for any other quarter or for the full year.

Foreign Currency

As a global business, we are subject to the impact of gains and losses on currency translations, which occur when the financial statements of foreign operations are translated into U.S. dollars. We operate a geographically diverse business with approximately 40% of our sales for the three months ended March 31, 2019 and the year ended December 31, 2018, respectively, in currencies other than the U.S. dollar. Because our consolidated financial results are reported in U.S. dollars, sales or earnings generated in currencies other than the U.S. dollar can result in a significant increase or decrease in the amount of those sales and earnings when translated to U.S. dollars. The foreign currencies to which we have the most significant exchange rate exposure include the Euro, British pound, Canadian dollar, Brazilian real and the Mexican peso.

Results of Operations

Three Months Ended March 31, 2019 Compared to the Three Months Ended March 31, 2018

Highlights

The following is a summary of our financial performance for the three months ended March 31, 2019 compared with the three months ended March 31, 2018.

Sales

- Sales decreased $7.0 million to $359.2 million. The decrease in sales was primarily due to lower sales volumes and the unfavorable effects of foreign currency translation, partially offset by higher average customer prices and favorable mix.

Gross Profit

- Gross profit increased $2.8 million to $80.9 million. The increase in gross profit was primarily due to favorable pricing and product mix and lower depreciation expenses, which was partially offset by higher manufacturing costs and lower volumes.

Operating Income

- Operating income increased by $1.2 million to $29.4 million. The increase in operating income was due to an increase in gross profit for the three months ended March 31, 2019.

Equity in Net Income of Affiliated Companies

- Equity in net income of affiliated companies for the three months ended March 31, 2019 was $2.1 million, compared to $11.9 million for the three months ended March 31, 2018. The decrease of $9.8 million was due to lower earnings generated by our Zeolyst Joint Venture for the three months ended March 31, 2019.

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The following is our unaudited condensed consolidated statements of income and a summary of financial results for the three months ended March 31, 2019 and 2018:

	Three months ended March 31,		Change	
	2019	2018	$	%
	(in millions, except percentages)			
Sales	$ 359.2	$ 366.2	$ (7.0)	(1.9)%
Cost of goods sold	278.3	288.1	(9.8)	(3.4)%
Gross profit	80.9	78.1	2.8	3.6 %
Gross profit margin	*22.5%*	*21.3%*		
Selling, general and administrative expenses	40.7	40.6	0.1	0.2 %
Other operating expense, net	10.8	9.3	1.5	16.1 %
Operating income	29.4	28.2	1.2	4.3 %
Operating income margin	*8.2%*	*7.7%*		
Equity in net (income) from affiliated companies	(2.1)	(11.9)	9.8	(82.4)%
Interest expense, net	28.6	29.2	(0.6)	(2.1)%
Debt extinguishment costs	—	5.9	(5.9)	(100.0)%
Other (income) expense, net	(3.0)	5.0	(8.0)	(160.0)%
Income before income taxes and noncontrolling interest	5.9	—	5.9	NM
Provision (benefit) for income taxes	2.4	(0.5)	2.9	NM
Effective tax rate	*41.6%*	*—%*		
Net income	3.5	0.5	3.0	NM
Less: Net income attributable to the noncontrolling interest	0.3	0.3	—	— %
Net income attributable to PQ Group Holdings Inc.	$ 3.2	$ 0.2	$ 3.0	NM

Sales

	Three months ended March 31,		Change	
	2019	2018	$	%
	(in millions, except percentages)			
Sales:				
Refining Services	$ 105.8	$ 100.7	$ 5.1	5.1 %
Catalysts	15.9	16.5	(0.6)	(3.6)%
Performance Materials	61.1	62.7	(1.6)	(2.6)%
Performance Chemicals	180.5	190.0	(9.5)	(5.0)%
Eliminations	(4.1)	(3.7)	(0.4)	
Total sales	$ 359.2	$ 366.2	$ (7.0)	(1.9)%

Refining Services: Sales in Refining Services for the three months ended March 31, 2019 were $105.8 million, an increase of $5.1 million, or 5.1%, compared to sales of $100.7 million for the three months ended March 31, 2018. The increase in sales was primarily due to higher average selling prices and favorable customer mix of $8.6 million, which offset lower volumes of $3.5 million.

The increase in higher average selling price and customer mix was driven by contract renewals in our regenerated sulfuric acid product line and higher cost pass-through pricing in our virgin sulfuric acid product line. This more than offset a decrease in volumes due to unplanned customer plant outages.

Catalysts: Sales in Catalysts for the three months ended March 31, 2019 were $15.9 million, a decrease of $0.6 million, or 3.6%, compared to sales of $16.5 million for the three months ended March 31, 2018. The decrease in sales was primarily due to lower volumes of $0.9 million and the unfavorable effects of foreign currency translation of $0.6 million, which was offset by higher average selling price and customer mix of $0.9 million.

The change in sales was due to foreign exchange impact and lower volumes of products sold to the packaging and engineered plastics industries offset by favorable product and customer mix.

Performance Materials: Sales in Performance Materials for the three months ended March 31, 2019 were $61.1 million, a decrease of $1.6 million, or 2.6%, compared to sales of $62.7 million for the three months ended March 31, 2018. The decrease in sales was primarily due to the unfavorable effects of foreign currency translation of $3.2 million and lower volumes of $1.3 million, which was partially offset by higher average selling price and favorable customer mix of $2.9 million.

The decrease in sales was a result of lower volumes of product sold to the electronics industry and the stronger U.S. dollar as compared to the Euro and Argentinian Peso. This was partially offset by higher average selling prices in North and Latin America.

Performance Chemicals: Sales in Performance Chemicals for the three months ended March 31, 2019 were $180.5 million, a decrease of $9.5 million, or 5.0%, compared to sales of $190.0 million for the three months ended March 31, 2018. The decrease in sales was primarily due to the unfavorable effects of foreign currency translation of $8.6 million and lower sales volumes of $6.5 million, which was partially offset by higher average selling price and favorable customer mix of $5.6 million.

The decrease in sales was a result of lower volumes of product sold to the consumer products industry and the unfavorable effects of foreign currency driven by the stronger U.S. dollar, which was partially offset by favorable cost pass-through pricing.

Gross Profit

Gross profit for the three months ended March 31, 2019 was $80.9 million, an increase of $2.8 million, or 3.6%, compared with $78.1 million for the three months ended March 31, 2018. The increase in gross profit was due to favorable customer pricing of $18.0 million, favorable product mix of $4.8 million and lower depreciation expense of $3.1 million, which was partially offset by unfavorable manufacturing costs of $14.1 million, lower volumes of $6.1 million and the unfavorable effects of foreign currency translation of $2.9 million.

Favorable customer pricing was a result of contract renewals and improved product mix. The unfavorable change in manufacturing costs was driven by higher raw material costs, some of which are passed through in price, and increased production and transportation costs. The decrease in volumes was due to customer plant outages and lower sales to the consumer products industry. The unfavorable effects of foreign currency were driven by the stronger U.S. dollar.

Selling, General and Administrative Expenses

Selling, general and administrative expenses for the three months ended March 31, 2019 were $40.7 million, an increase of $0.1 million compared with $40.6 million for the three months ended March 31, 2018. Selling, general and administrative expenses were generally consistent with expenses incurred in the prior year, with increases in employment costs offset by lower spending due to cost management programs.

Other Operating Expense, Net

Other operating expense, net for the three months ended March 31, 2019 was $10.8 million, an increase of $1.5 million, compared with $9.3 million for the three months ended March 31, 2018. During the three months ended March 31, 2018, we recognized insurance recoveries totaling $1.5 million related to losses sustained as a result of Hurricane Harvey in August 2017 (of which $1.2 million was recorded in other operating expense, net), and which claim was fully settled by the end of 2018.

Equity in Net Income of Affiliated Companies

Equity in net income of affiliated companies for the three months ended March 31, 2019 was $2.1 million, compared to $11.9 million for the three months ended March 31, 2018. The decrease was primarily due to $9.8 million of lower earnings from our Zeolyst Joint Venture during the three months ended March 31, 2019. The decrease in earnings from our Zeolyst Joint Venture was due to lower sales to the fuels and emission control industries.

Interest Expense, Net

Interest expense, net for the three months ended March 31, 2019 was $28.6 million, a decrease of $0.6 million, as compared with $29.2 million for the three months ended March 31, 2018. The decrease in interest expense is due to lower average debt balances, mainly as a result of the prepayment of $100.0 million related to the outstanding principal balance on our senior secured term loan facility during the third and fourth quarters of the year ended December 31, 2018.

Debt Extinguishment Costs

Debt extinguishment costs for the three months ended March 31, 2018 was $5.9 million. On February 8, 2018 we refinanced our existing senior secured term loan facility with a new $1,267.0 million senior secured term loan facility to reduce the applicable interest rates. We recorded $2.1 million of new creditor and third-party financing fees as debt extinguishment costs for the three months ended March 31, 2018. In addition, previous unamortized deferred financing costs of $1.4 million and original issue discount of $2.4 million associated with the existing senior secured term loan facility were written off as debt extinguishment costs for the three months ended March 31, 2018.

Other (Income) Expense, Net

Other (income) expense, net for the three months ended March 31, 2019 was income of $3.0 million, a decrease of $8.0 million, as compared with an expense of $5.0 million for the three months ended March 31, 2018. The change in other (income) expense, net primarily consisted of a decrease of $7.8 million of foreign currency losses driven by the non-permanent intercompany debt denominated in local currency and translated to U.S. dollars.

Provision (Benefit) for Income Taxes

The provision for income taxes for the three months ended March 31, 2019 was $2.4 million compared to a $0.5 million benefit for the three months ended March 31, 2018. The effective income tax rate for the three months ended March 31, 2019 was 41.6% compared to (1,959.3)% for the three months ended March 31, 2018.

The Company's effective income tax rate fluctuates based primarily on changes in income mix (including the effect of loss companies), impact of including foreign earnings in U.S. taxable income and changes in foreign exchange gains and losses, which create permanent differences in certain jurisdictions.

The difference between the U.S. federal statutory income tax rate and the Company's effective income tax rate for the three months ended March 31, 2019 was mainly due to the tax effect of permanent differences related to foreign currency exchange gain or loss, the inclusion of foreign earnings in U.S. taxable income, pre-tax losses with no associated tax benefit, prior year tax refunds not previously accrued for and state taxes.

Net Income Attributable to PQ Group Holdings

For the foregoing reasons and after the effect of the non-controlling interest in earnings of subsidiaries for each period presented, net income attributable to PQ Group Holdings was $3.2 million for the three months ended March 31, 2019 compared with net income of $0.2 million for the three months ended March 31, 2018.

Adjusted EBITDA

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

	Three months ended March 31,		Change	
	2019	2018	$	%
	(in millions, except percentages)			
Segment Adjusted EBITDA:[1]				
Refining Services	$ 39.7	$ 35.5	$ 4.2	11.8 %
Catalysts[2]	18.1	22.9	(4.8)	(21.0)%
Performance Materials	10.5	12.1	(1.6)	(13.2)%
Performance Chemicals	42.7	45.1	(2.4)	(5.3)%
Total Segment Adjusted EBITDA[3]	111.0	115.6	(4.6)	(4.0)%
Unallocated corporate expenses	(10.0)	(7.7)	(2.3)	29.9 %
Total Adjusted EBITDA	$ 101.0	$ 107.9	$ (6.9)	(6.4)%

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

(2) The Adjusted EBITDA from our Zeolyst Joint Venture included in the Catalysts segment is $8.4 million for the three months ended March 31, 2019, which includes $2.0 million of equity in net income, excluding $2.6 million of amortization of investment in affiliate step-up plus $3.8 million of joint venture depreciation, amortization and interest. The Adjusted EBITDA from our Zeolyst Joint Venture included in the Catalysts segment is $16.8 million for the three months ended March 31, 2018, which

includes $11.8 million of equity in net income, excluding $1.7 million of amortization of investment in affiliate step-up plus $3.3 million of joint venture depreciation, amortization and interest.

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

Adjusted EBITDA for the three months ended March 31, 2019 was $101.0 million, a decrease of $6.9 million, or 6.4%, compared with $107.9 million for the three months ended March 31, 2018.

Refining Services: Adjusted EBITDA for the three months ended March 31, 2019 was $39.7 million, an increase of $4.2 million, or 11.8%, compared with $35.5 million for the three months ended March 31, 2018. The increase in Adjusted EBITDA was driven by contract renewals, partially offset by lower volumes from unplanned customer plant outages and the timing of insurance recoveries recognized during the three months ended March 31, 2018.

Catalysts: Adjusted EBITDA for the three months ended March 31, 2019 was $18.1 million, a decrease of $4.8 million, or 21.0%, compared with $22.9 million for the three months ended March 31, 2018. The decrease in Adjusted EBITDA was a result of lower sales to the fuels and emission control industries partially offset by lower cost of goods sold.

Performance Materials: Adjusted EBITDA for the three months ended March 31, 2019 was $10.5 million, a decrease of $1.6 million, or 13.2%, compared with $12.1 million for the three months ended March 31, 2018. The decrease in Adjusted EBITDA was a result of higher manufacturing costs in Europe which was partially offset by improved pricing and product mix.

Performance Chemicals: Adjusted EBITDA for the three months ended March 31, 2019 was $42.7 million, a decrease of $2.4 million, or 5.3%, compared with $45.1 million for the three months ended March 31, 2018. The decrease in Adjusted EBITDA was due to lower volumes of product sold to the consumer products industry and the strengthening of the U.S. dollar, which was partially offset by favorable cost pass-through pricing.

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

	Three months ended March 31,	
	2019	2018
	(in millions)	
Reconciliation of net income attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA		
Net income attributable to PQ Group Holdings Inc.	$ 3.2	$ 0.2
Provision (benefit) for income taxes	2.4	(0.5)
Interest expense, net	28.6	29.2
Depreciation and amortization	45.9	48.5
EBITDA	80.1	77.4
Joint venture depreciation, amortization and interest[a]	3.8	3.3
Amortization of investment in affiliate step-up[b]	2.6	1.7
Amortization of inventory step-up[c]	—	1.6
Debt extinguishment costs	—	5.9
Net loss on asset disposals[d]	0.8	1.2
Foreign currency exchange (gain) loss[e]	(2.7)	5.1
LIFO expense[f]	10.2	4.9
Transaction and other related costs[g]	0.1	0.4
Equity-based compensation	3.4	3.8
Restructuring, integration and business optimization expenses[h]	0.7	1.1
Defined benefit pension plan cost[i]	1.0	0.6
Other[j]	1.0	0.9
Adjusted EBITDA	101.0	107.9
Unallocated corporate expenses	10.0	7.7
Segment Adjusted EBITDA	$ 111.0	$ 115.6

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

(b) Represents the amortization of the fair value adjustments associated with the equity affiliate investment in our Zeolyst Joint Venture as a result of the combination of the businesses of PQ Holdings Inc. and Eco Services Operations LLC in May 2016 (the “Business Combination”). We determined the fair value of the equity affiliate investment and the fair value step-up was then attributed to the underlying assets of our Zeolyst Joint Venture. Amortization is primarily related to the fair value adjustments associated with fixed assets and intangible assets, including customer relationships and technical know-how.

(c) As a result of the Sovitec acquisition there was a step-up in the fair value of inventory, which is amortized through cost of goods sold in the statements of income.

(d) When asset disposals occur, we remove the impact of net gain/loss of the disposed asset because such impact primarily reflects the non-cash write-off of long-lived assets no longer in use.

(e) Reflects the exclusion of the foreign currency transaction gains and losses in the statements of income primarily relates to the non-permanent intercompany debt denominated in local currency translated to U.S. dollars for the three months ended March 31, 2019 and primarily relates to the Euro denominated term loan (which was settled as part of the February 2018 term loan refinancing) for the three months ended March 31, 2018.

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

(g) Relates to certain transaction costs, including debt financing, due diligence and other costs related to transactions that are completed, pending or abandoned, that we believe are not representative of our ongoing business operations.

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

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

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

Adjusted Net Income

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

	Three months ended March 31, 2019	Three months ended March 31, 2018
	(in millions)	
Reconciliation of net income attributable to PQ Group Holdings Inc. to Adjusted Net Income[(1)(2)]		
Net income attributable to PQ Group Holdings Inc.	$ 3.2	$ 0.2
Amortization of investment in affiliate step-up[(b)]	1.6	1.2
Amortization of inventory step-up[(c)]	—	1.1
Debt extinguishment costs	—	4.1
Net loss on asset disposals[(d)]	0.5	0.8
Foreign currency exchange (gain) loss[(e)]	(2.0)	2.9
LIFO expense[(f)]	6.5	3.4
Transaction and other related costs[(g)]	0.1	0.3
Equity-based compensation	2.2	2.6
Restructuring, integration and business optimization expenses[(h)]	0.5	0.7
Defined benefit pension plan cost[(i)]	0.6	0.4
Other[(j)]	0.6	0.7
Adjusted Net Income, including non-cash GILTI tax	$ 13.8	$ 18.4
Impact of non-cash GILTI tax[(3)]	3.7	2.5
Adjusted Net Income	$ 17.5	$ 20.9

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

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

(3) Amount represents the impact to tax expense in net income before non-controlling interest and the related adjustments to net income associated with the Global Intangible Low Taxed Income ("GILTI") provisions of the Tax Cuts and Jobs Act of 2017 ("TCJA"). Beginning January 1, 2018, GILTI results in taxation of "excess of foreign earnings," which is defined as amounts greater than a 10% rate of return on applicable foreign tangible asset basis. The Company is required to record incremental tax provision impact with respect to GILTI as a result of having historical U.S. net operating loss ("NOL") amounts to offset the GILTI taxable income inclusion. This NOL utilization precludes us from recognizing foreign tax credits ("FTCs") which would

otherwise help offset the tax impacts of GILTI. No FTCs will be recognized with respect to GILTI until our cumulative NOL balance has been exhausted. Because the GILTI provision does not impact our cash taxes (given available U.S. NOLs), and given that we expect to recognize FTCs to offset GILTI impacts once the NOLs are exhausted, we do not view this item as a component of core operations.

The adjustments to net income attributable to PQ Group Holdings Inc. are shown net of applicable tax rates of 36.5% and 30.6% for the three months ended March 31, 2019 and 2018, respectively, except for the foreign currency exchange loss for which the tax is calculated as a discrete item using the applicable statutory income tax rates.

Financial Condition, Liquidity and Capital Resources

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

We believe that our existing cash, cash equivalents and cash flows from operations, combined with availability under our asset based lending revolving credit facility, will be sufficient to meet our presently anticipated future cash needs for at least the next 12 months. We may also pursue strategic acquisition opportunities, which may impact our future cash requirements. We may, from time to time, increase borrowings under our asset based lending revolving credit facility to meet our future cash needs. As of March 31, 2019, we had cash and cash equivalents of $52.3 million and availability of $170.2 million under our asset based lending revolving credit facility, after giving effect to $19.9 million of outstanding letters of credit and $2.0 million of revolving credit facility borrowings, for a total available liquidity of $222.5 million. As of March 31, 2019, we were in compliance with all covenants under our debt agreements.

Included in our cash and cash equivalents balance as of March 31, 2019 was $40.7 million of cash and cash equivalents held in foreign jurisdictions. We repatriate cash held outside of the United States from certain foreign subsidiaries in order to meet domestic liquidity needs. Depending on domestic and foreign cash balances, we have certain flexibility to repatriate funds in order to meet those needs. Specifically, we have an intercompany loan structure in place with several of our foreign subsidiaries that allows us to repatriate foreign cash in a tax efficient manner from those subsidiaries. In certain cases, the repatriation of foreign cash under previous U.S. tax law had generally been subject to U.S. income taxes at the time of cash distribution. Due to the enactment of the TCJA in December 2017, future overseas earnings repatriation will generally no longer be subject to U.S. federal income taxes at the time of cash distribution. However, future foreign earnings may still be taxed for state income tax purposes, as well as subject to certain foreign withholding tax obligations, when cash amounts are distributed back to the U.S.

As of March 31, 2019, our total indebtedness was $2,146.8 million, with up to $170.2 million of available borrowings under our asset based lending revolving credit facility. Our liquidity requirements are significant, primarily due to debt service requirements. As reported, our cash interest paid for the three months ended March 31, 2019 and 2018 was approximately $23.7 million and $16.6 million, respectively. Before any impact of hedges, a one percent change in assumed interest rates for our variable interest credit facilities would have an annual impact of approximately $11.7 million on interest expense.

Cash Flow

	Three months ended March 31,	
	2019	2018
	(in millions)	
Net cash provided by (used in):		
Operating activities	$ 26.8	$ 22.0
Investing activities	(29.2)	(33.1)
Financing activities	(2.5)	5.4
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(0.7)	(1.5)
Net change in cash, cash equivalents and restricted cash	(5.6)	(7.2)
Cash, cash equivalents and restricted cash at beginning of period	59.7	67.2
Cash, cash equivalents and restricted cash at end of period	$ 54.1	$ 60.0

	Three months ended March 31, 2019	Three months ended March 31, 2018
	(in millions)	
Net income	$ 3.5	$ 0.5
Non-cash and non-working capital related activities[1]	46.8	59.3
Changes in working capital	(19.9)	(34.8)
Other operating activities	(3.6)	(3.0)
Net cash provided by operating activities	$ 26.8	$ 22.0

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

	Three months ended March 31, 2019	Three months ended March 31, 2018
	(in millions)	
Working capital changes that provided (used) cash:		
Receivables	$ 1.1	$ (11.1)
Inventories	(19.2)	(19.5)
Prepaids and other current assets	2.9	(4.7)
Accounts payable	(3.9)	(7.0)
Accrued liabilities	(0.8)	7.5
	$ (19.9)	$ (34.8)

	Three months ended March 31, 2019	Three months ended March 31, 2018
	(in millions)	
Purchases of property, plant and equipment	$ (33.6)	$ (33.3)
Net interest proceeds on swaps designated as net investment hedges	3.9	—
Other, net	0.5	0.2
Net cash used in investing activities	$ (29.2)	$ (33.1)

	Three months ended March 31, 2019	Three months ended March 31, 2018
	(in millions)	
Net revolving credit facilities borrowings	$ 3.5	$ 6.5
Net cash repayments on debt obligations	(5.0)	(1.0)
Other financing activities	(1.0)	(0.1)
Net cash (used in) provided by financing activities	$ (2.5)	$ 5.4

Net cash provided by operating activities was $26.8 million for the three months ended March 31, 2019, compared to $22.0 million provided for the three months ended March 31, 2018. Cash generated by net income plus non-cash and non-working capital related activities waslower during the three months ended March 31, 2019 by $9.5 million compared to the same period in the prior year. The change in working capital during thethree months ended March 31, 2019 was favorable compared to the three months ended March 31, 2018. Cash used to fund working capital was $19.9 million and $34.8 million for the three months ended March 31, 2019 and 2018, respectively.

The decrease in cash generated by net income plus non-cash and non-working capital related activities of $9.5 million as compared to the prior year period was primarily due to lower dividends received from affiliated companies and net interest income on our cross currency swaps.

The increase in cash from working capital of $14.9 million as compared to the prior year was primarily due to favorable changes in accounts receivable, prepaid and other current assets and accounts payable, which was partially offset by unfavorable changes in accrued liabilities.

The favorable change in accounts receivable was due to lower Refining Services receivables related to customer plant outages. The favorable change in accounts payable was due to decreased levels of pending capital payments in accounts payable in the current year and the timing of plant maintenance costs in the prior year. The unfavorable change in accrued liabilities was primarily due to the timing of interest payments made under our new debt structure.

Net cash used in investing activities was $29.2 million for the three months ended March 31, 2019, compared to cash used of $33.1 million during the same period in 2018. Cash used in investing activities primarily consisted of utilizing $33.6 million and $33.3 million to fund capital expenditures during the three months ended March 31, 2019 and 2018, respectively. During the three months ended March 31, 2019, we received $3.9 million in interest proceeds related to our cross currency swaps.

Net cash used in financing activities was $2.5 million for the three months ended March 31, 2019, compared to net cash provided of $5.4 million during the same period in 2018. Net cash used in financing activities was primarily driven by $5.0 million in long-term debt repayments offset by $3.5 million of net borrowings under our revolving credit facilities made through the three months ended March 31, 2019. Net cash provided by financing activities for the three months ended March 31, 2018 was mainly due to $6.5 million of net borrowings under our revolving credit facility partially offset by the net impact of the term loan refinancing (including debt issuance costs).

Debt

	March 31, 2019	December 31, 2018
	(in millions)	
Term Loan Facility	1,157.5	1,157.5
6.75% Senior Secured Notes due 2022	625.0	625.0
5.75% Senior Unsecured Notes due 2025	295.0	300.0
ABL Facility	2.0	—
Other	67.3	65.9
Total debt	2,146.8	2,148.4
Original issue discount	(17.9)	(18.6)
Deferred financing costs	(15.1)	(15.9)
Total debt, net of original issue discount and deferred financing costs	2,113.8	2,113.9
Less: current portion	(10.7)	(7.2)
Total long-term debt, excluding current portion	$ 2,103.1	$ 2,106.7

As of March 31, 2019, our total debt was $2,146.8 million, including $15.5 million of other foreign debt and $51.8 million of notes payable for the New Market Tax Credit financing and excluding the original issue discount of $17.9 million and deferred financing fees of $15.1 million for our senior secured credit facilities and notes. Our net debt as of March 31, 2019 was $2,094.5 million including cash and cash equivalents of $52.3 million. We may seek, subject to market conditions and other factors, opportunities to repurchase, refinance or otherwise reprice our debt.

Capital Expenditures

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

	Three months ended March 31,	
	2019	2018
	(in millions)	
Maintenance capital expenditures	$ 18.5	$ 20.6
Growth capital expenditures	6.7	4.7
Total capital expenditures	$ 25.2	$ 25.3

Capital expenditures remained at a level sufficient for required maintenance and certain expansion growth initiatives during these periods. Maintenance capital expenditures are lower in the three months ended March 31, 2019 as compared to the three months ended March 31, 2018 due to fewer plant maintenance projects incurred during the period. Growth capital expenditures are higher in the three months ended March 31, 2019 as compared to the three months ended March 31, 2018 due to increased spending to expand capacity at our production facilities.

Pension Funding

We paid $3.4 million in cash contributions into our defined benefit pension plans and other post-retirement plans during each of the three-month periods ended March 31, 2019 and 2018. The net periodic pension expense was $1.2 million and $0.8 million for those same periods, respectively.

Off–Balance Sheet Arrangements

We had $19.9 million of outstanding letters of credit on our ABL Facility as of March 31, 2019.

Contractual Obligations

Information related to our contractual obligations at December 31, 2018 can be found in Item 7, “Management’s Discussion and Analysis of Financial Condition and Results of Operations” included in our Annual Report on Form 10-K for the year ended December 31, 2018, filed with the SEC on March 1, 2019, which we refer to as our Annual Report on Form 10-K. During the three months ended March 31, 2019, there have been no significant changes to our contractual obligations as disclosed in our Annual Report on Form 10-K.

Critical Accounting Policies and Estimates

We prepare our condensed consolidated financial statements in conformity with GAAP and our significant accounting policies are described in Note 2 to our audited consolidated financial statements included in our Annual Report on Form 10-K. The preparation of financial statements in conformity with GAAP requires us to make estimates and assumptions that affect reported amounts and related disclosures. We base our estimates and judgments on historical experience and other relevant factors that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions. We evaluate our critical accounting estimates, assumptions and judgments on an ongoing basis.

There has been no material change in our critical accounting policies and use of estimates from those described in Item 7, “Management’s Discussion and Analysis of Financial Condition and Results of Operations,” included in our Annual Report on Form 10-K.

Accounting Standards Not Yet Adopted

See Note 2 to our unaudited condensed consolidated financial statements for a discussion of recently issued accounting standards and their effect on us.

ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK.

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

There have been no material changes in the foreign exchange risk, interest rate risk, commodity risk or credit risk discussed in Item 7A., “Quantitative and Qualitative Disclosures about Market Risk,” included in our Annual Report on Form 10-K.

ITEM 4. CONTROLS AND PROCEDURES.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of March 31, 2019, the end of the period covered by this Quarterly Report on Form 10-Q.

The term “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (“Exchange Act”), means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC’s rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company’s management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at a reasonable assurance level.

Changes in Internal Control Over Financial Reporting

No changes in our internal control over financial reporting occurred during the quarter endedMarch 31, 2019 that materially affected, or which are reasonably likely to materially affect, our internal control over financial reporting.

PART II—OTHER INFORMATION

ITEM 1. LEGAL PROCEEDINGS.

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

ITEM 1A. RISK FACTORS.

There has been no material change from the risk factors described in our Annual Report on Form 10-K.

ITEM 2. UNREGISTERED SALES OF EQUITY SECURITIES AND USE OF PROCEEDS.

Tax Withholdings

The following table contains information about shares of common stock delivered to the Company by employees to satisfy withholding tax obligations of the employees in connection with the vesting of restricted stock units during the first quarter of 2019.

	Total Number of Shares of Common Stock Purchased	Average Price Paid per Share of Common Stock	Total Number of Shares of Common Stock Purchased as Part of Publicly Announced Plans or Programs	Maximum Number (or Dollar Value) of Shares of Common Stock that May Yet Be Purchased Under the Plans or Programs
January 1, 2019 - January 31, 2019	88,567	$ 15.11	N/A	N/A
February 1, 2019 - February 28, 2019	—	—	N/A	N/A
March 1, 2019 - March 31, 2019	—	—	N/A	N/A
Total	88,567			

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ITEM 6. EXHIBITS.

The following exhibits are being filed or furnished as part of this Quarterly Report on Form 10-Q:

Exhibit No.	Description
10.1	Form of Performance Stock Unit Award Agreement under the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan
10.2	Letter of employment, dated August 30, 2017, by and between PQ Corporation and David Taylor
10.3	Consent under the August 31, 2017 Severance Agreement, dated March 29, 2019, by and between PQ Corporation and Scott Randolph
31.1	Certification of Chief Executive Officer of PQ Group Holdings Inc. pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2	Certification of Chief Financial Officer of PQ Group Holdings Inc. pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1	Certification of Chief Executive Officer of PQ Group Holdings Inc. pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2	Certification of Chief Financial Officer of PQ Group Holdings Inc. pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS	XBRL Instance Document
101.SCH	XBRL Taxonomy Extension Schema Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	XBRL Taxonomy Definition Linkbase Document
101.LAB	XBRL Taxonomy Extension Label Linkbase Document
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

PQ GROUP HOLDINGS INC.

Date: May 10, 2019

By: /s/ MICHAEL CREWS

Michael Crews

Executive Vice President and Chief Financial Officer

(Duly Authorized Officer and Principal Financial and Accounting Officer)

Exhibit 10.1

PQ GROUP HOLDINGS INC.
2017 Omnibus Incentive Plan

Performance Stock Unit Award Agreement

This Performance Stock Unit Award Agreement (this "*Agreement*") is made by and between PQ Group Holdings Inc., a Delaware corporation (the "*Company*"), and [●] (the "*Participant*"), effective as of [●] (the "*Date of Grant*").

RECITALS

WHEREAS, the Company has adopted the PQ Group Holdings Inc. 2017 Omnibus Incentive Plan (as the same may be amended and/or amended and restated from time to time, the "*Plan*"), which Plan is incorporated herein by reference and made a part of this Agreement, and capitalized terms not otherwise defined in this Agreement will have the meanings ascribed to those terms in the Plan; and

WHEREAS, the Committee has authorized and approved the grant of an Award of performance stock units ("*PSUs")* to the Participant that provides the Participant the conditional opportunity to acquire one share of Common Stock (a "*Share*") with respect to each PSU forming part of the Award, subject to the terms and conditions set forth in the Plan and this Agreement.

NOW THEREFORE, in consideration of the premises and mutual covenants set forth in this Agreement, the parties agree as follows:

1. Grant of PSUs. The Company has granted to the Participant [●] PSUs (the "*Target Award*), effective as of the Date of Grant, on the terms and conditions set forth in the Plan and this Agreement, subject to adjustment as forth in the Plan.

2. Earning and Vesting of PSUs. Subject to the terms and conditions set forth in the Plan and this Agreement, the PSUs may be earned and will vest as follows:

   (a) Performance Conditions. Between 0% and 200% (the "*Payout Range*") of the Target Award is eligible to be earned contingent on achievement of the Performance Measures set forth on Appendix A to this Agreement during the period beginning on January 1, 2019 and ending on December 31, 2021 (the "*Performance Period*") and other terms and conditions as set forth in Appendix A to this Agreement.

   (b) Vesting Schedule. Subject to the terms and conditions set forth in the Plan and this Agreement, and except as otherwise provided in Section 2(b) or Appendix A of this Agreement, any PSUs that are earned in accordance with Appendix A will vest on the date the Committee certifies the levels of achievement of the Performance Measures, which shall be no later than sixty (60) days following the end of the Performance Period (the "*Performance Vesting Date*"), subject to the Participant's continued Service through the Performance Vesting Date (or other earlier vesting date specified in Appendix A). Any PSUs that are not earned in accordance with Appendix A on the Performance Vesting Date (or any other date specified in Appendix A) will immediately terminate and be forfeited and cancelled without payment of consideration therefor.

(c) Termination of Service. Except as otherwise provided in Appendix A of this Agreement, the Participant shall forfeit, immediately and without consideration, all unvested PSUs upon a termination of the Participant's Service for any reason. Without limiting the generality of the foregoing, the PSUs and the Shares (and any resulting proceeds) will continue to be subject to Section 13 of the Plan.

3. Payment

(a) Settlement. The Company shall deliver to the Participant within thirty (30) days following the vesting date of the PSUs (but no later than March 15th of the year following the year in which such PSUs are earned hereunder) a number of Shares equal to the aggregate number of PSUs that are earned in accordance with Appendix A and that vest on such date. No fractional Shares shall be delivered. The Company may deliver such Shares either through book entry accounts held by, or in the name of, the Participant or cause to be issued a certificate or certificates representing the number of Shares to be issued in respect of the PSUs registered in the name of the Participant.

(b) Withholding Requirements. The Company will have the power and the right to deduct or withhold automatically from any Shares deliverable under this Agreement or from any other compensation payable to the Participant, or to require the Participant or the Participant's representative to remit to the Company, up to the maximum statutory amount necessary to satisfy federal, state and local taxes, domestic or foreign, required by law or regulation to be withheld with respect to any taxable event arising as a result of this Agreement. Nothing in this Agreement may be construed as relieving the Participant of his or her obligation to satisfy all taxes required to be withheld in connection with the award, vesting or settlement of the PSUs.

4. Adjustment of Shares. In the event of any change with respect to the outstanding shares of Common Stock contemplated by Section 4.5 of the Plan, the PSUs may be adjusted by the Committee in accordance with Section 4.5 of the Plan.

5. Miscellaneous Provisions

(a) Securities Laws Requirements. No Shares will be issued or transferred pursuant to this Agreement unless and until all then applicable requirements imposed by federal and state securities and other laws, rules and regulations and by any regulatory agencies having jurisdiction, and by any exchanges upon which the Shares may be listed, have been fully met. As a condition precedent to the issuance of Shares pursuant to this Agreement, the Company may require the

Participant to take any reasonable action to meet those requirements. The Committee may impose such conditions on any Shares issuable pursuant to this Agreement as it may deem advisable, including, without limitation, restrictions under the Securities Act, under the requirements of any exchange upon which shares of the same class are then listed and under any blue sky or other securities laws applicable to those Shares.

(b) Rights of a Shareholder of the Company. Prior to settlement of the PSUs and the delivery of Shares to the Participant with respect thereto, neither the Participant nor the Participant's representative will have any rights as a shareholder of the Company with respect to any Shares underlying the PSUs and the Participant will not receive payment of, or credit for, dividends or dividend equivalents with respect to any Shares underlying the PSUs.

(c) Transfer Restrictions. The PSUs may not be transferred except as expressly permitted under Section 15.3 of the Plan. The Shares delivered hereunder will be subject to such stop transfer orders and other restrictions as the Committee may deem advisable under the Plan or the rules, regulations and other requirements of the Securities and Exchange Commission, any stock exchange upon which such Shares are listed, any applicable federal or state laws and any agreement with, or policy of, the Company or the Committee to which the Participant is a party or subject, and the Committee may cause orders or designations to be placed upon the books and records of the Company's transfer agent to make appropriate reference to such restrictions.

(d) No Right to Continued Service. Nothing in this Agreement or the Plan confers upon the Participant any right to continue in Service for any period of specific duration or interfere with or otherwise restrict in any way the rights of the Company (or any Subsidiary retaining the Participant) or of the Participant, which rights are hereby expressly reserved by each, to terminate his or her Service at any time and for any reason, with or without Cause.

(e) Notification. Any notification required by the terms of this Agreement will be given by the Participant (i) in a writing addressed to the Company at its principal executive office and will be deemed effective upon actual receipt when delivered by personal delivery or by registered or certified mail, with postage and fees prepaid, or (ii) by electronic transmission to the Company's e-mail address of the Company's General Counsel and will be deemed effective upon actual receipt. Any notification required by the terms of this Agreement will be given by the Company (x) in a writing addressed to the address that the Participant most recently provided to the Company and will be deemed effective upon personal delivery or within three (3) days of deposit with the United States Postal Service, by registered or certified mail, with postage and fees prepaid, or (y) by facsimile or electronic transmission to the Participant's primary work fax number or e-mail address (as applicable) and will be deemed effective upon confirmation of receipt by the sender of such transmission.

(f) Entire Agreement. This Agreement and the Plan constitute the entire agreement between the parties hereto with regard to the subject matter of this Agreement. This Agreement and the Plan supersede any other agreements, representations or understandings (whether oral or written and whether express or implied) that relate to the subject matter of this Agreement.

(g) Waiver. No waiver of any breach or condition of this Agreement will be deemed to be a waiver of any other or subsequent breach or condition whether of like or different nature.

(h) Successors and Assigns. The provisions of this Agreement will inure to the benefit of, and be binding upon, the Company and its successors and assigns and upon the Participant, the Participant's executor, personal representative(s), distributees, administrator, permitted transferees, permitted assignees, beneficiaries, and legatee(s), as applicable, whether or not any such person will have become a party to this Agreement and have agreed in writing to be joined herein and be bound by the terms hereof.

(i) Severability. The provisions of this Agreement are severable, and if any one or more provisions are determined to be illegal or otherwise unenforceable, in whole or in part, then the remaining provisions will nevertheless be binding and enforceable.

(j) Choice of Law; Jurisdiction. This Agreement and all claims, causes of action or proceedings (whether in contract, in tort, at law or otherwise) that may be based upon, arise out of or relate to this Agreement will be governed by the laws of the State of Delaware, excluding any conflicts or choice-of-law rule or principle that might otherwise refer construction or interpretation of this Agreement to the substantive law of another jurisdiction. The Participant agrees that he or she will bring all claims, causes of action and proceedings (whether in contract, in tort, at law or otherwise) that may be based upon, arise out of or be related to the Plan and this Agreement exclusively in the federal and state courts located within the geographic boundaries of the United States District Court for the Eastern District of Pennsylvania (the "*Chosen Court*"), and hereby (i) irrevocably submits to the exclusive jurisdiction of the Chosen Court, (ii) waives any objection to laying venue in any such proceeding in the Chosen Court, (iii) waives any objection that the Chosen Court is an inconvenient forum or does not have jurisdiction over any party and (iv) agrees that service of process upon such party in any such claim or cause of action will be effective if notice is given in accordance with this Agreement.

(k) Acceptance. The Participant hereby acknowledges receipt of a copy of the Plan and this Agreement. The Participant has read and understands the terms and provisions of the Plan and this Agreement, and accepts the PSUs subject to all of the terms and conditions of the Plan and this Agreement. In the event of a conflict between any term or provision contained in this Agreement and a term or provision of the Plan, the applicable term and provision of the Plan will govern and prevail.

Appendix A

PERFORMANCE MEASURES AND VESTING TERMS

Performance Measures. The Performance Measures associated with the PSUs are Three-Year Average Return on Average Net Tangible Assets *("ROANTA"),* as calculated utilizing the methodology and adjustments described in the definition below, and Three-Year Average Adjusted Free Cash Flow, as calculated utilizing the methodology and adjustments described in the definition below. After Three-Year Average ROANTA and Three-Year Average Adjusted Free Cash Flow are determined, a performance factor (the " *Performance Factor*") is applied, as set forth in the table below.

	THREE-YEAR AVERAGE ROANTA	***Performance Factor***					
Maximum	18.5%	100%	125%	150%	175%	200%	
	18.3%	75%	100%	125%	150%	175%	
Target	18.1%	50%	75%	100%	125%	150%	
	17.55%	25%	50%	75%	100%	125%	
Threshold	17.0%	12.5%	25%	50%	75%	100%	
	THREE-YEAR AVERAGE ADJUSTED FREE CASH FLOW	**$117MM**	**$127MM**	**$138MM**	**$145MM**	**$150MM**	
		Threshold		**Target**		**Maximum**	

1. *Determination of Earned PSUs.* The number of PSUs that are earned under this Appendix A will be determined by multiplying the Performance Factor by the Target Award.

2. *Rules for Determining the Performance Factor.* The following rules will apply in determining the Performance Factor:

2.1 If actual performance is below threshold for either Performance Measure, the Performance Factor will be zero percent (0%), and no PSUs will be earned.

2.2 If actual performance is above maximum for both Performance Measures, the Performance Factor will be (and will not exceed) two hundred percent (200%).

2.3 If actual performance is between the threshold and maximum benchmarks for Three-Year Average ROANTA and Three-Year Average Adjusted Free Cash Flow set forth in the chart above, then the Performance Factor will be determined by linear interpolation.

2.4 In calculating the Performance Factor, all percentages will be rounded to the nearest one-tenth ($1/10^{th}$) of one percent (1%). In calculating the number of PSUs that are earned under Section 1 of this Appendix A, the number of earned PSUs shall be rounded to the nearest whole PSU.

3. *Definition of Three-Year Average ROANTA*. ROANTA is defined as:

$$\frac{\underline{(\textit{Adjusted EBITDA} \textbf{ – Depreciation) * (1- Adjusted Tax Rate)}}}{\textbf{Average Investment (Average Net Working Capital + Average Net Property, Plant \& Equipment)}}$$

EBITDA consists of net income (loss) attributable to the Company before interest, taxes, depreciation and amortization. Adjusted EBITDA consists of EBITDA adjusted for (i) non-operating income or expense, (ii) the impact of certain non-cash, nonrecurring or other items included in net income (loss) and EBITDA that the Company does not consider indicative of its ongoing operating performance, and (iii) depreciation, amortization and interest of the Company's 50% share of the Zeolyst Joint Venture.

Adjusted Tax Rate – the tax rate effective for each tax jurisdiction. Tax rates are frozen at the assumed 2019 operating plan tax rates.

Average Net Working Capital – the sum of Accounts Receivable and Inventory, less Accounts Payable for the corresponding year.

Average Net Working Capital and Average Net Property, Plant & Equipment shall be calculated each year based upon the balances at the beginning and ending of each year.

Three-Year Average ROANTA shall be calculated as the simple average of the three annual ROANTA calculations.

4. *Three-Year Average Adjusted Free Cash Flow* is defined as:

Cash Flow from Operating Activities – Purchases of Property, Plant and Equipment + Proceeds from Asset Sales + appropriate addbacks with the following assumptions:

Cash taxes – excludes any U.S. Federal cash taxes for the period.

Foreign exchange rates – frozen using assumptions in the 2019 operating plan.

Three-Year Average Adjusted Free Cash Flow shall be calculated as the simple average of the three annual Adjusted Free Cash Flow calculations.

5. *Adjustments*. Certain adjustments may be made at the discretion of the Committee to the Average Three-Year ROANTA and the Three-Year Average Adjusted Free Cash Flow thresholds, targets and maximums as set forth in the table above in the event of the Company's acquisition or divestiture of an entity, business, or product line, or any capital market transactions including debt refinancings or equity offerings.

6. *Termination by Reason of Disability, Retirement, Good Reason, Termination by the Company without Cause or Death*. Upon a termination of the Participant's Service during the Performance Period by reason of Disability, Retirement (defined below), Good Reason (defined below), termination by the Company without Cause, or death, the PSUs shall be eligible to be earned and to vest as follows (and any PSUs that are not earned and do not vest under the circumstances described below will be forfeited and cancelled without payout of consideration therefor):

6.1 If the Participant's Service is terminated by the Company without Cause or due to his or her Disability, or if the Participate terminates his or her Service due to Retirement or Good Reason, in each case, before the end of the Performance Period, the PSUs will remain outstanding and will be eligible to be earned based on actual performance as determined under this Appendix A, subject to pro ration as provided for below, and to vest on the Performance Vesting Date. Any PSUs that are so earned will be pro rated by dividing the number of earned PSUs by a fraction, the numerator of which is the number of days the Participant actually worked in the Performance Period, and the denominator of which is the number of days in the Performance Period.

6.2 If the Participant's Service is terminated due to his or her death before the end of the Performance Period, upon such termination, a number of PSUs will be deemed earned and will vest equal to the Target Award multiplied by a fraction, the numerator of which is the number of days worked in the Performance Period, and the denominator which is the total number of days in the Performance Period.

6.3 For purposes of this Appendix A, "*Retirement*" means a termination of Service due to the voluntary resignation of the Participant, other than at a time when Cause exists, after attaining the age of 60 with a minimum of ten years of continued Service (for the avoidance of doubt, from the most recent hire date, including service with predecessor acquired entities).

6.4 For purposes of this Appendix A, "*Good Reason*" shall have the meaning set forth in any severance agreement between the Participant and the Company and/or any of its Subsidiaries to the extent that such severance agreement provides for the voluntary resignation of the Participant for "Good Reason".

7. *Change in Control.*

7.1 If a Change in Control occurs during the Performance Period, upon such Change in Control, a number of PSUs will be deemed earned and will vest as provided for in Section 7.2 below. Any PSUs that do not vest in connection with such Change in Control as provided for in this Section 7 will be forfeited and cancelled without payment of consideration therefor.

7.2 For purposes of determining the number of PSUs that vest in connection with a Change in Control, the Performance Factor shall be determined as otherwise set forth in Sections 2, 3 and 4 of this Appendix A, except that (i) the Performance

Period shall be deemed to have ended on (A) the date of the Change in Control, if the Change in Control occurs on the last date of a fiscal quarter, or (B) the last day of the fiscal quarter preceding the Change in Control if the Change in Control does not occur on the last day of a fiscal quarter, and (ii) if the date the Performance Period is deemed to have ended under clause (i) is not also the last day of a fiscal year, then the period between the last day of the Company's immediately preceding fiscal year and the deemed last day of the Performance Period (the "*Stub Period*") shall be deemed a fiscal year for purposes of this Appendix A and the Company's ROANTA and Free Cash Flow for such deemed fiscal year shall be annualized amounts based on the Company's actual ROANTA and Free Cash Flow for the Stub Period.

Exhibit 10.2

August 28, 2017

Mr. David Taylor
5022 Antler Circle
Emmaus, PA 18049

Dear David:

We are pleased to offer you (hereinafter referred to as "you", "your" or "Executive") the position of Senior Vice President, Strategic Development of PQ Corporation (the "Company"). In accordance with our discussions, set forth below are the basic terms and conditions of your employment.

1. Start Date. We look forward to a start date of September 1, 2017 (the "Start Date"). Your place of employment will be Malvern, Pennsylvania. You understand and agree that you shall frequently travel on behalf of the Company.

2. Base Salary. Your annual Base Salary shall be at the rate of $400,000 per year, payable pursuant to the Company's normal payroll practices. Your Base Salary may be adjusted from time to time on review by the Compensation Committee of the Board of Directors.

3. Annual Performance Bonus. For each calendar year of your employment, you shall have the opportunity to earn an annual bonus (the "Annual Performance Bonus") with a target bonus equal to 55% of Base Salary, based on achievement of annual target performance goals (based on EBITDA metrics or other financial metrics) established by the Board of Directors of the Company ("Board") or the Compensation Committee of the Board, and as further described in and governed by the PQ Corporation Incentive Plan ("PQIP"), as it may be amended from time to time. For 2017, your Annual Performance Bonus will be based on the EBITDA of both businesses and 55% of your base salary paid in 2017.

4. Benefits. You shall be entitled to participate in all employee benefit plans, practices and programs maintained by the Company, as in effect from time to time (collectively, "Employee Benefit Plans") to the extent consistent with applicable law and the terms of the applicable Employee Benefit Plans. The Company reserves the right to amend or cancel any Employee Benefit Plans at any time in its sole discretion, subject to the terms of such Employee Benefit Plans and applicable law.

5. Business Expenses. You shall be entitled to reimbursement for all reasonable and necessary out-of-pocket business expenses incurred by you in connection with the performance of your duties in accordance with the Company's expense reimbursement policies and procedures.

6. Vacation. Beginning in 2018, you shall be entitled to twenty-five (25) days of paid vacation per year, accruing in accordance with the Company's vacation policy.

7. Equity Participation. In the event of an IPO, you shall receive an Equity Grant as outlined on the term sheet previously provided to you.

8. Severance. The Company is in the process of developing a new severance plan. In the interim, if your employment is terminated by the Company without Cause, and subject to your execution of a General Release of Claims, you shall be entitled to receive continued Base Salary and health benefits at the active employee contribution rates for the 12 month period following the date of termination.

9. Confidentiality; Covenant Not to Compete. As a condition subsequent to the execution of this Agreement and a condition to the Equity Participation set forth in Section 7, and any severance set forth in Section 8, Executive must sign at the start of his employment a Confidentiality, Non-Competition, Non-Solicitation and Intellectual Property Agreement to be provided by the Company which, among other provisions, will contain a 24 month non-compete/non-solicitation provision.

10. Assignment and Binding Effect. This Agreement shall be binding upon and inure to the benefit of you and your heirs, executors, administrators, estate, beneficiaries, and legal representatives. Neither this Agreement nor any rights or obligations under this Agreement shall be assignable by the Executive. The Company may assign this Agreement without Executive's consent.

11. Choice of Law and Venue. Except for the terms and conditions of any Equity Participation as set forth in Section 7, which will be controlled by the language in any applicable plan documents relating to that Equity Participation, this Agreement shall be construed and interpreted in accordance with the laws of Pennsylvania. Each of the parties hereto agrees to the exclusive jurisdiction of the state and federal courts located in the Commonwealth of Pennsylvania for any and all actions between the parties. Any controversy or claim arising out of or relating to this Agreement or the branch thereof, whether involving remedies at law or in equity, shall be adjudicated in Pennsylvania.

12. Counterparts. This Agreement may be executed in any number of counterparts, each of which when so executed and delivered shall together constitute an original hereof.

13. Sections 280G and 409A of the Code. Notwithstanding anything to the contrary in this Agreement, the parties agree that this Agreement shall be interpreted to comply with or be exempt from Sections 280(g) and 409 of the Internal Revenue Code of 1986, as amended, as interpreted and applied by the Board.

This offer of employment, if accepted, does not constitute a contract of employment between PQ Corporation and you. You will be considered an employee at will. No commitment for employment for any specified duration (e.g. "lifetime", "permanent", or "as long as performance is satisfactory") shall be valid or binding on PQ unless it is expressly set forth in a written document and signed by you and the Chief Executive Officer of PQ Corporation. Any attempt to orally modify any of the terms of this offer of employment will have no effect.

We are pleased to offer you this opportunity. If you agree to the terms of this offer of employment, please sign and date where appropriate below and return a signed copy to me. We look forward to a positive response. Please contact me if you have any questions.

Sincerely,

PQ CORPORATION

By: /s/ William J. Sichko, Jr
Name: William J. Sichko, Jr.
Title: Chief Administrative Officer

Accepted: /s/ David Taylor   Date: August 30, 2017
David Taylor

cc: Dave Burford

Exhibit 10.3

CONSENT UNDER THE AUGUST 31, 2017 SEVERANCE AGREEMENT

This CONSENT UNDER THE AUGUST 31, 2017 SEVERANCE AGREEMENT (this "*Consent*") is made and entered into as of the 29th day of March, 2019 with reference to the Severance Agreement (the "*Agreement*") dated as of August 31, 2017, by and between PQ Corporation, a Pennsylvania corporation (the "*Company*") a wholly-owned subsidiary of PQ Group Holdings Inc., a Delaware corporation ("*Holdings"*), and Scott Randolph (the "*Executive*"). Any capitalized term not otherwise defined herein shall have the meaning ascribed to it in the Agreement.

WHEREAS, the Executive currently serves as Executive Vice President and Group President—Performance Materials and Chemicals;

WHEREAS, effective as of March 1, 2019, Executive has agreed to become, and consents to assuming, the role in Potter Industries, LLC, as its President, with the duties assigned to that job as have been or may be outlined to the Executive by the Chief Executive Officer of the Company (the "*2019 Change in Title and Responsibilities*"); and

WHEREAS, the 2019 Change in Title and Responsibilities may constitute a Good Reason termination event pursuant to subpart (A) of the Good Reason definition in Section 1.01 of the Agreement.

NOW, THEREFORE, in consideration of the covenants contained herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and intending to be legally bound hereby, the parties hereto agree and acknowledge as follows:

1. The Executive agrees that in exchange for the delay in the period under which he can consider a Good Reason termination as set forth in paragraph 2 below, he will not use in any way the 2019 Change in Title and Responsibilities as a means or basis to provide the Company a Termination Notice for a Good Reason termination (or otherwise claim a Good Reason termination under the Agreement with respect to the 2019 Change in Title and Responsibilities). The Executive also waives any time period provided for in the Agreement to consider the 2019 Change in Title and Responsibilities as it relates to a basis for Good Reason termination, except as set forth in paragraph 2 below. For the avoidance of doubt, nothing in this Agreement shall affect the Executive's right to claim a Good Reason termination or to provide the Company a Termination Notice for a Good Reason termination for any reason other than the 2019 Change in Title and Responsibilities.
2. In consideration for the Executive's delay of the time period and other promises in paragraphs 1 and 2 hereof, the Company agrees that beginning on January 15, 2020 and ending on January 31, 2020 (the "Window Period"), Executive shall have the right to make a claim for a Good Reason termination and to provide the Company a Termination Notice in accordance with the requirements of Sections 1.01 and 2.01 of the Agreement as a result of the 2019 Change in Title and Responsibilities. If such a claim is made, the Executive's separation of employment from the Company will be (unless otherwise agreed by the Company in writing) no sooner than March 1, 2020.

Executive acknowledges and agrees that the Window Period will be his only opportunity to make a claim for, and to provide a Termination Notice in connection with, a Good Reason termination resulting from the 2019 Change in Title and Responsibilities. No Good Reason termination will be effective under the Agreement, based on the 2019 Change in Title and Responsibilities, other than provided in this paragraph.

3. Other than as set forth in this Consent, the Agreement is unchanged and unamended, and remains in full force and effect.
4. The provisions of this Consent may be amended and waived only with the prior written consent of the Company and the Executive, and no course of conduct or failure or delay in enforcing the provisions of this Consent shall affect the validity, binding effect or enforceability of this Consent or any provision hereof.
5. This Consent shall be governed by and construed in accordance with the domestic laws of the Commonwealth of Pennsylvania without giving effect to any choice or conflict of law provision or rule that would cause the application of the laws of any jurisdiction other than the Commonwealth of Pennsylvania.
6. This Consent may be executed in counterparts, each of which shall be deemed an original and all of which together shall constitute one and the same instrument. The parties hereto agree to accept a signed electronic copy of this Consent as a fully binding original.

IN WITNESS WHEREOF, the parties hereto have executed this Consent as of the date first written above.

EXECUTIVE

/s/ Scott Randolph
Scott Randolph

PQ CORPORATION

By: /s/ Belgacem Chariag
Name: Belgacem Chariag
Title: President and CEO

Exhibit 31.1

CERTIFICATION OF CHIEF EXECUTIVE OFFICER
PURSUANT TO SECTION 302 OF THE
SARBANES-OXLEY ACT OF 2002

I, Belgacem Chariag, certify that:

1. I have reviewed this quarterly report on Form 10-Q of PQ Group Holdings Inc.;

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: May 10, 2019	/s/ BELGACEM CHARIAG
	Belgacem Chariag
	Chief Executive Officer, President and Director
	(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION OF CHIEF FINANCIAL OFFICER
PURSUANT TO SECTION 302 OF THE
SARBANES-OXLEY ACT OF 2002

I, Michael Crews, certify that:

1. I have reviewed this quarterly report on Form 10-Q of PQ Group Holdings Inc.;

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: May 10, 2019

/s/ MICHAEL CREWS

Michael Crews
Executive Vice President and Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

**CERTIFICATION OF CHIEF EXECUTIVE OFFICER
PURSUANT TO 18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002**

In connection with the quarterly report of PQ Group Holdings Inc. (the "Company") on Form 10-Q for the quarterly period ended March 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Belgacem Chariag, President and Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that to my knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: May 10, 2019	/s/ BELGACEM CHARIAG
	Belgacem Chariag
	Chief Executive Officer, President and Director
	(Principal Executive Officer)

Exhibit 32.2

CERTIFICATION OF CHIEF FINANCIAL OFFICER
PURSUANT TO 18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the quarterly report of PQ Group Holdings Inc. (the "Company") on Form 10-Q for the quarterly period ended March 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Michael Crews, Executive Vice President and Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that to my knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: May 10, 2019	/s/ MICHAEL CREWS
	Michael Crews
	Executive Vice President and Chief Financial Officer
	(Principal Financial Officer)