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 September 30, 2018

OR

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

For the transition period from to

Commission File Number: 001-38221

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 ☒

The number of shares of common stock outstanding as of November 2, 2018 was 135,590,622.

PQ GROUP HOLDINGS INC.

INDEX—FORM 10-Q
September 30, 2018

PART I—FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS (UNAUDITED).

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

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Sales	$ 427,203	$ 391,829	$ 1,228,113	$ 1,114,027
Cost of goods sold	319,703	289,270	934,088	821,342
Gross profit	107,500	102,559	294,025	292,685
Selling, general and administrative expenses	42,145	36,341	126,240	106,411
Other operating expense, net	16,501	19,833	41,688	47,156
Operating income	48,854	46,385	126,097	139,118
Equity in net (income) from affiliated companies	(5,605)	(10,257)	(31,123)	(24,879)
Interest expense, net	28,238	49,079	84,622	144,041
Debt extinguishment costs	864	453	6,743	453
Other expense, net	2,451	4,954	13,114	21,235
Income (loss) before income taxes and noncontrolling interest	22,906	2,156	52,741	(1,732)
Provision for income taxes	8,470	5,172	21,590	5,269
Net income (loss)	14,436	(3,016)	31,151	(7,001)
Less: Net income attributable to the noncontrolling interest	251	329	970	407
Net income (loss) attributable to PQ Group Holdings Inc.	$ 14,185	$ (3,345)	$ 30,181	$ (7,408)
Net income (loss) per share:				
Basic income (loss) per share	$ 0.11	$ (0.03)	$ 0.23	$ (0.07)
Diluted income (loss) per share	$ 0.11	$ (0.03)	$ 0.22	$ (0.07)
Weighted average shares outstanding:				
Basic	133,336,352	104,096,837	133,237,653	104,020,180
Diluted	134,576,162	104,096,837	134,223,628	104,020,180

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 September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Net income (loss)	$ 14,436	$ (3,016)	$ 31,151	$ (7,001)
Other comprehensive income (loss), net of tax:				
Pension and postretirement benefits	(52)	(20)	1,305	(223)
Net gain (loss) from hedging activities	370	(301)	3,106	(3,326)
Foreign currency translation	5,186	18,850	(15,636)	60,492
Total other comprehensive income (loss)	5,504	18,529	(11,225)	56,943
Comprehensive income	19,940	15,513	19,926	49,942
Less: Comprehensive income attributable to noncontrolling interests	1,218	82	1,697	661
Comprehensive income attributable to PQ Group Holdings Inc.	$ 18,722	$ 15,431	$ 18,229	$ 49,281

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)

	September 30, 2018	December 31, 2017
ASSETS		
Cash and cash equivalents	$ 56,684	$ 66,195
Receivables, net	230,388	193,456
Inventories	249,298	262,388
Prepaid and other current assets	39,264	26,929
Total current assets	575,634	548,968
Investments in affiliated companies	467,558	469,276
Property, plant and equipment, net	1,204,901	1,230,384
Goodwill	1,262,979	1,305,956
Other intangible assets, net	747,352	786,144
Other long-term assets	98,167	74,727
Total assets	$ 4,356,591	$ 4,415,455
LIABILITIES		
Notes payable and current maturities of long-term debt	$ 21,372	$ 45,166
Accounts payable	129,188	149,326
Accrued liabilities	91,510	93,917
Total current liabilities	242,070	288,409
Long-term debt, excluding current portion	2,147,086	2,185,320
Deferred income taxes	194,650	189,336
Other long-term liabilities	110,312	120,471
Total liabilities	2,694,118	2,783,536
Commitments and contingencies (Note 16)		
EQUITY		
Common stock ($0.01 par); authorized shares 450,000,000; issued shares 135,249,216 and 135,244,379 on September 30, 2018 and December 31, 2017, respectively; outstanding shares 135,206,108 and 135,244,379 on September 30, 2018 and December 31, 2017, respectively	1,352	1,352
Preferred stock ($0.01 par); authorized shares 50,000,000; no shares issued or outstanding on September 30, 2018 and December 31, 2017	—	—
Additional paid-in capital	1,667,036	1,655,114
Accumulated deficit	(2,596)	(32,777)
Treasury stock, at cost; shares 43,108 and 0 on September 30, 2018 and December 31, 2017, respectively	(768)	—
Accumulated other comprehensive income (loss)	(7,641)	4,311
Total PQ Group Holdings Inc. equity	1,657,383	1,628,000
Noncontrolling interest	5,090	3,919
Total equity	1,662,473	1,631,919
Total liabilities and equity	$ 4,356,591	$ 4,415,455

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	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	—	—	30,181	—	—	970	31,151
Other comprehensive income (loss)	—	—	—	—	(11,952)	727	(11,225)
Repurchase of common shares	—	—	—	(768)	—	—	(768)
Distributions to noncontrolling interests	—	—	—	—	—	(526)	(526)
Stock compensation expense	—	11,879	—	—	—	—	11,879
Shares issued under equity incentive plan	—	43	—	—	—	—	43
Balance, September 30, 2018	$ 1,352	$ 1,667,036	$ (2,596)	$ (768)	$ (7,641)	$ 5,090	$ 1,662,473

	Common stock	Additional paid-in capital	Accumulated deficit	Treasury stock, at cost	Accumulated other comprehensive income (loss)	Non-controlling interest	Total
Balance, December 31, 2016	$ 73	$ 1,167,137	$ (90,380)	$ (239)	$ (53,711)	$ 5,064	$ 1,027,944
Net income (loss)	—	—	(7,408)	—	—	407	(7,001)
Stock split and conversion	989	(1,228)	—	239	—	—	—
Other comprehensive income	—	—	—	—	56,689	254	56,943
Distributions to noncontrolling interests	—	—	—	—	—	(785)	(785)
Stock compensation expense	—	3,869	—	—	—	—	3,869
Balance, September 30, 2017	$ 1,062	$ 1,169,778	$ (97,788)	$ —	$ 2,978	$ 4,940	$ 1,080,970

See accompanying notes to condensed consolidated financial statements.

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

	Nine months ended September 30, 2018	Nine months ended September 30, 2017
Cash flows from operating activities:		
Net income (loss)	$ 31,151	$ (7,001)
Adjustments to reconcile net income (loss) to net cash provided by operating activities:		
Depreciation	99,491	89,987
Amortization	39,807	39,148
Acquisition accounting valuation adjustments on inventory sold	1,603	871
Amortization of deferred financing costs and original issue discount	4,629	6,626
Debt extinguishment costs	4,619	253
Foreign currency exchange loss	15,347	21,612
Pension and postretirement healthcare benefit expense	347	2,642
Pension and postretirement healthcare benefit funding	(6,415)	(7,525)
Deferred income tax provision (benefit)	1,494	(12,447)
Net loss on asset disposals	11,106	6,419
Stock compensation	11,879	3,869
Equity in net (income) from affiliated companies	(31,123)	(24,879)
Dividends received from affiliated companies	35,890	19,071
Net interest income on swaps designated as net investment hedges	(4,279)	—
Other, net	(6,473)	(3,243)
Working capital changes that provided (used) cash, excluding the effect of business combinations:		
Receivables	(43,106)	(28,900)
Inventories	8,778	4,897
Prepaids and other current assets	(1,555)	(6,000)
Accounts payable	(7,594)	(9,044)
Accrued liabilities	407	13,460
Net cash provided by operating activities	166,003	109,816
Cash flows from investing activities:		
Purchases of property, plant and equipment	(95,322)	(90,229)
Investment in affiliated companies	(5,000)	(9,000)
Loan receivable under the New Markets Tax Credit Arrangement	—	(6,221)
Business combinations, net of cash acquired	(1,006)	(41,572)
Net interest proceeds on swaps designated as net investment hedges	4,279	—
Other, net	1,142	491
Net cash used in investing activities	(95,907)	(146,531)
Cash flows from financing activities:		
Draw down of revolver	139,577	302,725
Repayments of revolver	(163,103)	(270,088)
Issuance of long-term debt	1,267,000	8,820
Debt issuance costs	(6,156)	(1,205)
Repayments of long-term debt	(1,313,832)	(10,289)
Distributions to noncontrolling interests	(526)	(785)
Repurchase of common shares	(768)	—
Other	43	—
Net cash (used in) provided by financing activities	(77,765)	29,178
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(1,557)	(6,402)
Net change in cash, cash equivalents and restricted cash	(9,226)	(13,939)
Cash, cash equivalents and restricted cash at beginning of period	67,243	85,077
Cash, cash equivalents and restricted cash at end of period	$ 58,017	$ 71,138

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") conducts operations throughtwo reporting segments: (1) Environmental Catalysts & Services ("EC&S"): a leading global innovator and producer of silica catalysts used in the production of high-density polyethylene ("HDPE"), methyl methacrylate ("MMA"), specialty zeolite-based catalysts sold to the emissions control industry, the petrochemical industry and other areas of the broader chemicals industry and a merchant sulfuric acid producer operating a network of plants serving a variety of end uses, including the oil refining, nylon, mining, general industrial and chemical industries; and (2) Performance Materials & Chemicals ("PM&C"): a fully integrated, global leader in silicate technology, producing sodium silicate, specialty silicas, zeolites, spray dry silicates, magnesium silicate, and other high performance chemical products used in a variety of end uses such as adsorbents for surface coatings, clarifying agents for beverages, cleaning and personal care products and engineered glass products for use in highway safety, polymer additives, metal finishing and electronics end uses.

Seasonal changes and weather conditions typically affect the Company's performance materials and refining services product groups. In particular, the Company's performance materials product group 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 product group 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 fourth quarters of the year, which can adversely affect the Company's liquidity and cash flows. Because of this seasonality associated with certain of the Company's product groups, 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, 2017. Other than the update to our accounting policies described inNote 3, 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 August 2017, the Financial Accounting Standards Board ("FASB") issued amendments related to hedge accounting. The amendments expand hedge accounting for non-financial and financial risk components and revise the measurement methodologies to better align with an entity's risk management activities. Separate presentation of hedge ineffectiveness is eliminated to provide greater transparency of the full impact of hedging by requiring presentation of the results of the hedged item and hedging instrument in a single financial statement line item. In addition, the amendments reduce complexity by simplifying the manner in which assessments of hedge effectiveness may be performed. The new guidance is effective for public companies for annual periods beginning after December 15, 2018, including interim periods within those years. Early adoption is permitted, and the guidance should be applied prospectively for the amended presentation and disclosure requirements, and through a cumulative-effect adjustment to beginning retained earnings for any cash flow and net investment hedges existing at the date of adoption. The Company early adopted the guidance effective January 1, 2018. The Company's cash flow hedges in place at the date of adoption yielded an immaterial amount of ineffectiveness; therefore, the Company did not reflect an adjustment to beginning retained earnings upon adoption. The amended presentation and disclosure requirements are reflected under the new guidance in Note 13 to these 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)

In May 2017, the FASB issued guidance to clarify which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting. Under the new guidance, an entity should account for the effects of a change in a share-based payment award using modification accounting unless the fair value, vesting conditions and classification as either a liability or equity are all the same with respect to the award immediately prior to modification and the modified award itself. The new guidance is effective for annual periods beginning after December 15, 2017, including interim periods within those years, and the new guidance should be applied prospectively to awards modified on or after the adoption date. The Company adopted the new guidance on January 1, 2018 as required, with no impact on the Company's condensed consolidated financial statements upon adoption.

In March 2017, the FASB issued guidance to improve the presentation of net periodic pension cost and net periodic postretirement benefit cost (collectively, "pension costs"). Under current GAAP, there are several components of pension costs which are presented net to arrive at pension costs as included in the income statement and disclosed in the notes. As part of this amendment to the existing guidance, the service cost component of pension costs will be bifurcated from the other components and included in the same line items of the income statement as compensation costs are reported. The remaining components will be reported together below operating income on the income statement, either as a separate line item or combined with another line item on the income statement and disclosed. Additionally, with respect to capitalization to inventory, fixed assets, etc., only the service cost component will be eligible for capitalization upon adoption of the guidance. The new guidance is effective for public companies for annual periods beginning after December 15, 2017, including interim periods within those years. The amendments should be applied retrospectively upon adoption with respect to the presentation of the service and other cost components of pension costs in the income statement, and prospectively for the capitalization of the service cost component in assets.

The Company adopted the new guidance on January 1, 2018 as required. Prior to the adoption of the guidance, the Company reflected its pension costs within cost of goods sold and selling, general and administrative expenses in the condensed consolidated statements of operations, depending on whether the costs were associated with employees involved in manufacturing or back office support functions. Under the new guidance, the service cost component of the Company's pension costs remained in the same line items of the condensed consolidated statements of operations, but the remaining components are now reported as part of nonoperating income in the other (income) expense, net line item of the condensed consolidated statements of operations. Although the guidance requires retrospective application upon adoption, a practical expedient permits the Company to use the amounts disclosed in its pension and other post-retirement benefit plan note as its basis of estimation for the prior comparative periods. The Company utilized the practical expedient, and $172 and $504 of a net pension benefit for the three and nine months ended September 30, 2017, respectively, was reclassified to other (income) expense, net. For the three and nine months ended September 30, 2018, the amount of pension costs included in other (income) expense, net was a net benefit of $803 and $2,572, respectively.

In January 2017, the FASB issued guidance that clarifies the definition of a business and provides revised criteria and a framework to determine whether an integrated set of assets and activities is a business. For public companies, the new guidance is effective for fiscal years beginning after December 15, 2017, including interim periods within those years. The Company adopted the new guidance on January 1, 2018 as required, with no impact on the Company's condensed consolidated financial statements upon adoption.

In November 2016, the FASB issued guidance which clarifies the classification and presentation of changes in restricted cash on the statement of cash flows. The updates in the guidance require that the statement of cash flows explain the change during the period in the total of cash, cash equivalents and restricted cash when reconciling the beginning-of-period and end-of-period total amounts. The updates also require a reconciliation between cash, cash equivalents and restricted cash presented on the balance sheet to the total of the same amounts presented on the statement of cash flows. For public companies, the new guidance is effective for fiscal years beginning after December 15, 2017 and interim periods within those years, and the new guidance should be applied retrospectively to each period presented.

The Company adopted the new guidance on January 1, 2018 as required. As of September 30, 2018 and 2017, the Company had $1,333 and $2,300, respectively, of restricted cash included in prepaid and other current assets on its condensed consolidated balance sheets related to its New Market Tax Credit financing arrangements as well as other small restricted cash balances. Changes in the Company's restricted cash balances prior to the adoption of the new guidance were reflected within cash flows from investing activities in the Company's condensed consolidated statements of cash flows. The prior comparative period in the Company's condensed consolidated statement of cash flows has been updated to conform to the new guidance. See Note 20 to these condensed consolidated financial statements for supplemental cash flow disclosures.

In August 2016, the FASB issued guidance which clarifies the classification of certain cash receipts and cash payments in the statement of cash flows, including debt prepayment or extinguishment costs and distributions from equity method investees. For public companies, the new guidance is effective for fiscal years beginning after December 15, 2017, and interim periods within those fiscal years, and the new guidance should be applied retrospectively to each period presented. The Company adopted the new guidance on January 1, 2018 as required. There was no impact to the Company's condensed consolidated statement of cash flows for the nine months ended September 30, 2017. The Company applied the new guidance to the term loan refinancing that occurred during the nine months ended September 30, 2018; see Note 12 to these condensed consolidated financial statements for further information on the debt refinancing transaction. There were no other items in the new guidance which necessitated a change in the Company's reporting in its condensed consolidated statements of cash flows for the nine months ended September 30, 2018 or 2017.

In May 2014, the FASB issued accounting guidance (with subsequent targeted amendments) to significantly enhance comparability of revenue recognition practices across entities, industries, jurisdictions and capital markets. The core principle of the guidance is that revenue recognized from a transaction or event that arises from a contract with a customer should reflect the consideration to which an entity expects to be entitled in exchange for goods or services provided. To achieve that core principle, the new guidance sets forth a five-step revenue recognition model that will need to be applied consistently to all contracts with customers, except those that are within the scope of other topics in the Accounting Standards Codification ("ASC"). Also required are enhanced disclosures to help users of financial statements better understand the nature, amount, timing and uncertainty of revenues and cash flows from contracts with customers. The enhanced disclosures include qualitative and quantitative information about contracts with customers, significant judgments made in applying the revenue guidance, and assets recognized related to the costs to obtain or fulfill a contract. For public companies, the new requirements are effective for annual reporting periods beginning after December 15, 2017, including interim periods within those years. The Company reviewed its key revenue streams and assessed the underlying customer contracts within the framework of the new guidance. The Company evaluated the key aspects of its revenue streams for impact under the new guidance and performed a detailed analysis of its customer agreements to quantify the changes under the guidance. The Company concluded that the guidance did not have a material impact on its existing revenue recognition practices upon adoption on January 1, 2018. The Company implemented the guidance under the modified retrospective transition method of adoption. Comparative information has not been restated and continues to be reported under the accounting standards in effect for those periods. The impact of adoption of the new revenue recognition guidance was immaterial for the nine months ended September 30, 2018, and there was no transition adjustment required upon adoption. See Note 3 to these condensed consolidated financial statements for additional disclosures required by the new guidance.

Accounting Standards Not Yet Adopted

In August 2018, the FASB issued guidance which will align the requirements for capitalizing implementation costs incurred in a cloud computing arrangement (i.e., a hosting arrangement) that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software. Capitalized implementation costs related to a hosting arrangement that is a service contract will be amortized over the term of the hosting arrangement, beginning when the module or component of the hosting arrangement is ready for its intended use. The guidance is effective for fiscal years beginning after December 15, 2019, including all interim periods within that fiscal year. The Company is currently evaluating the effect that the new guidance would have on its consolidated financial statements.

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 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 is currently evaluating the effect that the new guidance would have on its consolidated financial statements.

In February 2018, the FASB issued guidance which will permit entities to make an election to reclassify income tax effects stranded in accumulated other comprehensive income ("AOCI") to 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, with early adoption permitted in any interim period for which the financial statements have not yet been issued. 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. The Company is evaluating the impact that the new guidance will have on its consolidated financial statements. If the Company makes the election to reclassify the stranded income tax effects from AOCI, it may do so using one of two transition methods: restrospectively, or at the beginning of the period of adoption.

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

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.

In February 2016, the FASB issued guidance (with subsequent targeted amendments) that modifies the accounting for leases. Under the new guidance, a lessee will recognize assets and liabilities for most leases (including those classified under existing GAAP as operating leases, which based on current standards are not reflected on the balance sheet), but will recognize expenses similar to current lease accounting. For public companies, the new guidance is effective for fiscal years beginning after December 15, 2018, including interim periods within those years. Early adoption is permitted. The new guidance must be adopted using a modified retrospective transition method. The Company can choose to apply the new guidance at the beginning of the earliest period presented in the financial statements, or at the date of adoption, with a cumulative-effect adjustment to the opening balance of retained earnings. The Company has operating lease agreements for which it expects to recognize right of use assets and corresponding liabilities on its balance sheet upon adoption of the new guidance. The Company has prepared a detailed plan to implement the new guidance, gathered the information related to its current lease population, and is assessing its leases in the context of the new framework. The Company is working with a vendor to implement a lease management system which will assist in delivering the required accounting changes. The Company is currently evaluating the impact that the new guidance will have on its consolidated financial statements, business processes, systems and control environment. The Company does not plan to implement the guidance prior to the required adoption date of January 1, 2019, and the Company plans to initially apply the transition requirements of the guidance at the date of adoption.

3. Revenue from Contracts with Customers:

Revenue Recognition Model

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

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

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

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

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

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

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. Other than trade accounts receivable and customer return accruals, the Company has not recorded any additional contract assets or contract liabilities on its condensed consolidated balance sheet as of September 30, 2018.

Practical Expedients and Accounting Policy Elections

The Company has elected to use certain practical expedients and has made certain accounting policy elections as permitted under the new revenue recognition guidance. Certain of the Company's contracts with customers are based on an individual purchase order; thus, the duration of these contracts are for one year or less. The Company has made an accounting policy election to omit certain disclosures related to remaining performance obligations for contracts which have an initial term of one year or less.

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When the Company performs shipping and handling activities after the transfer of control to the customer (e.g. when control transfers prior to delivery), they are considered fulfillment activities as opposed to separate performance obligations, and the Company recognizes revenue upon the transfer of control to the customer. Accordingly, the costs associated with these shipping and handling activities are accrued when the related revenue is recognized under the Company’s policy election. The Company expenses incremental costs of obtaining a contract as incurred if the expected amortization period of the asset that the Company would have recognized is one year or less. Sales, value added and other taxes the Company collects concurrent with revenue producing activities are excluded from revenues.

Disaggregated Revenue

The Company’s primary means of disaggregating revenues is by product group, 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

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The following tables disaggregate the Company's sales, by segment and end use, for thethree and nine months ended September 30, 2018:

	Three months ended September 30, 2018		
	Environmental Catalysts & Services	Performance Materials & Chemicals	Total
Industrial & process chemicals	$ 21,027	$ 65,070	$ 86,097
Fuels & emission control [1]	66,095	—	66,095
Packaging & engineered plastics	32,983	31,848	64,831
Highway safety & construction [1]	—	105,204	105,204
Consumer products	—	67,138	67,138
Natural resources	19,611	19,059	38,670
Total	139,716	288,319	428,035
Inter-segment sales eliminations	(832)	—	(832)
Total segment sales	$ 138,884	$ 288,319	$ 427,203

	Nine months ended September 30, 2018		
	Environmental Catalysts & Services	Performance Materials & Chemicals	Total
Industrial & process chemicals	$ 55,401	$ 216,152	$ 271,553
Fuels & emission control [1]	182,304	—	182,304
Packaging & engineered plastics	95,145	97,622	192,767
Highway safety & construction [1]	—	263,095	263,095
Consumer products	—	209,256	209,256
Natural resources	53,471	58,177	111,648
Total	386,321	844,302	1,230,623
Inter-segment sales eliminations	(2,510)	—	(2,510)
Total segment sales	$ 383,811	$ 844,302	$ 1,228,113

(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.

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.

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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 of September 30, 2018 and December 31, 2017, and indicates the fair value hierarchy of the valuation techniques the Company utilized to determine such fair value.

	9/30/2018	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Derivative contracts (Note 13)	$ 13,486	$ —	$ 13,486	$ —
Restoration plan assets	4,865	4,865	—	—
Total	$ 18,351	$ 4,865	$ 13,486	$ —
Liabilities:				
Derivative contracts (Note 13)	$ 114	$ —	$ 114	$ —
Total	$ 114	$ —	$ 114	$ —

	12/31/2017	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Derivative contracts (Note 13)	$ 1,043	$ —	$ 1,043	$ —
Restoration plan assets	5,576	5,576	—	—
Total	$ 6,619	$ 5,576	$ 1,043	$ —
Liabilities:				
Derivative contracts (Note 13)	$ 448	$ —	$ 448	$ —
Total	$ 448	$ —	$ 448	$ —

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 operations. Unrealized gains and losses associated with the underlying stock and fixed income mutual funds were immaterial as of September 30, 2018 and December 31, 2017, 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.

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5. Accumulated Other Comprehensive Income:

The following tables present the tax effects of each component of other comprehensive income (loss) for the three and nine months ended September 30, 2018 and 2017:

	Three months ended September 30,					
	2018			2017		
	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	$ (69)	$ 17	$ (52)	$ (33)	$ 13	$ (20)
Benefit plans, net	(69)	17	(52)	(33)	13	(20)
Net gain (loss) from hedging activities	494	(124)	370	(486)	185	(301)
Foreign currency translation	3,391	1,795	5,186	21,343	(2,493)	18,850
Other comprehensive income	$ 3,816	$ 1,688	$ 5,504	$ 20,824	$ (2,295)	$ 18,529

	Nine months ended September 30,					
	2018			2017		
	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	$ 1,740	$ (435)	$ 1,305	$ (261)	$ 38	$ (223)
Benefit plans, net	1,740	(435)	1,305	(261)	38	(223)
Net gain (loss) from hedging activities	4,143	(1,037)	3,106	(5,373)	2,047	(3,326)
Foreign currency translation	(16,442)	806	(15,636)	69,202	(8,710)	60,492
Other comprehensive income (loss)	$ (10,559)	$ (666)	$ (11,225)	$ 63,568	$ (6,625)	$ 56,943

The following table presents the change in accumulated other comprehensive income, net of tax, by component for the nine months ended September 30, 2018 and 2017:

	Defined benefit and other postretirement plans	Net gain (loss) from hedging activities	Foreign currency translation	Total
December 31, 2017	$ 7,412	$ 967	$ (4,068)	$ 4,311
Other comprehensive income (loss) before reclassifications	1,360	2,906	(16,363)	(12,097)
Amounts reclassified from accumulated other comprehensive income(1)	(55)	200	—	145
Net current period other comprehensive income (loss)	1,305	3,106	(16,363)	(11,952)
September 30, 2018	$ 8,717	$ 4,073	$ (20,431)	$ (7,641)
December 31, 2016	$ 7,513	$ 4,557	$ (65,781)	$ (53,711)
Other comprehensive income (loss) before reclassifications	(126)	(3,404)	60,238	56,708
Amounts reclassified from accumulated other comprehensive income(1)	(97)	78	—	(19)
Net current period other comprehensive income (loss)	(223)	(3,326)	60,238	56,689
September 30, 2017	$ 7,290	$ 1,231	$ (5,543)	$ 2,978

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

The following table presents the reclassifications out of accumulated other comprehensive income for the three and nine months ended September 30, 2018 and 2017.

Details about Accumulated Other Comprehensive Income Components	Amount Reclassified from Accumulated Other Comprehensive Income(a)				Affected Line Item in the Statements of Operations
	Three months ended September 30,		Nine months ended September 30,		
	2018	2017	2018	2017	
Defined benefit and other postretirement plans					
Amortization of prior service credit	$ (40)	$ (19)	$ (79)	$ (58)	(b)
Amortization of net (gain) loss	2	(19)	5	(58)	(b)
	(38)	(38)	(74)	(116)	Total before tax
	13	6	19	19	Tax expense (benefit)
	$ (25)	$ (32)	$ (55)	$ (97)	Net of tax
Net (gain) loss from hedging activities					
Interest rate caps	$ 71	$ 13	$ 164	$ 22	Interest expense
Natural gas swaps	30	94	101	104	Cost of goods sold
	101	107	265	126	Total before tax
	(24)	(41)	(65)	(48)	Tax expense (benefit)
	$ 77	$ 66	$ 200	$ 78	Net of tax
Total reclassifications for the period	$ 52	$ 34	$ 145	$ (19)	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 (seeNote 15 to these condensed consolidated financial statements for additional details).

6. Acquisition:

Acquisitions are accounted for using the acquisition method of accounting. Under the acquisition method, the purchase price is allocated to the identifiable net assets acquired based on the fair values of the identifiable assets acquired and liabilities assumed as of the acquisition date. The excess of the purchase price over the fair values of the identifiable net assets acquired is recorded as goodwill.

On June 12, 2017 (the “Acquisition Date”), the Company acquired the facilities of Sovitec Mondial S.A. (“Sovitec”) located in Belgium, Spain, Argentina and France as part of a stock transaction (the “Acquisition”) for $41,572 in cash, excluding assumed debt. Based in Fleurus, Belgium, Sovitec is a high quality producer of engineered glass products used in transportation safety, metal finishing and polymer additives. The results of operations of Sovitec have been included in the Company’s consolidated financial statements since the Acquisition Date.

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The following table sets forth the calculation and allocation of the purchase price to the identifiable net assets acquired with respect to the Acquisition, which was complete as of March 31, 2018.

	Provisional Purchase Price Allocation	Adjustments	Purchase Price Allocation
Total consideration, net of cash acquired	$ 41,572	$ —	$ 41,572
Recognized amounts of identifiable assets acquired and liabilities assumed:			
Receivables	$ 14,305	$ —	$ 14,305
Inventories	7,645	1,603	9,248
Prepaid and other current assets	400	—	400
Property, plant and equipment	9,020	15,960	24,980
Other intangible assets	—	5,753	5,753
Other long-term assets	129	15,921	16,050
Fair value of assets acquired	31,499	39,237	70,736
Current debt	(6,420)	—	(6,420)
Accounts payable	(10,748)	—	(10,748)
Long-term debt	(10,189)	—	(10,189)
Deferred income taxes	—	(4,426)	(4,426)
Other long-term liabilities	(154)	—	(154)
Fair value of net assets acquired	3,988	34,811	38,799
Goodwill	37,584	(34,811)	2,773
	$ 41,572	$ —	$ 41,572

As of the Acquisition Date, the fair value of accounts receivable approximated historical cost. The gross contractual amount of accounts receivable at the Acquisition Date was $14,607, of which $302 was deemed uncollectible. The fair value of inventory is defined as estimated selling prices less the sum of (a) costs of disposal and (b) a reasonable profit allowance for the selling effort of the acquiring entity, which was $1,603 higher than the historical cost.

The Company's cost of goods sold for the nine months ended September 30, 2018 includes a pre-tax charge of $1,603 relating to the step-up on inventory, $108 of additional amortization expense related to identified intangible assets and $421 of additional depreciation expense, which would have been recorded during the year ended December 31, 2017 if the adjustments to the provisional amounts had been recognized as of the Acquisition Date. The Company's other expense, net for the nine months ended September 30, 2018 includes additional amortization expense related to identified intangible assets of $101 which would have been recorded during the year ended December 31, 2017 if the adjustments to the provisional amounts had been recognized as of the Acquisition Date. The Company's provision for income taxes for the nine months ended September 30, 2018 includes an additional $990 tax benefit associated with the year ended December 31, 2017, to reflect impacts as if the adjustments to the provisional amounts had been recognized as of the Acquisition Date. This amount is primarily a result of opening balance sheet adjustments recorded during the nine months ended September 30, 2018, which needed to be re-measured through the income statement because of income tax rate changes that occurred subsequent to the Acquisition Date.

The Company believes that the Acquisition will enable it to offer a more comprehensive, cost-effective and high-quality portfolio of products and services to its customers worldwide when, combined with anticipated synergies within its existing business, contributed to a total purchase price that resulted in the recognition of goodwill. All of the goodwill was assigned to the Company's PM&C reporting segment. The goodwill associated with the Acquisition is not deductible for tax purposes.

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The valuation of the intangible assets acquired and the related weighted-average amortization periods are as follows:

	Amount	Weighted-Average Expected Useful Life (in years)
Intangible assets subject to amortization:		
Trademarks	$ 1,767	11
Technical know-how	1,892	11
Total intangible assets subject to amortization	3,659	
Trade names, not subject to amortization	2,094	Indefinite
Total	$ 5,753	

Net sales and net income generated by the Sovitec legal entities included in the Company's condensed consolidated statements of operations are as follows:

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Net sales	$ 16,455	$ 13,490	$ 46,702	$ 17,194
Net income	386	644	1,200	1,148

Acquisition costs were immaterial for the three and nine months ended September 30, 2018 and were $737 and $2,065 for the three and nine months ended September 30, 2017, respectively. Acquisition costs are included in other operating expense, net in the Company's condensed consolidated statements of operations.

Pro Forma Financial Information

The unaudited pro forma financial information for the nine months ended September 30, 2017 has been derived from the Company's historical consolidated financial statements and prepared to give effect to the Acquisition, assuming that the Acquisition occurred on January 1, 2016. The unaudited pro forma consolidated results of operations are provided for illustrative purposes only and are not indicative of the Company's actual consolidated results of operations had the Acquisition been made as of January 1, 2016. The unaudited pro forma results of operations do not reflect any operating efficiencies or potential cost savings which may result from the Acquisition.

	Unaudited
	Nine months ended September 30, 2017
Pro forma sales	$ 1,130,454
Pro forma net loss	(6,865)
Pro forma net loss attributable to PQ Group Holdings Inc.	(7,272)
Pro forma basic and diluted net loss per share	$ (0.07)

The results of operations for the three months ended September 30, 2017 and for the three and nine months ended September 30, 2018 include the operating results of the combined company for the full period and therefore, there is no pro forma presentation for such periods included in the table above.

Certain non-recurring charges included in the Company's results of operations for the nine months ended September 30, 2017 were allocated to the respective prior year periods for pro forma purposes. For the nine months ended September 30, 2017, non-recurring charges allocated to the prior year period include transaction fee charges of $2,065 which were excluded from pro forma net loss. Also included in pro forma net loss for the nine months ended September 30, 2017 is amortization expense of $272 and depreciation expense of $521 associated with the fair value step-up of identifiable intangible assets and property, plant and equipment, respectively.

7. Goodwill:

The change in the carrying amount of goodwill for the nine months ended September 30, 2018 is summarized as follows:

	Performance Materials & Chemicals	Environmental Catalysts & Services	Total
Balance as of December 31, 2017	$ 914,623	$ 391,333	$ 1,305,956
Goodwill recognized	649	—	649
Goodwill adjustments[1]	(34,811)	—	(34,811)
Foreign exchange impact	(7,816)	(999)	(8,815)
Balance as of September 30, 2018	$ 872,645	$ 390,334	$ 1,262,979

(1) Represents the measurement period adjustments on the net assets acquired as part of the Acquisition (see Note 6 to these condensed consolidated financial statements for further information regarding the Acquisition).

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8. Other Operating Expense, Net:

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

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Amortization expense	$ 8,711	$ 9,146	$ 26,404	$ 23,270
Transaction and other related costs[1]	215	966	827	5,295
Restructuring and other related costs (Note 18)	273	4,106	403	5,578
Net loss on asset disposals[2]	5,202	3,494	11,106	6,419
Management advisory fees	—	1,250	—	3,750
Insurance proceeds[2]	—	—	(1,557)	—
Other, net	2,100	871	4,505	2,844
	$ 16,501	$ 19,833	$ 41,688	$ 47,156

(1) Transaction and other related costs for the three and nine months ended September 30, 2018 and 2017 primarily include transaction costs associated with the Company's initial public offering (exclusive of the direct costs recorded in stockholders' equity net of the proceeds from the offering) and the Acquisition (see Note 6 to these condensed consolidated financial statements for further information).

(2) During the nine months ended September 30, 2018, the Company recognized $2,500 of insurance proceeds in its condensed consolidated statement of operations related to the Company's claim for losses sustained during Hurricane Harvey in August 2017. For the nine months ended September 30, 2018, $1,557 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 $736 represented proceeds in excess of the Company's property losses which was recorded as a non-operating gain in other expense, net, in the Company's consolidated statement of operations.

9. Inventories:

Inventories are classified and valued as follows:

	September 30, 2018	December 31, 2017
Finished products and work in process	$ 189,004	$ 199,919
Raw materials	60,294	62,469
	$ 249,298	$ 262,388
Valued at lower of cost or market:		
LIFO basis	$ 153,093	$ 162,315
Valued at lower of cost and net realizable value:		
FIFO or average cost basis	96,205	100,073
	$ 249,298	$ 262,388

10. 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 of September 30, 2018 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%

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

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Net sales	$ 74,088	$ 83,983	$ 271,562	$ 225,770
Gross profit	24,495	33,276	100,686	91,862
Operating income	14,594	22,713	72,257	60,408
Net income	14,545	23,819	72,204	63,663

(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 September 30, 2018 and December 31, 2017 includes net purchase accounting fair value adjustments of $259,725 and $264,700, respectively, related to the combination of the businesses of PQ Holdings Inc. and Eco Services Operations LLC in May 2016, 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 $1,658 and $4,975 of amortization expense related to purchase accounting fair value adjustments for thethree and nine months ended September 30, 2018, respectively. Consolidated equity in net income from affiliates is net of $1,658 and $6,941 of amortization expense related to purchase accounting fair value adjustments for thethree and nine months ended September 30, 2017.

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11. Property, Plant and Equipment:

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

	September 30, 2018	December 31, 2017
Land	$ 191,883	$ 191,006
Buildings	210,314	200,054
Machinery and equipment	1,082,219	1,005,025
Construction in progress	114,042	145,414
	1,598,458	1,541,499
Less: accumulated depreciation	(393,557)	(311,115)
	$ 1,204,901	$ 1,230,384

Depreciation expense was $30,626 and $31,957 for the three months ended September 30, 2018 and 2017, respectively. Depreciation expense was $99,491 and $89,987 for the nine months ended September 30, 2018 and 2017, respectively.

12. Long-term Debt:

The summary of long-term debt is as follows:

	September 30, 2018	December 31, 2017
Term Loan Facility (U.S. dollar denominated)	$ —	$ 916,153
Term Loan Facility (Euro denominated)	—	335,808
New Term Loan Facility	1,212,498	—
6.75% Senior Secured Notes due 2022	625,000	625,000
5.75% Senior Unsecured Notes due 2025	300,000	300,000
ABL Facility	—	25,000
Other	68,361	68,318
Total debt	2,205,859	2,270,279
Original issue discount	(20,050)	(18,390)
Deferred financing costs	(17,351)	(21,403)
Total debt, net of original issue discount and deferred financing costs	2,168,458	2,230,486
Less: current portion	(21,372)	(45,166)
Total long-term debt, excluding current portion	$ 2,147,086	$ 2,185,320

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 September 30, 2018 and December 31, 2017, the fair value of the senior secured term loans and senior secured and unsecured notes was higher than book value by $26,578 and $59,319, 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).

New Term Loan Facility

On February 8, 2018 (the "Closing Date"), PQ Corporation (the "Borrower"), an indirect, wholly owned subsidiary of the Company, refinanced its existing senior secured term loan facility with a new $1,267,000 senior secured term loan facility (the "New Term Loan Facility") by entering into a third amendment agreement (the "Amendment"), which amended and restated the Term Loan Credit Agreement dated as of May 4, 2016, among the Borrower, CPQ Midco I Corporation, Credit Suisse AG, Cayman Island Branch, as administrative agent and collateral agent, and the lenders and the other parties party thereto from time to time (as amended prior to the Amendment, the "Existing Credit Agreement" and as amended and restated by the Amendment, the "New Credit Agreement").

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The New Term Loan Facility bears interest at a floating rate of LIBOR plus2.50% per annum and matures in February 2025, effectively lowering the interest rate margin, eliminating the interest rate floor that existed on the Euro-denominated tranche prior to refinancing, and extending the maturity of its senior secured term loan facility. The New Term Loan Facility requires scheduled quarterly amortization payments, each equal to 0.25% of the original principal amount of the loans under the New Term Loan Facility. Outstanding loans under the New Term Loan Facility may be voluntarily prepaid at any time without premium or penalty. In addition, the New Credit Agreement contains customary mandatory prepayments, affirmative and negative covenants and events of default, all of which are substantially the same as under the Existing Credit Agreement.

The Company recorded $2,124 of new creditor and third-party financing costs as debt extinguishment costs during the nine months endedSeptember 30, 2018. In addition, previous unamortized deferred financing costs of $1,403 and original issue discount of $2,352 associated with the previously outstanding debt were written off as debt extinguishment costs during the nine months ended September 30, 2018.

On the Closing Date, the Company also entered into multiple cross currency swap arrangements to hedge foreign currency risk. The swaps are designed to enable the Company to effectively convert a portion of its fixed-rate U.S. dollar denominated debt obligations into approximately €280,000 equivalent ($324,940 as of September 30, 2018). The swaps are expected to mature in February 2023.

During the quarter ended September 30, 2018, the Company prepaid $45,000 of outstanding principal balance on the New Term Loan Facility. The Company wrote off $258 of previously unamortized deferred financing costs and original issue discount of$606 as debt extinguishment costs for the three and nine months ended September 30, 2018.

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 consolidated statements of operations in the period in which the associated inventory is sold. As of September 30, 2018, the Company's natural gas swaps had a remaining notional quantity of 4.6 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 consolidated statements of operations 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 September 30, 2018 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 connection with the February 2018 term loan refinancing (see Note 12 to these condensed consolidated financial statements), the Company entered into multiple cross currency interest rate swap arrangements with an aggregate notional amount of €280,000 ($324,940 as of September 30, 2018) 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 September 30, 2018 and December 31, 2017 are shown below:

	Balance sheet location	September 30, 2018	December 31, 2017
Derivative assets:			
Derivatives designated as cash flow hedges:			
Natural gas swaps	Prepaid and other current assets	$ 248	$ —
Interest rate caps	Prepaid and other current assets	1,825	$ 44
Interest rate caps	Other long-term assets	2,614	999
		4,687	1,043
Derivatives designed as net investment hedges:			
Cross currency swaps	Prepaid and other current assets	6,894	—
Cross currency swaps	Other long-term assets	1,905	—
		8,799	—
Total derivative assets		$ 13,486	$ 1,043
Derivative liabilities:			
Derivatives designated as cash flow hedges:			
Natural gas swaps	Accrued liabilities	$ —	$ 318
Natural gas swaps	Other long-term liabilities	114	130
Total derivative liabilities		$ 114	$ 448

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The following tables show the effect of the Company's derivative instruments designated as cash flow hedges on accumulated other comprehensive income ("AOCI") for the three and nine months ended September 30, 2018 and 2017:

		Three months ended September 30,			
		2018		2017	
	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	$ 93	$ (71)	$ (1,842)	$ (13)
Natural gas swaps	Cost of goods sold	300	(30)	(28)	(94)
		$ 393	$ (101)	$ (1,870)	$ (107)

		Nine months ended September 30,			
		2018		2017	
	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	$ 3,396	$ (164)	$ (4,712)	$ (22)
Natural gas swaps	Cost of goods sold	482	(101)	(787)	(104)
		$ 3,878	$ (265)	$ (5,499)	$ (126)

The following tables show the effect of the Company's cash flow hedge accounting on the condensed consolidated statements of operations for thethree and nine months ended September 30, 2018 and 2017:

	Location and amount of gain (loss) recognized in income on cash flow hedging relationships			
	Three months ended September 30,			
	2018		2017	
	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 operations in which the effects of cash flow hedges are recorded	$ (319,703)	$ (28,238)	$ (289,270)	$ (49,079)
The effects of cash flow hedging:				
Gain (loss) on cash flow hedging relationships:				
Interest contracts:				
Amount of gain (loss) reclassified from AOCI into income	—	(71)	—	(13)
Commodity contracts:				
Amount of gain (loss) reclassified from AOCI into income	(30)	—	(94)	—

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	Location and amount of gain (loss) recognized in income on cash flow hedging relationships			
	Nine months ended September 30,			
	2018		2017	
	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 operations in which the effects of cash flow hedges are recorded	(934,088)	(84,622)	(821,342)	(144,041)
The effects of cash flow hedging:				
Gain (loss) on cash flow hedging relationships:				
Interest contracts:				
Amount of gain (loss) reclassified from AOCI into income	—	(164)	—	(22)
Commodity contracts:				
Amount of gain (loss) reclassified from AOCI into income	(101)	—	(104)	—

The following tables show the effect of the Company's net investment hedges on AOCI and the condensed consolidated statements of operations for the three and nine months ended September 30, 2018 and 2017:

	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 September 30,			Three months ended September 30,			Three months ended September 30,	
	2018	2017		2018	2017		2018	2017
Cross currency swaps	$ 1,138	$ —	Gain (loss) on sale of subsidiary	$ —	$ —	Interest (expense) income	$ 2,271	$ —

	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)	
	Nine months ended September 30,			Nine months ended September 30,			Nine months ended September 30,	
	2018	2017		2018	2017		2018	2017
Cross currency swaps	$ 8,799	$ —	Gain (loss) on sale of subsidiary	$ —	$ —	Interest (expense) income	$ 5,662	$ —

The amount of unrealized losses in AOCI that are expected to be reclassified to the consolidated statement of operations over the next twelve months is $294 as of September 30, 2018.

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14. Income Taxes:

The effective income tax rate for the three months ended September 30, 2018 was 37.0% compared to 239.9% for the three months ended September 30, 2017. The effective income tax rate for the nine months ended September 30, 2018 was 40.9% compared to (304.2)% for the nine months ended September 30, 2017. The Company's effective income tax rate has fluctuated primarily because of changes in income mix (including the effect of loss companies), the impacts of recently enacted U.S. tax law, the recording of provision to return adjustments in the U.S. 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 nine months ended September 30, 2018 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, the recording of provision to return adjustments in the U.S., discrete impacts of opening balance sheet adjustments related to the Sovitec acquisition and state taxes.

The difference between the U.S. federal statutory income tax rate and the Company's effective income tax rate for nine months ended September 30, 2017 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.

On December 22, 2017, the U.S. government enacted tax reform legislation (the Tax Cuts and Jobs Act of 2017, or "TCJA") that introduced significant changes to the taxation of multination corporations. As a result of the TCJA, at December 31, 2017 the Company recorded a provisional tax benefit of $64,343 related to the corporate rate reduction from 35% to 21%, a provisional tax expense of $43,000 related to the one-time mandatory transition tax and a provisional tax benefit of $25,196 related to undistributed foreign earnings that are no longer intended to be permanently reinvested.

Due to the complexities involved in accounting for the enactment of the TCJA, the SEC staff issued Staff Accounting Bulletin ("SAB") No. 118, which allowed the Company to record provisional amounts in earnings for the year ended December 31, 2017. SAB No. 118 provides that where reasonable estimates can be made, provisional accounting should be employed with respect to such estimates and when no reasonable estimate can be made, the provisional accounting may be based on the tax law in effect prior to the TCJA. The income tax provision for the nine months ended September 30, 2018 reflects a discrete tax benefit with respect to a $1,459 adjustment made to our year-end provisional estimate of the one-time mandatory transition tax. The Company will continue to analyze the effects of the TCJA on its financial statements. Additional revised impacts with respect to the TCJA will be recorded as they are identified during the allowed measurement period prescribed by SAB No. 118. This measurement period extends up to one year from the enactment date.

The final impact of the TCJA may differ from the provisional amounts that have been recognized, possibly materially, due to, among other items, changes in the Company's interpretation of the TCJA, legislative or administrative actions taken to clarify the intent of the statutory language which may differ from the Company's current interpretation, any changes in accounting standards for income taxes made in response to the TCJA or any updates or changes to original estimates used to compute the provisional amounts. Updates to original estimates may include changes to earnings estimates as well as applicable foreign exchange rates.

The 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 recent 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 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 and nine months ended September 30, 2018, the Company has continued to incorporate an estimate of the GILTI income inclusion when estimating its U.S. GAAP annual effective tax rate. The Company expects this inclusion to be included in its 2018 U.S. taxable income. However, the estimated 2018 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 tax planning or 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.

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

Defined Benefit Pension Plans

	U.S.		Foreign	
	Three months ended September 30,		Three months ended September 30,	
	2018	2017	2018	2017
Service cost	$ 243	$ 305	$ 933	$ 859
Interest cost	2,395	2,536	(601)	1,339
Expected return on plan assets	(3,165)	(3,061)	453	(1,111)
Amortization of net loss	—	—	13	—
Net periodic expense (benefit)	$ (527)	$ (220)	$ 798	$ 1,087

	U.S.		Foreign	
	Nine months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Service cost	$ 776	$ 914	$ 2,665	$ 2,642
Interest cost	7,137	7,608	2,512	4,024
Expected return on plan assets	(9,515)	(9,183)	(2,494)	(3,329)
Amortization of net less	—	—	38	—
Curtailment gain recognized	(576)	—	—	—
Net periodic expense (benefit)	$ (2,178)	$ (661)	$ 2,721	$ 3,337

Supplemental Retirement Plans

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Interest cost	$ 110	$ 123	$ 330	$ 370
Net periodic expense	$ 110	$ 123	$ 330	$ 370

Other Postretirement Benefit Plans

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Service cost	$ 3	$ 5	$ 12	$ 15
Interest cost	43	40	108	122
Amortization of prior service credit	(40)	(19)	(79)	(58)
Amortization of net gain	(11)	(19)	(33)	(58)
Net periodic expense (benefit)	$ (5)	$ 7	$ 8	$ 21

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 ensure compliance 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 our condensed consolidated financial statements and are described in detail within this note.

The Company triggered the requirement of New Jersey's Industrial Site Recovery Act ("ISRA") statute with the PQ Holdings stock transfer/corporate merger in December 2004. As required under ISRA, a General Information Notice with respect to the Company's two New Jersey locations was filed with the New Jersey Department of Environmental Protection ("NJDEP") in December 2004 and again in July 2007. Based on an initial review of the facilities by the NJDEP in 2005, the Company estimated that $500 would be required for contamination assessment and removal work of one specific contaminant (polychlorinated biphenyls) that exceeded applicable NJDEP standards at these facilities, and had recorded a reserve for such amount as of December 31, 2005. During subsequent years, it was determined that additional assessment, removal and remediation work would be required and the reserve was increased to cover the estimated cost of such work. In addition, during this period, work had been performed and the reserve was reduced for actual costs incurred for the assessment and remediation work. Work at the Carlstadt facility has been completed and is closed from an ISRA standpoint, but as of September 30, 2018 and December 31, 2017, the Company has recorded a reserve of $861 and $842, respectively, for costs required for contamination assessment and removal work at Rahway. There may be additional costs related to the remediation of Rahway, but until further investigation takes place, the Company cannot reasonably estimate the amount of additional liability that may exist.

As part of a Delaware River Basin Commission ("DRBC") required Pollutant Minimization Plan ("PMP"), in July 2013, the Company's Chester facility conducted limited paint sampling for polychlorinated biphenyls ("PCBs"). Also, as part of demolition, repair and maintenance projects scheduled for the Company's Baltimore facility in 2014, the Company conducted limited paint sampling during the fall of 2013 for waste categorization purposes. Paint samples were analyzed for PCB Aroclor 1254, the specific PCB congener commonly used in the manufacture of paint until the late 1970s. The Company's analytical results indicated that PCB Aroclor 1254 is present in paint on some structures (e.g., piping, structural steel, tanks) in excess of the fifty (50) parts per million ("ppm") regulatory threshold. Under the Toxic Substances Control Act ("TSCA"), there is no requirement to test in use paint for PCB content. However, once PCB content is identified at concentrations at or above the regulatory threshold, absent specific approval from the U.S. Environmental Protection Agency ("EPA"), the PCB-containing paint is regulated as an unauthorized use of PCBs, and the paint must be addressed. The Company abated painted surfaces that have tested positive for PCBs at levels exceeding 50 ppm at Baltimore in 2015 and early 2016. Similar abatement of painted structures as necessary at Chester have also been substantially completed. Characterization studies to evaluate whether soils have been impacted at Baltimore have been initiated as required under the TSCA, and have yet to commence at Chester. As of September 30, 2018 and December 31, 2017, the Company has recorded a reserve of $630 and $701, respectively, for the remediation costs of PCB impacted soils at the Company's facilities.

In 2008, the Company sold the property of a manufacturing facility located in the United States to the local port authority. In 2009, the port authority commissioned an environmental investigation of portions of the property. In 2010, the port authority advised the Company of alleged soil and groundwater contamination on the property and alleged the Company liable for certain conditions. The Company received and reviewed the environmental investigation documentation and determined it may have liability with respect to some, but not all, of the alleged contamination. As of September 30, 2018 and December 31, 2017, the Company has recorded a reserve of $752 and $837, respectively, for costs related to this potential liability.

The Company has recorded a reserve of $1,047 and $1,245 as of September 30, 2018 and December 31, 2017, respectively, to address remaining subsurface remedial and wetlands/marsh management activities at the Company's Martinez, CA site. Although currently a sulfuric acid regeneration plant, the site originally was operated by Mountain Copper Company ("Mococo") as a copper smelter. Also, the site sold iron pyrite to various customers and allowed their customers to deposit waste iron pyrite cinder and slag on the site. The property is adjacent to Peyton Slough, where Mococo had a permitted discharge point from its process. In 1997, the San Francisco Bay Regional Water Quality Control Board ("RWQCB") required characterization and remediation of Peyton Slough for Copper, Zinc and Acidic Soils. Various remediation activities were undertaken and completed, and the site has received final concurrence from the Army Corps with respect to the completed work. The RWQCB has agreed that Eco Services has achieved the goals for vegetative cover, but the current marsh condition is not sustainable without continued operation of the tide gates. The Company is continuing to work with the RWQCB on a plan to involve the County and work towards development of an alliance for operating, maintaining and funding the tide gates in the future.

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As of September 30, 2018 and December 31, 2017, the Company has recorded a reserve of $1,013 and $1,220, respectively, for subsurface remediation and the Soil Vapor Extraction Project at the Company's Dominguez, CA site. In the 1980s and 1990s, the EPA and the Los Angeles Regional Water Quality Control Board conducted investigations of the site due to historic chlorinated pesticide and chlorinated solvent use. Soil and groundwater beneath the site were impacted by chlorinated solvents and associated breakdown products, petroleum hydrocarbons, chlorinated pesticides and metals. A Corrective Measures Plan approved in October 2011 requires (1) soil vapor extraction ("SVE") in affected areas, (2) covering of unpaved areas containing pesticide impacted soil, and (3) annual groundwater monitoring of the perched water-bearing zone. Installation of the SVE unit has been completed and startup has occurred. The California Department of Toxic Substances Control ("DTSC") has granted conditional approval of the Company's soil management, and monitoring and maintenance plans. Most recently, the DTSC is requiring the Company to delineate the PCE plume on the eastern boundary of the site. The Company has submitted an action plan to address this matter and is awaiting comments from the DTSC.

17. Reportable Segments:

Summarized financial information for the Company's (1) Environmental Catalysts & Services and (2) Performance Materials & Chemicals reportable segments is shown in the following table:

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Net sales:				
Silica Catalysts	$ 16,347	$ 15,117	$ 50,167	$ 52,302
Refining Services	123,369	100,424	336,154	298,512
Environmental Catalysts & Services[(1)]	139,716	115,541	386,321	350,814
Performance Chemicals	174,722	175,467	548,446	515,454
Performance Materials	115,380	104,433	304,660	257,676
Eliminations	(1,783)	(2,828)	(8,804)	(7,349)
Performance Materials & Chemicals	288,319	277,072	844,302	765,781
Inter-segment sales eliminations[(2)]	(832)	(784)	(2,510)	(2,568)
Total	$ 427,203	$ 391,829	$ 1,228,113	$ 1,114,027
Segment Adjusted EBITDA:[(3)]				
Environmental Catalysts & Services[(4)]	$ 65,309	$ 61,900	$ 188,594	$ 182,578
Performance Materials & Chemicals	63,088	65,885	193,629	184,741
Total Segment Adjusted EBITDA[(5)]	$ 128,397	$ 127,785	$ 382,223	$ 367,319

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(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 10 to these condensed consolidated financial statements for further information). The proportionate share of sales is $32,297 and $37,622 for the three months ended September 30, 2018 and 2017, respectively. The proportionate share of sales is $120,159 and $100,991 for the nine months ended September 30, 2018 and 2017, respectively.

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

(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.

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(4) The Adjusted EBITDA from the Zeolyst Joint Venture included in the Environmental Catalysts and Services segment is $10,513 for the three months ended September 30, 2018, which includes $5,563 of equity in net income plus $1,658 of amortization of investment in affiliate step-up plus $3,292 of joint venture depreciation, amortization and interest. The Adjusted EBITDA from the Zeolyst Joint Venture included in the Environmental Catalysts and Services segment is $14,398 for the three months ended September 30, 2017, which includes $10,151 of equity in net income plus $1,658 of amortization of investment in affiliate step-up plus $2,563 of joint venture depreciation, amortization and interest.

The Adjusted EBITDA from the Zeolyst Joint Venture included in the Environmental Catalysts and Services segment is $45,194 for the nine months ended September 30, 2018, which includes $31,005 of equity in net income plus $4,975 of amortization of investment in affiliate step-up plus $9,214 of joint venture depreciation, amortization and interest. The Adjusted EBITDA from the Zeolyst Joint Venture included in the Environmental Catalysts and Services segment is $39,690 for the nine months ended September 30, 2017, which includes $24,594 of equity in net income plus $6,941 of amortization of investment in affiliate step-up plus $8,073 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.

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

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Reconciliation of net income (loss) attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA				
Net income (loss) attributable to PQ Group Holdings Inc.	$ 14,185	$ (3,345)	$ 30,181	$ (7,408)
Provision for income taxes	8,470	5,172	21,590	5,269
Interest expense, net	28,238	49,079	84,622	144,041
Depreciation and amortization	43,827	45,929	139,298	129,135
Segment EBITDA	94,720	96,835	275,691	271,037
Unallocated corporate expenses	10,276	7,885	27,322	23,474
Joint venture depreciation, amortization and interest	3,292	2,563	9,214	8,073
Amortization of investment in affiliate step-up	1,658	1,658	4,975	6,941
Amortization of inventory step-up	—	—	1,603	871
Debt extinguishment costs	864	453	6,743	453
Net loss on asset disposals	5,202	3,494	11,106	6,419
Foreign currency exchange loss	3,527	5,256	15,347	21,612
LIFO expense	856	750	5,903	3,229
Management advisory fees	—	1,250	—	3,750
Transaction and other related costs	210	966	895	5,300
Equity-based and other non-cash compensation	4,252	1,041	11,879	3,869
Restructuring, integration and business optimization expenses	2,178	4,957	5,662	8,009
Defined benefit pension plan cost	112	791	260	2,200
Other	1,250	(114)	5,623	2,082
Segment Adjusted EBITDA	$ 128,397	$ 127,785	$ 382,223	$ 367,319

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

18. Restructuring and Other Related Costs:

The following table presents the components of restructuring and other related costs for thethree and nine months ended September 30, 2018 and 2017 included in other operating expense, net in the accompanying condensed consolidated statements of operations:

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Severance and other employee costs related to legacy Eco restructuring plan	$ —	$ —	$ —	$ 830
Severance and other employee costs related to performance materials plant closure	219	3,868	326	3,868
Other related costs	54	238	77	880
	$ 273	$ 4,106	$ 403	$ 5,578

Legacy Eco Restructuring Plan

On July 30, 2014, Eco Services Operations LLC ("Eco Services"), a newly formed Delaware limited liability company and indirect subsidiary of certain investment funds affiliated with CCMP Capital Advisors, LP, entered into an Asset Purchase Agreement with Solvay USA, Inc. ("Solvay"), a Delaware corporation, which provided for the sale, transfer and assignment by Solvay and the acquisition, acceptance and assumption by Eco Services, of substantially all of the assets of Solvay's Eco Services business unit of Solvay's regeneration and virgin sulfuric acid production business operations in the United States (the "2014 Acquisition"). Prior to the Asset Purchase Agreement with Solvay, Eco Services operated as a business unit within Solvay, which is an indirect, wholly owned subsidiary of Solvay SA.

Subsequent to the 2014 Acquisition, the Company initiated a restructuring plan designed to improve organizational efficiency and streamline the operations of Eco Services as a stand-alone company. The primary impact of the plan to the Company's consolidated results of operations was the recognition of severance costs related to a reduction-in-force. These costs included benefits payable under ongoing Company severance plan arrangements, whereby payments are attributable to employee services rendered with benefits that accumulate over time. The liabilities and associated charges related to these severance costs are recognized by the Company when payment of the benefits becomes probable and estimable. Charges related to severance costs for the restructuring plan were $0 and $830 for the nine months ended September 30, 2018 and 2017, respectively. No severance costs were incurred related to this plan for the three months endedSeptember 30, 2018 and 2017.

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

Performance Materials Plant Closure

In September 2017, the Company approved and announced a plan to consolidate its manufacturing operations in Europe for the performance materials product group and close its facility in Kirchheimbolanden, Germany, and subsequently reduced production. The plan was part of the Company's overall strategy with respect to the Acquisition (see Note 6 to these condensed consolidated financial statements) and the realization of cost and other synergies in connection with the transaction.

As a result of a change in the market and increased customer demand for the products produced at this facility, the Company intends to keep the facility open and expanded production at this facility during the third quarter of 2018 from the previously reduced levels. However, the Company continues to pay its obligations to the individuals originally separated from service as part of the reorganization, with additional payments anticipated through 2019, primarily for individuals who extended their separation dates as a result of the decision to continue operations at the facility. The Company considers the restructuring plan related to the original decision to close the facility substantially complete, with no additional restructuring charges anticipated.

Rollforward of Restructuring Liabilities

The activity in the accrued liability balance associated with the Company's restructuring plans, all of which related to severance and other employee costs, was as follows for the nine months ended September 30, 2018:

	Legacy Eco Restructuring Plan	Performance Materials Plant Closure	Total Restructuring Charges
Balance at December 31, 2017	$ 215	$ 3,123	$ 3,338
Cash payments	(215)	(2,136)	(2,351)
Other adjustments	—	326	326
Foreign exchange impact	—	(18)	(18)
Balance at September 30, 2018	$ —	$ 1,295	$ 1,295

Other Related Costs

The Company incurred severance and other costs of $54 and $238 for the three months ended September 30, 2018 and 2017, respectively, and $77 and $880 for the nine months ended September 30, 2018 and 2017, respectively. These costs were not associated with formal restructuring plans and primarily related to severance charges for certain employees, professional fees and other expenses related to the Company's organizational changes.

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 shares reflect unvested restricted stock awards and restricted stock units with service conditions as well as options to purchase common stock, which have been included in the diluted earnings per share calculation using the treasury stock method.

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

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

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Weighted average shares outstanding – Basic	133,336,352	104,096,837	133,237,653	104,020,180
Dilutive effect of unvested common shares and restricted stock units with service conditions and assumed stock option exercises and conversions	1,239,810	—	985,975	—
Weighted average shares outstanding – Diluted	134,576,162	104,096,837	134,223,628	104,020,180

Basic and diluted earnings per share are calculated as follows:

	Three months ended September 30,		Nine months ended September 30,	
	2018	2017	2018	2017
Numerator:				
Net income (loss) attributable to PQ Group Holdings Inc.	$ 14,185	$ (3,345)	$ 30,181	$ (7,408)
Denominator:				
Weighted average shares outstanding – Basic	133,336,352	104,096,837	133,237,653	104,020,180
Weighted average shares outstanding – Diluted	134,576,162	104,096,837	134,223,628	104,020,180
Net income (loss) per share:				
Basic income (loss) per share	$ 0.11	$ (0.03)	$ 0.23	$ (0.07)
Diluted income (loss) per share	$ 0.11	$ (0.03)	$ 0.22	$ (0.07)

The table below presents the details of the Company’s equity-based awards outstanding at the end of each respective period that were excluded from the calculation of diluted earnings per share:

	September 30,	
	2018	2017
Restricted stock awards with performance only targets not yet achieved	1,659,050	1,769,447
Stock options with performance only targets not yet achieved	586,253	586,253
Anti-dilutive restricted stock awards and restricted stock units	—	340,380
Anti-dilutive stock options	—	1,539,266

Restricted stock awards and stock options with performance only vesting conditions are not included in the dilution calculation, as the performance targets have not been achieved as of the end of the respective periods. For the three and nine months ended September 30, 2017, all of the Company’s restricted stock awards and stock options subject to service vesting conditions were considered anti-dilutive, as the Company was in a net loss position. Anti-dilutive awards are not included in the dilution calculation, as their inclusion would have the effect of increasing diluted income per share.

PQ GROUP HOLDINGS INC. AND SUBSIDIARIES
NOTES TO CONDENSED CONSOLIDATED FINANCIAL STATEMENTS
(Dollars in thousands, except share and per share amounts)
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20. Supplemental Cash Flow Information:

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

	Nine months ended September 30,	
	2018	2017
Cash paid during the period for:		
Income taxes	$ 16,121	$ 21,005
Interest[1]	79,333	118,793
Non-cash investing activity:		
Capital expenditures acquired on account but unpaid as of the period end	10,624	12,924

(1) Excludes capitalized interest and the 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.

The following table provides a reconciliation of cash, cash equivalents, and restricted cash reported within the unaudited condensed consolidated balance sheets as of September 30, 2018 and 2017 to the total of the same amounts shown in the unaudited condensed consolidated statements of cash flows for thenine months then ended:

	September 30,	
	2018	2017
Cash and cash equivalents	$ 56,684	$ 68,838
Restricted cash included in prepaid and other current assets	1,333	2,300
Total cash, cash equivalents and restricted cash shown in the condensed consolidated statements of cash flows	$ 58,017	$ 71,138

21. Subsequent Events:

Other than the $500,000 notional amount of interest rate cap agreements entered into by the Company in November 2018 as described inNote 13 to these condensed consolidated financial statements, 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;
- 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 product group;
- reductions in highway safety spending;
- seasonal fluctuations in demand for some of our products;
- retention of certain key personnel;
- 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;
- our insurance coverage;
- product quality;
- our acquisition strategy;
- 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 For 10-K for the year ended December 31, 2017.

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

We conduct operations through two reporting segments: (1) Environmental Catalysts and Services, and (2) Performance Materials and Chemicals. Our Environmental Catalysts and Services business consists of three product groups: silica catalysts, zeolite catalysts, and refining services. Our Environmental Catalysts and Services business is a leading global innovator and producer of catalysts for the refinery, emission control, and petrochemical industries and is also a leading provider of catalyst recycling services to the North American refining industry. We believe our products are critical for our customers in these growing applications and impart essential functionality in chemical and refining production processes and in emission control for engines. Our Performance Materials and Chemicals business consists of two product groups: performance chemicals and performance materials. Our Performance Materials and Chemicals business is a silicates and specialty materials producer with leading supply positions for the majority of our products sold in North America, Europe, South America, Australia and Asia serving diverse and growing end uses such as personal and industrial cleaning products, fuel efficient tires (“green tires”), surface coatings, and food and beverage. Our products are essential additives, ingredients, and precursors that are critical to the performance characteristics of our customers’ products, yet typically represent only a small portion of our customers’ overall end-product costs.

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

Historically, our Performance Materials and Chemicals business has experienced relatively stable demand both seasonally and 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 product group are made on both a purchase order basis and pursuant to long-term contracts. In the performance materials product group, 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 product group 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 Environmental Catalysts and Services business 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 product group is supplied by customers for a nominal charge as part of their contracts. Over 87% of our refining services product group sales for the year endedDecember 31, 2017 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 and Chemicals business include soda ash, industrial sand, aluminum trihydrate, sodium hydroxide, and cullet. For the year ended December 31, 2017 approximately 42% 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.

Industry

We compete in the specialty chemicals and materials industry. Our industry is characterized by constant development of new products and the need to support customers with new product innovation and technical services to meet their challenges. In addition, products must maintain consistent quality and be a reliable source of supply in order to meet the needs of customers. Many products in the specialty chemicals and materials industry benefit from economics that favor incumbent producers because the capital cost to expand existing capacity is typically significantly less than the capital cost necessary to build a new plant. Our industry is also characterized by the need to produce consistent quality in a safe and environmentally sustainable manner.

Seasonality

Seasonal changes and weather conditions typically affect our performance materials and refining services product groups. In particular, our performance materials product group 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 product group typically experiences similar seasonal fluctuations as a result of higher demand for gasoline products in the summer months. As a result, our working capital requirements tend to be higher in the first and fourth quarters of the year, which can adversely affect our liquidity and cash flows. Because of this seasonality associated with certain of our product groups, 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.

Inflation

Inflationary pressures may have an adverse effect on us, impacting raw material costs and other operating costs, as well as resulting in higher fixed asset replacement costs. We attempt to manage these impacts with cost control, productivity improvements and contractual arrangements, as well as price increases to customers.

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% and 41% of our sales for the nine months ended September 30, 2018 and the year ended December 31, 2017, 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 September 30, 2018 Compared to the Three Months Ended September 30, 2017

Highlights

The following is a summary of our financial performance for the three months ended September 30, 2018 compared with the three months ended September 30, 2017.

Sales

- Net sales increased $35.4 million to $427.2 million. The increase in sales was primarily due to higher sales volumes, the pass-through of higher commodity in sales prices and favorable customer mix.

Gross Profit

- Gross profit increased $5.0 million to $107.5 million. Our increase in gross profit was primarily due to higher sales volumes which was partially offset by unfavorable manufacturing and transportation costs and product mix.

Operating Income

- Operating income increased by $2.5 million to $48.9 million. Our operating income increased due to an increase in our gross profit, partially offset by compensation related expenses for the three months ended September 30, 2018.

Equity in Net Income of Affiliated Companies

- Equity in net income of affiliated companies for the three months ended September 30, 2018 was $5.6 million, compared to $10.3 million for the three months ended September 30, 2017. The decrease of $4.7 million was due to lower earnings generated by our Zeolyst Joint Venture for the three months ended September 30, 2018.

The following is our unaudited condensed consolidated statements of operations and a summary of financial results for the three months ended September 30, 2018 and 2017:

	Three months ended September 30,		Change	
	2018	2017	$	%
	(in millions, except percentages)			
Sales	$ 427.2	$ 391.8	$ 35.4	9.0 %
Cost of goods sold	319.7	289.3	30.4	10.5 %
Gross profit	107.5	102.5	5.0	4.9 %
Gross profit margin	*25.2%*	*26.2%*		
Selling, general and administrative expenses	42.1	36.3	5.8	16.0 %
Other operating expense, net	16.5	19.8	(3.3)	(16.7)%
Operating income	48.9	46.4	2.5	5.4 %
Operating income margin	*11.4%*	*11.8%*		
Equity in net (income) from affiliated companies	(5.6)	(10.3)	4.7	(45.6)%
Interest expense, net	28.2	49.1	(20.9)	(42.6)%
Debt extinguishment costs	0.9	0.5	0.4	80.0 %
Other expense, net	2.5	5.0	(2.5)	(50.0)%
Income before income taxes and noncontrolling interest	22.9	2.1	20.8	990.5 %
Provision for income taxes	8.5	5.2	3.3	63.5 %
Effective tax rate	*37.0%*	*239.9%*		
Net income (loss)	14.4	(3.1)	17.5	(564.5)%
Less: Net income attributable to the noncontrolling interest	0.2	0.3	(0.1)	(33.3)%
Net income (loss) attributable to PQ Group Holdings Inc.	$ 14.2	$ (3.4)	$ 17.6	(517.6)%

Sales

	Three months ended September 30,		Change	
	2018	2017	$	%
	(in millions, except percentages)			
Sales:				
Silica Catalysts	$ 16.3	$ 15.1	$ 1.2	7.9 %
Refining Services	123.4	100.4	23.0	22.9 %
Environmental Catalysts & Services	139.7	115.5	24.2	21.0 %
Performance Chemicals	174.7	175.5	(0.8)	(0.5)%
Performance Materials	115.4	104.4	11.0	10.5 %
Eliminations	(1.8)	(2.8)	1.0	(35.7)%
Performance Materials & Chemicals	288.3	277.1	11.2	4.0 %
Inter-segment sales eliminations	(0.8)	(0.8)	—	— %
Total sales	$ 427.2	$ 391.8	$ 35.4	9.0 %

Environmental Catalysts & Services: Sales in Environmental Catalysts and Services for the three months ended September 30, 2018 were $139.7 million, an increase of $24.2 million, or 21.0%, compared to sales of $115.5 million for the three months ended September 30, 2017. The increase in sales was primarily due to higher volumes of $15.8 million and higher average selling price and customer mix of $8.9 million.

The increase in volumes was driven by higher customer demand for our virgin sulfuric acid, regeneration services and polyolefin product lines. The higher average selling price and customer mix was driven by higher cost pass-through pricing in our virgin sulfuric acid product line.

Performance Materials & Chemicals: Sales in Performance Materials and Chemicals for the three months ended September 30, 2018 were $288.3 million, an increase of $11.2 million, or 4.0%, compared to sales of $277.1 million for the three months ended September 30, 2017. The increase in sales was primarily due to higher average selling price and favorable customer mix of $10.8 million and higher sales volumes of $7.9 million, which was partially offset by the unfavorable effects of foreign currency translation of $7.5 million.

Higher average selling prices were principally a result of favorable cost pass-through pricing and increased volumes of higher-priced product lines. The increase in volumes was due to growth in our highway safety product line and sodium silicate industrial demand, which more than offset lower demand in our consumer cleaning product line. The unfavorable effects of foreign currency were primarily driven by the stronger U.S. dollar.

Gross Profit

Gross profit for the three months ended September 30, 2018 was $107.5 million, an increase of $5.0 million, or 4.9%, compared with $102.5 million for the three months ended September 30, 2017. The increase in gross profit was due to favorable customer pricing of $19.4 million, higher volumes of $12.8 million and lower depreciation expense of $1.5 million, which was offset by unfavorable manufacturing costs of $23.2 million, unfavorable product mix of $3.5 million and the unfavorable effects of foreign currency translation of $2.0 million.

Higher virgin sulfuric acid and regeneration services product line volumes more than offset a decline in consumer cleaning product sales. The unfavorable change in manufacturing costs was driven by higher raw material costs, some of which are passed through in price, and increased production, transportation and labor inflation costs. The unfavorable change in manufacturing costs was partially offset by lower highway safety product line normalization of manufacturing costs that were incurred during the three months ended September 30, 2017. Unfavorable product mix was driven by increased volumes of lower-margin products.

Selling, General and Administrative Expenses

Selling, general and administrative expenses for the three months ended September 30, 2018 were $42.1 million, an increase of $5.8 million compared with $36.3 million for the three months ended September 30, 2017. The increase in selling, general and administrative expenses was due to higher stock compensation expense related to awards issued in conjunction with our initial public offering and increased professional fees.

Other Operating Expense, Net

Other operating expense, net for the three months ended September 30, 2018 was $16.5 million, a decrease of $3.3 million, compared with $19.8 million for the three months ended September 30, 2017. The decrease in other operating expense, net was due to lower severance costs related to a plant shutdown and lower management advisory fees due to agreements terminated as a result of our initial public offering.

Equity in Net Income of Affiliated Companies

Equity in net income of affiliated companies for the three months ended September 30, 2018 was $5.6 million, compared to $10.3 million for the three months ended September 30, 2017. The decrease was primarily due to $4.6 million of lower earnings from our Zeolyst Joint Venture during the three months ended September 30, 2018. The decrease in earnings from our Zeolyst Joint Venture was due to lower specialty catalyst product sales orders to the petrochemical industry.

Interest Expense, Net

Interest expense, net for the three months ended September 30, 2018 was $28.2 million, a decrease of $20.9 million, as compared with $49.1 million for the three months ended September 30, 2017. The decrease in interest expense is due to lower average debt balances, mainly as a result of the repayment of outstanding debt with the proceeds from our initial public offering in October 2017, and reduction in interest rates related to our refinancing efforts completed during the 2017 fiscal year and first quarter of 2018.

Debt Extinguishment Costs

Debt extinguishment costs for the three months ended September 30, 2018 and 2017 were $0.9 million and $0.5 million, respectively. During the quarter ended September 30, 2018, the Company prepaid $45.0 million of outstanding principal balance on the New Term Loan Facility. The Company wrote off $0.3 million of previously unamortized deferred financing costs and original issue discount of $0.6 million as debt extinguishment costs for the three and nine months ended September 30, 2018.

On August 7, 2017, we re-priced the existing U.S. dollar-denominated tranche and existing Euro-denominated tranche of our term loans to reduce the applicable interest rates. The Company recorded $0.2 million of new creditor and third-party financing fees as debt extinguishment costs. In addition, previous unamortized deferred financing costs of $0.1 million and original issue discount of $0.2 million associated with the old debt were written off as debt extinguishment costs.

Other Expense, Net

Other expense, net for the three months ended September 30, 2018 was $2.5 million, a decrease of $2.5 million, as compared with $5.0 million for the three months ended September 30, 2017. The change in other expense, net primarily consisted of a decrease of $1.8 million of foreign currency losses driven by the non-permanent debt denominated in local currency and translated to U.S. dollars.

Provision for Income Taxes

The provision for income taxes for the three months ended September 30, 2018 was $8.5 million compared to a $5.2 million provision for the three months ended September 30, 2017. The effective income tax rate for the three months ended September 30, 2018 was 37.0% compared to 239.9% for the three months ended September 30, 2017.

The Company's effective income tax rate fluctuates based primarily on changes in income mix (including the effect of loss companies), impact of recently enacted U.S. tax law, the recording of provision to return adjustments in the U.S. 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 September 30, 2018 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, the recording of provision to return adjustments in the U.S., discrete impacts of opening balance sheet adjustments related to the Sovitec acquisition and state taxes.

Net Income (Loss) 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 $14.2 million for the three months ended September 30, 2018 compared with a net loss of $3.4 million for three months ended September 30, 2017.

Adjusted EBITDA

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

	Three months ended September 30,		Change	
	2018	**2017**	**$**	**%**
	(in millions, except percentages)			
Segment Adjusted EBITDA:[1]				
Environmental Catalysts & Services[2]	$ 65.3	$ 61.9	$ 3.4	5.5 %
Performance Materials & Chemicals	63.1	65.9	(2.8)	(4.2)%
Total Segment Adjusted EBITDA[3]	128.4	127.8	0.6	0.5 %
Unallocated corporate expenses	(10.3)	(7.9)	(2.4)	30.4 %
Total Adjusted EBITDA	$ 118.1	$ 119.9	$ (1.8)	(1.5)%

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

(2) The Adjusted EBITDA from our Zeolyst Joint Venture included in the Environmental Catalysts and Services segment is $10.5 million for the three months ended September 30, 2018, which includes $5.5 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. The Adjusted EBITDA from our Zeolyst Joint Venture included in the Environmental Catalysts and Services segment is $14.4 million for the three months ended September 30, 2017, which includes $10.1 million of equity in net income, excluding $1.7 million of amortization of investment in affiliate step-up plus $2.6 million of joint venture depreciation, amortization and interest.

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

Adjusted EBITDA for the three months ended September 30, 2018 was $118.1 million, a decrease of $1.8 million, or 1.5%, compared with $119.9 million for the three months ended September 30, 2017.

Environmental Catalysts & Services: Adjusted EBITDA for the three months ended September 30, 2018 was $65.3 million, an increase of $3.4 million, or 5.5%, compared with $61.9 million for the three months ended September 30, 2017.

The increase in Adjusted EBITDA was driven by higher customer demand for our virgin sulfuric acid and regeneration services product lines. This was partly offset by lower specialty catalyst product sales orders to the petrochemical industry.

Performance Materials & Chemicals: Adjusted EBITDA for the three months ended September 30, 2018 was $63.1 million, a decrease of $2.8 million, or 4.2%, compared with $65.9 million for the three months ended September 30, 2017.

The decrease in Adjusted EBITDA was due to higher raw materials costs, some of which are passed through in price, and increased labor and transportation costs. Increased demand in our highway safety product line partially offset the increase in costs.

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

	Three months ended September 30,	
	2018	2017
	(in millions)	
Reconciliation of net income (loss) attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA		
Net income (loss) attributable to PQ Group Holdings Inc.	$ 14.2	$ (3.4)
Provision for income taxes	8.5	5.2
Interest expense, net	28.2	49.1
Depreciation and amortization	43.8	45.9
EBITDA	94.7	96.8
Joint venture depreciation, amortization and interest[(a)]	3.3	2.6
Amortization of investment in affiliate step-up[(b)]	1.7	1.7
Debt extinguishment costs	0.9	0.5
Net loss on asset disposals[(c)]	5.2	3.5
Foreign currency exchange loss[(d)]	3.5	5.3
LIFO expense[(e)]	0.9	0.8
Management advisory fees[(f)]	—	1.3
Transaction and other related costs[(g)]	0.2	1.0
Equity-based compensation	4.3	1.0
Restructuring, integration and business optimization expenses[(h)]	2.2	5.0
Defined benefit pension plan cost[(i)]	0.1	0.8
Other[(j)]	1.1	(0.4)
Adjusted EBITDA	118.1	119.9
Unallocated corporate expenses	10.3	7.9
Total Segment Adjusted EBITDA	$ 128.4	$ 127.8

(a) We use Adjusted EBITDA as a performance measure to evaluate our financial results. Because our Environmental Catalysts and Services 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 inventory, fixed assets and intangible assets, including customer relationships and technical know-how.

(c) We do not have a history of significant asset disposals. However, 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.

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

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

(f) Reflects consulting fees paid to CCMP and affiliates of INEOS for consulting services that include certain financial advisory and management services. These payments ceased upon the closing of our initial public offering.

(g) Relates to certain transaction costs described in our condensed consolidated financial statements as well as other costs related to several transactions that are completed, pending or abandoned and 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 statement of operations. 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 September 30,	
	2018	**2017**
	(in millions)	
Reconciliation of net income (loss) attributable to PQ Group Holdings Inc. to Adjusted Net Income[(1)(2)]		
Net income (loss) attributable to PQ Group Holdings Inc.	$ 14.2	$ (3.4)
Amortization of investment in affiliate step-up[(b)]	0.9	1.0
Debt extinguishment costs	0.2	0.3
Net loss on asset disposals[(c)]	2.9	2.1
Foreign currency exchange loss[(d)]	4.0	5.2
LIFO expense[(e)]	0.3	0.5
Management advisory fees[(f)]	—	0.8
Transaction and other related costs[(g)]	0.1	0.6
Equity-based compensation	2.2	0.7
Restructuring, integration and business optimization expenses[(h)]	1.2	2.9
Defined benefit pension plan cost[(i)]	0.1	0.5
Other[(j)]	0.4	—
Adjusted Net Income, including non-cash GILTI tax	$ 26.5	$ 11.2
Impact of non-cash GILTI tax[(3)]	11.4	—
Impact of tax reform[(4)]	(2.5)	—
Adjusted Net Income	$ 35.4	$ 11.2

(1) We define adjusted net income as net income (loss) 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 (loss) 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 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.

(4) Represents the provisional adjustment for the impact of the U.S. Tax Cuts and Jobs Act of 2017 recorded in Net Income.

The adjustments to net income (loss) attributable to PQ Group Holdings Inc. are shown net of applicable tax rates which range between 38.0% and 42.1% for the three months ended September 30, 2018 and September 30, 2017, except for the foreign currency exchange loss for which the tax is calculated as a discrete item using the applicable statutory income tax rates.

Results of Operations

Nine Months Ended September 30, 2018 Compared to the Nine Months Ended September 30, 2017

Highlights

The following is a summary of our financial performance for the nine months ended September 30, 2018 compared with the nine months ended September 30, 2017.

Sales

- Net sales increased $114.1 million to $1,228.1 million. The increase in sales was primarily due to higher sales volumes, favorable price and mix and the favorable effects of foreign currency translation.

Gross Profit

- Gross profit increased $1.3 million to $294.0 million. The increase in gross profit was primarily due to higher average customer prices and higher sales volumes, which was partially offset by unfavorable manufacturing costs and mix.

Operating Income

- Operating income decreased by $13.0 million to $126.1 million. The decrease in operating income was primarily due to higher compensation related expenses and professional fees, partially offset by an increase in gross profit for the nine months ended September 30, 2018.

Equity in Net Income of Affiliated Companies

- Equity in net income of affiliated companies for the nine months ended September 30, 2018 was $31.1 million, compared with $24.9 million for the nine months ended September 30, 2017. The increase was due to an increase in earnings of $4.3 million generated by our Zeolyst Joint Venture during the nine months ended September 30, 2018 as compared to the nine months ended September 30, 2017 and $2.0 million of lower amortization on the fair value step-up of the underlying assets of our Zeolyst Joint Venture.

The following is our unaudited condensed consolidated statements of operations and a summary of financial results for the nine months ended September 30, 2018 and 2017.

	Nine months ended September 30,		Change	
	2018	2017	$	%
	(in millions, except percentages)			
Sales	$ 1,228.1	$ 1,114.0	$ 114.1	10.2 %
Cost of goods sold	934.1	821.3	112.8	13.7 %
Gross profit	294.0	292.7	1.3	0.4 %
Gross profit margin	*23.9%*	*26.3 %*		
Selling, general and administrative expenses	126.2	106.4	19.8	18.6 %
Other operating expense, net	41.7	47.2	(5.5)	(11.7)%
Operating income	126.1	139.1	(13.0)	(9.3)%
Operating income margin	*10.3%*	*12.5 %*		
Equity in net (income) from affiliated companies	(31.1)	(24.9)	(6.2)	24.9 %
Interest expense, net	84.6	144.0	(59.4)	(41.3)%
Debt extinguishment costs	6.7	0.5	6.2	1,368.7 %
Other expense, net	13.1	21.2	(8.1)	(38.2)%
Income (loss) before income taxes and noncontrolling interest	52.8	(1.7)	54.5	(3,205.9)%
Provision for income taxes	21.6	5.3	16.3	307.5 %
Effective tax rate	*40.9%*	*(304.2)%*		
Net income (loss)	31.2	(7.0)	38.2	(545.7)%
Less: Net income attributable to the noncontrolling interest	1.0	0.4	0.6	150.0 %
Net income (loss) attributable to PQ Group Holdings Inc.	$ 30.2	$ (7.4)	$ 37.6	(508.1)%

Sales

	Nine months ended September 30,		Change	
	2018	2017	$	%
	(in millions, except percentages)			
Sales:				
Silica Catalysts	$ 50.2	$ 52.3	$ (2.1)	(4.0)%
Refining Services	336.2	298.5	37.7	12.6 %
Environmental Catalysts & Services	386.4	350.8	35.6	10.1 %
Performance Chemicals	548.4	515.5	32.9	6.4 %
Performance Materials	304.7	257.7	47.0	18.2 %
Eliminations	(8.8)	(7.3)	(1.5)	20.5 %
Performance Materials & Chemicals	844.3	765.9	78.4	10.2 %
Inter-segment sales eliminations	(2.6)	(2.7)	0.1	(3.7)%
Total sales	$ 1,228.1	$ 1,114.0	$ 114.1	10.2 %

Environmental Catalysts & Services: Sales in Environmental Catalysts and Services for the nine months ended September 30, 2018 were $386.4 million, an increase of $35.6 million, or 10.1%, compared to sales of $350.8 million for the nine months ended September 30, 2017. The increase in sales was primarily due to higher average selling price and customer mix of $21.8 million and higher volumes of $13.3 million.

The higher average selling price and customer mix was driven by higher cost pass-through pricing in our virgin sulfuric acid product line. The increase in volumes was driven by higher customer demand within our virgin sulfuric acid, regeneration services and polyolefin catalysts product lines, which was partially offset by lower methyl methacrylate sales.

Performance Materials & Chemicals: Sales in Performance Materials and Chemicals for the nine months ended September 30, 2018 were $844.3 million, an increase of $78.4 million, or 10.2%, compared to sales of $765.9 million for the nine months ended September 30, 2017. The increase in sales was primarily due to favorable volumes of $48.5 million, higher average selling price and customer mix of $20.5 million and the favorable effects of foreign currency translation of $9.4 million.

The increase in volumes was primarily driven by the integration of Sovitec into our existing European operations, growth in highway safety product sales and sodium silicate industrial demand. Higher average selling prices were principally a result of increased sales of higher-priced products and favorable cost pass-through pricing. The favorable effects of foreign currency were primarily driven by the stronger Euro and British Pound as compared to the U.S. dollar.

Gross Profit

Gross profit for the nine months ended September 30, 2018 was $294.0 million, an increase of $1.3 million, or 0.4%, compared with $292.7 million for the nine months ended September 30, 2017. The increase in gross profit was due to favorable pricing of $42.3 million, higher volumes of $31.5 million and the favorable effects of foreign currency translation of $2.5 million. This was partially offset by higher manufacturing costs of $57.7 million, unfavorable product mix of $15.0 million and higher depreciation expense of $2.3 million.

The higher average selling prices were principally a result of favorable cost pass through pricing, which offsets a portion of the unfavorable change in manufacturing costs. The increase in volumes was due to strong highway safety sales, increased sales of sodium silicates in emerging markets and stronger virgin and regenerated sulfuric acid demand. The unfavorable change in manufacturing costs was driven by higher raw material costs, some of which are passed through in price, and increased production, labor inflation and transportation costs. The unfavorable change in manufacturing costs was partially offset by lower highway product line normalization of manufacturing costs that were incurred during the nine months ended September 30, 2017. Unfavorable product mix was driven by increased volumes of lower-margin products.

Selling, General and Administrative Expenses

Selling, general and administrative expenses for the nine months ended September 30, 2018 were $126.2 million, an increase of $19.8 million, or 18.6%, compared with $106.4 million for the nine months ended September 30, 2017. The increase in selling, general and administrative expenses was due to higher compensation related expenses due to an increase in employee headcount, higher stock compensation expense related to awards issued in conjunction with our initial public offering and increased professional fees.

Other Operating Expense, Net

Other operating expense, net for the nine months ended September 30, 2018 was $41.7 million, a decrease of $5.5 million, or 11.7%, compared with $47.2 million for the nine months ended September 30, 2017. The decrease in other operating expense, net was due to incurring severance and restructuring costs related to a plant shutdown in the prior year period, incurring legal and professional fee costs in the prior year period related to our initial public offering, lower management advisory fees due to agreements terminated as a result of our initial public offering, lower transaction-related costs related to our June 2017 acquisition of Sovitec and the receipt of insurance proceeds totaling $2.5 million in the current period related to losses sustained as a result of Hurricane Harvey in August 2017 (of which $1.6 million was recorded in other operating expense, net). Offsetting the decrease in other operating expense, net was an increase in amortization expense related to the intangible assets identified as part of the Sovitec acquisition.

Equity in Net Income of Affiliated Companies

Equity in net income of affiliated companies for the nine months ended September 30, 2018 was $31.1 million, an increase of $6.2 million, compared with income of $24.9 million for the nine months ended September 30, 2017. The increase in earnings generated by our Zeolyst Joint Venture was due to higher sales for emission control and packaging & engineered plastics products, which was partially offset by increased fixed and production costs.

Interest Expense, Net

Interest expense, net for the nine months ended September 30, 2018 was $84.6 million, a decrease of $59.4 million, as compared with $144.0 million for the nine months ended September 30, 2017. The decrease in interest expense is due to lower average debt balances, mainly as a result of the repayment of outstanding debt with the proceeds from our initial public offering in October 2017, and reduction in interest rates related to our refinancing efforts completed during the 2017 fiscal year and first quarter of 2018.

Debt Extinguishment Costs

Debt extinguishment costs for the nine months ended September 30, 2018 and 2017 were $6.7 million and $0.5 million, respectively. 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. The company recorded $2.1 million of new creditor and third-party financing fees as debt extinguishment costs. 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.

During the quarter ended September 30, 2018, the Company prepaid $45.0 million of outstanding principal balance on the New Term Loan Facility. The Company wrote off $0.3 million of previously unamortized deferred financing costs and original issue discount of $0.6 million as debt extinguishment costs for the three and nine months ended September 30, 2018.

On August 7, 2017, we re-priced the existing U.S. dollar-denominated tranche and existing Euro-denominated tranche of our term loans to reduce the applicable interest rates. The Company recorded $0.2 million of new creditor and third-party financing fees as debt extinguishment costs. In addition, previous unamortized deferred financing costs of $0.1 million and original issue discount of $0.2 million associated with the old debt were written off as debt extinguishment costs.

Other Expense, Net

Other expense, net was $13.1 million for the nine months ended September 30, 2018, a favorable change of $8.1 million, compared with other expense, net of $21.2 million for the nine months ended September 30, 2017. The change in other expense, net primarily consisted of a decrease of $6.3 million of foreign currency losses mainly driven by the February 8, 2018 refinancing of our Euro-denominated term loan and the non-permanent debt denominated in local currency and translated to U.S. dollars.

Provision for Income Taxes

The provision for income taxes for the nine months ended September 30, 2018 was $21.6 million compared to a $5.3 million provision for the nine months ended September 30, 2017. The effective income tax rate for the nine months ended September 30, 2018 was 40.9% compared to (304.2)% for the nine months ended September 30, 2017.

The Company's effective income tax rate fluctuates based primarily on changes in income mix (including the effect of loss companies), impact of recently enacted U.S. tax law, the recording of provision to return adjustments in the U.S. 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 nine months ended September 30, 2018 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, the recording of provision to return adjustments in the U.S., discrete impacts of opening balance sheet adjustments related to the Sovitec acquisition and state taxes.

Net Income (Loss) 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 Inc. was $30.2 million for the nine months ended September 30, 2018 as compared to a net loss of $7.4 million for the nine months ended September 30, 2017.

Adjusted EBITDA

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

	Nine months ended September 30,		Change	
	2018	**2017**	**$**	**%**
	(in millions, except percentages)			
Segment Adjusted EBITDA:(1)				
Environmental Catalysts & Services(2)	$ 188.6	$ 182.6	$ 6.0	3.3%
Performance Materials & Chemicals	193.6	184.8	8.8	4.8%
Total Segment Adjusted EBITDA(3)	382.2	367.4	14.8	4.0%
Unallocated corporate expenses	(27.3)	(23.5)	(3.8)	16.2%
Total Adjusted EBITDA	$ 354.9	$ 343.9	$ 11.0	3.2%

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

(2) The Adjusted EBITDA from the Zeolyst Joint Venture included in the Environmental Catalyst and Services segment is $45.2 million for the nine months ended September 30, 2018, which includes $31.0 million of equity in net income, excluding $5.0 million of amortization of investment in affiliate step-up plus $9.2 million of joint venture depreciation, amortization and interest. The Adjusted

EBITDA from the Zeolyst Joint Venture included in the Environmental Catalyst and Services segment is $39.7 million for the nine months ended September 30, 2017, which includes $24.6 million of equity in net income, excluding $6.9 million of amortization of investment in affiliate step-up plus $8.1 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 nine months ended September 30, 2018 was $354.9 million, an increase of $11.0 million, or 3.2%, compared with $343.9 million for the nine months ended September 30, 2017.

Environmental Catalysts & Services: Adjusted EBITDA for the nine months ended September 30, 2018 was $188.6 million, an increase of $6.0 million, or 3.3%, compared with $182.6 million for the nine months ended September 30, 2017.

The increase in Adjusted EBITDA was driven primarily by increased earnings generated by our Zeolyst Joint Venture due to higher sales volumes of aromatic catalyst and catalyst sales for emission control and higher cost pass-through pricing in our virgin sulfuric acid product line. The increase in Adjusted EBITDA was partially offset by lower chemical synthesis catalysts sales due to the timing of customer order patterns, increased fixed costs and plant maintenance costs incurred at three of our refining services facilities.

Performance Materials & Chemicals: Adjusted EBITDA for the nine months ended September 30, 2018 was $193.6 million, an increase of $8.8 million, or 4.8%, compared with $184.8 million for the nine months ended September 30, 2017.

The increase in Adjusted EBITDA was due to higher contribution margins from sodium silicate and highway safety product line sales, the integration of Sovitec into our European operations and the favorable effects of foreign currency translation, which was partially offset by higher fixed costs.

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

	Nine months ended September 30,	
	2018	**2017**
	(in millions)	
Reconciliation of net income (loss) attributable to PQ Group Holdings Inc. to Segment Adjusted EBITDA		
Net income (loss) attributable to PQ Group Holdings Inc.	$ 30.2	$ (7.4)
Provision for income taxes	21.6	5.3
Interest expense, net	84.6	144.0
Depreciation and amortization	139.3	129.1
EBITDA	275.7	271.0
Joint venture depreciation, amortization and interest[a]	9.2	8.1
Amortization of investment in affiliate step-up[b]	5.0	6.9
Amortization of inventory step-up[c]	1.6	0.9
Debt extinguishment costs	6.7	0.5
Net loss on asset disposals[d]	11.1	6.4
Foreign currency exchange loss[e]	15.3	21.6
LIFO expense[f]	5.9	3.2
Management advisory fees[g]	—	3.8
Transaction and other related costs[h]	0.9	5.3
Equity-based compensation	11.9	3.9
Restructuring, integration and business optimization expenses[i]	5.7	8.0
Defined benefit pension plan cost[j]	0.3	2.2
Other[k]	5.6	2.1
Adjusted EBITDA	354.9	343.9
Unallocated corporate expenses	27.3	23.5
Total Segment Adjusted EBITDA	$ 382.2	$ 367.4

(a) We use Adjusted EBITDA as a performance measure to evaluate our financial results. Because our Environmental Catalysts and Services 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 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 inventory, fixed assets and intangible assets, including customer relationships and technical know-how.

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

(d) We do not have a history of significant asset disposals. However, 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 negative or positive transaction gains and losses of foreign currency in the income statement primarily related to the Euro denominated term loan (which was settled as part of the February 2018 term loan refinancing) and the non-permanent intercompany debt denominated in local currency translated to U.S. dollars.

(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) Reflects consulting fees paid to CCMP and affiliates of INEOS for consulting services that include certain financial advisory and management services. These payments ceased as of the closing of our initial public offering.

(h) Relates to certain transaction costs described in our condensed consolidated financial statements as well as other costs related to several transactions that are completed, pending or abandoned and that we believe are not representative of our ongoing business operations.

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

(j) Represents adjustments for defined benefit pension plan costs in our statement of operations. 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.

(k) 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).

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Adjusted Net Income

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

	Nine months ended September 30, 2018	Nine months ended September 30, 2017
	(in millions)	
Reconciliation of net income (loss) attributable to PQ Group Holdings Inc. to Adjusted Net Income[(1)(2)]		
Net income (loss) attributable to PQ Group Holdings Inc.	$ 30.2	$ (7.4)
Amortization of investment in affiliate step-up[(b)]	3.1	4.0
Amortization of inventory step-up[(c)]	1.0	0.5
Debt extinguishment costs	4.3	0.3
Net loss on asset disposals[(d)]	6.9	3.7
Foreign currency exchange loss[(e)]	12.0	14.9
LIFO expense[(f)]	3.6	1.9
Management advisory fees[(g)]	—	2.2
Transaction and other related costs[(h)]	0.6	3.1
Equity-based compensation	7.3	2.2
Restructuring, integration and business optimization expenses[(i)]	3.5	4.6
Defined benefit pension plan cost[(j)]	0.2	1.3
Other[(k)]	3.3	1.2
Adjusted Net Income, including non-cash GILTI tax	$ 76.0	$ 32.5
Impact of non-cash GILTI tax[(3)]	19.0	—
Impact of tax reform[(4)]	(1.5)	—
Adjusted Net Income	$ 93.5	$ 32.5

(1) We define adjusted net income as net loss 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 associated with the GILTI provisions of the 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. NOL amounts to offset the GILTI taxable income inclusion. This NOL utilization precludes us from recognizing 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.

(4) Represents the provisional adjustment for the impact of the TCJA recorded in Net Income.

The adjustments to net income (loss) attributable to PQ Group Holdings Inc. are shown net of applicable tax rates of 38.2% and 42.1% for thenine months ended September 30, 2018 and September 30, 2017, 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, 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, environmental initiatives and cost savings initiatives as well as growth, which includes spending to drive organic sales growth.

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 September 30, 2018, we had cash and cash equivalents of $56.7 million and availability of $170.9 million under our asset based lending revolving credit facility, after giving effect to $19.9 million of outstanding letters of credit and $0.0 million of revolving credit facility borrowings, for a total available liquidity of $227.6 million. As of September 30, 2018, we were in compliance with all covenants under our debt agreements.

Included in our cash and cash equivalents balance as of September 30, 2018 was $53.0 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 September 30, 2018, our total indebtedness was $2,205.9 million, with up to $170.9 million of available borrowings under our asset based lending revolving credit facility. Our liquidity requirements are significant, primarily due to debt service requirements. As reported, our cash interest expense for the nine months ended September 30, 2018 and 2017 was approximately $79.3 million and $118.8 million, respectively. Before any impact of hedges, a one percent change in assumed interest rates for our variable interest credit facilities would have an annual impact of approximately $12.3 million on interest expense.

Cash Flow

	Nine months ended September 30,	
	2018	**2017**
	(in millions)	
Net cash provided by (used in)		
Operating activities	$ 166.0	$ 109.8
Investing activities	(95.8)	(146.5)
Financing activities	(77.8)	29.2
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(1.6)	(6.5)
Net change in cash, cash equivalents and restricted cash	(9.2)	(14.0)
Cash, cash equivalents and restricted cash at beginning of period	67.2	85.1
Cash, cash equivalents and restricted cash at end of period	$ 58.0	$ 71.1

	Nine months ended September 30,	
	2018	**2017**
	(in millions)	
Net income (loss)	$ 31.2	$ (7.0)
Non-cash and non-working capital related activities[(1)]	184.3	145.7
Changes in working capital	(43.1)	(25.5)
Other operating activities	(6.4)	(3.4)
Net cash provided by operating activities	$ 166.0	$ 109.8

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

Net cash provided by operating activities was $166.0 million for the nine months ended September 30, 2018, compared to $109.8 million provided for the nine months ended September 30, 2017. Cash generated by net income (loss) plus non-cash and non-working capital related activities washigher during the nine months ended September 30, 2018 by $76.8 million compared to the same period in the prior year. The change in working capital during thenine months ended September 30, 2018 was unfavorable compared to the nine months ended September 30, 2017. Cash used to fund working capital was $43.1 million and $25.5 million for the nine months ended September 30, 2018 and 2017, respectively.

The increase in cash generated by net income (loss) plus non-cash and non-working capital related activities of$76.8 million as compared to the prior year period was primarily due to lower interest expense under our new debt structure, the integration of Sovitec into our existing European operations, higher highway safety sales, increased sales within our Zeolyst Joint Venture and higher cost pass-through pricing, which was partially offset by higher plant maintenance costs, higher compensation related costs due to increased employee headcount and increased labor inflation costs.

	Nine months ended September 30,	
	2018	2017
	(in millions)	
Working capital changes that provided (used) cash:		
Receivables	$ (43.1)	$ (28.9)
Inventories	8.8	4.9
Prepaids and other current assets	(1.6)	(6.0)
Accounts payable	(7.6)	(9.0)
Accrued liabilities	0.4	13.5
	$ (43.1)	$ (25.5)

The decrease in cash from working capital of$17.6 million as compared to the prior year was primarily due to unfavorable changes in accounts receivable and accrued liability balances, which was partially offset by favorable changes in inventory and accounts payable.

The unfavorable change in accounts receivable was due to increased sales within our highway safety product line and refining services product groups. The unfavorable change in accrued liabilities was primarily due to the timing of interest payments made under our new debt structure. The favorable change in inventory was driven by increased sales and seasonal depletion of inventory within our highway safety product line. 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.

	Nine months ended September 30,	
	2018	2017
	(in millions)	
Purchases of property, plant and equipment	$ (95.3)	$ (90.2)
Investment in affiliated companies	(5.0)	(9.0)
Loan receivable under the New Markets Tax Credit Arrangement	—	(6.2)
Business combinations, net of cash acquired	(1.0)	(41.6)
Net interest proceeds on swaps designated as net investment hedges	4.3	—
Other, net	1.2	0.5
Net cash used in investing activities	$ (95.8)	$ (146.5)

Net cash used in investing activities was $95.8 million for the nine months ended September 30, 2018, compared to cash used of $146.5 million during the same period in 2017. Cash used in investing activities primarily consisted of utilizing$95.3 million and $90.2 million to fund capital expenditures during the nine months ended September 30, 2018 and 2017, respectively. The acquisitions of a cullet business in May 2018 and Sovitec in June 2017 used cash of approximately$1.0 million and $41.6 million during the nine months ended September 30, 2018 and 2017, respectively.

	Nine months ended September 30,	
	2018	2017
	(in millions)	
Net revolver borrowings	$ (23.5)	$ 32.6
Net cash repayments on debt obligations	(53.0)	(2.7)
Other financing activities	(1.3)	(0.8)
Net cash (used in) provided by financing activities	$ (77.8)	$ 29.2

Net cash used in financing activities was $77.8 million for the nine months ended September 30, 2018, compared to net cash provided of $29.2 million during the same period in 2017. Net cash used in financing activities was primarily driven by $80.4 million in repayments of our term debt and revolving credit facility made through the nine months ended September 30, 2018. This was partially offset by $10.0 million of new borrowings made under the new term loan facility for refinancing costs and borrowings made under our working capital line of credit in the first half of 2018. Net cash provided by financing activities for the nine months ended September 30, 2017 was mainly due to $32.6 million of net borrowings under our revolving credit facility.

Debt

	September 30, 2018	December 31, 2017
	(in millions)	
Term Loan Facility (U.S. dollar denominated)	$ —	$ 916.2
Term Loan Facility (Euro denominated)	—	335.8
New Term Loan Facility	1,212.5	—
6.75% Senior Secured Notes due 2022	625.0	625.0
5.75% Senior Unsecured Notes due 2025	300.0	300.0
ABL Facility	—	25.0
Other	68.4	68.3
Total debt	2,205.9	2,270.3
Original issue discount	(20.1)	(18.4)
Deferred financing costs	(17.4)	(21.4)
Total debt, net of original issue discount and deferred financing costs	2,168.4	2,230.5
Less: current portion	(21.4)	(45.2)
Total long-term debt, excluding current portion	$ 2,147.0	$ 2,185.3

As of September 30, 2018, our total debt was $2,205.9 million, including $16.6 million of other foreign debt and $51.8 million of notes payable for the NMTC financing and excluding the original issue discount of $20.1 million and deferred financing fees of $17.4 million for our senior secured credit facilities. Our net debt as of September 30, 2018 was $2,080.8 million, excluding $16.6 million of other foreign debt and $51.8 million of NMTC notes payable, and including cash and cash equivalents of $56.7 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, cost savings initiatives and health, safety and environmental initiatives. Growth capital expenditures include spending to drive organic sales growth. These capital expenditures represent our "book" capital expenditures for which the company has recorded, but not necessarily paid for the capital expenditures.

	Nine months ended September 30,	
	2018	2017
	(in millions)	
Maintenance capital expenditures	$ 68.5	$ 66.7
Growth capital expenditures	16.1	18.2
Total capital expenditures	$ 84.6	$ 84.9

Capital expenditures remained at a level sufficient for required maintenance and certain expansion growth initiatives during these periods. Maintenance capital expenditures are higher in the nine months ended September 30, 2018 as compared to the nine months ended September 30, 2017 due to plant maintenance costs incurred at three plants in the current period as compared to two plants in the prior period. Growth capital expenditures are lower in the nine months ended September 30, 2018 as compared to the nine months ended September 30, 2017 due to plant expansion projects related to the Thermodrop® product line launched in 2017.

Pension Funding

We paid $6.4 million and $7.5 million in cash contributions into our defined benefit pension plans and other post-retirement plans during the nine months ended September 30, 2018 and 2017, respectively. The net periodic pension expense was $0.3 million and $2.6 million for those same periods, respectively.

Off–Balance Sheet Arrangements

We had $19.9 million of outstanding letters of credit on our revolver facility as of September 30, 2018.

Contractual Obligations

Information related to our contractual obligations at December 31, 2017 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, 2017, filed with the SEC on March 22, 2018, which we refer to as our Annual Report on Form 10-K. During the nine months ended September 30, 2018, there have been no significant changes to our contractual obligations as disclosed in our Annual Report on Form 10-K, other than as described below.

New Term Loan Facility

On February 8, 2018, we refinanced our then-existing senior secured term loan facility, which was to mature on November 2022, with a new $1,267.0 million senior secured term loan facility with a maturity date of February 2025. Annual principal payments are $12.7 million under the new senior secured term loan facility, which represents an immaterial change in our debt payment obligations under the then-existing senior secured term loan facility. Estimated interest expense (on an annualized basis), using the interest rate effective on September 30, 2018, is approximately $54.0 million on the new senior secured term loan facility through the maturity date of February 2025. Refer to Note 12 in these condensed consolidated financial statements for additional information.

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.

Other than changes to our critical accounting policies and estimates regarding the recognition of revenue, as described in Note 3 to our September 30, 2018 unaudited condensed consolidated financial statements, 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.

Other than the items noted below related to foreign exchange risk, there have been no material changes in the 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.

Foreign Exchange Risk

Our financial results are subject to the impact of gains and losses on currency translations, which occur when the financial statements of foreign operations are translated into U.S. dollars. Because consolidated financial results are reported in U.S. dollars, sales or earnings generated in currencies other than the U.S. dollar can result in a significant increase or decrease in the amount of those sales and earnings when translated to U.S. dollars. The financial statements of our operations outside the United States, where the local currency is considered to be the functional currency, are translated into U.S. dollars using the exchange rate in effect at each balance sheet date for assets and liabilities and the average exchange rate for each period for sales, expenses, gains, losses and cash flows. The exchange rates between these currencies and the U.S. dollar in recent years have fluctuated significantly and may continue to do so in the future. The effect of translating foreign subsidiaries' balance sheets into U.S. dollars is included in other comprehensive income. The impact of gains and losses on transactions denominated in currencies other than the functional currency of the relevant operations are included in other non-operating expense. Income and expense items are translated at average exchange rates during the year. The foreign currency loss realized in the year ended December 31, 2017 was primarily driven by the Euro-denominated term loan and the non-permanent intercompany debt denominated in local currency and translated to U.S. dollars, and was principally non-cash in nature.

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

As described in Note 2 to the condensed consolidated financial statements included in this report, the Financial Accounting Standards Board ("FASB") issued guidance in August 2017 with the objective of improving the financial reporting of hedging relationships to better portray the economic results of an entity's risk management activities in its financial statements. As a result of our early adoption of the FASB guidance, and because the swap agreements are designated as net investment hedges, changes in the fair value of the cross-currency swap agreements will be recognized as a component of "Foreign currency translation, net of tax" within "Other comprehensive income (loss), net of tax" in the condensed consolidated statement of comprehensive income. In this regard, a favorable foreign currency change in the designated investment value of our foreign subsidiaries that use the euro as their functional currency generally will be offset by an unfavorable foreign currency change in the cross-currency swap agreements, and vice versa. At September 30, 2018, a 10% fluctuation in the U.S. dollar-to-euro currency exchange rate would have an approximately $32 million impact on the fair value of the notional amount of the cross-currency swap agreements and an offsetting $32 million impact on the designated net investment value of the foreign subsidiaries. In addition, in the event of a significant decline in the U.S. dollar-to-euro exchange rate, our payment obligations to the counterparties could have a material adverse effect on our cash flows. In this regard, if, at the expiration or earlier termination of the swap agreements, the U.S. dollar-to-euro currency exchange rate has declined by 10% from the rate in effect at September 30, 2018, we would be required to pay approximately $32 million to the counterparties. The swap agreements entail risk that the counterparties will not fulfill their obligations under the agreements. However, we believe the risk is reduced because we have entered into separate agreements with three different counterparties, all of whom are large, well-established financial institutions.

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 September 30, 2018, 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.

Changes in Internal Control Over Financial Reporting

There was no change in the Company's internal control over financial reporting that occurred during the quarter endedSeptember 30, 2018 that has materially affected, or is reasonably likely to materially affect, the Company's 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. Refer to Note 16 of our September 30, 2018 unaudited condensed consolidated financial statements for additional information regarding the Company's legal proceedings.

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 certain tax obligations of the employees in connection with the vesting of restricted stock awards during the third quarter of 2018.

	Total Number of Shares of Common Stock Purchased	Average Price Paid per Share of Common Stock	Total Number of Shares of Common Stock Purchased as Part of Publicly Announced Plan or Programs	Maximum Number (or Dollar Value) of Shares of Common Stock that May Yet Be Purchased Under the Plans or Programs
July 2018	39,595	$ 17.94	N/A	N/A
August 2018	—	—	N/A	N/A
September 2018	—	—	N/A	N/A
Total	39,595			

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	Transition Agreement, dated August 9, 2018, between PQ Corporation and James F. Gentilcore (previously filed as Exhibit 10.1 to the Company's Current Report on Form 8-K filed August 9, 2018 and incorporated herein by reference).
10.2	Severance Agreement, dated August 9, 2018, between PQ Corporation and Belgacem Chariag (previously filed as Exhibit 10.2 to the Company's Current Report on Form 8-K filed August 9, 2018 and incorporated herein by reference).
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:	November 7, 2018	By: /s/ MICHAEL CREWS
		Michael Crews
		Executive Vice President and Chief Financial Officer
		(Duly Authorized Officer and Principal Financial and Accounting Officer)

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)) 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) 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

   (c) 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: November 7, 2018

/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)) 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) 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

   (c) 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: November 7, 2018

/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 September 30, 2018 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: November 7, 2018	/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 September 30, 2018 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: November 7, 2018

/s/ MICHAEL CREWS

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