Kraton Corp
Form 10-K
February 28, 2019

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

FORM 10-K

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

For the fiscal year ended December 31, 2018
or
o TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
Commission file number
001-34581

KRATON CORPORATION
(Exact Name of Registrant as Specified in its Charter)

Delaware	20-0411521
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
15710 John F. Kennedy Blvd, Suite 300 Houston, TX 77032	281-504-4700
(Address of principal executive offices, including zip code)	(Registrant's telephone number, including area code)

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

Title of Each Class	Name of Each Exchange on Which Registered
Kraton Corporation Common Stock, par value $0.01	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. YES x NO o
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. YES o NO x
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 x NO o
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 x NO o
Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. o
Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See definitions of "large accelerated filer," "accelerated

filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Securities Exchange Act.

Large accelerated filer:	x	Accelerated filer:	o
Non-accelerated filer:	o	Smaller reporting company:	o
		Emerging growth company:	o

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. o

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). YES o NO x

Estimated aggregate market value of the common equity held by nonaffiliates of Kraton Corporation at June 30, 2018: $1,095,920,418. Number of shares of Kraton Corporation Common Stock, $0.01 par value, outstanding at February 25, 2019: 31,923,799.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of Kraton Corporations proxy statement for the 2019 Annual Meeting of Shareholders are incorporated by reference in Part III of this Annual Report on Form 10-K.

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Year Ended December 31, 2018

CAUTIONARY STATEMENT REGARDING FORWARD-LOOKING INFORMATION

Some of the statements and information in this Annual Report on Form 10-K contain forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. We may also make written or oral forward-looking statements in our reports on Forms 10-Q and 8-K, in press releases and other written materials and in oral statements made by our officers, directors or employees to third parties. Statements that are not historical facts, including statements about our beliefs and expectations, are forward-looking statements. Forward-looking statements are often characterized by the use of words such as "outlook," "believes," "estimates," "expects," "projects," "may," "intends," "anticipates," "forsees," "future," or by discussions of strategy, plans, or intentions; anticipated benefits of or performance of our products; beliefs regarding opportunities for new, differentiated applications, and other innovations; beliefs regarding strengthening relationships with customers; adequacy of cash flows to fund our working capital requirements; our investment in the joint venture with Formosa Petrochemical Corporation ("FPCC"); our expectations regarding indebtedness to be incurred by our joint venture with FPCC; debt payments, interest payments, benefit plan contributions, and income tax obligations; nonrealization of expected benefits from our acquisitions or business dispositions and our ability to timely execute and close such acquisitions and dispositions; our anticipated capital expenditures, health, safety, environmental, and security and infrastructure and maintenance projects, projects to optimize the production capabilities of our manufacturing assets and to support our innovation platform; our ability to fully access our senior secured credit facilities; expectations regarding future dividend payments; expectations regarding our counterparties' ability to perform, including with respect to trade receivables; estimates regarding tax expense of repatriating certain cash and short-term investments related to foreign operations; expectations regarding differentiated applications; our ability to realize certain deferred tax assets and our beliefs with respect to tax positions; expectations regarding our full year effective tax rate; estimates related to the useful lives of certain assets for tax purposes; expectations regarding our pension contributions; estimates or expectations related to raw material costs or availability, ending inventory levels and related estimated charges; the outcome and financial impact of legal proceedings; expectations regarding the spread between FIFO and ECRC (each as defined herein) in future periods; expectations regarding the impact of natural disasters; estimated impacts of changing tariff rates; and projections regarding environmental costs and capital expenditures and related operational savings.

Forward-looking statements involve known and unknown risks, uncertainties, assumptions and other important factors that could cause the actual results, performance or our achievements, or industry results, to differ materially from historical results, any future results, or performance or achievements expressed or implied by such forward-looking statements. There are a number of risks and uncertainties that could cause our actual results to differ materially from the forward-looking statements contained in this report. Important factors that could cause our actual results to differ materially from those expressed as forward-looking statements include, but are not limited to the factors set forth in this report, including but not limited to under Part I, Item 1A. "Risk Factors" and Part II, Item 7. "Management's Discussion and Analysis of Financial Condition and Results of Operations," and in our other filings with the Securities and Exchange Commission (the "SEC").

There may be other factors of which we are currently unaware or deem immaterial that may cause our actual results to differ materially from the forward-looking statements. In addition, to the extent any inconsistency or conflict exists between the information included in this report and the information included in our prior reports and other filings with the SEC, the information contained in this report updates and supersedes such information.

Forward-looking statements are based on current plans, estimates, assumptions, and projections, and, therefore, you should not place undue reliance on them. Forward-looking statements speak only as of the date they are made, and we undertake no obligation to update them in light of new information or future events.

PART I

Item 1. Business.

THE COMPANY

General

We are a leading global specialty chemicals company that manufactures styrenic block copolymers (“SBCs”), specialty polymers, and high-value performance products primarily derived from pine wood pulping co-products. Our operations are managed through two operating segments: (i) Polymer segment and (ii) Chemical segment. Operating results for Arizona Chemical are included in the accompanying consolidated financial statements since the date of acquisition. See Note 15 Industry Segment and Foreign Operations to the consolidated financial statements for segment reporting of financial results.

Presentation of Financial Statements.

References in this report to “Kraton,” “our company,” “we,” “our,” “ours,” and “us” as used in this report refer collectively to Kraton Corporation, and its consolidated subsidiaries, unless the context otherwise requires.

This Form 10-K includes financial statements and related notes that present the consolidated financial position, results of operations, comprehensive income (loss), and cash flows of Kraton Corporation. Kraton Corporation is a holding company whose only material asset is its investment in its wholly owned subsidiary, Kraton Polymers LLC. Kraton Polymers LLC and its subsidiaries own all of our consolidated operating assets.

Corporate History

Kraton Corporation was incorporated in 2009 under Delaware law and is the successor to a Delaware limited liability company formed in 2003. In December 2009, we completed our initial public offering and our common stock commenced trading on the New York Stock Exchange. On January 6, 2016, we completed the acquisition of Arizona Chemical (the “Arizona Chemical Acquisition”). We conduct our business through Kraton Polymers LLC and its consolidated subsidiaries.

POLYMER SEGMENT PRODUCTS AND COMMERCIAL APPLICATIONS

SBCs are highly-engineered synthetic elastomers, which we invented and commercialized over 50 years ago. We developed the first unhydrogenated styrenic block copolymers (“USBC”) in 1964 and the first hydrogenated styrenic block copolymers (“HSBC”) in the late 1960s. Our SBCs enhance the performance of numerous products by imparting greater flexibility, resilience, strength, durability, and processability, and are used in a wide range of applications, including adhesives, coatings, consumer and personal care products, sealants, lubricants, medical, packaging, automotive, paving and roofing, and footwear products. Under the Cariflex brand name, we also sell isoprene rubber (“IR”) and isoprene rubber latex (“IRL”), which are non-SBC products primarily used in applications such as medical products, personal care, adhesives, tackifiers, paints, and coatings.

Our SBCs are high performance elastomers that are engineered for a wide range of applications. Our SBC products possess a combination of high strength and low viscosity, which facilitates ease of processing at elevated temperatures and high processing speeds. Our products can be processed in a variety of manufacturing applications, including injection molding, blow molding, compression molding, extrusion and hot melt, and solution applied coatings.

The majority of worldwide SBC production is dedicated to USBCs, which are primarily used in paving, roofing, adhesives, sealants, coatings, and footwear applications. HSBCs, which are significantly more complex and capital-intensive to manufacture than USBCs, are used in applications such as soft touch and flexible materials, personal hygiene products, medical products, automotive components, and certain adhesive and sealant applications. Our Cariflex IR and IRL products are primarily used in surgical gloves and condoms.

Our Polymer segment products are manufactured and our commercial activities are organized in the following product groups based upon polymer chemistry and process technologies: Performance Products, Specialty Polymers, and Cariflex.

Performance Products

Our Performance Products impart characteristics such as:

- resistance to temperature and weather extremes in roads and roofing;
- resistance to cracking, reduced road noise, and better water dispersion; and
- increased processing flexibility in adhesive formulations for packaging tapes and labels, and materials used in disposable diapers.

In paving and roofing applications, our Performance Products primarily consist of styrene-butadiene-styrene (“SBS”) for use in modified asphalt applications, which in roofing applications produces stronger and more durable felts and shingles, and in paving applications enhances the strength and elasticity of asphalt-based paving compositions over an extended temperature range. In paving applications, we believe our HiMA technology polymers will extend road life by allowing pavements to withstand heavy traffic loads and varying climate conditions. Our products primarily compete with chemicals such as styrene-butadiene rubber latex, acetates, polyphosphoric acids and thermoplastic materials like ethylene-propylene-diene-monomer, polyethylene, atactic polypropylene and unmodified asphalts. We believe that customer choice for these markets is driven principally by total end-product cost, temperature performance, bitumen source and application.

In personal care applications, our Performance Products primarily consist of SBS and styrene-isoprene-styrene (“SIS") for the manufacturing of ultra-thin stretchable films used for the production of diapers. In addition, our SIS polymers are also used in the lamination process for other personal care products. Our products primarily compete against low priced alternatives such as metallocenes. We believe that customer choice for these markets is driven principally by total end-product cost and performance.

In adhesives applications, our Performance Products primarily compete with ethylene-vinyl acetate, polyolefins, and metallocene polyolefins. The choice between these materials is influenced by bond strength, specific adhesion, consistent performance to specification, processing speed, hot-melt application, resistance to water and cost. Our SBCs are compatible with many other formulating ingredients. We believe demand for utilization of SBC-based adhesives is primarily driven by cost reduction and higher performance.

Specialty Polymers. Our Specialty Polymers are comprised of HSBC products that are significantly more complex to produce than our Performance Products. As a result, our Specialty Polymers generally generate higher margins than our Performance Products.

Our Specialty Polymers impart characteristics such as:

- improved flow characteristics for many industrial and consumer sealant and lubricating fluids;
- soft feel in numerous consumer products such as razor handles, power tools, and automobile components;
- impact resistance for demanding engineered plastic applications;
- flexibility for wire and cable plastic outer layers;
- stretch properties in disposable diapers and adult incontinence products;
- resistance to ultraviolet light;
- processing stability and viscosity; and
- elevated temperature resistance.

Our products primarily compete against a variety of chemical and non-chemical alternatives including, but not limited to, thermoplastic vulcanizate, thermoplastic polyurethane, PVC, thermoplastic polyolefin, polyethylene terephthalate, polycarbonate, polyamide, and ethylene-propylene-diene-monomer based products. We believe demand for our Specialty Polymers portfolio is principally driven by customer-specific needs and by the ability to balance performance characteristics such as soft-touch, durability, stretch and impact.

Because many of our products are highly engineered and customized formulations, they require specialized product testing and validation, production and process evaluation. This results in potentially long lead times to achieve customer and industry established approvals. Our innovation-led growth strategy focuses on translating the inherent strengths of our product technologies such as flexibility, resilience, impact and moisture resistance, and aesthetics (clarity and haptics) to target opportunities in which we can expand and/or have the potential to create new market spaces for our solutions.

Cariflex™. Our Cariflex IR and IRL products combine the key qualities of natural rubber, such as good mechanical properties and hysteresis, with purity and clarity enhancements, good flow, low gel content, and absence of nitrosamines and natural rubber proteins.

We focus our high purity IR polymers in demanding applications such as medical products, paints, coatings, and specialized footwear. Our IRL is specialized polyisoprene latex with a controlled structure and low chemical impurity level obtained through an anionic polymerization process followed by a proprietary latex processing step, both of which were first developed by us. IRL is durable, tear resistant, soft, transparent and odorless. In addition, the synthetic material is non-allergenic and has superior consistency and other advantages over natural rubber latex. As a result, IRL is a substitute for natural rubber latex, particularly in applications with high purity requirements, such as medical, healthcare, personal care, including products such as synthetic surgical gloves and condoms as well as in food contact operations.

Our products primarily compete with natural rubber, conventional Ziegler Natta sourced solid IR, halo butyl rubber and several synthetic latex alternatives, notably neoprene, nitrile, and polychloroprene latex rubber, as well as polyurethane.

CHEMICAL SEGMENT PRODUCTS AND COMMERCIAL APPLICATIONS

Effective January 1, 2018, results for our Roads and Construction product line have been consolidated into our Adhesives and Performance Chemicals product lines to better align customer portfolio and end usage. We have adjusted the presentations for the years ended December 31, 2017 and 2016 to conform to the respective 2018 presentations.

We manufacture and sell high value products primarily derived from pine wood pulping co-products. We refine and further upgrade two primary feedstocks, crude tall oil ("CTO") and crude sulfate turpentine ("CST"), both of which are co-products of the wood pulping process, into value-added specialty chemicals. We refine CTO through a distillation process into four primary constituent fractions: tall oil fatty acids ("TOFA"); tall oil rosin ("TOR"); distilled tall oil ("DTO"); and tall oil pitch. We further upgrade TOFA, TOR, and DTO into derivatives such as dimer acids, polyamide resins, rosin resins, dispersions, and disproportionated resins. We refine CST into terpene monomer fractions, which can be further upgraded into terpene resins. The various fractions and derivatives resulting from our CTO and CST refining process provide for distinct functionalities and properties, determining their respective applications and end markets.

While this business is based predominantly on the refining and upgrading of CTO and CST, we have the capacity to use both hydrocarbon-based raw materials, such as alpha-methyl-styrene ("AMS"), tall oil, and gum rosins where appropriate and, accordingly, are able to offer tailored solutions for our customers.

Our Chemical segment products are manufactured and our commercial activities are organized in the following product groups based upon end markets and process technologies: Adhesives, Performance Chemicals, and Tires.

Adhesives. We offer a broad range of products to service target adhesives submarkets, including rosin-based tackifiers for packaging and pressure-sensitive adhesive applications, terpene-based tackifiers for bookbinding, hygiene and pressure-sensitive adhesive applications, AMS resins for bookbinding and pressure-sensitive adhesive applications and hot melt polyamides for flexible packaging.

Our tackifiers are primarily used in hot melt adhesives, which are heavily used in the packaging submarket. Our focus in packaging is to improve our competitive position by introducing higher stability tackifiers that work in new polymer systems. We believe our efforts to improve functionality of tackifier offerings will enable differentiated and profitable growth in emerging markets.

Roads and Construction. Within the pavement marking submarket, we provide rosin-based binders for the thermoplastic pavement marking submarket and produce insoluble maleic-based tackifiers.

Performance Chemicals. We serve various submarkets with a wide product offering, providing value across several different applications including, among others, fuel additives, oilfield chemicals, mining fluids, coatings, and metalworking fluids and lubricants. Our products include:

TOFA. Compared to other fatty acids obtained from various vegetable and animal origins, TOFA has a chemical composition characterized by distinctive features used as components in various applications. For example:

End use market	Features
Coatings	• serves as a binder in solvent-based paints as well as in hybrid coatings • preferred over soybean oil due to its higher unsaturation, better reactivity, flexibility, and compatibility
Mining	• lower viscosity and higher affinity with the ore extract allow a higher recovery yield • preferred over oleic acid
Oilfield chemicals	• easier handling, better solubility in drilling muds, as well as higher surface activity and emulsifying power • preferred over oleic acid
Fuel additives	•

improves the lubricity of low-sulfur diesel fuel, preventing engine fuel pump wear

We also sell TOFA for the asphalt paving market and niche products, including bitumen additives. Our performance bitumen additives were developed to increase the amount of reclaimed asphalt that can be used in a paving application, while meeting local performance specifications. We believe we have a strong market position supported by our increasing expertise in bitumen chemistry for aged materials, a comprehensive understanding of market needs, innovative product solutions, and a growing patent portfolio.

Dimer Acids. Our dimer acids are used for the production of polyamide resins used in applications such as epoxy coatings, flexographic inks, and high performance adhesive applications. In addition, dimer acids are building blocks in the production of corrosion inhibitors and emulsifiers used in the production and recovery of petroleum and natural gas. Our dimer acids compete with dimer acids derived from other feedstocks such as rapeseed and cottonseed oil.
TOR. TOR is used in all major rosin applications for the manufacture of adhesives, inks, pavement markers, rubber, and paper.
DTO. DTO is a mixture of TOFA and rosin acids. Our DTO is primarily used as an emulsifier for metalworking fluids and lubricants, in which our product offers improved performance attributes and, in many cases, replaces less environmentally friendly hydrocarbon-based chemicals. In these applications, it is sometimes used in place of TOFA.
Terpene Fractions. We supply terpene fractions, alpha-pinene and beta-pinene, and upgrade them mainly as specialty tackifiers for the adhesives market and tread enhancers for the tires market.
Tires. We sell a range of products that enhance the performance and manufacturing of high performance, winter, and all-season tires. Our terpene-based tread enhancement resins optimize wet grip of tire treads while maintaining reduced rolling resistance and enhanced durability which contribute to improved vehicle fuel efficiency. We market our AMS-based tread enhancement additives through product attributes that include reduced rolling resistance, increased durability, wet grip enhancement, and exceptional compatibility with rubber compounds, especially solution styrene-butadiene rubber polymers. We also sell TOFA, DTO, and rosins as processing aids, which provide select functionalities at various steps in the rubber and tire manufacturing process.
We were one of the first companies to supply tread enhancement resins to the tire industry and won early qualifications with innovative tire manufacturers. The quest for improved fuel economy has prompted the introduction of silica-based “green tires” in which certain of our products are a key component. AMS resins were the first tread enhancement additive commercialized beyond basic hydrocarbon tackifiers, and we believe they offer a good balance of properties, price, and performance for current generation tires.

GENERAL

Sales and Marketing

Our business is predominantly based on a short sales cycle. We sell our products through a number of channels including a direct sales force, marketing representatives, and distributors. We use third-party marketing representatives and distributors in markets where they have existing platforms and are more cost effective in completing market coverage. We have long-term relationships and a wide network of distributors across North America, Europe, Latin America, and Asia Pacific.
Our sales personnel are primarily responsible for maintaining relationships with our customer base and providing product advice. In general, they coordinate contact between our customers and our research and development personnel to provide quality control and new product solutions. Our close interaction with our customers has allowed us to develop and maintain what we consider to be strong customer relationships.

Competition

In each of our markets, we compete on a range of factors, including price, breadth of product availability, product quality, and the speed of service from order to delivery. We believe our customers also base their supply decisions on the supplier’s ability to design and produce customized products and the availability of technical support. We also compete against a broad range of alternative materials throughout our product groups, including petrochemical, animal and vegetable-based substitutes. Major competitors in our market include large domestic and international companies. No one or small number of competitors is dominant across all industries in which we compete and no single customer accounted for 10.0% or more of our total revenue during the years ended December 31, 2018, 2017, and 2016

Sources and Availability of Raw Materials

We use butadiene, styrene, and isoprene as our primary raw materials in our Polymer segment and CTO and CST in our Chemical segment as our primary raw materials.
For our Polymer segment, we procure our raw materials from multiple sources in the U.S. and foreign countries, through a range of short-term and long-term supply agreements.

For our Chemical segment, we have an exclusive long-term supply contract with International Paper, which extends through 2027, under which it has agreed to sell to us, and we have agreed to purchase from it, all of the CTO and CST produced at its paper mills. We also maintain long-standing relationships with other major suppliers of our raw materials in the U.S. and Europe. Additionally, our CTO supply sources are further diversified by our ability to refine and process black liquor soap into CTO in the U.S. Most of our Chemical segment manufacturing facilities are located in close proximity to the facilities of our raw material suppliers, allowing us to procure our raw materials at a low delivered cost. Furthermore, we work directly with our suppliers at their production facilities to enhance their CTO and CST yields through technological improvements, which we believe allows us to maximize our raw material supplies, to improve the efficiency of our suppliers' operations, and to foster strong, long-lasting relationships with them.

We believe that raw material supplies for both segments will be available in quantities sufficient to meet demand in 2019. The cost of these raw materials has generally correlated with changes in energy prices and is generally influenced by supply and demand factors, and for our isoprene monomers the prices of natural and synthetic rubber. Each of our reportable segments were impacted to a varying degree in 2018 by the volatility of raw material costs and these conditions may continue in 2019.

Research, Development, and Technology

Our research and development activities are primarily conducted in laboratories in Almere, Netherlands; Amsterdam, Netherlands; Houston, Texas; Savannah, Georgia; and Shanghai, China. We also have a world class facility located at our Belpre, Ohio, site that accelerates polymer development efforts and the commercialization of new products and reduces customer qualification lead times. In addition to our core research activities, research and development personnel also support maintenance of ongoing business activities and other support functions. The below details our significant research and development activities:

Core research and development

- New product and process development
- Technical support and new application development
- Technology platform development

Business support

- Safety and regulatory compliance
- Operations and quality support
- Technical support to sales team and customers

Patents, Trademarks, Copyrights, and Other Intellectual Property Rights

We rely on a variety of intellectual property rights to conduct our business, including patents, trademarks, and trade secrets. We had 1,054 granted patents and 343 pending patent applications at December 31, 2018. These patents protect our innovative technologies and applications against infringement, and create long-term, sustainable competitive advantages in our core growth markets. Since patents are generally in effect for a period of 20 years from the filing date, and therefore, assuming most of these applications will be granted, we expect a significant portion of our patent portfolio to remain in effect for a significant period. The granted patents and the applications cover both the U.S. and foreign countries. We do not expect that the expiration of any single patent or specific group of patents would have a material impact on our business and the overall profitability of our business is not dependent on any single patent, trademark, license, or franchise.

Our material trademarks will remain in effect unless we decide to abandon any of them, subject to possible third-party claims challenging our rights. Similarly, our trade secrets will preserve their status as such for as long as they are the subject of reasonable efforts, on our part, to maintain their secrecy. We maintain a number of trade names that are protected by trademark laws.

Employees

As of December 31, 2018, we had 1,918 employees, the majority of which are full-time employees.

Environmental Regulation

Our operations in the U.S. and abroad are subject to a wide range of environmental laws and regulations at the international, national, state, and local levels. Matters pertaining to the environment are discussed in Part I, Item 1A. Risk Factors; Part I, Item 3. Legal Proceedings; and Part II, Item 7. Management's Discussion and Analysis of

Financial Condition and Results of Operations.

We have made, and intend to continue to make, the expenditures necessary for compliance with applicable laws and regulations relating to health, safety, environmental, and security matters. We incurred capital expenditures in 2018 for regulatory purposes of $9.6 million, and estimate such expenditures will be approximately $7.0 million in 2019 and $4.9 million in 2020.

Costs of remediation at our current and former facilities are covered by indemnification agreements, insurance or through allocated reserves. We currently estimate that the costs of remediation will not materially affect our operations or cause us to materially exceed our anticipated level of capital expenditures. Although resolution of environmental liabilities will require future cash outlays, it is not expected that such outlays will materially impact our liquidity position, although there can be no assurance that such impacts would not occur.

Seasonality

Seasonal changes and weather conditions typically affect our sales of products in our paving, pavement marking, roofing, and construction applications, which generally results in higher sales volumes in the second and third quarters of the calendar year compared to the first and fourth quarters of the calendar year. Sales for our other product applications tend to show relatively little seasonality.

Available Information

We electronically file reports with the Securities and Exchange Commission ("SEC"), including annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to such reports. The SEC maintains an internet site that contains reports and information statements, and other information regarding issuers that file electronically with the SEC at www.sec.gov. Additionally, information about us, including our reports filed with the SEC, is available through our web site at www.kraton.com. Such reports are accessible at no charge through our web site and are made available as soon as reasonably practicable after such material is filed with or furnished to the SEC. Our website and the information contained on that site, or connected to that site, are not incorporated by reference into this report.

Item 1A. Risk Factors.

Our substantial indebtedness could adversely affect our financial condition and prevent us from fulfilling our obligations under the terms of our indebtedness, including our senior notes and our senior secured credit facilities.

As of December 31, 2018, we had $362.0 million in outstanding borrowings under the U.S. dollar denominated tranche (the “USD Tranche”) and €300.0 million, or approximately $342.9 million, in outstanding borrowings under the Euro dollar denominated tranche (the “Euro Tranche”) of our senior secured term loan facility (the “Term Loan Facility”). In addition, we had $399.1 million of 7.0% Senior Notes due 2025 (the “7.0% Senior Notes”) and €290.0 million, or approximately $331.5 million, of 5.25% Senior Notes due 2026 (the “5.25% Senior Notes” and, together with the 7.0% Senior Notes, the “Senior Notes”) outstanding as of December 31, 2018. We also have a $250.0 million asset-based revolving credit facility (the “ABL Facility”), under which we had $5.0 million of outstanding borrowings as of December 31, 2018. Pursuant to the terms of our Term Loan Facility and ABL Facility, we may request up to an aggregate of $350.0 million and $100.0 million, respectively, of additional facility commitments subject to compliance with certain covenants and other conditions.

In addition, in July 2014, our KFPC joint venture executed a syndicated loan agreement (“KFPC Loan Agreement”) in the amount of 5.5 billion new Taiwanese dollars (“NTD”), or approximately $178.9 million, to provide additional funding to construct the HSBC facility in Taiwan and to provide funding for working capital requirements and/or general corporate purposes. FPCC and Kraton Polymers LLC are guarantors of the KFPC Loan Agreement with each guaranteeing fifty percent (50%) of the indebtedness, of which NTD 3.5 billion, or approximately $112.5 million, of indebtedness was outstanding as of December 31, 2018. KFPC also has revolving credit facilities (the “KFPC Revolving Facilities”) to provide funding for working capital requirements and/or general corporate purposes, which allow for total borrowings of up to NTD 2.2 billion, or approximately $69.9 million. As of December 31, 2018, NTD 400.0 million, or approximately $13.0 million, was drawn on the KFPC Revolving Facilities. Kraton Polymers LLC does not guarantee any of the KFPC Revolving Facilities.

Our current, or any future, indebtedness could:

- make it more difficult for us to satisfy our financial obligations;
- increase our vulnerability to adverse economic and industry conditions;
- increase the risk that we breach financial covenants and other restrictions in our debt agreements, which can be exacerbated by volatility in the cost of our raw materials and the resulting impact on our earnings;
- require us to dedicate a substantial portion of our cash flow from operations to make payments on our indebtedness, thereby reducing the availability of our cash flow to fund working capital, capital expenditures and other general corporate purposes;
- limit our flexibility in planning for, or reacting to, changes in the business and industry in which we operate;
- restrict us from exploiting business opportunities;
- place us at a disadvantage compared to our competitors that have less debt and lease obligations; and
- limit our ability to borrow additional funds for working capital, capital expenditures, acquisitions, debt service requirements, execution of our business strategy and other general corporate purposes or to refinance our existing debt.

In addition, our ability to pay principal of and interest on indebtedness, fund working capital and make anticipated capital expenditures depends on our future performance, which is subject to general economic conditions and other factors, some of which are beyond our control. There can be no assurance that our business will generate sufficient cash flow from operations or that future borrowings will be available under our indebtedness to fund liquidity needs, including debt service. Furthermore, if we decide to undertake additional investments in existing or new facilities, this will likely require additional capital, and there can be no assurance that this capital will be available.

Despite current indebtedness levels and restrictive covenants, we and our subsidiaries may incur additional indebtedness or we may pay dividends in the future. This could further exacerbate the risks associated with our substantial financial leverage.

We and our subsidiaries may incur significant additional indebtedness in the future under the agreements governing our indebtedness. Although the terms of the Term Loan Facility, the ABL Facility and the Senior Notes contain restrictions on the incurrence of additional indebtedness and the payment of distributions to our equity holders, these restrictions are subject to a number of thresholds, qualifications and exceptions, and the additional indebtedness incurred, and distributions paid, in compliance with these restrictions could be substantial. Additionally, these restrictions also permit us to incur obligations that, although preferential to our common stock in terms of payment, do not constitute indebtedness. As of the date of this filing, we had $8.5 million of outstanding borrowings under the ABL Facility with a remaining available borrowing capacity of $192.1

million. In addition, if we and/or our subsidiaries incur new debt, the related risks that we now face as a result of our leverage would intensify.

Our current and future debt instruments may impose significant operating and financial restrictions on us and affect our ability to access liquidity.

Our current debt instruments do, and any future debt instruments may, contain a number of restrictive covenants that impose significant operating and financial restrictions on us. Under the terms of our ABL Facility, we are subject to a financial covenant requiring us to maintain a fixed charge coverage ratio of 1.0 to 1.0 if availability under the facility is below specified amounts. In addition, our debt instruments may include restrictions on our ability to, among other things:

- place liens on our or our restricted subsidiaries' assets;
- make investments other than permitted investments;
- incur additional indebtedness;
- merge, consolidate or dissolve;
- sell assets;
- engage in transactions with affiliates;
- change the nature of our business;
- change our or our subsidiaries' fiscal year or organizational documents; and
- make restricted payments (including certain equity issuances).

A failure by us or our subsidiaries to comply with the covenants and restrictions contained in the agreements governing our indebtedness could result in an event of default under such indebtedness, which could adversely affect our ability to respond to changes in our business and manage our operations. Upon the occurrence of an event of default under any of the agreements governing our indebtedness, the lenders could elect to declare all amounts outstanding to be due and payable and exercise other remedies as set forth in the agreements. Further, an event of default or acceleration of indebtedness under one instrument may constitute an event of default under another instrument. If any of our indebtedness were to be accelerated, there can be no assurance that our assets would be sufficient to repay this indebtedness in full, which could have a material adverse effect on our ability to continue to operate as a going concern.

To service our current, and any future, indebtedness, we will require a significant amount of cash, which may have an adverse effect on our results of operations, financial condition, and cash flow.

Our ability to generate cash depends on many factors beyond our control, and any failure to meet our debt service obligations could harm our business, financial condition and results of operations. Our ability to make payments on and to refinance our indebtedness, and to fund working capital needs and planned capital expenditures, will depend on our ability to generate cash in the future. This, to a certain extent, is subject to general economic, financial, competitive, business, legislative, regulatory and other factors that are beyond our control, including, among other things, the costs of raw materials used in the production of our products.

If our business does not generate sufficient cash flow from operations or if future borrowings are not available to us in an amount sufficient to enable us to pay our indebtedness, or to fund our other liquidity needs, we may need to refinance all or a portion of our indebtedness, on or before the maturity thereof, sell assets, reduce or delay capital investments or seek to raise additional capital, any of which could have a material adverse effect on our operations. We might not generate sufficient cash flow to repay indebtedness as currently anticipated. In addition, we may not be able to effect any of these actions, if necessary, on commercially reasonable terms or at all. Our ability to restructure or refinance our indebtedness, will depend on the condition of the capital markets and our financial condition at such time. Any refinancing of our indebtedness could be at higher interest rates and could require us to comply with more onerous covenants, which could further restrict our business operations. The terms of existing or future debt instruments may limit or prevent us from taking any of these actions. In addition, any failure to make scheduled payments of interest and principal on our outstanding indebtedness would likely result in a reduction of our credit rating, which could harm our ability to incur additional indebtedness on commercially reasonable terms or at all. Our inability to generate sufficient cash flow to satisfy our debt service obligations, or to refinance or restructure our obligations on commercially reasonable terms or at all, would have a material adverse effect on our business, financial condition and results of operations.

Our variable rate indebtedness subjects us to interest rate risk, which could cause our debt service obligations to increase significantly.
Borrowings under the Term Loan Facility, the ABL Facility, KFPC Loan Agreement, and KFPC Revolving Credit Facilities are, and additional borrowings in the future may be, at variable rates of interest that expose us to interest rate risk. If interest rates increase, our debt service obligations on the variable rate indebtedness will increase even though the amount borrowed will remain the same, and our net income and cash flows, including cash available for servicing our indebtedness, will correspondingly decrease. At December 31, 2018, approximately $835.4 million of our debt was variable rate debt. Additionally, any interest rate swaps we enter may not fully mitigate our interest rate risk.
Conditions in the global economy and capital markets which may have an adverse effect on our results of operations, financial condition, and cash flow.
Our products are sold in markets that are sensitive to changes in general economic conditions, such as automotive, construction and consumer products. Downturns in general economic conditions can cause fluctuations in demand for our products, product prices, sales volumes and margins. A decline in the demand for our products or a shift to lower-margin products due to deteriorating economic conditions could adversely affect sales of our products and our profitability and could also result in impairments of certain of our assets.
Our business and operating results have been affected by fluctuating commodity prices, volatile exchange rates and other challenges currently affecting the global economy and our customers. Uncertainty regarding global economic conditions poses a continuing risk to our business, as consumers and businesses may postpone spending in response to tighter credit, negative financial news or declines in income or asset values, which may reduce demand for our products. If global economic and market conditions, or economic conditions in key markets, remain uncertain or deteriorate further, our results of operations, financial condition and cash flows could be materially adversely affected.
The failure of our raw material suppliers to perform their obligations under long-term supply agreements, or our inability to replace or renew these agreements when they expire, could increase our cost for these materials, interrupt production or otherwise adversely affect our results of operations.
Our manufacturing processes use the following primary raw materials: butadiene, styrene, isoprene, CTO, including black liquor soap that we refine into CTO and CST. We have long-term supply agreements with LyondellBasell Industries (“LyondellBasell”), International Paper, and others to supply our raw material needs in the U.S. and Europe. However, most of our long-term contracts contain provisions that allow our suppliers to limit, or allocate, the amount of raw materials shipped to us below the contracted amount in certain circumstances. If we are required to obtain alternate sources for raw materials because a supplier is unwilling or unable to perform under raw material supply agreements, if a supplier terminates its agreements with us, if we are unable to renew our existing contract, or if we are unable to obtain new long-term supply agreements to meet changing demand, we may not be able to obtain these raw materials in sufficient quantities,on economic terms, or in a timely manner, and we may not be able to enter into long-term supply agreements on terms as favorable to us, if at all. A lack of availability of raw materials could have a material adverse effect on our results of operations, financial condition and cash flows.
If the availability of our raw materials, including butadiene, styrene, isoprene, CST, and CTO is limited, we may be unable to produce some of our products in quantities sufficient to meet customer demand or on favorable economic terms, which may have an adverse effect on our results of operations, financial condition, and cash flow.
We use butadiene, styrene, and isoprene as our primary raw materials in our Polymer segment and CTO and CST in our Chemical segment and use additional non-primary raw materials in the production of our products. Suppliers may not be able to meet our raw material requirements and we may not be able to obtain substitute supplies from alternative suppliers in sufficient quantities, on economic terms, or in a timely manner. A lack of availability of our raw materials in the quantities we require to produce our products could result in our inability to meet customer demand and could have a material adverse effect on our results of operations, financial condition and cash flows.

The European Union's Directive 2009/28 on the promotion of the use of energy from renewable resources ("Renewable Energy Directive" or "RED"), which will be repealed on July 1, 2021 (the "RED"), and the new Directive replacing Directive 2009/28, which has to be transposed by Member States by June 30, 2021 (the "RED II"), and similar legislation in the U.S. and elsewhere may incentivize the use of CTO as a feedstock for production of alternative fuels, which may have an adverse effect on our results of operations, financial condition, and cash flow.

In December 2008, the European Union adopted RED, which established a 20% EU-wide target for energy consumed from renewable sources relative to the EU's gross final consumption of energy, as well as a 10% target for energy consumed from renewable sources in the transport section by 2020. In order to reach these targets, the RED established mandatory targets for each Member State (as defined in RED) and required each Member State to adopt a national renewable energy action plan setting forth measures to achieve its national targets. RED also established sustainability criteria for biofuels, which must be satisfied in order for the consumption of a fuel to count toward a Member State's national targets. CTO-based biofuel currently fulfills RED's biofuel sustainability criteria. In spring 2015, the EU adopted amendments to RED, expressly listing CTO as a residue-type feedstock whose use in biofuel would make that biofuel eligible for double counting towards national targets of the Member States, and at least two Member States additionally have or plan fiscal incentives for the domestic marketing of CTO-based and other qualifying biofuels. In late 2018 the EU adopted the RED II for the period 2021-2030. The RED II contains higher set obligations and goals than the RED; an EU-wide binding target of a 32% share of energy from renewable sources in the gross final consumption of energy by 2030, and a share of 14% of renewable energy in the transport sector by 2030. According to the RED II, Member States shall set out national indicative trajectories for their contributions to the EU-wide target and these trajectories shall be based on the targets set out in the RED for 2020. As for the transport sector target, the RED II provides that Member States shall oblige fuel suppliers to supply a share of at least 14% of fuels from renewable sources, including a share of 3.5% of advanced biofuels. CTO based biofuels shall, according to the RED II, be counted as advanced biofuels and Member States may still double count the contribution of such fuels.

In addition to these developments in the European Union, various pieces of legislation regarding the use of alternative fuels have been introduced in the U.S. Because the supply of CTO is inherently constrained by the volume of kraft pulp processing, any diversion of CTO for production of alternative fuels would reduce the available supply of CTO as the principal raw material of the pine chemicals industry. A reduced ability to procure an adequate supply of CTO due to competing new uses such as for biofuel production, could have a material adverse effect on our results of operations, financial condition and cash flows.

Increases in the costs of our raw materials which may have an adverse effect on our results of operations, financial condition, and cash flow if those costs cannot be passed through to our customers.

Our results of operations are directly affected by the cost of raw materials. Our primary raw materials are butadiene, styrene, and isoprene in our Polymer segment and CTO and CST in our Chemical segment. Since the cost of these primary raw materials comprises a significant amount of our total cost of goods sold, the selling prices for our products and therefore our total revenue is impacted by movements in these raw material costs, as well as by the cost of other inputs. In the past we have experienced erratic and significant changes in the costs of these raw materials, the cost of which has generally correlated with changes in energy prices, supply and demand factors, and prices for natural and synthetic rubber. The pricing for butadiene has historically been particularly volatile. In addition, product mix can have an impact on our overall unit selling prices, since we provide an extensive product offering and therefore experience a wide range of unit selling prices. Because of the significant portion of our cost of goods sold represented by these raw materials, our gross profit margins could be adversely affected by changes in the cost of these raw materials if we are unable to pass the increases on to our customers.

Due to volatile raw material prices, there can be no assurance that we can continue to recover raw material costs or retain customers in the future. As a result of our pricing actions, customers may become more likely to consider competitors' products, some of which may be available at a lower cost. Significant loss of customers could result in a material adverse effect on our results of operations, financial condition and cash flows.

Significant fluctuations in raw material costs may result in volatility in our quarterly operating results and impact the market price of our common stock.

In periods of raw material price volatility, reported results under U.S. generally accepted accounting principles ("U.S. GAAP") will differ from what the results would have been if cost of goods sold were based on estimated current replacement cost (“ECRC”). Specifically, in periods of declining raw material costs, reported gross profit will be lower under U.S. GAAP than under ECRC, and in periods of rising raw material costs, gross profit will be higher under U.S. GAAP than under ECRC. However, because raw material costs are difficult to predict, we cannot accurately anticipate fluctuations in raw material costs with precision, or effectively or economically hedge against the effects of any such change. If raw material costs fluctuate in a quarter, our results of operations will be affected, the magnitude of which could be significant, which could cause our earnings to depart from the periodic expectations of financial analysts or investors and, therefore, the market price of our common stock may be volatile as a result.

Maintenance, expansion and refurbishment of our facilities, the construction of new facilities and the development and implementation of new manufacturing processes involve significant risks which may have an adverse effect on our results of operations, financial condition, and cash flow.

Our facilities may require regulatory or periodic maintenance, upgrading, expansion, refurbishment or improvement. Any unexpected operational or mechanical failure, including failure associated with breakdowns and forced outages, could reduce our facilities' production capacity below expected levels which would reduce our revenues. Unanticipated capital expenditures associated with maintaining, upgrading, expanding, repairing, refurbishing, or improving our facilities may also reduce profitability. Our facilities may also be subject to unanticipated damage as a result of natural disasters or terrorist attacks, as was the case for our Panama City, Florida, manufacturing facility during Hurricane Michael in October 2018. See “Domestic or international natural disasters or terrorist attacks may disrupt our operations, decrease the demand for our products or otherwise have an adverse effect on our results of operations, financial condition, and cash flow.”

If we make any major modifications to our facilities, such modifications likely would result in substantial additional capital expenditures and could prolong the time necessary to bring the facility on line. We may also choose to refurbish or upgrade our facilities based on our assessment that such activity will provide adequate financial returns. However, such activities require time for development and capital expenditures before commencement of commercial operations, and key assumptions underpinning a decision to make such an investment may prove incorrect, including assumptions regarding construction costs and timing which could have a material adverse effect on our business, financial condition, results of operations and cash flows. The construction of new manufacturing facilities entails a number of risks, including the ability to begin production within the cost and timeframe estimated and to attract a sufficient number of skilled workers to meet the needs of the new facility. Additionally, our assessment of the projected benefits associated with the construction of new manufacturing facilities is subject to a number of estimates and assumptions, which in turn are subject to significant economic, competitive and other uncertainties that are beyond our control. If we experience delays or increased costs, our estimates and assumptions are incorrect, or other unforeseen events occur, our business, ability to supply customers, financial condition, results of operations and cash flows could be adversely impacted.

Finally, we may not be successful or efficient in developing or implementing new production processes. Innovation in production processes involves significant expense and carries inherent risks, including difficulties in designing and developing new process technologies, development and production timing delays, lower than anticipated manufacturing yields, and product defects. Disruptions in the production process can also result from errors, defects in materials, delays in obtaining or revising operating permits and licenses, returns of product from customers, interruption in our supply of materials or resources, and disruptions at our facilities due to accidents, maintenance issues, or unsafe working conditions, all of which could affect the timing of production ramps and yields. Production issues can lead to increased costs and may affect our ability to meet product demand, which could adversely impact our business and the results from operations.

Third parties provide significant operating and other services under agreements that are important to our business. The failure of these third parties to perform their obligations, or the termination of these agreements, which may have an adverse effect on our results of operations, financial condition, and cash flow.

We are party to agreements with third parties who provide site services, utilities, materials and facilities. Additionally our Berre, France and Wesseling, Germany plants are operated and maintained by a third party who also employs and provides substantially all of the staff for those facilities. If relationships with these third parties were to deteriorate or if the agreements for these services were to terminate, we would be forced to obtain these services from other parties or provide them ourselves. Additionally, at Berre and Wesseling, a termination of the third party agreement would require use to relocate our manufacturing facilities at those locations. The failure of our third party service providers and partners at our manufacturing facilities to perform their obligations under, or the termination of, any of these agreements could materially adversely affect our operations and, depending on market conditions at the time of any such termination, we might not be able to enter into substitute arrangements in a timely manner, if at all, and if we are able to enter into a substitute arrangement, it may not be on terms as favorable to us.

Failure to successfully consummate the acquisition and integration of, or disposition of, businesses, assets, products or technologies or realize the financial and strategic goals that were contemplated at the time of any such transaction may adversely affect our future results of operations, financial condition, and cash flow.

From time to time, we explore and pursue (i) acquisitions and strategic investments in businesses, products or technologies that we believe could complement or expand our business and we expect to continue to do so in the future or (ii) dispositions of non-strategic assets. The expense and effort incurred in exploring and consummating such acquisitions or dispositions, the time it takes to integrate an acquisition or our failure to integrate businesses successfully, could result in additional and/or unexpected expenses and losses. For example, an investment in, or acquisition of, complementary businesses, products or technologies in the future could materially decrease the amount of our available cash or require us to seek additional equity or debt financing. We also may not be successful in negotiating the terms of any potential acquisition or disposition or, in the case of acquisitions, conducting thorough due diligence, financing the acquisition or effectively integrating the acquired business, product or technology into our existing business and operations. Acquisitions and dispositions may also be affected by unanticipated delays, including in obtaining regulatory, governmental, customer or other third party approvals, which may result in such transactions being delayed, or in limited circumstances not being completed at all. In addition, we may decide to abandon a previously disclosed transaction.

Moreover, we may incur significant expenses whether or not a contemplated transaction is ultimately consummated. Additionally, in connection with any acquisition or disposition we consummate, we may not achieve the synergies or other benefits we expected to achieve, including, in the case of dispositions, receipt of the consideration expected from such transaction, and we may incur unanticipated expenses, write-downs, impairment charges or unforeseen liabilities that could negatively affect our business, financial condition and results of operations, disrupt relationships with current and new employees, customers and vendors, incur significant debt or have to delay or not proceed with announced transactions.

Further, exploring or consummating a disposition or acquisition and integrating an acquired business, product or technology could divert management and employee time and resources from other matters.

Our industry is highly competitive, and we may lose market share to other producers of SBCs, pine-based specialty chemicals or other products that can be substituted for our products, which may have an adverse effect on our results of operations, financial condition, and cash flow.

Our industry is highly competitive, and we face significant competition from both large international producers and from smaller regional competitors. Our competitors may improve their competitive position in our core markets by successfully introducing new products, improving their manufacturing processes, or expanding their capacity or manufacturing facilities. Further, some of our competitors benefit from advantageous cost positions that could make it increasingly difficult for us to compete in markets for less-differentiated applications. If we are unable to keep pace with our competitors' product and manufacturing process innovations or cost position, it could have a material adverse effect on our results of operations, financial condition, and cash flows.

In addition, competition in the various product applications in which we compete is intense. Increased competition from existing or newly developed SBCs, pine-based specialty chemicals or other products may reduce demand for our products in the future and our customers may decide on alternate sources to meet their requirements. If we are unable to successfully compete with other producers of SBCs or refiners of CTO, or if other products can be successfully substituted for our products, our sales may decline. Our tall oil-based resins compete against hydrocarbon and gum-based resins in the adhesives and inks submarkets, and our TOFA competes against animal and vegetable-based fatty acids. We could be subject to pricing pressure from Chinese manufacturers of gum rosins, and hydrocarbon competitors have introduced metallocene-based products that compete directly with many of our adhesive tackifiers.

If we are not able to continue the technological innovation and successful commercial introduction of new products, our customers may turn to other producers to meet their requirements.

Our industry and the markets into which we sell our products experience periodic technological change and ongoing product improvements. In addition, our customers may introduce new generations of their own products or require new technological and increased performance specifications that would require us to develop customized products. Innovation or other changes in our customers' product performance requirements may also adversely affect the demand for our products. Our future growth and profitability will depend on our ability to gauge the direction of the commercial and technological progress in all key markets, and upon our ability to successfully develop, manufacture and sell products in such changing markets. In order to maintain our profit margins and our competitive position, we must continue to identify, develop and market innovative products on a timely basis to replace existing products. We may not be successful in developing new products and technology that successfully compete with newly introduced products and materials, and our customers may not accept, or may have lower demand for, any of our new products. Further, an important part of our strategy is the creation of demand for innovations that we develop and introduce to the markets. If we fail to keep pace with evolving technological innovations, fail to modify our products in response to our customers' needs or fail to develop innovations that generate additional demand, then our business, financial condition and results of operations could be adversely affected as a result of reduced sales of our products or diminished return on investment in innovations.

Our business relies on intellectual property and other proprietary information, and our failure to protect our rights could harm our competitive advantages with respect to the manufacturing of some of our products, which may have an adverse effect on our results of operations, financial condition, and cash flow.

Our success depends, to a significant degree, upon our ability to protect and preserve our intellectual property and other proprietary information relating to our business. However, we may be unable to prevent third parties from using our intellectual property and other proprietary information without our authorization or from independently developing intellectual property and other proprietary information that is similar to ours, particularly in those countries where the laws do not protect our proprietary rights to the same degree as in the U.S. The use of our intellectual property and other proprietary information by others could reduce or eliminate any competitive advantage we have developed, potentially causing us to lose sales or otherwise harm our business. If it becomes necessary for us to litigate to protect these rights, any proceedings could be burdensome and costly, and we may not prevail.

Our patent applications and issued patents may not provide us with any competitive advantage and may be challenged by third parties. Our competitors may also attempt to design around our patents or copy or otherwise obtain and use our intellectual property and other proprietary information. Moreover, our competitors may already hold or have applied for patents in the U.S. or abroad that, if enforced or issued, could possibly prevail over our patent rights or otherwise limit our ability to manufacture or sell one or more of our products in the U.S. or abroad. With respect to our pending patent applications, we may not be successful in securing patents for these claims. Our failure to secure these patents may limit our ability to protect inventions that these applications were intended to cover. In addition, the expiration of a patent can result in increased competition with consequent erosion of profit margins.

Our confidentiality agreements could be breached or may not provide meaningful protection for our trade secrets or proprietary manufacturing expertise. Adequate remedies may not be available in the event of an unauthorized use or disclosure of our trade secrets and manufacturing expertise. Violations by others of our confidentiality agreements and the loss of employees who have specialized knowledge and expertise could harm our competitive position and cause our sales and operating results to decline as a result of increased competition. In addition, others may obtain knowledge of our trade secrets through independent development or other access by legal means.

The applicable governmental authorities may not approve our pending service mark and trademark applications. A failure to obtain trademark registrations in the U.S. and in other countries could limit our ability to obtain and retain our trademarks and impede our marketing efforts in those jurisdictions. Moreover, third parties may seek to oppose our applications or otherwise challenge the resulting registrations. In the event that our trademarks are successfully challenged, we could be forced to rebrand our products, which could result in loss of brand recognition and could require us to devote resources to advertising and marketing new brands.

The failure of our patents, trademarks, or confidentiality agreements to protect our intellectual property and other proprietary information, including our processes, apparatuses, technology, trade secrets, trade names and proprietary manufacturing expertise, methods and compounds, could have a material adverse effect on our competitive advantages over other producers.

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

Many of our competitors have a substantial amount of intellectual property. We cannot guarantee that our processes and products do not and will not infringe issued patents (whether present or future) or other intellectual property rights belonging to others, including, without limitation, situations in which our products, processes or technologies may be covered by patent applications filed by other parties in the U.S. or abroad.

From time to time, we oppose patent applications that we consider overbroad or otherwise invalid in order to maintain the necessary freedom to operate fully in our various business lines without the risk of being sued for patent infringement. If, however, patents are subsequently issued on any such applications by other parties, or if patents belonging to others already exist that cover our products, processes or technologies, we could be liable for infringement or have to take other remedial or curative actions to continue our manufacturing and sales activities with respect to one or more products.

We may also be subject to legal proceedings and claims in the ordinary course of our business, including claims of alleged infringement of the patents, trademarks and other intellectual property rights of third parties by us or our licensees in connection with their use of our products. Intellectual property litigation is expensive and time-consuming, regardless of the merits of any claim, and could divert our management’s attention from operating our business.

If we were to discover that our processes, technologies or products infringe the valid intellectual property rights of others, we might need to obtain licenses from these parties or substantially re-engineer our products in order to avoid infringement. We may not be able to obtain the necessary licenses on acceptable terms, or at all, or be able to re-engineer our products successfully. Moreover, if we are sued for infringement and lose, we could be required to pay substantial damages and/or be enjoined from using or selling the infringing products or technology. If we incur significant costs to litigate our intellectual property rights or to obtain licenses, or if our inability to obtain required licenses for our processes, technologies or products prevents us from selling our products, it could have a material adverse effect on our business and results of operations.

Increased information systems security threats and more sophisticated and targeted computer crime could pose a risk to our systems, networks, products, and services.

We depend on integrated information systems to conduct our business. Increased global information systems security threats and more sophisticated, targeted computer crime pose a risk to the security of our systems and networks and the confidentiality, availability, and integrity of our data, operations, and communications. While we attempt to mitigate these risks by employing a number of measures, including security measures, employee training, comprehensive monitoring of our networks and systems, and maintenance of backup and protective systems, if these measures prove inadequate, we could be adversely affected by, among other things, loss or damage of intellectual property, proprietary and confidential information, and communications or customer data, having our business operations interrupted and increased costs to prevent, respond to, or mitigate these cyber security threats. Any significant disruption or slowdown of our systems could cause customers to cancel orders or cause standard business processes to become inefficient or ineffective, which could adversely affect our results of operations, financial position or cash flows.

Our business is subject to seasonality that may affect our quarterly operating results and impact the market price of our common stock.

Seasonal changes and weather conditions typically affect our sales in our paving (including pavement markings), roofing, and construction applications. In particular, sales volumes generally rise in the warmer months and generally decline during the colder months of fall and winter, or during abnormally wet seasons. In addition, sales into the ink submarket are typically highest in the third quarter of the year due to increased demand for holiday catalog printing. However, because seasonal weather patterns are difficult to predict, we cannot accurately estimate quarterly fluctuations in sales into our paving, roofing, construction, and ink submarkets in any given year.

Seasonality also affects the availability of CTO and CST, two of our primary raw materials. Yields of CTO and CST are higher during the first half of the year, generally peaking during the early summer months, due to the natural growth and associated chemical yield cycles of trees, in addition to higher yields from kraft pulping during the cooler months.

Chemical manufacturing is inherently hazardous, which could result in accidents that disrupt our operations or expose us to significant losses or liabilities.

Hazards associated with chemical manufacturing and the related storage and transportation of raw materials, products and wastes exist in our operations and the operations of other occupants with whom we share manufacturing sites. These hazards could lead to an interruption or suspension of operations and have an adverse effect on the productivity and profitability of a particular manufacturing facility or on us as a whole. These potential risks include, but are not necessarily limited to:

- pipeline and storage tank leaks and ruptures;
- explosions and fires;
- inclement weather and natural disasters;
- terrorist attacks;
- mechanical failure; and
- chemical spills and other discharges or releases of toxic or hazardous substances or gases.

These hazards may result in personal injury and loss of life, damage to property and contamination of the environment, which may result in a suspension of operations and the imposition of civil or criminal penalties, including governmental fines, expenses for remediation and claims brought by governmental entities or third parties. The loss or shutdown of operations over an extended period at any of our major operating facilities could have a material adverse effect on our industry, reputation, or our financial condition and results of operations. Our property, business interruption and casualty insurance may not fully insure us against all potential hazards incidental to our business.

We may be liable for damages based on product liability claims brought against our customers, which may have an adverse effect on our results of operations, financial condition, and cash flow.

Many of our products provide critical performance attributes to our customers' products, which are sold to consumers who could potentially bring product liability suits in which we could be named as a defendant. For example, certain of the chemicals or substances that are used in our businesses, including alkyl phenols such as bisphenol A and nonylphenol, flammable solvents such as toluene, xylene and alcohols, and rosin, formaldehyde and resin dust, have been identified as having potentially harmful health effects. The sale of these products entails the risk of product liability claims. If a person were to bring a product liability suit against one of our customers, the customer may attempt to seek contribution from us. A person may also bring a product liability claim directly against us. A successful product liability claim or series of claims against us in excess of our insurance coverage, for which we are not otherwise indemnified, could have a material adverse effect on our industry, reputation, or our financial condition or results of operations. There can be no assurance that our efforts to protect ourselves from product liability claims in this regard will ultimately protect us from any such claims.

Failure to comply with the Foreign Corrupt Practices Act and other similar worldwide anti-bribery, anti-corruption, and anti-fraud laws may subject us to penalties, which may have an adverse effect on our results of operations, financial condition, and cash flow.

Our international operations require us to comply with a number of U.S. and international laws and regulations, including those involving anti-bribery, anti-corruption and anti-fraud. In particular, our international operations are subject to U.S. and foreign anti-corruption laws and regulations, including the regulations imposed by the Foreign Corrupt Practices Act ("FCPA"), which generally prohibits issuers and their strategic or local partners, agents or representatives, which we refer to as our intermediaries (even if those intermediaries are not themselves subject to the FCPA or other similar laws), from making improper payments to foreign officials for the purpose of obtaining or keeping business or obtaining an improper business benefit, and the United Kingdom Bribery Act 2010 (the "Bribery Act") as well as anti-bribery and anti-corruption laws of the various jurisdictions in which we operate. We currently take precautions to comply with these laws. However, these precautions may not protect us against liability, particularly as a result of actions by our intermediaries through whom we have exposure under these anti-bribery, anti-corruption and anti-fraud laws even though we may have limited or no ability to control such intermediaries. Additionally, we have operations in certain countries where strict compliance with anti-bribery and anti-corruption laws may conflict with local customs and practices. In order to effectively operate in certain foreign jurisdictions, circumstances may require that we establish joint ventures with local operators or use third-party agents, distributors and marketing representatives. The establishment of joint ventures with local operators and the use of third-party intermediaries may expose us to the risk of violating, or being accused of violating, the foregoing or other anti-bribery, anti-corruption laws or anti-fraud. Such violations could be punishable by criminal fines, imprisonment, civil penalties, disgorgement of profits, injunctions and exclusion from government contracts, as well as other remedial measures. Investigations of alleged violations can be very expensive, disruptive and damaging to our reputation and could negatively impact our stock price. Failure by us or our intermediaries to comply with the foregoing or other anti-bribery, anti-corruption and anti-fraud laws could adversely impact our results of operations, financial position, and cash flows, damage our reputation and negatively impact our stock price.

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

We procure raw materials from foreign countries and have significant operations in foreign countries, including manufacturing facilities, research and development facilities, offices, sales personnel and customer support operations. Currently, we operate, or others operate on our behalf, facilities in Brazil, Finland, France, Germany, Japan and Sweden, in addition to our operations in the U.S. Furthermore, we are a 50/50 joint venture partner with FPCC to own and operate a 30 kiloton HSBC plant at FPCC's petrochemical site in Mailiao, Taiwan.

Our foreign operations are subject to risks inherent in doing business in foreign countries, including, but not necessarily limited to:

- new and different legal and regulatory requirements in local jurisdictions;
- data privacy regulations;
- export duties or import quotas;
- domestic and foreign customs and tariffs or other trade barriers;
- potential staffing difficulties and labor disputes;
- risk of non-compliance with the U.S. FCPA, the Bribery Act, or similar anti-bribery legislation in other countries by agents or other third-party representatives;
- managing and obtaining support and distribution for local operations;
- increased costs of transportation or shipping;
- credit risk and financial conditions of local customers and distributors;
- potential difficulties in protecting intellectual property;
- risk of nationalization of private enterprises by foreign governments;
- potential imposition of restrictions on investments;
- varying permitting and approval requirements;
- potentially adverse tax consequences, including imposition or increase of withholding and other taxes on remittances and other payments by subsidiaries;

- foreign currency exchange restrictions and fluctuations;

- local political and social conditions, including the possibility of hyperinflationary conditions and political instability in certain countries; and
- civil unrest, including labor unrest, in response to local political conditions.

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

Compliance with extensive environmental, health and safety laws could require material expenditures, changes in our operations or site remediation.

The manufacturing of our products can present potentially significant health and safety concerns. Our products are also used in a variety of applications that have specific regulatory requirements such as those relating to products that have contact with food or are used for medical applications.

We use large quantities of hazardous substances and generate hazardous wastes in our manufacturing operations. Consequently, our operations are subject to extensive environmental, health and safety laws and regulations at the international, national, state and local level in multiple jurisdictions. These laws and regulations govern, among other things, air emissions, wastewater discharges, solid and hazardous waste management and disposal, occupational health and safety, including dust and noise control, site remediation programs and chemical use and management. Many of these laws and regulations have become more stringent over time and the costs of compliance with these requirements may increase, including costs associated with any necessary capital investments. In addition, our production facilities require operating permits that are subject to renewal and, in some circumstances, revocation. The necessary permits may not be issued or continue in effect, and renewals of any issued permits may contain significant new requirements or restrictions. The nature of the chemical industry exposes us to risks of liability due to the use, production, management, storage, transportation and sale of materials that are heavily regulated or hazardous and can cause contamination or personal injury or damage if released into the environment.

Because of the nature of our operations, we could be subject to legislation and regulation affecting the emission of greenhouse gases. The U.S. Environmental Protection Agency ("EPA") has promulgated regulations applicable to projects involving greenhouse gas emissions above a certain threshold, and the U.S. and certain states within the U.S. have enacted, or are considering, limitations on greenhouse gas emissions.

Jurisdictions outside the U.S. are also addressing greenhouse gases by legislation or regulation. In addition, efforts have been made and continue to be made at the international level toward the adoption of international treaties or protocols that would address global greenhouse gas emissions. These requirements to limit greenhouse gas emissions may require us to incur capital investments to upgrade our operations to comply with any future greenhouse gas emissions controls. While the impact of any such legislation, regulation, treaties or protocols is currently speculative, any such legislation, regulation, treaties or protocols, if enacted, may have an adverse effect on our operations or financial condition.

Compliance with environmental laws and regulations generally increases the costs of transportation and storage of raw materials and finished products, as well as the costs of storage and disposal of wastes. We may incur substantial costs, including fines, damages, criminal or civil sanctions and remediation costs, or experience interruptions in our operations for violations arising under environmental laws, regulations or permit requirements.

Regulation of our employees' exposure to certain chemicals could require material expenditures or changes in our operations, which may have an adverse effect on our results of operations, financial condition, and cash flow.

The Occupational Safety and Health Act ("OSHA") in the U.S. and the Registration, Evaluation and Authorization of Chemicals ("REACH"), directive in Europe, prescribe limitations restricting exposure to a number of chemicals used in our operations, including butadiene, formaldehyde and nonylphenol, a raw material used in the manufacture of phenolic ink resins. Butadiene is a known carcinogen in laboratory animals at high doses and is being studied for its potential adverse health effects. Future studies on the health effects of these, and other, chemicals may result in additional regulations or new regulations that further restrict or prohibit the use of, and exposure to, such chemicals. Additional regulation of or requirements for these chemicals could require us to change our operations, and these changes could affect the quality of our products and materially increase our costs.

We may be subject to losses due to lawsuits arising out of environmental damage or personal injuries associated with chemical manufacturing, which may have an adverse effect on our results of operations, financial condition, and cash flow.

We face the risk that individuals could, in the future, seek damages for personal injury due to exposure to chemicals at our facilities or to chemicals otherwise owned or controlled by us. We may be subject to future claims with respect to workplace exposure, workers' compensation, and other matters. Additionally, under certain of the lease and operating agreements for our sites we are required to indemnify the third party in certain circumstances, including in certain circumstances for loss and damages resulting from their negligence in performing their obligations.

Some environmental laws could impose on us the entire cost of clean-up of contamination present at a facility even though we did not cause the contamination and we may be required to undertake and pay for remediation of on-site contamination resulting from past operations at our current sites.

In general, there is always the possibility that a third-party plaintiff or claimant, or governmental or regulatory authority, could seek to include us in an action or claim for damages, clean-up, or remediation pertaining to events or circumstances occurring or existing at one or more of our sites prior to the time of our ownership or occupation of the applicable site. In the event that any of these actions or claims were asserted against us, our results of operations could be adversely affected.

We are subject to customs, international trade, export control, data privacy, antitrust, zoning and occupancy and labor and employment laws that could require us to modify our current business practices and incur increased costs.

We are subject to numerous regulations, including customs and international trade laws, export control, data privacy, antitrust laws and zoning and occupancy laws that regulate manufacturers generally and/or govern the importation, promotion and sale of our products, the operation of factories and warehouse facilities and our relationship with our customers, suppliers and competitors. Particularly, data privacy and protection laws in the U.S, Europe, including but not limited to the General Data Protection Regulation, and elsewhere are evolving and may be interpreted and applied inconsistently from jurisdiction to jurisdiction. In addition, we face risk associated with trade protection laws, policies and measures and other regulatory requirements affecting trade and investment, including loss or modification of exemptions for taxes and tariffs, imposition of new tariffs and duties and import and export licensing requirements. In 2018, the U.S. implemented new tariffs on imports from various countries. This may lead to retaliatory tariffs on U.S. goods, as evidenced by the Chinese imposition of tariffs on U.S. exports to China.

If these laws or regulations were to change or were violated by our management, employees, suppliers, buying agents or trading companies, the costs of certain goods could increase, or we could experience delays in shipments of our goods, be subject to fines or penalties, or suffer reputational harm, which could reduce demand for our products and hurt our business and negatively impact our results of operations. In addition, changes in federal and state minimum wage laws and other laws relating to employee benefits could cause us to incur additional wage and benefits costs, which could negatively impact our profitability.

Legal requirements are frequently changed and subject to interpretation, and we are unable to predict the ultimate cost of compliance with these requirements or their effects on our operations. We may be required to make significant expenditures or modify our business practices to comply with existing or future laws and regulations, which may increase our costs and materially limit our ability to operate our business.

Fluctuations in currency exchange rates may significantly impact our results of operations and may significantly affect the comparability of our results between financial periods.

Our operations are conducted by our subsidiaries in many countries. The results of the operations and the financial position of these subsidiaries are reported in the relevant foreign currencies and then translated into U.S. dollars at the applicable exchange rates for inclusion in our consolidated financial statements. The main currencies to which we are exposed, besides the U.S. dollar, are the Euro, Japanese Yen, British Pound, Brazilian Real, Swedish Krona, Chinese Yuan Renminbi, Taiwanese Dollar, and Mexican Peso. 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. A depreciation of these currencies against the U.S. dollar will decrease the U.S. dollar equivalent of the amounts derived from these operations reported in our consolidated financial statements and an appreciation of these currencies will result in a corresponding increase in such amounts. Because many of our raw material costs are determined with respect to the U.S. dollar rather than these currencies, depreciation of these currencies may have an adverse effect on our profit margins or our reported results of operations. Conversely, to the extent that we are required to pay for goods or services in foreign currencies, the appreciation of such currencies against the U.S. dollar will tend to negatively impact our results of operations. In addition, currency fluctuations may affect the comparability of our results of operations between financial periods.

We incur currency transaction risk whenever we enter into either a purchase or sale transaction using a currency other than the local currency of the transacting entity. From time to time, we use hedging strategies to reduce our exposure to currency fluctuations. Given the volatility of exchange rates, there can be no assurance that we will be able to effectively manage our currency transaction risks, that our hedging activities will be effective or that any volatility in currency exchange rates will not have a material adverse effect on our financial condition or results of operations.

We may have additional tax liabilities, which may have an adverse effect on our results of operations, financial condition, and cash flow.

We are subject to income taxes and state taxes in the U.S., as well as numerous foreign jurisdictions. Significant judgment is required in determining our worldwide provision for income taxes. In the ordinary course of our business, there are many transactions and calculations for which the ultimate tax determination is uncertain. Although we believe our tax estimates are reasonable, the final determination of tax audits and any related litigation could be materially different from that which is reflected in our consolidated financial statements. Should any tax authority take issue with our estimates, our results of operations, financial position, and cash flows could be adversely affected.

The U.S. Tax Cuts and Jobs Act ("Tax Act") was enacted on December 22, 2017 and introduced significant changes to U.S. income tax law. Accounting Standards Codification 740, Accounting for Income Taxes, requires companies to recognize the effects of tax law changes in the period of enactment. Effective in 2018, the Tax Act made a number of changes, such as reducing the U.S. statutory tax rate from 35.0% to 21.0%, creating new taxes on certain foreign sourced earnings and certain related-party payments, which are referred to as the global intangible low taxed income tax and the base erosion tax, respectively, establishing a dividends received deduction for dividends paid by foreign subsidiaries to the U.S., the elimination or limitation of certain deductions, and imposing a mandatory tax on previously unrepatriated earnings accumulated offshore.

Due to the timing of the enactment and the complexity involved in applying the provisions of the Tax Act, we made reasonable estimates of the effects and recorded provisional amounts in our consolidated financial statements as of December 31, 2017. As we collected and prepared necessary data, and interpreted the additional guidance issued by the U.S. Treasury Department, the IRS, and other standard-setting bodies, we made adjustments, over the course of the year, to the provisional amounts. The accounting for the tax effects of the Tax Act has been completed as of December 31, 2018.

We may be unable to realize the benefits of our net operating loss carry-forwards ("NOLs").

NOLs may be carried forward to offset federal and state taxable income in future years and eliminate income taxes otherwise payable on such taxable income, subject to certain adjustments. Based on current federal and state corporate income tax rates, our NOLs and other carry-forwards could provide a benefit to us, if fully utilized, of significant future tax savings. However, our ability to use these tax benefits in future years will depend upon the amount of our otherwise federal and state taxable income. If we do not have sufficient federal and state taxable income in future years to use the tax benefits before they expire, we will lose the benefit of these NOLs permanently.

The amount of NOLs that we have claimed has not been audited or otherwise validated by the U.S. Internal Revenue Service ("IRS"). The IRS could challenge our calculation of the amount of our NOLs or our determinations as to when a prior change in ownership occurred, and other provisions of the Internal Revenue Code may limit our ability to carry forward our NOLs to offset taxable income in future years. If the IRS were successful with respect to any such challenge, the potential tax benefit of the NOLs to us could be substantially reduced.

Our relationship with our employees could deteriorate, which may have an adverse effect on our results of operations, financial condition, and cash flow.

As a manufacturing company, we rely on our employees and good relations with our employees to produce our products and maintain our production processes and productivity. A significant number of our non-U.S. employees are subject to arrangements similar to collective bargaining arrangements. Approximately 14.5% of our combined U.S. employees are represented by unions. Our collective bargaining agreements at our Savannah, Georgia, manufacturing facility will expire in May and June 2019. We may not be able to negotiate existing or future arrangements on satisfactory terms or at all, which may adversely affect our business. If these workers were to engage in a strike, work stoppage or other slowdown, our operations could be disrupted or we could experience higher labor costs, which could adversely affect our business, results of operations, financial condition, and cash flow.

In addition, if our other employees were to become unionized, in particular our employees at our Belpre, Ohio, facility, we could experience significant operating disruptions and higher ongoing labor costs, which could adversely affect our results of operations, financial condition, and cash flow. Because many of the personnel who operate our European facilities are employees of a third party, relations between the third party and its employees may also adversely affect our business, results of operations, financial condition, and cash flow.

Loss of key personnel or our inability to attract and retain new qualified personnel could hurt our business and inhibit our ability to operate and grow successfully.

Our success in the highly competitive markets in which we operate will continue to depend to a significant extent on our key employees. We are dependent on the expertise of our executive officers and key employees. Loss of the services of any of our executive officers or key employees could have an adverse effect on our prospects. We may not be able to retain our key employees or to recruit qualified individuals to join our company. The loss of key employees could result in high transition costs and could disrupt our operations.

We generally do not have long-term contracts with our customers and the loss of customers could adversely affect our sales and profitability.

With some exceptions, our business is based primarily upon individual sales orders by our customers. As such, our customers could cease buying products from us at any time, for any reason, with little or no notice or recourse. If multiple customers elected not to purchase products from us, our business prospects, results of operations, financial condition, and cash flow could be adversely affected.

A decrease in the fair value of pension assets could materially increase future funding requirements of the pension plans.

We sponsor defined benefit pension plans. The total projected benefit obligation of our defined benefit pension plans exceeded the fair value of the plan assets by approximately $102.8 million at December 31, 2018. We contributed $12.8 million to the pension plans in 2018. Among the key assumptions inherent in the actuarially calculated pension plan obligations and pension plan expenses are the discount rate and the expected rate of return on plan assets. If discount rates or actual rates of return on invested plan assets were to decrease, the pension plan obligations could increase materially. The size of future required pension contributions could result in our dedicating a substantial portion of our cash flow from operations to making the contributions, which could materially adversely affect our business, financial condition and results of operations.

Domestic or international natural disasters or terrorist attacks may disrupt our operations, decrease the demand for our products or otherwise have an adverse impact on our business.

Chemical related assets, and U.S. corporations such as ours, may be at a greater risk of future terrorist attacks than other possible targets in the U.S. and throughout the world. Moreover, extraordinary events such as natural disasters could result in significant damage to our facilities and may negatively affect local economies, including those of our customers or suppliers. The occurrence of such events cannot be predicted, although their occurrence can be expected to continue to adversely impact the economy in general and our specific markets. The resulting damage from such an event could include loss of life, property damage or site closure. Several of our facilities are located in regions where natural disasters have previously disrupted, and may in the future disrupt, our ability to manufacture and deliver products from that facility and require us to temporarily declare an excused performance, or force majeure, on certain products under our existing agreements with customers. Any damage resulting in stoppage or reduction of our facilities' production capacity could reduce our revenues and any unanticipated capital expenditures to repair such damage (to the extent not covered by our insurance policies) may reduce profitability. Any, or a combination, of these factors could also adversely impact our results of operations, financial position and cash flows.

Delaware law and certain provisions of our organizational documents may make a takeover of our company more difficult.

Provisions of our charter and bylaws may have the effect of delaying, deferring or preventing a change in control of our company. A change of control could be proposed in the form of a tender offer or takeover proposal that might result in a premium over the market price for our common stock. In addition, these provisions could make it more difficult to bring about a change in the composition of our board of directors, which could result in the entrenchment of current management. For example, our charter and bylaws:

- establish a classified board of directors so that not all members of our board of directors are elected at one time;
- require that the number of directors be determined, and provide that any vacancy or new board seat may be filled only by the board;
- do not permit stockholders to act by written consent;
- do not permit stockholders to call a special meeting;
- permit the bylaws to be amended by a majority of the board without shareholder approval, and require that a bylaw amendment proposed by stockholders be approved by two-thirds of all outstanding shares;
- establish advance notice requirements for nominations for elections to our board of directors or for proposing matters that can be acted upon by stockholders at stockholder meetings; and
-

authorize the issuance of undesignated preferred stock, or "blank check" preferred stock, by our board of directors without shareholder approval.

Our Kraton Corporation Executive Severance Program and the equity arrangements with our executive officers also contain change in control provisions. Under the terms of these arrangements, the executive officers are entitled to receive significant cash payments, immediate vesting of options, restricted shares and notional shares, and continued medical benefits in the event their employment is terminated under certain circumstances within one year following a change in control, and with respect to certain equity awards, within two years following a change in control.

Any amounts accrued under the Kraton Polymers LLC Executive Deferred Compensation Plan are immediately payable upon a change of control. We disclose in proxy statements filed with the SEC potential payments to our named executive officers in connection with a change of control. Further, the terms of each of the indentures governing our Senior Notes require us, upon certain change of control transactions, to repurchase our outstanding Senior Notes at a price equal to 101.0% of their principal amount, plus any accrued and unpaid interest.

These arrangements and provisions of our organizational documents and Delaware law may have the effect of delaying, deferring or preventing changes of control or changes in management of our company, even if such transactions or changes would have significant benefits for our stockholders. As a result, these provisions could limit the price some investors might be willing to pay in the future for shares of our common stock.

We do not currently pay dividends and may not pay any dividends for the foreseeable future.

We do not currently pay dividends, and we may not pay dividends to our stockholders for the foreseeable future. The terms of the Term Loan Facility, the ABL Facility and our Senior Notes limit our ability to pay cash dividends, and we may be subject to other restrictions on our ability to pay dividends from time to time. In addition, because we are a holding company, our ability to pay dividends depends on our receipt of cash dividends and distributions from our subsidiaries. Accordingly, investors must be prepared to rely on sales of their common stock after price appreciation to earn an investment return, which may never occur. Investors seeking cash dividends should not purchase our common stock. Any determination to pay dividends in the future will be made at the discretion of our board of directors and will depend upon our results of operations, financial condition, contractual restrictions, restrictions imposed by applicable law or the SEC and other factors that our board deems relevant.

We are a holding company with nominal net worth and will depend on dividends and distributions from our subsidiaries to pay any dividends.

Kraton Corporation is a holding company with nominal net worth. We do not have any assets or conduct any business operations other than our investments in our subsidiaries, including Kraton Polymers LLC. As a result, our ability to pay dividends, if any, will be dependent upon cash dividends and distributions or other transfers from our subsidiaries. Payments to us by our subsidiaries will be contingent upon their respective earnings and subject to any limitations on the ability of such entities to make payments or other distributions to us. In addition, our subsidiaries are separate and distinct legal entities and have no obligation to make any funds available to us.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Our principal executive offices are located at 15710 John F. Kennedy Boulevard, Suite 300, Houston, Texas 77032. We believe that our properties and equipment are generally in good operating condition and are adequate for our present needs. Production capacity at our sites can vary greatly depending upon feedstock, product mix, and operating conditions. Approximate annual capacity amounts may fluctuate as a result of capital expenditures or lean process initiatives to increase capacity, a shutdown of certain equipment to reduce capacity or permanent changes in mix, which could increase or decrease capacity. The following table sets forth our approximate square footage of each of our manufacturing facilities.

Polymer Segment

Location	Principal Products	Approximate Square Footage	Owned/Leased	
Belpre, Ohio	Performance Products, Specialty Polymers, Cariflex	3,600,000	Owned	(1)
Wesseling, Germany	Performance Products	354,000	Owned	(2)
Berre, France	Performance Products, Specialty Polymers	392,000	Owned	(2)
Paulinia, Brazil	Cariflex	2,220,000	Owned	
Kashima, Japan	Performance Products	395,000	Owned	(3)
Mailiao, Taiwan	Specialty Polymers	1,800,000	Owned	(4)

Chemical Segment

Location	Principal Products (Upgrades)	Approximate Square Footage	Owned/Leased	
Panama City, Florida	Rosin Esters, Dispersions	217,626	Owned	
Pensacola, Florida	Terpene Resins	64,109	Owned	
Savannah, Georgia	Resin Esters	186,125	Owned	(5)
Dover, Ohio	Dimer Acids, Polyamides	166,824	Owned	
Oulu, Finland	Rosin Esters and Soaps	167,681	Owned	(6)
Niort, France	AMS, Terpene Resins	187,405	Owned	
Sandarne, Sweden	Rosin Esters, Dispersions	378,892	Owned	
Gersthofen, Germany	Disprorosins	39,116	Owned	

(1) A portion of the HSBC capacity at the Belpre facility is owned by Infineum USA, a joint venture between Shell Chemicals and ExxonMobil that makes products for the lubricant additives business.

(2) Our Wesseling and Berre manufacturing facilities are located on LyondellBasell sites. We lease the land, but own the manufacturing facilities and production equipment. We have operating agreements with LyondellBasell for various site services, utilities, materials, and facilities.

(3) The Kashima manufacturing facility is owned and operated by a 50%-50% joint venture between us and JSR, named Kraton JSR Elastomers K.K. (“KJE”). We are generally entitled to 50% of this production pursuant to our joint venture agreement. JSR markets its portion of the production under its own trademarks, and we market our portion of the production under the Kraton® brand name although this amount may vary from time to time.

(4) The Mailiao facility is our 50%-50% KFPC joint venture with FPCC and the joint venture leases the land, but owns the manufacturing facility and production equipment.

(5) We own our black liquor soap acidulation manufacturing facility located in Savannah, Georgia. However, this manufacturing facility is located on land that we lease and the lease expires on February 28, 2057.

(6) We own our manufacturing facility located in Oulu, Finland. However, this facility is located on land that we lease and the lease expires on August 31, 2044, with an option to extend the term until August 31, 2095.

Item 3. Legal Proceedings.

We and certain of our subsidiaries, from time to time, are parties to various other legal proceedings, claims, and disputes that have arisen in the ordinary course of business. These claims may involve significant amounts, some of which would not be covered by insurance. While the outcome of these proceedings cannot be predicted with certainty, our management does not expect any of these other existing matters, individually or in the aggregate, to have a material adverse effect upon our financial position, results of operations, or cash flows.

For information regarding legal proceedings, including environmental matters, see Note 13 Commitments and Contingencies (subsections (b) and (c) of which are incorporated herein by reference) to the consolidated financial statements for further discussion.

Item 4. Mine Safety Disclosures.

Not applicable.

PART II

Item 5. Market for Registrant’s Common Equity and Related Stockholder Matters

Our common stock is listed on the New York Stock Exchange (“NYSE”) under the symbol “KRA.”

As of February 25, 2019, we had approximately 78 shareholders of record of our common stock and approximately 5,482 beneficial owners.

Stock Performance Graph

The following graph reflects the comparative changes in the value from December 31, 2013 through December 31, 2018, assuming an initial investment of $100 and the reinvestment of dividends, if any, in (1) our common stock, (2) the S&P SmallCap 600 Index, and (3) the Dow Jones U.S. Specialty Chemicals Index. The information under this caption is not deemed to be “soliciting material” or to be “filed” with the SEC or subject to Regulation 14A or 14C under the Securities Exchange Act of 1934 or to the liabilities of Section 18 of the Securities Exchange Act of 1934, and will not be deemed to be incorporated by reference into any filing under the Securities Act of 1933 or the Securities Exchange Act of 1934, except to the extent we specifically incorporate it by reference into such a filing. Historical performance should not be considered indicative of future stockholder returns.

Total Return to Shareholders
(Includes reinvestment of dividends)

Company Name / Index	Annual Return Percentage, Years Ending 12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018
Kraton Corporation	(9.80)%	(20.11)%	71.46 %	69.14 %	(54.66)%
S&P SmallCap 600 Index	5.76 %	(1.97)%	26.56 %	13.23 %	(8.48)%
Dow Jones U.S. Specialty Chemicals	8.62 %	(9.79)%	10.54 %	22.39 %	(6.84)%

Cumulative Value of $100 Investment, through December 31, 2018

Company Name / Index	Base Period 12/31/13	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018
Kraton Corporation	$100.00	$ 90.20	$ 72.06	$ 123.56	$ 208.98	$ 94.75
S&P SmallCap 600 Index	$100.00	$ 105.76	$ 103.67	$ 131.20	$ 148.56	$ 135.96
Dow Jones U.S. Specialty Chemicals	$100.00	$ 108.62	$ 97.99	$ 108.32	$ 132.57	$ 123.50

Dividends

We have not previously declared or paid any dividends or distributions on our common stock and have instead deployed earnings to fund the development of our business. Any future determination to pay dividends will be at the discretion of our board of directors and will depend on our financial condition, results of operations, capital expenditure requirements, restrictions contained in current and future financing instruments, and other factors that our board of directors deems relevant. Because we are a holding company, our ability to pay dividends depends on our receipt of cash dividends and distributions from our subsidiaries. The terms of certain of our current debt instruments restrict our ability and the ability of our subsidiaries to pay dividends, as may the terms of any of our future debt or preferred securities.

Item 6. Selected Financial Data.

The selected financial data below should be read in conjunction with “Management’s Discussion and Analysis of Financial Condition and Results of Operations” included under Item 7 of this Form 10-K as well as the consolidated financial statements and the related notes.

	Years Ended December 31,				
	2018	2017	2016	2015	2014
	(In thousands, except per share data)				
Consolidated statements of operations data:					
Revenue	$2,011,675	$1,960,362	$1,744,104	$1,034,626	$1,230,433
Cost of goods sold	1,431,069	1,415,659	1,262,542	803,072	991,796
Gross profit	580,606	544,703	481,562	231,554	238,637
Operating expenses:					
Research and development	41,296	40,283	39,129	30,509	31,127
Selling, general, and administrative	153,897	161,260	177,356	116,193	103,682
Depreciation and amortization	141,410	137,162	125,658	62,093	66,242
Impairment of long-lived assets	—	—	—	—	4,731
Gain on insurance proceeds	(8,900)	—	—	—	—
Loss on disposal of fixed assets	2,169	514	665	237	314
Operating income	250,734	205,484	138,754	22,522	32,541
Other expense	(3,472)	(3,360)	(2,503)	(4,291)	(2,026)
Disposition and exit of business activities	—	—	28,416	—	—
Loss on extinguishment of debt	(79,866)	(35,389)	(13,423)	—	—
Earnings of unconsolidated joint venture [1]	471	486	394	406	407
Interest expense, net	(93,772)	(132,459)	(138,952)	(24,223)	(24,594)
Income (loss) before income taxes	74,095	34,762	12,686	(5,586)	6,328
Income tax benefit (expense)	(3,574)	57,884	91,954	(6,943)	(5,118)
Consolidated net income (loss)	70,521	92,646	104,640	(12,529)	1,210
Net (income) loss attributable to noncontrolling interest	(3,506)	4,903	2,668	1,994	1,209
Net income (loss) attributable to Kraton	$67,015	$97,549	$107,308	$(10,535)	$2,419
Earnings (loss) per common share:					
Basic	$2.10	$3.12	$3.48	$(0.34)	$0.07
Diluted	$2.08	$3.07	$3.43	$(0.34)	$0.07
Weighted average common shares outstanding:					
Basic	31,416	30,654	30,180	30,574	32,163
Diluted	31,789	31,140	30,621	30,574	32,483

(1) Represents our 50% joint venture interest in KJE, which is accounted for using the equity method of accounting.

	December 31,				
	2018	2017	2016	2015	2014
	(In thousands)				
Consolidated balance sheets data:					
Cash and cash equivalents	$85,891	$89,052	$121,749	$70,049	$53,818
Total assets	$2,894,704	$2,932,527	$2,906,645	$1,079,235	$1,076,877
Total debt	$1,532,619	$1,617,528	$1,739,525	$415,732	$351,872

EBITDA, Adjusted EBITDA, and Adjusted Diluted Earnings Per Share

We consider EBITDA, Adjusted EBITDA, and Adjusted Diluted Earnings Per Share to be important supplemental measures of our performance and believe they are frequently used by investors, securities analysts, and other interested parties in the evaluation of our performance and/or that of other companies in our industry, including period-to-period comparisons. In addition, management uses these measures to evaluate operating performance, and our incentive compensation plan bases incentive compensation payments on our Adjusted EBITDA performance, along with other factors. EBITDA, Adjusted EBITDA, and Adjusted Diluted Earnings Per Share have limitations as analytical tools and in some cases can vary substantially from other measures of our performance. You should not consider any of them in isolation, or as substitutes for analysis of our results under U.S. generally accepted accounting principles ("U.S. GAAP").

	Years Ended December 31,		
	2018	2017	2016
	(In thousands, except per share data)		
EBITDA [2][4]	$309,277	$304,383	$277,296
Adjusted EBITDA [1][3][4]	$378,043	$374,199	$354,132
Adjusted Diluted Earnings Per Share [1][4]	$3.16	$2.85	$2.36

(1) The majority of our consolidated inventory is measured using the FIFO basis of accounting. As part of our pricing strategy, we measure our business performance using the estimated current replacement cost ("ECRC") of our inventory and cost of goods sold. Our ECRC is based on our current expectation of the current cost of our significant raw material inputs. ECRC is developed monthly based on actual market-based contracted rates and spot market purchase rates that are expected to occur in the period. We then adjust the value of the significant raw material inputs and their associated impact to finished goods to the current replacement cost to arrive at an ECRC value for inventory and cost of goods sold. The result of this revaluation from the U.S. GAAP carrying value creates the spread between U.S. GAAP and ECRC. We maintain our perpetual inventory in our global enterprise resource planning system, where the carrying value of our inventory is determined. With inventory valued under U.S. GAAP and ECRC, we then have the ability to report cost of goods sold and therefore Adjusted EBITDA and Adjusted Diluted Earnings Per Share under both our U.S. GAAP convention and ECRC.

(2) On a consolidated basis, EBITDA represents net income before interest, taxes, depreciation and amortization. On a reporting segment basis, EBITDA represents segment operating income before depreciation and amortization, disposition and exit of business activities, other income (expense), loss on extinguishment of debt, and earnings of unconsolidated joint venture. Limitations for EBITDA as an analytical tool include the following:

- EBITDA does not reflect the significant interest expense on our debt;
- EBITDA does not reflect the significant depreciation and amortization expense associated with our long-lived assets;
- EBITDA included herein should not be used for purposes of assessing compliance or non-compliance with financial covenants under our debt agreements. The calculation of EBITDA in the debt agreements includes adjustments, such as extraordinary, non-recurring or one-time charges, proforma cost savings, certain non-cash items, turnaround costs, and other items included in the definition of EBITDA in the debt agreements; and
- other companies in our industry may calculate EBITDA differently than we do, limiting its usefulness as a comparative measure.

(3) Adjusted EBITDA is EBITDA net of the impact of the spread between the FIFO basis of accounting and ECRC and net of the impact of items we do not consider indicative of our ongoing operating performance. We explain how each adjustment is derived and why we believe it is helpful and appropriate in the reconciliation below. You are encouraged to evaluate each adjustment and the reasons we consider it appropriate for supplemental analysis. As an analytical tool, Adjusted EBITDA is subject to the limitations applicable to EBITDA described above, as well as the following limitations:

- due to volatility in raw material prices, Adjusted EBITDA may, and often does, vary substantially from EBITDA, net income and other performance measures, including net income calculated in accordance with U.S. GAAP; and

- Adjusted EBITDA may, and often will, vary significantly from EBITDA calculations under the terms of our debt agreements and should not be used for assessing compliance or non-compliance with financial covenants under our debt agreements.

(4) Included in EBITDA, Adjusted EBITDA, and Adjusted Diluted Earnings Per Share is $8.9 million, which was recognized as a gain on insurance proceeds for the three months ended December 31, 2018.

Because of these and other limitations, EBITDA and Adjusted EBITDA should not be considered as a measure of discretionary cash available to us to invest in the growth of our business.

Our presentation of non-GAAP financial measures and the adjustments made therein should not be construed as an inference that our future results will be unaffected by unusual or non-recurring items, and in the future we may incur expenses or charges similar to the adjustments made in the presentation of our non-GAAP financial measures.

We compensate for the above limitations by relying primarily on our U.S. GAAP results and using EBITDA, Adjusted EBITDA, and Adjusted Diluted Earnings Per Share only as supplemental measures. See our financial statements included under Item 8 of this Form 10-K.

We reconcile each of consolidated net income (loss) and reporting segment operating income to EBITDA, and then to Adjusted EBITDA as follows:

	Year Ended December 31, 2018			Year Ended December 31, 2017			Year Ended December 31, 2016		
	Polymer	Chemical	Total	Polymer	Chemical	Total	Polymer	Chemical	Total
	(In thousands)								
Net income attributable to Kraton			$67,015			$97,549			$107,308
Net income (loss) attributable to noncontrolling interest			3,506			(4,903)			(2,668)
Consolidated net income			70,521			92,646			104,640
Add (deduct):									
Income tax expense (benefit)			3,574			(57,884)			(91,954)
Interest expense, net			93,772			132,459			138,952
Earnings of unconsolidated joint venture			(471)			(486)			(394)
Loss on extinguishment of debt			79,866			35,389			13,423
Other expense			3,472			3,360			2,503
Disposition and exit of business activities			—			—			(28,416)
Operating income	$159,162	$91,572	250,734	$121,089	$84,395	205,484	$80,910	$57,844	138,754
Add (deduct):									
Depreciation and amortization	71,006	70,404	141,410	67,998	69,164	137,162	59,930	65,728	125,658
Disposition and exit of business activities	—	—	—	—	—	—	32,776	(4,360)	28,416
Other income (expense)	(4,311)	839	(3,472)	(3,687)	327	(3,360)	(3,019)	516	(2,503)
Loss on extinguishment of debt	(79,866)	—	(79,866)	(35,389)	—	(35,389)	(13,423)	—	(13,423)
Earnings of unconsolidated	471	—	471	486	—	486	394	—	394

joint venture EBITDA (non-GAAP)	146,462	162,815	309,277	150,497	153,886	304,383	157,568	119,728	277,296
Add (deduct):									
Transaction, acquisition related costs, restructuring, and other costs (a)	5,517	(607)	4,910	13,000	(165)	12,835	25,035	8,529	33,564
Disposition and exit of business activities (b)	—	—	—	—	—	—	(32,776)	4,360	(28,416)
Loss on extinguishment of debt	79,866	—	79,866	35,389	—	35,389	13,423	—	13,423
Effect of purchase price accounting on inventory valuation (c)	—	—	—	—	—	—	—	24,719	24,719
Hurricane related costs (d)	—	13,651	13,651	4,145	1,320	5,465	—	—	—
KFPC startup costs (e)	897	—	897	14,618	—	14,618	6,179	—	6,179
Non-cash compensation expense	8,102	—	8,102	7,627	—	7,627	8,334	—	8,334
Spread between FIFO and ECRC	(26,042)	(12,618)	(38,660)	(2,261)	(3,857)	(6,118)	5,324	13,709	19,033
Adjusted EBITDA (non-GAAP)	$214,802	$163,241	$378,043	$223,015	$151,184	$374,199	$183,087	$171,045	$354,132

(a) Charges related to the evaluation of acquisition transactions, severance expenses, and other restructuring related charges, which are recorded primarily in selling, general, and administrative expenses.

(b) Includes $38.2 million gain on sale of the Belpre Compounding Unit (“BCU”), $3.2 million gain on disposition of joint venture, $4.4 million loss on exit of our Solution Resinates product line, and $8.6 million loss of exit of our NEXAR product line.

(c) Higher costs of goods sold for our Chemical segment related to the fair value adjustment in purchase accounting for their inventory.

(d) 2018 costs are related to Hurricane Michael, which are mostly recorded in cost of goods sold and $1.3 million recorded in loss on disposal of fixed assets. 2017 costs are related to Hurricane Harvey and Hurricane Irma, which are all recorded in cost of goods sold.

(e) Startup costs related to the joint venture company, KFPC, which are recorded in selling, general, and administrative expenses for 2018, costs of goods sold for 2017, and selling, general, and administrative expenses for 2016.

We reconcile U.S. GAAP Diluted Earnings Per Share to Adjusted Diluted Earnings Per Share as follows:

	Years Ended December 31,		
	2018	2017	2016
Diluted Earnings Per Share	$2.08	$3.07	$3.43
Transaction, acquisition related costs, restructuring, and other costs (a)	0.13	0.31	0.90
Disposition and exit of business activities (b)	—	—	(0.59)
Loss on extinguishment of debt	1.91	0.87	0.27
Hurricane related costs (c)	0.32	0.13	—
Effect of purchase price accounting on inventory valuation (d)	—	—	0.63
KFPC startup costs (e)	0.01	0.26	0.08
Tax reform repatriation (f)	(0.28)	1.46	—
Tax reform deferred tax rate change (f)	—	(3.06)	—
Valuation allowance (g)	—	—	(2.75)
Spread between FIFO and ECRC	(1.01)	(0.19)	0.39
Adjusted Diluted Earnings Per Share (non-GAAP)	$3.16	$2.85	$2.36

(a) Charges related to the evaluation of acquisition transactions, severance expenses, and other restructuring related charges, which are recorded primarily in selling, general, and administrative expenses.

(b) Includes $38.2 million gain on sale of BCU, $3.2 million gain on disposition of joint venture, $4.4 million loss on exit of our Solution Resinates product line, and $8.6 million loss of exit of our NEXAR product line.

(c) 2018 costs are related to Hurricane Michael, which are mostly recorded in cost of goods sold and $1.3 million recorded in loss on disposal of fixed assets. 2017 costs are related to Hurricane Harvey and Hurricane Irma, which are all recorded in cost of goods sold.

(d) Higher costs of goods sold for our Chemical segment related to the fair value adjustment in purchase accounting for their inventory.

(e) Startup costs related to the joint venture company, KFPC, which are recorded in selling, general, and administrative expenses for 2018, costs of goods sold for 2017, and selling, general, and administrative expenses for 2016.

(f) Tax repatriation and deferred tax rate change relating to the 2017 U.S. Tax Cuts and Jobs Act, see Note 12 Income Taxes to the consolidated financial statements.

(g) Income tax benefit related to a portion of the change in our valuation allowance for deferred tax assets.

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

INTRODUCTION

Management's Discussion and Analysis of Financial Condition and Results of Operations should be read in conjunction with Item 8. Financial Statements and Supplementary Data. This discussion contains forward-looking statements and involves numerous risks and uncertainties, including, but not limited to those described in Item 1A. Risk Factors and below under the caption "Factors Affecting Our Results of Operations." Actual results may differ materially from those contained in any forward-looking statements.

OVERVIEW

We are a leading global specialty chemicals company that manufactures styrenic block copolymers ("SBCs"), specialty polymers, and high-value performance products primarily derived from pine wood pulping co-products. Our operations are managed through two operating segments: (i) Polymer segment and (ii) Chemical segment. Operating results for Arizona Chemical are included in the accompanying consolidated financial statements since the date of acquisition.

Polymer Segment

SBCs are highly-engineered synthetic elastomers, which we invented and commercialized over 50 years ago. We developed the first unhydrogenated styrenic block copolymers ("USBC") in 1964 and the first hydrogenated styrenic block copolymers ("HSBC") in the late 1960s. Our SBCs enhance the performance of numerous products by imparting greater flexibility, resilience, strength, durability, and processability, and are used in a wide range of applications, including adhesives, coatings, consumer and personal care products, sealants, lubricants, medical, packaging, automotive, paving, roofing, and footwear products. We also sell isoprene rubber ("IR") and isoprene rubber latex ("IRL"), which are non-SBC products primarily used in applications such as medical products, personal care, adhesives, tackifiers, paints, and coatings.

Our polymers are typically formulated or compounded with other products to achieve improved, customer-specific performance characteristics in a variety of applications. We seek to maximize the value of our product portfolio by emphasizing complex or specialized polymers and innovations that yield higher margins than more commoditized products. We sometimes refer to these complex or specialized polymers or innovations as being more "differentiated." Our products are found in many everyday applications, including personal care products, such as disposable diapers, and in the rubberized grips of toothbrushes, razor blades, and power tools. Our products are also used to impart tack and shear properties in a wide variety of adhesive products and to impart characteristics such as flexibility and durability in sealants and corrosion resistance in coatings. Our paving and roofing applications provide durability, extending road and roof life.

We also produce Cariflex™ isoprene rubber and isoprene rubber latex. Our Cariflex products are based on synthetic polyisoprene polymer and do not contain natural rubber latex or other natural rubber products making them an ideal substitute for natural rubber latex, particularly in applications with high purity requirements such as medical, healthcare, personal care, and food contact. We believe the versatility of Cariflex provides opportunities for new, differentiated applications.

Chemical Segment

Effective January 1, 2018, results for our Roads and Construction product line have been consolidated into our Adhesives and Performance Chemicals product lines to better align customer portfolio and end usage. We have adjusted the presentations for the years ended December 31, 2017 and 2016 to conform to the respective 2018 presentations.

We manufacture and sell high value products primarily derived from pine wood pulping co-products. We refine and further upgrade two primary feedstocks, crude tall oil ("CTO") and crude sulfate turpentine ("CST"), both of which are co-products of the wood pulping process, into value-added specialty chemicals. We refine CTO through a distillation process into four primary constituent fractions: tall oil fatty acids ("TOFA"); tall oil rosin ("TOR"); distilled tall oil ("DTO"); and tall oil pitch. We further upgrade TOFA, TOR, and DTO into derivatives such as dimer acids, polyamide resins, rosin resins, dispersions, and disproportionated resins. We refine CST into terpene fractions, which can be further upgraded into terpene resins. The various fractions and derivatives resulting from our CTO and CST refining process provide for distinct functionalities and properties, determining their respective applications and end markets.

We focus our resources on three product groups: Adhesives, Performance Chemicals, and Tires. Within our product groups, our products are sold into a diverse range of submarkets, including packaging, tapes and labels, pavement marking, high performance tires, fuel additives, oilfield and mining, coatings, metalworking fluids and lubricants, inks, and flavor and fragrances, among others.

While this business is based predominantly on the refining and upgrading of CTO and CST, we have the capacity to use both hydrocarbon-based raw materials, such as alpha-methyl-styrene, rosins, and gum rosins where appropriate and, accordingly, are able to offer tailored solutions for our customers.

Recent Developments and Known Trends
Our business is subject to a number of known risks and uncertainties, some of which are a result of recent developments.
Tariffs. Effective September 24, 2018, the Office of the U.S. Trade Representative enacted a 10 percent tariff on certain goods imported from China under Section 301 of the Trade Expansion Act of 1974, which may increase to 25 percent in 2019. We expect that these tariffs and further trade actions will continue to add uncertainty to pricing and supply conditions.
Hurricane Michael. In October 2018, our Panama City, Florida, facility was damaged by Hurricane Michael. In November 2018, restoration of operations for the crude tall oil refinery were complete. The Company's Crude Sulfate Turpentine (CST) refinery was restored to approximately 65.0% of capacity in December 2018, and as of the filing date, we have restored full operational capacity. We are actively working to minimize the impact on our customers, through inventories on hand, and where possible, production from our other plant sites.
During the three months ended December 31, 2018, we incurred $12.3 million of direct costs, which are included in our costs of good sold, and that had not been reimbursed from our insurance carrier. With respect to lost sales, we estimate the associated margin to be $8.9 million. During the fourth quarter we recognized $8.9 million of cash proceeds as reimbursement under our business interruption policy, which is included in operating income. We currently estimate the replacement cost associated with damaged equipment to be in a range of $5.0 million to $7.0 million. During the fourth quarter, we impaired damaged equipment with a net book value of $1.3 million, which as of December 31, 2018, had not been reimbursed under our property and casualty insurance policy.
We expect the Chemical segment first quarter 2019 Adjusted EBITDA will be negatively impacted by lost sales in the period, and it is unlikely that we will receive further insurance proceeds until we settle our final claim under the business interruption portion of our policy. We will continue to work with our insurance carrier through 2019 to resolve the property and business interruptions claims.
Logistics cost. Logistics costs increased approximately $10.0 million during 2018, as compared to 2017. We expect these inflationary pressures will continue in 2019.
Share repurchase program. In February 2019, we announced a repurchase program for up to $50.0 million of the Company's common stock by March 2021. Repurchases may be made at management's discretion from time to time through privately-negotiated transactions, in the open market, or through broker-negotiated purchases in compliance with applicable securities law, including through a 10b5-1 Plan. The repurchase program may be suspended for periods or discontinued at any time, and the amount and timing of the repurchases are subject to a number of factors, including Kraton's stock price.
Strategic alternatives for Cariflex business. In February 2019, the Company's board of directors initiated a process to review strategic alternatives for our Cariflex business, which may result in a sale of that business. There can be no assurance that the strategic review of Cariflex will result in the completion of a transaction. The Company's board of directors has not set a timetable for the completion of the strategic review.
Status of Synergies, Operational Improvement, and Cost Reduction Initiatives
We previously announced synergies and operational improvement initiatives associated with the Arizona Chemical Acquisition and a cost reduction initiative targeted at lowering costs in our Polymer segment.
The Polymer segment cost reduction initiative began in 2015 with a total target savings of $70.0 million to be realized by the end of 2018. The cost reduction initiative was fully realized as of December 31, 2018.
In conjunction with the acquisition of Arizona Chemical, we identified $65.0 million of cost-based synergies, approximately $25.0 million of which relate to general and administrative costs, and approximately $40.0 million of which are associated with operation cost improvements; all of which were realized as of December 31, 2017.
RESULTS OF OPERATIONS
Factors Affecting Our Results of Operations
Raw Materials. We use butadiene, styrene, and isoprene in our Polymer segment and CTO and CST in our Chemical segment as our primary raw materials. The cost of these raw materials has generally correlated with changes in energy prices and is generally influenced by supply and demand factors, and for our isoprene monomers, the prices for natural and synthetic rubber. Average purchase prices of our raw materials increased during 2018 compared to 2017 and were higher in 2017 compared to 2016.

We use the FIFO basis of accounting for inventory and cost of goods sold, and therefore gross profit. In periods of raw material price volatility, reported results under FIFO will differ from what the results would have been if cost of goods sold were based on ECRC. Specifically, in periods of rising raw material costs, reported gross profit will be higher under FIFO than under ECRC. Conversely, in periods of declining raw material costs, reported gross profit will be lower under FIFO than under ECRC. In recognition of the fact that the cost of raw materials affects our results of operations and the comparability of our results of operations, we provide the difference, or spread, between FIFO and ECRC to arrive at our Adjusted EBITDA.

International Operations and Currency Fluctuations. We operate a geographically diverse business, serving customers in numerous countries from fourteen manufacturing facilities on four continents. Our sales and production costs are mainly denominated in U.S. dollars, Euro, Japanese Yen, Swedish Krona, and Brazilian Real. From time to time, we use hedging strategies to reduce our exposure to currency fluctuations.

We generated our revenue from customers located in the following regions:

	Years Ended December 31,		
Revenue by Geography	2018	2017	2016
Americas	42.1%	41.3%	43.1%
Europe, Middle East, and Africa	35.3%	35.7%	34.3%
Asia Pacific	22.6%	23.0%	22.6%

Seasonality. Seasonal changes and weather conditions typically affect our sales of products in our paving, pavement markings, roofing, and construction applications, which generally results in higher sales volumes in the second and third quarters of the calendar year compared to the first and fourth quarters of the calendar year. Sales for our other product applications tend to show relatively little seasonality.

KRATON CORPORATION
CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except per share data)

	Years Ended December 31,		
	2018	2017	2016
Revenue	$2,011,675	$1,960,362	$1,744,104
Cost of goods sold	1,431,069	1,415,659	1,262,542
Gross profit	580,606	544,703	481,562
Operating expenses:			
Research and development	41,296	40,283	39,129
Selling, general, and administrative	153,897	161,260	177,356
Depreciation and amortization	141,410	137,162	125,658
Gain on insurance proceeds	(8,900)	—	—
Loss on disposal of fixed assets	2,169	514	665
Operating income	250,734	205,484	138,754
Other expense	(3,472)	(3,360)	(2,503)
Disposition and exit of business activities	—	—	28,416
Loss on extinguishment of debt	(79,866)	(35,389)	(13,423)
Earnings of unconsolidated joint venture	471	486	394
Interest expense, net	(93,772)	(132,459)	(138,952)
Income before income taxes	74,095	34,762	12,686
Income tax benefit (expense)	(3,574)	57,884	91,954
Consolidated net income	70,521	92,646	104,640
Net (income) loss attributable to noncontrolling interest	(3,506)	4,903	2,668
Net income attributable to Kraton	$67,015	$97,549	$107,308
Earnings per common share:			
Basic	$2.10	$3.12	$3.48
Diluted	$2.08	$3.07	$3.43
Weighted average common shares outstanding:			
Basic	31,416	30,654	30,180
Diluted	31,789	31,140	30,621

Consolidated Results

Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Revenue was $2,011.7 million for the year ended December 31, 2018 compared to $1,960.4 million for the year ended December 31, 2017, an increase of $51.3 million, or 2.6%. Revenue for the Polymer segment increased $21.9 million and revenue for the Chemical segment increased $29.4 million. For additional information regarding the changes in revenue, see our segment disclosures below.

Cost of goods sold was $1,431.1 million for the year ended December 31, 2018 compared to $1,415.7 million for the year ended December 31, 2017, an increase of $15.4 million, or 1.1%. The increase was primarily driven by higher average raw material costs, partially offset by lower sales volumes.

Selling, general, and administrative expenses were $153.9 million for the year ended December 31, 2018 compared to $161.3 million for the year ended December 31, 2017. The $7.4 million decrease is primarily attributable to lower transaction, acquisition, and restructuring costs, and employee related costs, partially offset by foreign exchange rates.

Depreciation and amortization was $141.4 million for the year ended December 31, 2018 compared to $137.2 million for the year ended December 31, 2017. The increase of $4.2 million was primarily attributable to the start up of our manufacturing joint venture in Mailiao, Taiwan, and foreign exchange rates.

We recorded a $79.9 million loss on extinguishment of debt during the year ended December 31, 2018, which includes the write off of previously capitalized deferred financing costs and original issue discount, the tender offer and subsequent redemption of our 10.5% Senior Notes due 2023 (the "10.5% Senior Notes"), partially offset by a gain on the settlement of the ineffective portion of interest rate swaps.

Interest expense, net, was $93.8 million for the year ended December 31, 2018 compared to $132.5 million for the year ended December 31, 2017, a decrease of $38.7 million. The decrease is due to refinancing activities and lower overall indebtedness.

Our income tax provision was a $3.6 million expense, a $57.9 million benefit, and a $92.0 million benefit for the years ended December 31, 2018, 2017, and 2016, respectively. Our effective tax rates for the years ended December 31, 2018, 2017, and 2016 were a 4.8% expense, a 166.5% benefit, and a 724.8% benefit, respectively. Our effective tax rates differed from the U.S. corporate statutory tax rates, primarily due to the mix of pre-tax income or loss earned in certain jurisdictions, the tax impact of certain permanent items, and the change in our valuation allowance.

As of December 31, 2018 and December 31, 2017, a valuation allowance of $42.5 million and $51.3 million, respectively, has been provided for net operating loss carryforwards and other deferred tax assets. We decreased our valuation allowance by $8.8 million during the year ended December 31, 2018, which includes a $4.3 million decrease primarily related to deferred tax rate changes and the utilization of net operating loss carryforwards in France and the United Kingdom, a $2.2 million decrease related to utilization of foreign tax credits and net operating loss carryforwards in the U.S., and a $2.3 million decrease related to changes in other comprehensive income (loss). Of the $42.5 million valuation allowance at December 31, 2018, $31.5 million, $7.0 million, and $4.0 million relate to net deferred tax assets in France, United Kingdom, and the U.S., respectively. We increased our valuation allowance by $6.6 million during the year ended December 31, 2017, which includes a $4.9 million increase related to changes in other comprehensive income (loss) and $1.7 million primarily related to current period net operating losses in the U.S. As of December 31, 2017, $35.9 million and $8.8 million of the $51.3 million valuation allowance relates to net deferred tax assets in France and United Kingdom, respectively. We consider the reversal of deferred tax liabilities within the net operating loss carryforward period, projected future taxable income and tax planning strategies in making this assessment.

The Tax Act was enacted on December 22, 2017 and introduced significant changes to U.S. income tax law. Due to the timing of the enactment and the complexity involved in applying the provisions of the Tax Act, provisional amounts for the income tax effects of the Tax Act were recorded as of December 31, 2017. We recorded a provisional amount for our one-time transitional tax liability and income tax expense of $46.3 million. We have completed our analysis based on legislative updates relating to the Tax Act, including an assessment of our foreign tax credits, which resulted in an incremental tax benefit of $10.7 million for the year ended December 31, 2018. Additionally, the impact of the Tax Act to our deferred taxes was a benefit of $95.0 million, of which $68.9 million relates to the reduction of the U.S. statutory tax rate from 35.0% to 21.0% for years after 2017 and the remaining relates to changes in our investments in foreign subsidiaries.

Net income attributable to Kraton was $67.0 million, or $2.08 per diluted share, for the year ended December 31, 2018, a decrease of $30.5 million compared to a net income of $97.5 million, or $3.07 per diluted share, for the year ended December 31, 2017. Adjusted diluted earnings per share (non-GAAP) was $3.16 for the year ended December 31, 2018 compared to $2.85 for the year ended December 31, 2017. See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP diluted earnings (loss) per share to adjusted diluted earnings per share.

Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Our operating results for the year ended December 31, 2016 include the operating results for Arizona Chemical since the acquisition date of January 6, 2016.

Revenue was $1,960.4 million for the year ended December 31, 2017 compared to $1,744.1 million for the year ended December 31, 2016, an increase of $216.3 million, or 12.4%. Revenue for the Polymer segment increased $174.9 million and revenue for the Chemical segment increased $41.3 million. For additional information regarding the changes in revenue, see our segment disclosures below.

Cost of goods sold was $1,416.2 million for the year ended December 31, 2017 compared to $1,263.2 million for the year ended December 31, 2016, an increase of $153.0 million, or 12.0%. The increase was primarily driven by higher average raw material costs and sales volumes, partially offset by the $24.7 million of higher costs of goods sold in

2016 related to the fair value adjustment in purchase accounting for inventory.
Selling, general, and administrative expenses were $161.3 million for the year ended December 31, 2017 compared to $177.4 million for the year ended December 31, 2016. The $16.1 million decrease is primarily attributable to lower transaction, acquisition, and restructuring costs, partially offset by higher employee related costs.

Depreciation and amortization was $137.2 million for the year ended December 31, 2017 compared to $125.7 million for the year ended December 31, 2016. The increase of $11.5 million was primarily attributable to the start up of our manufacturing joint venture in Mailiao, Taiwan.

Disposition and exit of business activities was a gain of $28.4 million for the year ended December 31, 2016, which resulted from the sale of certain compounding assets and the dissolution of our joint venture in Paulinia, Brazil, partially offset by the exit from our NEXAR™ and solutions resinates product lines.

In March 2017, we completed the issuance of $400.0 million 7.0% Senior Notes, and in August 2017, we closed on a €260.0 million term loan. We used the net proceeds from both transactions, along with available cash, to repay approximately $758.0 million of existing U.S. term loan indebtedness. The repayment was considered an extinguishment of indebtedness an a loss on extinguishment of debt was recorded in 2017, represented by the write off of previously capitalized deferred financing costs and original issue discount.

Income tax provision was a benefit of $57.9 million and $92.0 million for the year ended December 31, 2017 and 2016, respectively. Our effective tax rate for the year ended December 31, 2017 was a benefit of 166.5%, primarily driven by the impact of recent U.S. tax reform. Given the level of our pre-tax book income for the year ended December 31, 2016 and the release of a significant portion of our valuation allowance (as further discussed below), our effective tax rate for the year ended December 31, 2016 is not meaningful. Our effective tax rates differ from the U.S. corporate statutory tax rate of 35.0% primarily due to the mix of our pretax income or loss generated in foreign jurisdictions, permanent items, uncertain tax positions, changes in our valuation allowances, and the effects of tax reform. For the year ended December 31, 2017 and 2016, our pretax earnings in the Netherlands, Sweden, and Finland decreased our effective tax rate due to the local statutory rates of 25%, 22%, and 20%, respectively.

As of December 31, 2017 and December 31, 2016, a valuation allowance of $51.3 million and $44.7 million, respectively, has been provided for net operating loss carryforwards and other deferred tax assets. We increased our valuation allowance by $6.6 million during the year ended December 31, 2017, which includes a $4.9 million increase related to changes in other comprehensive income (loss) and $1.7 million primarily related to current period net operating losses in the U.S. As of December 31, 2017, $35.9 million and $8.8 million of the $51.3 million valuation allowance relates to net deferred tax assets in France and United Kingdom, respectively. During the year ended December 31, 2016, we released $55.5 million of the valuation allowances, of which $87.0 million primarily related to our U.S. net operating loss carryforwards and other deferred tax assets, partially offset by $31.3 million of new valuation allowances assumed in connection with the Arizona Chemical Acquisition. As of December 31, 2016, $30.5 million and $8.5 million of the $44.7 million valuation allowance relates to net deferred tax assets in France and United Kingdom, respectively. We consider the reversal of deferred tax liabilities within the net operating loss carryforward period, projected future taxable income and tax planning strategies in making this assessment. Excluding the change in our valuation allowance and impact of U.S. tax reform, our effective tax rates would have been a benefit of 31.3% and 38.9% for the years ended December 31, 2017 and 2016, respectively.

The Tax Act was enacted on December 22, 2017 and introduces significant changes to U.S. income tax law. Due to the timing of the enactment and the complexity involved in applying the provisions of the Tax Act, provisional amounts for the income tax effects of the Tax Act have been recorded as of December 31, 2017 and are subject to change during 2018. We recorded a provisional amount for our one-time transitional tax liability and income tax expense of $46.3 million. Additionally, the impact of the Tax Act to our deferred taxes was a benefit of $95.0 million, of which $68.9 million relates to the reduction of the U.S. statutory tax rate from 35.0% to 21.0% for years after 2017 and the remaining relates to changes in our investments in foreign subsidiaries.

Net income attributable to Kraton was $97.5 million, or $3.07 per diluted share, for the year ended December 31, 2017, a decrease of $9.8 million compared to a net income of $107.3 million, or $3.43 per diluted share, for the year ended December 31, 2016. Adjusted diluted earnings per share (non-GAAP) was $2.85 for the year ended December 31, 2017 compared to $2.36 for the year ended December 31, 2016. See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP diluted earnings (loss) per share to adjusted diluted earnings per share.

Segment Results

Effective with the Arizona Chemical Acquisition our operating segments are as follows:

•Polymer Segment. Our Polymer segment is comprised of our SBCs and other engineered polymers business.

•Chemical Segment. Our Chemical segment is comprised of our pine-based specialty products business.

Polymer Segment

	Years Ended December 31,					
	2018		2017		2016	
Revenue	($ In thousands)					
Performance Products	$631,728	51.7%	$640,313	53.4%	$513,081	50.1%
Specialty Polymers	408,628	33.5%	389,873	32.5%	340,330	33.2%
Cariflex	180,814	14.8%	168,267	14.0%	170,983	16.7%
Other	416	— %	1,223	0.1 %	343	— %
	$1,221,586		$1,199,676		$1,024,737	
Operating income	$159,162		$121,089		$80,910	
Adjusted EBITDA (non-GAAP)(1)	$214,802		$223,015		$183,087	
Adjusted EBITDA margin (non-GAAP)(2)	17.6 %		18.6 %		17.9 %	

(1) See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP operating income to non-GAAP Adjusted EBITDA.

(2) Defined as Adjusted EBITDA as a percentage of revenue.

Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Revenue for the Polymer segment was $1,221.6 million for the year ended December 31, 2018 compared to $1,199.7 million for the year ended December 31, 2017. The increase was driven by higher average sales prices, partially offset by lower sales volumes. Sales volumes were 319.6 kilotons for the year ended December 31, 2018, a decrease of 14.1 kilotons, or 4.2%. Performance Products volumes decreased 6.9%, Specialty Polymers volumes increased 0.5%, and Cariflex volumes increased 8.0%. The decrease in Performance Products revenues were primarily impacted by lower paving sales outside of our core North American and European markets, as well as decreases in SIS volumes. The increase in Specialty Polymers revenue was primarily driven by higher average selling prices, resulting from higher average raw materials costs, and to a lesser extent, higher sales into lubricant additive applications. The increase in Cariflex revenue was driven by higher demand in our latex and solid rubber offerings. The positive effect from changes in currency exchange rates between the periods was $15.5 million.

Cost of goods sold was $872.5 million for the year ended December 31, 2018 compared to $887.1 million for the year ended December 31, 2017, a decrease of $14.6 million, or 1.6%. The decrease in cost of goods sold reflects lower overall sales volumes, partially offset by higher average raw material costs and higher operating expenses resulting from unplanned, short-term facility outages and market driven increases in logistics and transportation. Additionally, changes in currency exchange rates between the periods resulted in a negative impact of $10.4 million.

For the year ended December 31, 2018, the Polymer segment operating income was $159.2 million compared to $121.1 million for the year ended December 31, 2017.

For the year ended December 31, 2018, the Polymer segment generated Adjusted EBITDA (non-GAAP) of $214.8 million compared to $223.0 million for the year ended December 31, 2017. The decrease in Adjusted EBITDA was primarily due to higher operating expenses from the impact of unplanned, short-term facility outages and higher costs, including freight and logistics costs. We also experienced lower sales volumes, primarily in our Performance Products business, driven by lower SIS and paving demand, in our non-core markets. These negative impacts were partially offset by higher average unit margins. The positive effect from changes in currency exchange rates between the periods was $4.7 million. See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP operating income to Adjusted EBITDA (non-GAAP).

Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Revenue for the Polymer segment was $1,199.7 million for the year ended December 31, 2017 compared to $1,024.7 million for the year ended December 31, 2016. Sales volumes were 333.7 kilotons for the year ended December 31, 2017, an increase of 9.5 kilotons, or 2.9%. Performance Products volumes increased 2.9%, Specialty Polymers volumes increased 3.6% (excluding the effect of the sale of the compounding business, sales volumes would have increased 7.2%), and Cariflex volumes increased 0.4%. The revenue increases in Performance Products and Specialty Polymers were primarily driven by higher average selling prices resulting from higher raw material costs and to a lesser extent increased sales volumes. The positive effect from changes in currency exchange rates between the periods was $2.0 million.

Cost of goods sold was $887.1 million for the year ended December 31, 2017 compared to $747.6 million for the December 31, 2016, an increase of $139.5 million or 18.7%. The increase in cost of goods sold reflects higher average raw material costs and increases in sales volumes. Additionally, changes in currency exchange rates between the periods resulted in a negative impact of $4.6 million.

For the year ended December 31, 2017, the Polymer segment operating income was $121.0 million compared to $80.9 million for the year ended December 31, 2016.

For the year ended December 31, 2017, the Polymer segment generated Adjusted EBITDA (non-GAAP) of $223.0 million compared to $183.1 million for the year ended December 31, 2016. The increase in Adjusted EBITDA was primarily due to improved unit margins, which were driven by higher selling prices and the impact of cost reduction initiatives. In the third quarter 2017, we initiated a new manufacturing process for our Cariflex product at our manufacturing facility in Paulinia, Brazil. Although material produced using this new process met technical specifications, during the fourth quarter 2017, some customers notified us that they were experiencing processing issues with the material. While the majority of material shipped in the fourth quarter is being used, the degree of issues noted by our customers varied, and in certain cases the material was returned to us for evaluation. We have implemented a number of manufacturing changes in an effort to address these issues going forward and these changes appear to be lessening the processing issues. The negative financial impact to our fourth quarter 2017 operating income including our Adjusted EBITDA was $7.6 million. The negative effect from changes in currency exchange rates between the periods was $4.2 million. See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP operating income to Adjusted EBITDA (non-GAAP).

Chemical Segment

The following results of operations for the Chemical segment have been included in our consolidated results effective as of the date of the acquisition, January 6, 2016.

	Year Ended December 31, 2018		Year Ended December 31, 2017		For the period January 6, 2016 through December 31, 2016	
Revenue	($ In thousands)					
Adhesives	$280,867	35.5%	$294,467	38.7%	$288,009	40.0%
Performance Chemicals	461,100	58.4%	416,264	54.7%	388,878	54.1%
Tires	48,122	6.1 %	49,955	6.6 %	42,480	5.9 %
	$790,089		$760,686		$719,367	
Operating income	$91,572		$84,395		$57,844	
Adjusted EBITDA (non-GAAP) (1)	$163,241		$151,184		$171,045	
Adjusted EBITDA margin (non-GAAP) (2)(3)	20.7 %		19.9 %		23.8 %	

(1) See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP operating income to non-GAAP Adjusted EBITDA.

(2) Defined as Adjusted EBITDA as a percentage of revenue.

(3) For the year ended December 31, 2018, Adjusted EBITDA margin adjusted for lost revenues from Hurricane Michael would be 20.2%.

Effective January 1, 2018, results for our Roads and Construction product line have been consolidated into our Adhesives and Performance Chemicals product lines to better align customer portfolio and end usage. We have adjusted the presentations for the years ended December 31, 2017 and 2016 to conform to the respective 2018 presentations.

Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Revenue for the Chemical segment was $790.1 million for the year ended December 31, 2018 compared to $760.7 million for the year ended December 31, 2017. The increase was driven by higher average sales prices resulting from price actions, and to a lesser extent, an increase in sales volumes. Sales volumes were 428.5 kilotons for the year ended December 31, 2018, an increase of 2.1 kilotons, or 0.5%, despite volumes being negatively impacted due to lost sales from Hurricane Michael. Performance Chemicals volumes increased 3.2%, partially offset by a decrease of 4.5% and 5.6% in Adhesives and Tires volumes, respectively. . The positive effect from changes in currency exchange rates between the periods was $13.7 million.

Cost of goods sold was $558.6 million for the year ended December 31, 2018 compared to $528.6 million for the year ended December 31, 2017, an increase of $30.0 million, or 5.7%. The increase was driven by higher raw material prices and higher operating costs, including planned maintenance activities, logistics, and transportation costs, and recovery costs associated with Hurricane Michael. Additionally, the changes in currency exchange rates between the periods resulted in a negative impact of $11.6 million.

In October 2018, our Panama City, Florida, facility was damaged by Hurricane Michael. During the three months ended December 31, 2018, we incurred $12.3 million of direct costs, which are included in our costs of good sold, and that had not been reimbursed from our insurance carrier. With respect to lost sales, we estimate the associated margin to be $8.9 million. During the fourth quarter we recognized $8.9 million of cash proceeds as reimbursement under our business interruption policy, which is included in operating income. We currently estimate the replacement cost associated with damaged equipment to be in a range of $5.0 million to $7.0 million. During the fourth quarter, we impaired damaged equipment with a net book value of $1.3 million, which as of December 31, 2018, had not been reimbursed under our property and casualty insurance policy.

For the year ended December 31, 2018, the Chemical segment operating income was $91.6 million compared to $84.4 million for the year ended December 31, 2017.

For the year ended December 31, 2018, the Chemical segment generated $163.2 million of Adjusted EBITDA (non-GAAP) compared to $151.2 million for the year ended December 31, 2017. The increase in Adjusted EBITDA was primarily driven by improved unit margin in our Performance Chemicals and Tires product lines. The improved unit margins were partially offset by higher operating costs, including planned maintenance activities and higher average raw material costs. The negative effect from changes in currency exchange rates between the periods was $2.8 million. See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP operating income to non-GAAP Adjusted EBITDA.

Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Revenue for the Chemical segment was $760.7 million for the year ended December 31, 2017 compared to $719.4 million for the year ended December 31, 2016. The increase was driven by higher average sales prices in Performance Chemicals and Tires, combined with overall improved sales volumes. Sales volumes were 426.4 kilotons for the year ended December 31, 2017, an increase of 14.9 kilotons or 3.6%. Adhesives volumes increased 4.1%, Performance Chemicals volumes increased 3.1%, and Tires volumes increased 10.0%. The positive effect from changes in currency exchange rates between the periods was $4.7 million.

Cost of goods sold was $528.6 million for the year ended December 31, 2017 compared to $515.0 million for the December 31, 2016, an increase of $13.6 million or 2.6%. The increase was primarily driven by higher raw material costs, due to increased average purchase prices and stronger operating rates. The negative impact from changes in currency exchange rates between the periods was $4.4 million.

For the year ended December 31, 2017, the Chemical segment operating income was $84.4 million compared to $57.8 million for the year ended December 31, 2016.

For the year ended December 31, 2017, the Chemical segment generated $151.2 million of Adjusted EBITDA (non-GAAP) compared to $171.0 million for the year ended December 31, 2016. The decrease in Adjusted EBITDA was primarily due to lower margins indicative of the impact of low-cost C5/C9 hydrocarbon alternatives and pricing pressure for TOFA and TOR products, which more than offset the increase in sales volumes. The negative effect from changes in currency exchange rates between the periods was $1.2 million. See Item 6. Selected Financial Data for a reconciliation of U.S. GAAP operating income to non-GAAP Adjusted EBITDA.

Critical Accounting Policies
The preparation of these financial statements in conformity with U.S. GAAP requires management to make assumptions and estimates that directly affect the amounts reported in the consolidated financial statements. Certain critical accounting policies requiring significant judgments, estimates, and assumptions are described in this section. We consider an accounting estimate to be critical if it requires assumptions to be made that are uncertain at the time the estimate is made and changes to the estimate or different estimates that could have reasonably been used would materially change our consolidated financial statements.
We believe the current assumptions and other considerations used to estimate amounts reflected in our consolidated financial statements are appropriate. However, should our actual experience differ from these assumptions and other considerations used in estimating these amounts, the impact of these differences could have a material impact on our consolidated financial statements.
Inventories. Inventory values include all costs directly associated with manufacturing products and are stated at the lower of cost or net realizable value, primarily determined on a first-in, first-out basis. We evaluate the carrying cost of our inventory on a quarterly basis for this purpose. If the cost of the inventories exceeds their net realizable value, provisions are made for the difference between the cost and the net realizable value.
Impairment of Long-Lived Assets. In accordance with the Impairment or Disposal of Long-Lived Assets Subsections of FASB ASC Subtopic 360-10, Property, Plant, and Equipment—Overall, long-lived assets, such as property, plant, and equipment, and purchased intangible assets subject to amortization are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. If circumstances require a long-lived asset or asset group be tested for possible impairment, we first compare undiscounted cash flows expected to be generated by that asset or asset group to its carrying value. If the carrying value of the long-lived asset or asset group is not recoverable on an undiscounted cash flow basis, impairment is recognized to the extent that the carrying value exceeds its fair value. Fair value is determined through various valuation techniques including discounted cash flow models, quoted market values, and third-party independent appraisals, as considered necessary.
Goodwill. We record goodwill when the purchase price of an acquired business exceeds the fair value of the net identifiable assets acquired. Goodwill is allocated to the reporting unit level based on the estimated fair value at the date of acquisition. Goodwill was recorded as a result of the Arizona Chemical Acquisition and is recorded in the Chemical operating segment.
Goodwill is tested for impairment at the reporting unit level annually or more frequently as deemed necessary. Our annual measurement date for testing impairment is October 1st. The assessment is performed in three steps. We assess qualitative factors, or step zero, to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If it is more likely than not that an impairment exists utilizing the qualitative method, we then utilize step one to test for impairment via estimating the fair value of our reporting units utilizing a combination of market and income approaches through the application of discounted cash flows to determine whether it is more likely than not that the fair value of the reporting unit is less than its carrying value, including goodwill. If potential impairments are identified, we perform step two to measure the impairment loss through a full fair value allocation of the assets and liabilities of the reporting unit utilizing the acquisition method of accounting.
Asset Retirement Obligations (“ARO”). Our ARO consists of estimated costs of dismantlement, removal, site reclamation, and similar activities associated with our facilities. We recognize the fair value of a liability for an ARO in the period in which we have an existing legal obligation associated with the retirement of our facilities and the obligation can reasonably be estimated. The associated asset retirement cost is capitalized as part of the carrying cost of the asset. The recognition of an ARO requires that we make numerous estimates, assumptions, and judgments regarding such factors as the existence of a legal obligation for an ARO; estimated probabilities, amounts and timing of settlements; the credit-adjusted risk-free rate to be used; discount rate; and inflation rates. In periods subsequent to initial measurement of the ARO, we recognize changes in the liability resulting from the accretion of the liability to its non-discounted amount and revisions to either the timing or the amount of the original estimate of undiscounted cash flows. Revisions also result in increases or decreases in the carrying cost of these assets. Increases in the ARO liability due to accretion is charged to depreciation and amortization expense. The related capitalized cost, including revisions thereto, is charged to depreciation and amortization expense. See Note 13 Commitments and Contingencies (subsection (d)) to the consolidated financial statements.

Share-Based Compensation. Share-based compensation cost is measured at the grant date based on the fair value of the award. We recognize these costs using the straight-line method over the requisite service period. Upon adoption of ASU 2016-09, Improvements to Employee Share-Based Payment Accounting (Topic 817), we now recognize actual forfeitures by reducing the employee share-based compensation expense in the same period as the forfeitures occur.

We estimate the fair value of performance-based restricted share units using a combination of Monte Carlo simulations and internal metrics. The expected term represents the period of time that performance share units granted are expected to be outstanding. Our expected volatilities are based on historical volatilities for Kraton and the members of the peer group. The risk free interest rate for the periods within the contractual life of the performance-based restricted share units is equal to the yield, as of the valuation date, of the zero coupon U.S. Treasury STRIPS that have a remaining term equal to the length of the remaining performance period. The expected dividend yield is assumed to be zero, which is the equivalent of reinvesting dividends in the underlying company's stock. Forfeitures are recognized when they occur. See Note 6 Share-Based Compensation to the consolidated financial statements.

Income Taxes. We conduct operations in separate legal entities in different jurisdictions. As a result, income tax amounts are reflected in our consolidated financial statements for each of those jurisdictions.

Income taxes are recorded utilizing an asset and liability approach. This method gives consideration to the future tax consequences associated with the differences between the financial accounting and tax basis of the assets and liabilities as well as the ultimate realization of any deferred tax asset resulting from such differences. Valuation allowances are recorded to reduce deferred tax assets when it is more likely than not that a tax benefit will not be realized. In determining whether a valuation allowance is required, the company evaluates primarily the impact of cumulative losses in past years and current and/or recent losses. A recent trend in earnings despite cumulative losses is a prerequisite to considering not recording a valuation allowance.

In assessing the realizability of deferred tax assets, we consider whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences become deductible. We consider the scheduled reversal of deferred tax liabilities, projected future taxable income, and tax planning strategies in making this assessment. Based upon the level of historical taxable income and projections for future taxable income over the periods in which the deferred tax assets are deductible, we believe it is more likely than not that we will realize the benefits of these deductible differences, net of the existing valuation allowances.

The Tax Act was enacted on December 22, 2017 and introduced significant changes to U.S. income tax law. Effective in 2018, the Tax Act reduces the U.S. statutory tax rate from 35.0% to 21.0% and creates new taxes on certain foreign-sourced earnings and certain related-party payments, which are referred to as the global intangible low-taxed income tax and the base erosion tax, respectively. In addition, in 2017 we were subject to a one-time transition tax on accumulated foreign subsidiary earnings not previously subject to U.S. income tax. Accounting for the income tax effects of the Tax Act requires significant judgments and estimates in the interpretation and calculations of the provisions of the Tax Act.

Due to the timing of the enactment and the complexity involved in applying the provisions of the Tax Act, we made reasonable estimates of the effects and recorded provisional amounts in our financial statements for the year ended December 31, 2017. As we collected and prepared necessary data, and interpreted the additional guidance issued by the U.S. Treasury Department, the IRS, and other standard-setting bodies, we made adjustments, over the course of the year, to the provisional amounts. The accounting for the tax effects of the Tax Act has been completed as of December 31, 2018.

Benefit Plans Valuations. We sponsor defined benefit pension plans in both the U.S. and non-U.S. entities (“Pension Plans”), as well as a post-retirement benefit plan in the U.S. (“Retiree Medical Plan”). We annually evaluate significant assumptions related to the benefits and obligations of these plans. Our estimation of the projected benefit obligations and related benefit expense requires that certain assumptions be made regarding such variables such as expected return on plan assets, discount rates, rates of future compensation increases, estimated future employee turnover rates and retirement dates, distribution election rates, mortality rates, retiree utilization rates for health care services, and health care cost trend rates. The determination of the appropriate assumptions requires considerable judgment concerning future events and has a significant impact on the amount of the obligations and expense recorded. We rely in part on actuarial studies when determining the appropriateness of certain of the assumptions used in determining the benefit obligations and the annual expenses for these plans.

The discount rates are determined annually and are based on rates of return of high-quality long-term fixed income securities currently available with maturities consistent with the projected benefit payout period. The expected long-term rate of return on assets is derived from a review of anticipated future long-term performance of individual asset classes and consideration of an appropriate asset allocation strategy, given the anticipated requirements of the Pension Plans, to determine the average rate of earnings expected on the funds invested to provide for the pension plan benefits. We also consider recent fund performance and historical returns in establishing the expected rate of return. We estimated a range of returns on the plan assets using a historical stochastic simulation model that determines the compound average annual return (assuming these asset classes—stocks, bonds and cash) over a 20-year historical period (the approximate duration of our liabilities under the Pension Plans). The distribution of results from these simulations is then used to determine a median expected asset return.

Movements in the capital markets impact the market value of the investment assets used to fund our Pension Plans. Future changes in plan asset returns, assumed discount rates, and various other factors related to our pension and post-retirement plans will impact future pension expenses and liabilities.

The weighted average discount rate for our U.S. pension plans was 4.5% at December 31, 2018 compared to 3.9% at December 31, 2017, with an assumed weighted average long term expected rate of return on plan assets of 8.0%, and an assumed weighted average expected salary rate increase of 3.0%. The percentage of equity securities in our U.S. pension plans was 59.5% at December 31, 2018, down from 59.9% at December 31, 2017, and the percentage of debt securities was 40.0% at December 31, 2018 and 2017. Our strategic target asset allocation as of December 31, 2018 was 50% equity, 30% debt, and 20% other. Based on the plan’s current target asset allocation, the median estimate for future asset returns (before non-investment expenses) was 8.5%. The asset return assumption set for determining the 2018 FASB ASC 715 expense was 8.0%, after non-investment expenses paid by the Trust. For the past three years, non-investment related expenses have averaged 0.5%. Therefore, the 8.0% return after non-investment expenses assumption is equivalent to a gross assumption of 8.5% (8.0% + 0.5%). An 8.5% rate (before non-investment expenses) falls within an acceptable range of simulated asset returns, between the 40th and 60th percentile.

The weighted average discount rate for our non-U.S. pension plans was 2.6% at December 31, 2018, with an assumed weighted average long term expected rate of return on plan assets of 5.5%, and an assumed weighted average expected salary rate increase of 3.0%. The percentage of equity and debt securities in our non-U.S. pension plans was 46.9% and 48.4% at December 31, 2018, respectively. Our strategic target asset allocation as of December 31, 2018 was 50% equity and 50% debt for our non-U.S. Pension Plans.

For the U.S. Pension Plans, a 100 basis point decrease in the assumed discount rate would result in a corresponding increase of $2.7 million in our estimated expense for 2019. A 100 basis point decrease in the assumed rate of return on plan assets would result in a corresponding increase of $1.3 million in our estimated expense for 2019, and a 100 basis point increase in the expected salary rate would result in a corresponding increase of $0.9 million in our estimated expense for 2019, in each case holding all other assumptions and factors constant.

For the non-U.S. Pension Plans, a 100 basis point decrease in the assumed discount rate would result in a corresponding increase of $0.7 million in our estimated expense for 2019. A 100 basis point decrease in the assumed rate of return on plan assets would result in a corresponding increase of $0.4 million in our estimated expense for 2019, and a 100 basis point increase in the expected salary rate would result in a corresponding increase of $0.2 million in our estimated expense for 2019, in each case holding all other assumptions and factors constant.

For the Retiree Medical Plan, a 100 basis point decrease in the assumed discount rate would result in a corresponding increase of $0.2 million in our estimated expense for 2019, and a 100 basis point increase in the assumed health care trend rate would result in a corresponding increase of $10.0 thousand in our estimated expense for 2019, in each case holding all other assumptions and factors constant. For additional information about our benefit plans, see Note 14 Employee Benefits to the consolidated financial statements.

Revenue Recognition. Revenue is recognized in accordance with the provisions of ASC 606, “Revenue from Contracts with Customers,” when obligations under the terms of a contract with our customer are satisfied. Generally, this occurs at a point in time when the transfer of risk and title to the product transfers to the customer. Our products are generally sold free on board shipping point or, with respect to countries other than the U.S., an equivalent basis. Our standard terms of delivery are included in our contracts of sale, order confirmation documents, and invoices. As such, all revenue is considered revenue recognized from contracts with customers and we do not have other sources of revenue. Revenue is measured as the amount of consideration we expect to receive in exchange for transferring goods or providing services. Revenue is recognized net of sales tax, value-added taxes, and other taxes. Shipping and other transportation costs charged to customers are recorded in both revenue and cost of goods sold. We do not have any material significant payment terms as payment is received at or shortly after the point of sale. Certain customers may receive cash-based incentives (including rebates and price supports), which are accounted for as variable consideration. We estimate rebates and price supports based on the expected amount to be provided to customers and reduce revenues recognized once the performance obligation has been met. Sales commissions are expensed in cost of goods sold once the performance obligation with the associated sale has been met. We do not have significant changes in our estimates for variable considerations.

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LIQUIDITY AND CAPITAL RESOURCES

Kraton Corporation is a holding company without any operations or assets other than the operations of its subsidiaries. Cash flows from operations of our subsidiaries, cash on hand, and available borrowings under the Term Loan Facility and ABL Facility are our principal sources of liquidity.

As of December 31, 2018, our outstanding borrowings included (i) $362.0 million and €300.0 million, or approximately $342.9 million, under the USD Tranche and Euro Tranche, respectively, of the Term Loan Facility, (ii) $399.1 million and €290.0 million, or approximately $331.5 million, under the 7.0% Senior Notes and 5.25% Senior Notes, respectively, and (iii) $5.0 million under our ABL Facility. In addition, as of December 31, 2018, KFPC had NTD 3.5 billion, or approximately $112.5 million, and NTD 400.0 million, or approximately $13.0 million, of borrowings under the KFPC Loan Agreement and KFPC Revolving Facilities, respectively.

On March 8, 2018, we entered into a fifth amendment to the credit agreement governing the Term Loan Facility (the “Credit Agreement”) pursuant to which: borrowings under the Euro Tranche were increased by €150.0 million; we reduced our USD Tranche interest rate applicable margin to 2.5% and alternative base rate applicable margin to 1.5%; we reduced our Euro Tranche interest rate applicable margin to 2.0%; and extended the maturity date of the Term Loan Facility by three years to March 8, 2025. The proceeds from the additional borrowings under the Euro Tranche were used, together with available cash, to pay down $185.0 million of the then outstanding borrowings under the USD Tranche. On May 24, 2018, we entered into a sixth and seventh amendment to the Credit Agreement. The seventh amendment increased borrowings under the USD Tranche by $90.0 million, with the proceeds of such additional borrowing being used to fund a portion of the refinancing of the 10.5% Senior Notes discussed below. The sixth amendment provided for certain technical amendments to the Term Loan Facility to allow for greater flexibility in the repayment of unsecured indebtedness.

During the year ended December 31, 2018, approximately $157.6 million of the 10.5% Senior Notes were repurchased in a cash tender offer for any and all of the outstanding $440.0 million aggregate principal amount of 10.5% Senior Notes. The 10.5% Senior Notes that remained outstanding following the tender offer were redeemed on June 13, 2018. The consideration and redemption price plus, in each case, accrued and unpaid interest for the tender offer and redemption, respectively, and the fees and expenses of refinancing the 10.5% Senior Notes were paid with the net proceeds of the offering of the 5.25% Senior Notes and the additional $90.0 million borrowings under the USD Tranche, together with $60.0 million of borrowings under the ABL Facility and cash on hand.

On December 6, 2018, we commenced a repurchase program for up to $20.0 million of our 7.0% Senior Notes. Purchases under the program may take place from time to time in the open market and through privately negotiated transactions, including pursuant to a 10b5-1 Plan. While the Company may terminate the repurchase program at any time, the repurchase program will end no later than March 4, 2019. As of the date of this filing, we had repurchase $4.3 million of our 7.0% Senior Notes.

Based upon current and anticipated levels of operations, we believe that cash flows from operations of our subsidiaries, cash on hand, and borrowings available to us will be sufficient to fund our expected financial obligations, planned capital expenditures, and anticipated liquidity requirements, including working capital requirements, our investment in the KFPC joint venture, debt payments, interest payments, benefit plan contributions, and income tax obligations.

Our cash flows are subject to a number of risks and uncertainties, including, but not limited to, earnings, sensitivities to the cost of raw materials, seasonality and fluctuations in foreign currency exchange rates. Because feedstock costs generally represent a substantial portion of our cost of goods sold, in periods of rising feedstock costs, we generally consume cash in operating activities due to increases in accounts receivable and inventory costs, partially offset by increased value of accounts payable. Conversely, during periods in which feedstock costs are declining, we generate cash flow from decreases in working capital.

Going forward there can be no assurance that our business will generate sufficient cash flow from operations or that future borrowings will be available under the Term Loan Facility and the ABL Facility or any new credit facilities or financing arrangements to fund liquidity needs and enable us to service our indebtedness. As of the date of this filing, we had $8.5 million of outstanding borrowings under the ABL Facility with a remaining available borrowing capacity of $192.1 million. Subject to compliance with certain covenants and other conditions, we have the option to borrow up to $350.0 million of incremental term loans plus an additional amount subject to a senior secured net leverage ratio.

Our available cash and cash equivalents are held in accounts managed by third-party financial institutions and consist of cash invested in interest bearing funds and operating accounts. To date, we have not experienced any losses or lack of access to our invested cash or cash equivalents; however, we cannot provide any assurance that adverse conditions in the financial markets will not impact access to our invested cash and cash equivalents.

We made contributions of $12.8 million to our pension plans for the year ended December 31, 2018 and $12.5 million for the year ended December 31, 2017. We expect our total pension plans contribution for the year ended December 31, 2019 to be approximately $11.2 million. Our pension plan obligations are predicated on a number of factors, the primary ones being the return on our pension plan assets and the discount rate used in deriving our pension obligations. If the investment return on our pension plan assets does not meet or exceed expectations during 2019, and the discount rate decreases from the prior year, higher levels of contributions could be required in 2020 and beyond.

As of December 31, 2018, we had $83.0 million of cash and short-term investments related to foreign operations that management asserts are permanently reinvested.

In December 2017, the Tax Act was enacted and resulted in a one-time transition tax on accumulated foreign subsidiary earnings. After 2017, our foreign earnings held by foreign subsidiaries are no longer subject to U.S. tax upon repatriation to the U.S. As of December 31, 2018, the remaining long-term tax payable related to the Tax Act of $13.2 million is presented within income tax payable, non-current on our Consolidated Balance Sheets. As permitted by the Tax Act, we will pay the transition tax in annual interest-free installments through 2025.

Turbulence in U.S. and international markets and economies may adversely affect our liquidity and financial condition, the liquidity and financial condition of our customers, and our ability to timely replace maturing liabilities and access the capital markets to meet liquidity needs, resulting in adverse effects on our financial condition and results of operations. However, to date we have been able to access borrowings available to us in amounts sufficient to fund liquidity needs.

Our ability to pay principal and interest on our indebtedness, fund working capital, to make anticipated capital expenditures, and to fund our investment in the KFPC joint venture depends on our future performance, which is subject to general economic conditions and other factors, some of which are beyond our control. See Part I, Item 1A. Risk Factors for further discussion.

Operating Cash Flows

Net cash provided by operating activities totaled $246.6 million for the year ended December 31, 2018 and $255.4 million for the year ended December 31, 2017. This represents a net decrease of $8.9 million, which was primarily driven by increases in working capital, partially offset by increases in operating income. The period-over-period changes in working capital are as follows:

- $35.8 million decrease in cash flows associated with inventories of products, materials, and supplies due to higher inventory volumes and higher raw material costs;
- $32.2 million decrease in cash flows for other payables and accruals, primarily driven by timing of interest payments, employee related accruals, and customer rebates;
- $27.1 million decrease in cash flows for accounts receivable, primarily related to higher selling prices, partially offset by lower sales volumes; partially offset by
- $12.4 million increase in cash flows due to the timing of payments of other items, including related party transactions, pension costs, and VAT; and
- $12.0 million increase in cash flows associated with trade accounts payable due to timing of payments and higher raw material costs.

Net cash provided by operating activities totaled $255.4 million for the year ended December 31, 2017 and $138.5 million for the year ended December 31, 2016. This represents a net increase of $117.0 million, which was primarily driven by increases in operating income and decreases in working capital. The period-over-period changes in working capital are as follows:

- $36.9 million increase in cash flows for other payables and accruals, primarily due to the deferred income, transaction related costs, and accrued interest;
- $36.8 million increase in cash flows for accounts receivable, primarily related to timing of cash receipts; and
- $21.1 million increase in cash flows for other assets, primarily due to income tax refunds; partially offset by,
- $48.5 million decrease in cash flows associated with inventories of products, materials, and supplies, due to higher inventory volumes and increased raw material costs;
- $4.9 million decrease in cash flows associated with trade accounts payable due to timing of payments and high raw material costs; and
- $4.1 million decrease in cash flows due to the timing of payments of other items, including related party transactions and pension costs.

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Investing Cash Flows

Net cash used in investing activities totaled $111.1 million, $122.6 million, and $1,364.8 million for the years ended December 31, 2018, 2017, and 2016, respectively. Cash used from investing activities for the year ended December 31, 2016, includes $1,312.1 million related to the Arizona Chemical Acquisition, net of cash acquired, partially offset by $72.8 million cash received from the sale of the BCU.

Capital projects in 2018 included the following:

- $69.7 million related to health, safety, environmental, and security, including infrastructure and maintenance projects;
- $15.2 million related to projects to optimize the production capabilities of our manufacturing assets; and
- $11.0 million of capital expenditures related to information technology and research and development.

Capital projects in 2017 included the following:

- $53.8 million related to health, safety, environmental, and security, including infrastructure and maintenance projects;
- $34.0 million related to projects to optimize the production capabilities of our manufacturing assets;
- $17.1 million of capital expenditures incurred by KFPC in connection with the Taiwan plant construction; and
- $9.3 million of capital expenditures related to information technology and research and development.

Expected Capital Expenditures.

We currently expect 2019 capital expenditures, excluding expenditures by the KFPC joint venture, will be approximately $110.0 million, which includes approximately $4.0 million of capitalized interest. Also included is approximately $75.0 million for health, safety, environmental, security and infrastructure, and maintenance projects. The remaining anticipated 2019 capital expenditures are primarily associated with projects to optimize the production capabilities of our manufacturing assets, to support our innovation platform, and to upgrade our information technology systems. In addition, we are evaluating certain strategic capital activities, which we may fund up to $50.0 million of incremental capital expenditures in addition to the $110.0 million discussed above.

Financing Cash Flows and Liquidity

Our consolidated capital structure as of December 31, 2018 was approximately 30.9% equity, 67.7% debt, and 1.4% noncontrolling interest compared to approximately 27.1% equity, 71.6% debt, and 1.3% noncontrolling interest as of December 31, 2017.

Net cash used in financing activities totaled $136.7 million for the year ended December 31, 2018 compared to net cash used in financing activities of $175.1 million and net cash provided by financing activities of $1,280.1 million for the years ended December 31, 2017 and 2016, respectively.

In connection with our March and May 2018 refinancing of the Term Loan Facility and the 10.5% Senior Notes, we recorded a $79.9 million loss on extinguishment of debt during the year ended December 31, 2018, which includes the write off of previously capitalized deferred financing costs and original issue discount, the tender offer and subsequent redemption of our 10.5% Senior Notes, partially offset by a gain on the settlement of the ineffective portion of interest rate swaps. We deferred $11.1 million of debt issuance costs.

On December 6, 2018, we commenced a repurchase program for up to $20.0 million of our 7.0% Senior Notes. During the year ended December 31, 2018, we repurchased $0.9 million of our 7.0% Senior Notes.

During the year ended December 31, 2017, we completed the issuance of $400.0 million 7.0% Senior Notes and borrowed €300.0 million under the Euro Tranche. We used the total net proceeds of $758.0 million from both transactions, together with available cash, to prepay principal payments under the USD Tranche. In connection with the Arizona Chemical Acquisition, during the year ended December 31, 2016, we issued the initial $1,350.0 million USD Tranche of the Term Loan Facility and $440.0 million of 10.5% Senior Notes. We incurred $14.3 million deferred financing costs associated with the 2017 repricing of our USD Tranche, the issuance of the $400.0 million 7.0% Senior Notes, and the issuance of the €300.0 million Euro Tranche.

During the year ended December 31, 2018 (excluding borrowings under the KFPC Loan Agreement) we decreased Kraton Corporation indebtedness by $83.7 million, while decreasing cash on hand (excluding KFPC cash) by approximately $4.0 million.

Other Contingencies

As a chemicals manufacturer, our operations in the U.S. and abroad are subject to a wide range of environmental laws and regulations at the international, national, state, and local levels. These laws and regulations govern, among other things, air emissions, wastewater discharges, the use, handling, and disposal of hazardous materials and wastes, occupational health and safety, including dust and noise control, site remediation programs, and chemical registration, use, and management.

Pursuant to these laws and regulations, our facilities are required to obtain and comply with a wide variety of environmental permits and authorizations for different aspects of their operations. Generally, many of these environmental laws and regulations are becoming increasingly stringent, and the cost of compliance with these various requirements can be expected to increase over time.

In connection with our separation from Shell Chemicals in February 2001, Shell Chemicals agreed to indemnify us for specific categories of environmental claims brought with respect to matters occurring before the separation. However, the indemnity from Shell Chemicals is subject to dollar and time limitations. Coverage under the indemnity also varies depending upon the nature of the environmental claim, the location giving rise to the claim and the manner in which the claim is triggered. Therefore, if claims arise in the future related to past operations, we cannot give assurances that those claims will be covered by the Shell Chemicals' indemnity and also cannot be certain that any amounts recoverable will be sufficient to satisfy claims against us.

In connection with International Paper's divestiture of Arizona Chemical in February 2007, International Paper provided an indemnity to the buyer for specific known environmental liabilities and other environmental liabilities pertaining to former properties. At the closing of the Arizona Chemical Acquisition, Kraton was assigned the right to International Paper's indemnity for such environmental liabilities and assumed certain related obligations. Certain liabilities may fall outside the scope of the indemnity and therefore we cannot be certain that the indemnity will be sufficient to satisfy all environmental liabilities of Arizona Chemical.

In addition, we may in the future be subject to claims that arise solely from events or circumstances occurring after February 2001 for legacy Kraton manufacturing sites or after February 2007 for legacy Arizona Chemical manufacturing sites, which would not, in any event, be covered by the Shell Chemicals or International Paper indemnities, respectively. While we recognize that we may in the future be held liable for remediation activities beyond those identified to date, at present we are not aware of any circumstances that are reasonably expected to give rise to remediation claims that would have a material adverse effect on our results of operations or cause us to exceed our projected level of anticipated capital expenditures.

Except for the foregoing, we currently estimate that any expenses incurred in maintaining compliance with environmental laws and regulations will not materially affect our results of operations or cause us to exceed our level of anticipated capital expenditures. However, we cannot give assurances unknown contingencies may not arise or that regulatory requirements or permit conditions will not change, and we cannot predict the aggregate costs of additional measures that may be required to maintain compliance as a result of such changes or expenses.

We had no material operating expenditures for environmental fines, penalties, government imposed remedial, or corrective actions during the years ended December 31, 2018, 2017, or 2016.

Off-Balance Sheet Arrangements

We are not a party to any material off-balance sheet arrangements as of December 31, 2018, other than operating leases.

Contractual Obligations

Our principal outstanding contractual obligations relate to the Term Loan Facility, Senior Notes, KFPC Loan Agreement, interest payments, the operating leases of some of our facilities, the minimum purchase obligations required under our KFPC joint venture agreement and other agreements, and the feedstock contracts with LyondellBasell and others to provide us with raw materials. The following table summarizes our contractual cash obligations as of December 31, 2018 for the periods indicated.

	Payments Due by Period						
	Total	2019	2020	2021	2022	2023	2024 and thereafter
	(In millions)						
Long-term debt obligations[1]	$1,567.1	$45.3	$80.5	$5.2	$0.2	$0.2	$ 1,435.7
Estimated interest payments on debt	475.6	73.5	72.0	72.9	73.0	73.3	110.9
Operating lease obligations	70.3	19.1	16.9	12.4	8.3	5.1	8.5
Purchase obligations [2] [3]	3,061.0	469.1	260.8	237.8	235.1	227.8	1,630.4
Uncertain tax positions, including interest and penalties [4]	29.6	—	—	—	—	—	29.6
Estimated pension obligations [5]	11.2	11.2	—	—	—	—	—
Total contractual cash obligations	$5,214.8	$618.2	$430.2	$328.3	$316.6	$306.5	$ 3,215.1

(1) Includes capital lease obligations.

(2) Included in this line are our estimated minimum purchases required under our KFPC joint venture agreement. Due to the indefinite term of this joint venture, we have based our minimum purchases on an assumed 20 year useful life of the facility.

(3) Pursuant to operating agreements with LyondellBasell, we are currently paying the costs incurred by them in connection with the operation and maintenance of, and other services related to, our Berre, France, and Wesseling, Germany, facilities. These obligations are not included in this table.

(4) Due to uncertainties in the timing of the effective settlement of tax positions with the respective taxing authorities, we are unable to determine the timing of payments related to uncertain tax positions, including interest and penalties. Amounts beyond the current year are therefore reflected in “2024 and thereafter.”

(5) This represents our expected 2019 minimum pension contributions. Due to the complexity of aligning future assumptions for multiple pension plans subsequent to the acquisition of Arizona Chemical, we have changed the methodology and presentation for the pension obligations from prior annual reports.

Impact of Inflation. Our results of operations and financial condition are presented based on historical cost. While it is difficult to accurately measure the impact of inflation due to the imprecise nature of the estimates required, we do not believe the overall effects of inflation, if any, on our results of operations and financial condition have been material.

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

We are exposed to certain market risks, including risks from changes in interest rates, foreign currency exchange rates, and commodity prices that could impact our financial condition, results of operations, and cash flows. We selectively manage our exposure to these and other market risks through regular operating and financing activities as well as through the use of market risk sensitive instruments. We use such financial instruments as risk management tools and not for trading purposes. The market risk sensitive instruments that we have entered into as of December 31, 2018 consist of a series of non-deliverable forward contracts.

Interest rate risk. Borrowings under the Term Loan Facility, the ABL Facility, KFPC Loan Agreement, and KFPC Revolving Credit Facilities, and additional borrowings in the future may, bear interest at variable rates, thereby exposing us to interest rate risk. At December 31, 2018, approximately $835.4 million of our debt was variable rate debt.

We entered into a series of interest rate swaps for a portion of the forecasted USD Tranche whereby we exchanged floating for fixed rate interest payments in order to reduce exposure to interest rate volatility. However, the interest rate swaps we entered may not fully mitigate our interest rate risk. We performed a hypothetical analysis to determine the impact to our financial position if the LIBOR forward rates increased or decreased by 10%, from the rates as of December 31, 2018 for the life of the interest rate swap agreement, which would result in a change of $1.4 million in accumulated other comprehensive income (loss) as of December 31, 2018.

As a result of the interest rate swaps and our variable interest rate floors, a hypothetical 10% change in interest rates would not materially impact our interest expense. However, we may incur additional interest expense in the future if the variable interest rates increase higher than our applicable interest rate floors.

Foreign currency exchange risk. We conduct operations in many countries around the world. Our results of operations are subject to both currency transaction and currency translation risk. We incur currency transaction risk when we enter into either a purchase or sale transaction using a currency other than the local currency of the transacting entity. We are subject to currency translation risk because our financial condition and results of operations are measured and recorded in the relevant domestic currency and then translated into U.S. dollars for inclusion in our historical consolidated financial statements. We attempt to selectively manage significant exposures to potential foreign currency exchange losses based on current market conditions, future operating activities, and the associated cost in relation to the perceived risk of loss. The purpose of our foreign currency risk management activities is to minimize the risk that our cash flows from the sale and/or purchase of services and products in foreign currencies will be adversely affected by changes in exchange rates.

Periodically, we enter into foreign currency agreements to hedge or otherwise protect against fluctuations in foreign currency exchange rates. These agreements typically do not qualify for hedge accounting and gains/losses resulting from both the up-front premiums and/or settlement of the hedges at expiration of the agreements are recognized in the period in which they are incurred. In 2018 and 2017, we entered into a series of foreign currency forward contracts to reduce our exposure to exchange rate volatility. These contracts were structured such that the underlying foreign currency exchange gains/losses would be offset by the mark-to-market impact of the hedging instruments and reduce the impact of foreign currency exchange movements throughout the year. The notional amounts of open foreign currency forward contracts were $90.5 million at December 31, 2018 and $77.7 million at December 31, 2017. The notional amounts of our forward contracts do not generally represent amounts exchanged by the parties, and thus are not a measure of our exposure or of the cash requirements related to these contracts. As such, cash flows related to these contracts are typically not material. The amounts exchanged are calculated by reference to the notional amounts and by other terms of the contracts, such as exchange rates.

We use sensitivity analysis models to measure the impact of a hypothetical 10% adverse movement of foreign currency exchange rates against the U.S. dollar. For our foreign currency transaction risk, a hypothetical 10% adverse change in the foreign currency exchange rates for all our foreign currency positions would result in a $8.1 million pre-tax loss for our net monetary assets denominated in currencies other than the respective entity's functional currency at December 31, 2018. For our foreign currency translation risk, a hypothetical 10% adverse change in the applicable average foreign currency exchange rates relative to the U.S. dollar in 2019 would negatively impact our pre-tax income by $7.0 million.

There are certain limitations inherent in the sensitivity analyses presented, primarily due to the assumption that interest rates and exchange rates change instantaneously in an equally adverse fashion. In addition, the analyses are unable to reflect the complex market reactions that normally would arise from the market shifts modeled. While this is our best estimate of the impact of the various scenarios, these estimates should not be viewed as forecasts.

Commodity price risk. We are exposed to commodity price risk due to our forward contractual purchase commitments for raw materials. Our raw materials are primarily supplied by a portfolio of suppliers under long-term supply contracts and arrangements with various expiration dates. We are subject to future purchase commitments for these raw materials under minimum purchase contracts. Based on pricing as of December 31, 2018, a hypothetical 10.0% change in the market price for these raw materials would change our 2019 cost of goods sold by $37.9 million.

Item 8. Financial Statements and Supplementary Data.
The financial statements are set forth herein commencing on page F-5 of this report.
Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure.
None.
Item 9A. Controls and Procedures.
Evaluation of Disclosure Controls and Procedures
An evaluation of the effectiveness of the design and operation of our disclosure controls and procedures (as defined in Rule 13a-15 under the Securities Exchange Act of 1934) was carried out under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer. As of December&#