MINERALS TECHNOLOGIES INC
Form 10-K
February 15, 2019
UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM 10-K

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

For the fiscal year ended December 31, 2018

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

For the transition period from _____ to _____

Commission file number 1-11430

MINERALS TECHNOLOGIES INC.
(Exact name of registrant as specified in its charter)

Delaware	25-1190717
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification Number)

622 Third Avenue, 38th Floor New York, New York	10017-6707
(Address of principal executive office)	(Zip Code)

(212) 878-1800
(Registrant's telephone number, including area code)

(212) 878-1800
(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
Common Stock, $.10 par value	New York Stock Exchange

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

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

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

Indicate by check mark whether the Registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the Registrant

was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.
Yes No

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

Indicate by check mark 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. .

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 the definitions of “large accelerated filer,” “accelerated filer,” “smaller reporting company,” and “emerging growth company” in Rule 12b-2 of the Exchange Act

Large Accelerated Filer Accelerated Filer
Non-accelerated Filer Smaller Reporting Company
Emerging Growth Company

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

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

The aggregate market value of the voting stock held by non-affiliates of the Registrant, based upon the closing price at which the stock was sold as of July 1, 2018, was approximately $2.3 billion. Solely for the purposes of this calculation, shares of common stock held by officers, directors and beneficial owners of 10% or more of the outstanding common stock have been excluded in that such persons may be deemed to be affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

As of February 4, 2019, the Registrant had outstanding 35,230,318 shares of common stock, all of one class.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant’s Proxy Statement for its 2019 Annual Meeting of Stockholders are incorporated herein by reference in Part III of this Annual Report on Form 10-K.

MINERALS TECHNOLOGIES INC.
2018 FORM 10-K ANNUAL REPORT
Table of Contents

PART I

Item 1. Business

Minerals Technologies Inc. (together with its subsidiaries, the "Company", “we”, “us” or “our”) is a resource- and technology-based company that develops, produces, and markets on a worldwide basis a broad range of specialty mineral, mineral-based and synthetic mineral products and supporting systems and services.

The Company has four reportable segments: Performance Materials, Specialty Minerals, Refractories and Energy Services.

The Performance Materials segment is a leading supplier of bentonite and bentonite-related products, chromite and leonardite. This segment also provides products for non-residential construction, environmental and infrastructure projects worldwide, serving customers engaged in a broad range of construction projects.

The Specialty Minerals segment produces and sells the synthetic mineral product precipitated calcium carbonate ("PCC") and processed mineral product quicklime ("lime"), and mines mineral ores then processes and sells natural mineral products, primarily limestone and talc. This segment is a leading supplier globally of PCC products to the paper industry. This segment's products are used principally in the paper, building materials, paint and coatings, glass, ceramic, polymer, food, automotive and pharmaceutical industries.

The Refractories segment produces monolithic and shaped refractory materials and specialty products. It also provides services and sells application and measurement equipment, calcium metal and metallurgical wire products. Refractories segment products are primarily used in high-temperature applications in the steel, non-ferrous metal and glass industries.

The Energy Services segment provides services to improve the production, costs, compliance, and environmental impact of activities performed in the oil and gas industry. This segment offers a range of services for off-shore filtration and well testing to the worldwide oil and gas industry.

The following table sets forth the percentage of our revenues generated from each segment for each of our last three fiscal years:

	2018	2017	2016
Percentage of Net Sales			
Performance Materials	46%	44%	42%
Specialty Minerals	33%	35%	36%
Refractories	17%	17%	17%
Energy Services	4%	4%	5%
Total	100%	100%	100%

The Company maintains a research and development focus. The Company's research and development capability for developing and introducing technologically advanced new products has enabled the Company to anticipate and satisfy changing customer requirements, creating market opportunities through new product development and product application innovations

Performance Materials Segment

The Performance Materials segment is a leading supplier of bentonite and bentonite-related products. Bentonite is a sedimentary deposit containing greater than 50% montmorillonite and is volcanic in origin. It is surface mined and then dried, crushed, sent through grinding mills where it is sized to customer requirements, and transferred to silos for

automatic bagging or bulk shipment. The processed bentonite may be chemically modified. Bentonite's unique chemical structure gives it a diverse range of capabilities, enabling it to act as a thickener, sealant, binder, lubricant or absorption agent. There are two primary types of natural bentonite utilized by the business, sodium and calcium. Sodium-bentonite is characterized by its ability to absorb large amounts of water and form viscous, thixotropic suspensions. Calcium-bentonite, in contrast, is characterized by its low water absorption and swelling capabilities and its inability to stay suspended in water. Each type of bentonite has its own unique applications. This segment also supplies chromite and leonardite, which is primarily used in metalcasting, drilling fluid additive, and agricultural applications. The principal products of this segment are marketed under various registered trade names, including VOLCLAY®, PANTHER CREEK®, PREMIUM GEL®, ADDITROL®, PREMIUM CHOICE®, ENERSOL®, RAFINOL® and Hevi-Sand®.

In addition, the segment provides products for non-residential construction, environmental and infrastructure projects worldwide. It serves customers engaged in a broad range of construction projects, including site remediation, concrete waterproofing for underground structures, liquid containment on projects ranging from landfills to flood control, and drilling applications including foundation, slurry wall, tunneling, water well, and horizontal drilling.

The Performance Materials segment has five product lines – metalcasting; household, personal care and specialty products; basic minerals, environmental products and building materials.

Metalcasting – Products and Markets

The metalcasting product line produces custom-blended mineral and non-mineral products to strengthen sand molds for casting auto parts, farm and construction equipment, oil and gas production equipment, power generation turbine castings and rail car components. These products help our customers in the foundry and casting industry to improve productivity by reducing scrap from metalcasting defects and poor surface quality. The ADDITROL® blends also improve the efficiency and recycling of sand blends in mold sand systems by lowering clay consumption and improve air quality by reducing volatile organic compound emissions. Our mine to mold operational capability has resulted in providing a consistent high-quality product, technical support and reliable on-time delivery service valued by our customers.

In the ferrous casting market, the Company specializes in blending bentonite of various grades by themselves or with mineral binders containing sodium bentonite, calcium bentonite, seacoal and other ingredients. In the steel alloy casting market, the Company sells chromite products with a particle size distribution specific to customers' needs. One of chromite's qualities is its ability to conduct heat. The Company markets the product for use in making very large, high integrity, steel alloy castings where the chromite is better suited to withstand the high heat and pressure associated with the casting process.

The Company is the exclusive distributor of certain specialty sand chromite products supplied by the Glencore-Merafe joint venture in select territories, including the Americas. This product line was originally sold into the U.S. by the American Colloid Company (ACC) and over the past 90 years has grown in its use throughout the world including China, Thailand, Korea, Australia and Southeast Asia. Over the past three years, the Company has focused on further investment in China and India, where we saw significant sales growth in 2017 and 2018.

The Company's metalcasting product line net sales were $328.9 million in 2018, $294.3 million in 2017 and $258.0 million in 2016.

Household, Personal Care and Specialty Products – Products and Markets

The household, personal care and specialty products product line contains pet litter, fabric care, health and beauty, and agricultural specialty products.

The pet litter products include sodium bentonite-based scoopable (clumping), traditional and alternative cat litters sold to grocery and drug stores, mass merchandisers, wholesale clubs and pet specialty stores throughout North America, Europe and Asia. The Company's scoopable products' clump-forming capability traps urine, thereby reducing waste by allowing for easy removal of only the odor-producing elements from the litter box. The Company is a provider of private-label cat litter to retail partners, as well as a provider of bulk cat litter to national brands and other private label packaging companies. In North America, these products are sold from three principal sites from which we package and distribute finished goods, as well as ship bulk material via rail cars. The Company's internal transportation group provides logistics services and is a key component of our capability in supplying customers on a national basis.

On April 30, 2018, the Company completed the acquisition of Sivomatic Holding, B.V. ("Sivomatic"). Sivomatic is a leading European supplier of premium pet litter products and is a vertically integrated manufacturer with production facilities in the Netherlands, Austria and Turkey.

The Company supplies fabric care products and additives consisting of high-grade, agglomerated bentonite and other mineral additives that perform as softening agents in certain powdered-detergent formulations or act as carriers for colorants, surfactants and fragrances. These fabric care products are formulated to adapt to our customers' changing

technical requirements.

The Company manufactures personal care products consisting of polymer delivery systems and purified grades of bentonite ingredients for sale to manufacturers of skin care products. The polymers are used to deliver high-value active ingredients and the bentonite-based materials act as thickening, suspension and dispersion agent emollients for topical skin care formulations. The personal care products range from ingredient sales to fully formulated finished goods.

Specialty Materials include bentonite and leonardite based proprietary solutions for agricultural and industrial applications. Agricultural uses include crop harvest enhancements, natural animal heath feed additives and vegetable cooking oil clarification.

The Company's household, personal care and specialty product line net sales were $248.8 million in 2018, $169.6 million in 2017 and $171.2 million in 2016.

Basic Minerals – Products and Markets

The basic minerals product line contains sales of bentonite and leonardite to a variety of end markets and industrial applications, including the following:

Drilling Fluid Additives: Sodium bentonite and leonardite are components of certain drilling fluids used in oil and gas well drilling. Bentonite imparts thickening and suspension properties that facilitate the transport of rock cuttings to the surface during the drilling process. It also contributes to a drilling fluid's ability to lubricate the drill bit and coat the underground formations to prevent hole collapse and drill-bit seizing. We market our drilling fluid additives under our own brand and private-label trade names. At least two drilling fluid service competitors have captive bentonite operations while others are party to long-term bentonite supply agreements. The potential customers for our products, therefore, are generally limited to those service organizations that are neither vertically integrated nor have long-term supply arrangements with other bentonite producers. Our primary trademark for this application is the trade name PREMIUM GEL®.

Drilling Products: Drilling products are used in environmental and geotechnical drilling applications, horizontal directional drilling, mineral exploration and foundation construction. The products are used to install monitoring wells, facilitate horizontal and water well drilling, and to seal abandoned exploration drill holes. VOLCLAY GROUT™, HYDRAUL-EZ®, BENTOGROUT® and VOLCLAY TABLETS™ are among the trade names for products used in these applications. Ground source heat loop systems utilizing GEOTHERMAL GROUT™ represent a developing area for drilling products. The Company also offers a range of drilling products used in the excavation of foundations for large buildings, bridges and dams; these products include SHORE PAC® and PREMIUM GEL®. The end-users for these products are typically small well drilling companies and general contractors.

Other Industrial: The Company produces bentonite and bentonite blends for the construction industry to be used as a plasticizing agent in cement, and plaster and bricks. The Company also supplies bentonite to help pelletize other materials for ease of use. Examples of this application include the pelletizing of iron ore.

This product line also includes sales from our internal transportation and logistics group. In 2018, we closed our chromite processing operations in South Africa and exited our bulk chromite business in this product line.

The Company's basic minerals product line net sales were $99.7 million in 2018, $125.0 million in 2017 and $103.9 million in 2016. The sales decline in 2018 was primarily driven by the decision to exit the bulk chromite business.

Environmental Products – Products and Markets

The environmental product line includes bentonite and polymer lining technologies, as well as, other environmental remediation applications.

The Company helps customers protect ground water and soil through the sale of geosynthetic clay liner products containing bentonite. These products are marketed under the RESISTEX® and BENTOMAT® trade names principally for lining and capping landfills, mine waste disposal sites and industrial waste storage sites, such as, bauxite residue and coal ash waste. The Company also provides associated geosynthetic materials for these applications, including geotextiles and drainage geocomposites.

Environmental Products also includes specialized technologies to mitigate vapor intrusion in new building construction. The Company's innovative vapor barrier systems prevent potentially harmful vapors from entering occupied space, thus facilitating low-risk redevelopment. The Company also provides reactive capping technologies

and solutions to effectively contain residual contamination, to reduce costs associated with ex-situ remedies, and aid in environmental protection. Products offered include Liquid Boot®, a liquid applied vapor barrier system; REACTIVE CORE-MAT™, an in-situ sediment capping material and QUIK-SOLID®, a super absorbent media. The Company specializes within the remediation market providing technologies to treat a variety of hazardous compounds in soil, groundwater, leachate and sediment. These products are marketed under the ORGANOCLAY® trade name. The Company also specializes in treating soil, groundwater, surface water and drinking water contaminated with Per-and polyfluoroalkyl substances (PFAS) and Perfluorooctane sulfonate (PFOS) under the FLUORO-SORB® trade name.

The Company’s environmental product line net sales were $80.3 million in 2018, $67.7 million in 2017 and $78.9 million in 2016.

Building Materials – Products and Markets

The building materials product line includes various active and passive products for waterproofing of underground structures, commercial building envelopes and tunnels.

The Company offers a wide variety of active and passive waterproofing and greenroof technologies for use in protecting the building envelope of non-residential construction, including buildings, subways, and parkway systems. Our products include VOLTEX®, a waterproofing composite comprised of two polypropylene geotextiles filled with sodium bentonite; ULTRASEAL®, an advanced membrane using a unique active polymer core; and COREFLEX®, featuring heat-welded seams for protection of critical infrastructure. In addition to these membrane materials, we also provide a variety of sealants and other accessories required to create a functional waterproofing system. The end-users of these products are generally building sub-contractors who are responsible for installing the products.

The Company’s building materials product line net sales were $70.4 million in 2018, $78.2 million in 2017 and $74.1 million in 2016.

Specialty Minerals Segment

PCC Products and Markets

The Company's PCC product line net sales were $445.4 million, $443.7 million and $452.2 million for the years ended December 31, 2018, 2017 and 2016, respectively. The Company's sales of PCC have been, and are expected to continue to be, made primarily to the printing and writing papers segment of the paper industry. The Company also produces PCC for sale to companies in the polymer, food and pharmaceutical industries.

PCC Products – Paper

In the paper industry, the Company's PCC is used:

as a filler in the production of coated and uncoated wood-free printing and writing papers, such as office papers;

as a filler in the production of coated and uncoated groundwood (wood-containing) paper such as magazine and catalog papers; and

as a coating pigment for both wood-free and groundwood papers.

The Company's Paper PCC product line net sales were $378.5 million, $377.7 million and $387.9 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Approximately 21% of the Company's sales consist of PCC sold to papermakers from "satellite" PCC plants. A satellite PCC plant is a PCC manufacturing facility located near a paper mill, thereby eliminating costs of transporting PCC from remote production sites to the paper mill. The Company believes the competitive advantages offered by improved economics and superior optical characteristics of paper produced with PCC manufactured by the Company's satellite PCC plants resulted in substantial growth in the number of the Company's satellite PCC plants since the first such plant was built in 1986. For information with respect to the locations of the Company's PCC plants as of December 31, 2018, see Item 2, "Properties," below.

The Company currently manufactures several customized PCC product forms using proprietary processes. Each product form is designed to provide optimum balance of paper properties including brightness, opacity, bulk, strength and improved printability. The Company's research and development and technical service staff focuses on expanding sales from its existing and potential new satellite PCC plants, as well as, developing new technologies for new

applications. These technologies include, among others, acid-tolerant ("AT®") PCC, which allows PCC to be introduced to the large wood-containing segment of the printing and writing paper market, OPACARB® PCC, a family of products for paper coating, our FulFill® family of products, a system of high-filler technologies that offers papermakers a variety of efficient, flexible solutions which decrease dependency on natural fibers, and NewYield® and ENVIROFIL®, innovative technologies that convert a paper and pulp mill waste stream into functional pigments for filling paper.

The Company owns, staffs, operates and maintains all of its satellite PCC facilities, and owns or licenses the related technology. Generally, the Company and its paper mill customers enter into long-term evergreen agreements, initially ten years in length, pursuant to which the Company supplies substantially all of the customer's precipitated calcium carbonate filler requirements. The Company is generally permitted to sell to third-parties PCC produced at a satellite plant in excess of the host paper mill's requirement.

The Company also sells a range of PCC products to paper manufacturers from production sites not associated with paper mills. These merchant facilities are located at Adams, Massachusetts and Lifford, United Kingdom.

PCC Markets – Paper

Uncoated Wood-Free Printing and Writing Papers – North America. Beginning in the mid-1980's, as a result of a concentrated research and development effort, the Company's satellite PCC plants facilitated the conversion of a substantial percentage of North American uncoated wood-free printing and writing paper producers to lower-cost alkaline papermaking technology. The Company estimates that during 2018, more than 90% of North American uncoated wood-free paper was produced employing alkaline technology. Presently, the Company owns and operates 17 commercial satellite PCC plants located at paper mills that produce uncoated wood-free printing and writing papers in North America.

Uncoated Wood-Free Printing and Writing Papers – Outside North America. The Company estimates the amount of uncoated wood-free printing and writing papers produced outside of North America at facilities that can be served by satellite and merchant PCC plants is more than twice as large (measured in tons of paper produced) as the North American uncoated wood-free paper market currently served by the Company. The Company believes that the superior brightness, opacity and bulking characteristics offered by its PCC products allow it to compete with suppliers of ground limestone and other filler products outside of North America. Presently, the Company owns and operates 34 commercial satellite PCC plants located at paper mills that produce uncoated wood-free printing and writing papers outside of North America.

Uncoated Groundwood Paper. The uncoated groundwood paper market, including newsprint, represents approximately 17% of worldwide paper production. Paper mills producing wood-containing paper still generally employ acid papermaking technology. The conversion to alkaline technology by these mills has been hampered by the tendency of wood-containing papers to darken in an alkaline environment. The Company has developed proprietary application technology for the manufacture of high-quality groundwood paper in an acidic environment using PCC (AT® PCC). Furthermore, as groundwood or wood-containing paper mills use larger quantities of recycled fiber, there is a trend toward the use of neutral papermaking technology in this segment for which the Company presently supplies traditional PCC chemistries. The Company now supplies PCC at 5 groundwood paper mills around the world and licenses its technology to a ground calcium carbonate producer to help accelerate the conversion from acid to alkaline papermaking.

Coated Paper. The Company continues to pursue satellite PCC opportunities in coated paper markets where our products provide unique performance and/or cost reduction benefits to papermakers and printers. Our Opacarb product line is designed to create value to the papermaker and can be used alone or in combination with other coating pigments. PCC coating products are produced at 7 of the Company's PCC plants worldwide.

Specialty PCC Products and Markets

The Company also produces and sells a full range of dry PCC products on a merchant basis for non-paper applications. The Company's Specialty PCC product line net sales were $66.9 million, $66.0 million and $64.3 million for the years ended December 31, 2018, 2017 and 2016, respectively. The Company sells surface-treated and untreated grades of PCC to the polymer industry for use in automotive and construction applications, and to the adhesives and printing inks industries. The Company's PCC is also used by the food and pharmaceutical industries as a source of calcium in tablets and food applications, as a buffering agent in tablets, and as a mild abrasive in toothpaste. The Company produces PCC for specialty applications from production sites at Adams, Massachusetts and Lifford, England.

Processed Minerals – Products and Markets

The Company mines and processes natural mineral products, primarily limestone and talc. The Company also manufactures lime, a limestone-based product. The Company's net sales of processed mineral products were $143.9 million, $141.1 million and $139.3 million for the years ended December 31, 2018, 2017 and 2016, respectively. Net sales of talc products were $52.9 million, $53.8 million and $55.7 million for the years ended December 31, 2018, 2017 and 2016, respectively. Net sales of ground calcium carbonate ("GCC") products, which are principally lime and limestone, were $91.0 million, $87.3 million and $83.6 million for the years ended December 31, 2018, 2017 and 2016, respectively.

The Company mines and processes GCC products at its reserves in the eastern and western parts of the United States. GCC is used and sold in the construction, automotive and consumer markets.

Lime produced at the Company's Adams, Massachusetts, and Lifford, United Kingdom, facilities is used primarily as a raw material for the manufacture of PCC at these sites and is sold commercially to various chemical and other industries.

The Company mines, beneficiates and processes talc at its Barretts site, located near Dillon, Montana. Talc is sold worldwide in finely ground form for ceramic applications and in North America for paint and coatings and polymer applications. Because of the exceptional chemical purity of the Barretts ore, a significant portion of worldwide automotive catalytic converter ceramic substrates contain the Company's Barretts talc.

Our high-quality limestone, dolomitic limestone, and talc products are defined primarily by the chemistry and color characteristics of the ore bodies. Ore samples are analyzed by x-ray fluorescence (XRF) and other techniques to determine purity and more generally by Hunter brightness measurement to determine dry brightness and the Hunter yellowness (b) value. We serve multiple markets from each of our operations, each of which has different requirements relating to a combination of chemical and physical properties.

Refractories Segment

Refractory – Products and Markets

The Company offers a broad range of monolithic and pre-cast refractory products and related systems and services. The Company's Refractory segment net sales were $311.9 million, $279.4 million and $274.5 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Refractory product sales are often supported by Company-supplied proprietary application equipment, laser measurement systems and on-site technical service support. The Company's proprietary application equipment is used to apply refractory materials to the walls of steel-making furnaces and other high temperature vessels to maintain and extend their useful life. Net sales of refractory products, including those for non-ferrous applications, were $261.1 million, $226.9 million and $219.0 million for the years ended December 31, 2018, 2017 and 2016, respectively. The Company's proprietary application systems, such as its MINSCAN®, allow for remote-controlled application of the Company's refractory products in steel-making furnaces, as well as, in steel ladles. Since the steel-making industry is characterized by intense price competition, which results in a continuing emphasis on increased productivity, these application systems and the technologically advanced refractory materials developed in the Company's research laboratories have been well accepted by the Company's customers. These products allow steel makers to improve their performance through, among other things, the application of monolithic refractories to furnace linings while the furnace is at operating temperature, thereby eliminating the need for furnace cool-down periods and steel-production interruption. The result is a lower overall cost for steel produced by steel makers. The Company also pursues cost-per-ton refractory contracts, where, together with other refractory companies, the Company is responsible for coordinating refractory maintenance of the steel furnaces and other steel production vessels. These opportunities provide longer-term stability and a closer working relationship with the customer.

The Company's technical service staff and application equipment assist customers to achieve desired productivity objectives. The Company's technicians are also able to conduct laser measurement of refractory wear, sometimes in conjunction with robotic application tools, to improve refractory performance at many customer locations. The Company believes that these services, together with its refractory product offerings, provide it with a strategic marketing advantage.

Over the past several years, the Refractories segment has continued to develop, reformulate, and optimize its products and application technology to maintain its competitive advantage in the market place. Some of the products the Company has developed and optimized in the past several years include:

HOTCRETE®: High durability shotcrete products for applications at high temperatures in ferrous applications, such as, steel ladles, electric arc furnaces (EAF) and basic oxygen furnaces (BOF) furnaces.
FASTFIRE®: High durability castable and shotcrete products in the non-ferrous and ferrous industries with the added benefit of rapid dry-out capabilities.
OPTIFORM®: A system of products and equipment for the rapid continuous casting of refractories for applications, such as, steel ladle safety linings.
ENDURATEQ®: A high durability refractory shape for glass contact applications, such as, plungers and orifice rings.
DECTEQ™: A system for the automatic control of electrical power feeding electrodes used in electric arc steel making furnaces.
LACAM® Torpedo: A laser scanning system that measures the refractory lining thickness inside a Hot Iron (Torpedo) Ladle. The torpedo ladles transport liquid iron from a blast furnace to the steel plant.
LACAM® LI Explorer: A laser scanning system that measures the refractory lining thickness from the interior of a Hot Steel Ladle. By entering the interior, the explorer provides the ability to see all areas of the ladle and identify the smallest flaws in the refractory lining.
LACAM®: A new, fourth generation Lacam® laser measurement device for use in the worldwide steel industry that is 17 times faster than the previous version. This new technology provides the fastest and most accurate laser scanning for hot surfaces available today.

The principal market for the Company's refractory products is the steel industry. Management believes that certain trends in the steel industry will provide growth opportunities for the Company. These trends include growth and quality improvements regarding the development of improved manufacturing processes, such as, thin-slab casting, the trend in North America to shift production from integrated mills to electric arc furnaces (mini-mills) and the ever-increasing need for improved productivity and longer lasting refractories.

The Company sells its refractory products in the following markets:

Steel Furnace. The Company sells gunnable monolithic refractory products and application systems to users of basic oxygen furnaces and electric arc furnaces for application on furnace walls to prolong the life of furnace linings.

Other Iron and Steel. The Company sells monolithic refractory materials and pre-cast refractory shapes for iron and steel ladles, vacuum degassers, continuous casting tundishes, blast furnaces and reheating furnaces. The Company offers a full line of materials to satisfy most continuous casting refractory applications. This full line consists of gunnable materials, refractory shapes and permanent linings.

Industrial Refractory Systems. The Company sells refractory shapes and linings to the glass, cement, aluminum, petrochemicals, power generation and other non-steel industries. The Company also produces a specialized line of carbon composites and pyrolitic graphite sold under the PYROID® trademark, primarily to the aerospace and electronics industries.

Metallurgical Products and Markets

The Company produces a number of other technologically advanced products for the steel industry, including calcium metal, metallurgical wire products and a number of metal treatment specialty products. Net sales of metallurgical products were $50.8 million, $52.5 million and $55.5 million for the years ended December 31, 2018, 2017 and 2016, respectively. The Company manufactures calcium metal at its Canaan, Connecticut, facility and purchases calcium in international markets. Calcium metal is used in the manufacture of the Company's PFERROCAL® solid-core calcium wire and is also sold for use in the manufacture of batteries and magnets. We also manufacture cored wires at our Canaan, Connecticut and Hengelo, Netherlands, manufacturing sites. The Company sells metallurgical wire products and associated wire-injection equipment, including SURECAL®, for use in the production of high-quality steel. These metallurgical wire products are injected into molten steel to improve castability and reduce imperfections.

Energy Services Segment

The Energy Services segment provides services to improve the production, cost, compliance, and environmental impact of activities performed in the oil and gas industry. The composition of customers within this segment varies from year to year and is significantly dependent on the type of activities each customer is undertaking within the year, regulations, and overall dynamics of the oil and gas industry. The Company provides services for off-shore filtration and well testing to the worldwide oil and gas industry. Services are provided through subsidiaries located in Australia, Brazil, Malaysia, Nigeria, Mexico, Indonesia, Saudi Arabia, the United Kingdom, and the U.S., in the Gulf of Mexico. Energy Services segment’s net sales were $78.3 million, $76.7 million and $85.9 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Principal Services

The Company provides the following principal services:

Water Treatment / Filtration: The Company helps customers comply with regulatory requirements by providing equipment, technologies, personnel and filtration media to treat waste water generated during oil production.

The Company specializes in water treatment processes and technologies to remove oil, hydrocarbons, heavy metals, solids, toxic materials and other contaminants from customers' operation wastewater stream through mechanical and chemical means.

Well Testing: The Company provides equipment and personnel to help customers control well production, as well as, to clean up, unload, separate, measure component flow, and capture fluids from oil and gas wells.

The Company delivers complete well testing solutions and effective operations in all testing environments.

Marketing and Sales

The Company relies principally on its worldwide direct sales force to market its products. The direct sales force is augmented by technical service teams that are familiar with the industries to which the Company markets its products, and by several regional distributors. The Company's sales force works closely with the Company's technical service staff to solve technical and other issues faced by the Company's customers.

In the Performance Materials segment, the Company relies on industry-specialized technically oriented sales persons. In Metalcasting, these sales teams provide expertise to educate our customers on the bentonite blend properties and to aid them in producing castings efficiently. Certain other products are distributed through networks of distributors and representatives, who warehouse specific products at strategic locations. In addition, the sales and distribution of environmental products and building materials are primarily performed through the Company’s own personnel and facilities. Our staff includes sales professionals and technical support engineers who analyze the suitability of our products in relation to the customer’s specific application and the conditions that products will endure or the environment in which they will operate.

In the Specialty Minerals segment, the Company's sales team and technical services staff assist paper producers in ongoing evaluations of the use of PCC for paper coating and filling applications as well as PCC, GCC and talc use in the automotive, construction and household goods markets.

In the Refractory segment, the Company's technical service personnel advise on the use of refractory materials, and, in many cases pursuant to service agreements, apply the refractory materials to the customers' furnaces and other vessels.

In the Energy Services segment, the Company’s sales team sell the services on a direct basis.

Continued use of skilled technical service teams is an important component of the Company's business strategy. The Company works closely with its customers to ensure that their requirements are satisfied, and it often trains and supports customer personnel in the use of the Company's products. The Company oversees domestic marketing and sales activities principally from Bethlehem, Pennsylvania and Hoffman Estates, Illinois, and from regional sales offices located elsewhere in the United States. The Company's international marketing and sales efforts are directed from regional centers located in India, the United Kingdom, Brazil, and China. The Company believes that its worldwide network of sales personnel and manufacturing sites facilitates continued international expansion.

Raw Materials

The Company depends in part on having an adequate supply of raw materials for its manufacturing operations, particularly lime and carbon dioxide for the PCC product line, and magnesia and alumina for its Refractory operations. We also depend on having an adequate supply of bentonite, leonardite and chromite for our Performance Materials segment and limestone and talc for our Processed Minerals product line. Supplies of bentonite, leonardite, chromite, limestone and talc are provided through the Company’s own mining operations and we depend on having adequate access to ore reserves of appropriate quality at such mining operations.

The Company uses lime in the production of PCC and is a significant purchaser of lime worldwide. Generally, the lime utilized in our business is readily available from numerous sources and we purchase lime under long-term supply contracts from unaffiliated suppliers located in close geographic proximity to the Company's PCC plants. We also produce lime at our Adams, Massachusetts facility and our Lifford, UK facility, although most of the lime produced at our Adams facility and all of the lime produced at our Lifford facility is consumed in the production of Specialty PCC at the plant. We currently supply some quantities of lime to third parties that are in close proximity to our Adams plant and could supply small quantities of lime to certain of our PCC satellite facilities that are in close geographic

proximity to the Adams plant. Carbon dioxide is readily available in exhaust gas from the host paper mills, or other operations at our merchant facilities.

The principal raw materials used in the Company's monolithic refractory products are refractory-grade magnesia and various forms of alumina silicates. Approximately 42% percent of the Company’s magnesia requirements were purchased from sources in China over the past five years. The price and availability of bulk raw materials from China are subject to fluctuations that could affect the Company's sales to its customers. In addition, the volatility of transportation costs has also affected the delivered cost of raw materials imported from China to North America and Europe. The Company has developed alternate sources of magnesia over the past few years that have reduced our reliance on China-sourced magnesia. The amount sourced from China and other locations can vary from year to year depending upon price and availability from each source. The alumina we utilize in our business is readily available from numerous sources. The Company also purchases calcium metal, calcium silicide, graphite, calcium carbide and various alloys for use in the production of metallurgical wire products and uses lime and aluminum in the production of calcium metal.

In addition to bentonite, leonardite and chromite provided through our mining operations, our Performance Materials segment's principal raw materials are coal, soda ash and woven and unwoven polyester material, all of which are readily available from numerous sources.

Mineral Reserves and Mining Process

The Company relies on access to bentonite reserves to support its Performance Materials segment. The Company has reserves of sodium and calcium bentonite at various locations in the U.S., including Wyoming, South Dakota, Montana and Alabama, as well as in Australia, China, and Turkey. Through the Company's affiliations and joint ventures, the Company also has access to bentonite deposits in India, and Mexico. Assuming the continuation of 2018 annualized usage rates, the Company has reserves of commercially usable sodium bentonite for the next 49 years. Under the same assumptions, the Company has reserves of commercially usable calcium bentonite for the next 30 years. The Company owns or controls the properties on which the bentonite reserves are located through long-term leases, royalty agreements (including easement and right of way agreements) and patented and unpatented mining claims. No single or group of mining claims or leases is significant or material to the financial condition or operations of our Company or our segments. The majority of our current bentonite mining in the U.S. occurs on reserves where our rights to such reserves accrue to us through over 80 mining leases and royalty agreements and 2,000 mining claims. A majority of these are with private parties and located in Montana, South Dakota and Wyoming. The bentonite deposits underlying these claims and leases generally lie in parcels of land varying between 20 and 40 acres.

In general, our bentonite reserves are immediately adjacent to, or within sixty miles of, one of the related processing plants. All of the properties on which our reserves are located are either physically accessible for the purposes of mining and hauling or the cost of obtaining physical access would not be material. Access to processing facilities from the mining areas is generally by private road, public highways, or railroads. For most of our leased properties and mining claims, there are multiple means of access.

Bentonite is surface mined, generally with large earthmoving bulldozers and scrapers, and then loaded into trucks and off-highway-haul wagons for movement to processing plants. The mining and hauling of our bentonite is done by us and by independent contractors. At the processing plants, bentonite is dried, crushed and sent through grinding mills, where it is sized to customer requirements, then chemically modified, where needed, and transferred to silos for automatic bagging or bulk shipment. Most of the production is shipped as processed rather than stored for inventory.

For our Performance Materials segment, we also mine leonardite, a form of oxidized lignite, in North Dakota, and transport it to nearby processing facilities. Assuming the continuation of 2018 annualized usage rates, the Company has reserves of commercially usable leonardite for the next 30 years. In 2018, we closed our chromite mine and processing operations in South Africa.

The Processed Minerals product line of our Specialty Minerals segment is supported by the Company's limestone reserves located in the western and eastern parts of the United States, and talc reserves located in Montana. The Company generally owns and surface mines these reserves and processes its products at nearby processing plants. The Company estimates these reserves, at current usage levels, to be in excess of 36 years at its limestone production facilities and in excess of 14 years at its talc production facility.

The Company has ongoing exploration and development activities for all of its mineral interests with the intent to increase its proven and probable reserves.

See Item 2, "Properties," for more information with respect to these facilities and mines.

The Company relies on shipping bulk cargos of bentonite within and from the United States, Turkey and China to customers, as well as our own subsidiaries, and we are sensitive to our ability to recover these shipping costs. In the last few years, bulk cargo shipping rates have been very volatile, and, to a lesser extent, the availability of bulk cargo

containers has been sporadic.

Competition

The Company is continually engaged in efforts to develop new products and technologies and refine existing products and technologies in order to remain competitive and to position itself as a market leader.

For the Performance Materials segment, the Company competes on the basis of product quality, service, technical support, price, product availability and logistics. There are numerous major producers of competing products and various regional suppliers in the areas the Company serves. The Company is the world leader in bentonite, including number one positions in metalcasting and pet litter. Some of the competitors are companies primarily in other lines of business with substantially greater financial resources than ours. With respect to the environmental products product line, the Company competes with geosynthetic clay liner manufacturers worldwide, several suppliers of alternative lining technologies, and providers of soil and environmental remediation solutions and products. The building materials product line competes in a highly fragmented market comprised of a wide variety of alternative technologies. A number of integrated bentonite companies compete with our drilling products.

With respect to its PCC products, the Company competes for sales to the paper industry with other minerals, such as GCC and kaolin, based in large part upon technological know-how, patents and processes that allow the Company to deliver PCC that it believes imparts gloss, brightness, opacity and other properties to paper on an economical basis. The Company is the leading manufacturer and supplier of PCC to the paper industry.

The Company competes in sales of its limestone and talc based primarily upon quality, price, and geographic location.

With respect to the Company's refractory products, competitive conditions vary by geographic region. Competition is based upon the performance characteristics of the product (including strength, consistency and ease of application), price, and the availability of technical support.

The Energy Services segment competes with other oil and gas services companies. However, the Company believes that the Company offers several competitive advantages, especially in the area of water treatment services, due to superior and innovative technologies that the Company has developed internally and the combination of services that the Company can provide.

Seasonality

Some of our product lines and operations in the Performance Materials segment are impacted by weather and soil conditions. Many of the products cannot be applied in wet or winter weather conditions and, as such, sales and profits tend to be greater during the period from April through October. As a result, we consider the business of this segment to be seasonal. Our Processed Minerals product line of our Specialty Minerals segment is subject to similar seasonal patterns.

Much of the business in the Energy Services segment can be impacted by weather conditions. Our business is concentrated in the Gulf of Mexico where our customers' oil and gas production facilities are subject to natural disasters, such as hurricanes. Given this, our Energy Services sales could be lower in the June to November months.

Research and Development

Many of the Company's product lines are technologically advanced. The Company's internal research team has dedicated years of experience into analyzing properties of minerals and synthetic materials while developing processes and applications to enhance their performance. Our expertise in inorganic chemistry, crystallography and structural analysis, fine particle technology and other aspects of materials science apply to and support all of our product lines. The Company's business strategy for growth in sales and profitability depends, to a large extent, on the continued success of its research and development activities.

The Company's Performance Materials segment also offers a strong portfolio of custom blended compounds, formulations and technology, which have been primarily developed internally by the Company's research and development efforts. The ADDITROL® formulation, a custom blend, meets the need of both ferrous and non-ferrous applications. The Volclay® application is used in green sand molding applications ranging from the production of iron and steel castings to the production of non-ferrous castings. The Hevi-Sand® specialty chromite blend prevents metal penetration and can be used with most foundry binders in molds and cores. In addition, the Company's RESISTEX™ and CONTINUUM® formulation enables withstanding aggressive leachates. The ORGANOCLAY® technology offers highly effective solutions in effective in removing oils, greases and other high molecular weight, low solubility organic compounds from aqueous streams. The Company will also continue to seek out promising compounds and innovative technologies, developed mainly by our internal research team, to incorporate into our product lines.

In the Specialty Minerals segment, the significant achievements of the Company's research and development efforts include: the satellite PCC plant concept; PCC crystal morphologies for paper filling and coating; FulFill® high filler technology systems; NewYield® Waste Stream Process Technology; ENVIROFIL® Waste Stream Process

Technology; Thixocarb® PCC, Vicality® USP PCC, EMforce®, and Optibloc® for the Processed Minerals and Specialty PCC product lines.

The FulFill® brand High Filler Technology is a portfolio of high-filler technologies that offers papermakers a variety of efficient, flexible solutions that decreases dependency on natural fiber and reduces costs. The FulFill® E and V series allows papermakers to increase filler loading levels of precipitated calcium carbonate (PCC), which replaces higher cost pulp, and increases PCC usage. Depending on paper grades, this PCC volume increase may range from 15 to 30 percent. NewYield® Waste Stream Process Technology cost-effectively converts a problematic pulp mill waste stream into a functional pigment for filling paper, eliminating the cost of environmental disposal and remediation of certain waste streams to papermakers. The product and technology have been validated on a commercial scale in a pulping operation and papermaking system in China, with several current projects underway. ENVIROFIL® Waste Stream Process Technology cost-effectively converts a problematic de-inked sludge waste into a functional pigment for filling paper, eliminating the cost of environmental disposal and remediation.

In the Refractories segment, the Company's achievements include the development of FASTFIRE® and OPTIFORM® shotcrete refractory products; LACAM® laser-based refractory measurement systems; and the MINSCAN® and HOTCRETE® application systems. The Company will continue to reformulate its refractory materials to be more competitive.

For the years ended December 31, 2018, 2017 and 2016, the Company spent approximately $22.7 million, $23.7 million and $23.8 million, respectively, on research and development. The Company's research and development spending for 2018, 2017 and 2016 was approximately 1.3%, 1.4% and 1.5% of net sales, respectively.

The Company maintains its primary research facilities in Bethlehem and Easton, Pennsylvania; Houston, Texas; and Hoffman Estates, Illinois. It also has research and development facilities in China, England, Germany, Ireland, Japan and Turkey. Approximately 202 employees worldwide are engaged in research and development. In addition, the Company has access to some of the world's most advanced papermaking and paper coating pilot facilities.

Patents and Trademarks

The Company owns or has the right to use approximately 403 patents and approximately 1,710 trademarks related to its business. Our patents expire between 2019 and 2036. Our trademarks continue indefinitely. The Company believes that its rights under its existing patents, patent applications and trademarks are of value to its operations, but no one patent, application or trademark is material to the conduct of the Company's business as a whole.

Insurance

The Company maintains liability and property insurance and insurance for business interruption in the event of damage to its production facilities and certain other insurance covering risks associated with its business. The Company believes such insurance is adequate for the operation of its business. There is no assurance that in the future the Company will be able to maintain the coverage currently in place or that the premiums will not increase substantially.

Employees

At December 31, 2018, the Company employed 3,720 persons, of whom 1,995 were employed outside of the United States.

Environmental, Health and Safety Matters

The Company's operations are subject to federal, state, local and foreign laws and regulations relating to the environment and health and safety. In particular, we are subject to certain requirements under the Clean Air Act. In addition, certain of the Company's operations involve and have involved the use and release of substances that have been and are classified as toxic or hazardous within the meaning of these laws and regulations. Environmental operating permits are, or may be, required for certain of the Company's operations and such permits are subject to modification, renewal and revocation. We are also subject to land reclamation requirements. The Company regularly monitors and reviews its operations, procedures and policies for compliance with these laws and regulations. The Company believes its operations are in substantial compliance with these laws and regulations and that there are no violations that would have a material effect on the Company. Despite these compliance efforts, some risk of environmental and other damage is inherent in the Company's operations, as it is with other companies engaged in similar businesses, and there can be no assurance that material violations will not occur in the future. The cost of compliance with these laws and regulations is not expected to have a material adverse effect on the Company.

Laws and regulations are subject to change. See Item 1A, Risk Factors, for information regarding the possible effects that compliance with new environmental laws and regulations, including those relating to climate change, may have

on our businesses and operating results.

Under the terms of certain agreements entered into in connection with the Company's initial public offering in 1992, Pfizer Inc. ("Pfizer") agreed to indemnify the Company against certain liabilities being retained by Pfizer and its subsidiaries including, but not limited to, pending lawsuits and claims, and any lawsuits or claims brought at any time in the future alleging damages or injury from the use, handling of or exposure to any product sold by Pfizer's specialty minerals business prior to the closing of the initial public offering.

Available Information

The Company maintains an internet website located at http://www.mineralstech.com. Its reports on Forms 10-K, 10-Q and 8-K, and amendments to those reports, as well as its Proxy Statement and filings under Section 16 of the Securities Exchange Act of 1934 are available free of charge through the Investor Relations page of its website, as soon as reasonably practicable after they are filed with the Securities and Exchange Commission ("SEC"). Investors may access these reports through the Company's website by navigating to "Investor Relations" and then to "SEC Filings."

Item 1A. Risk Factors

Our business faces significant risks. Set forth below are all risks that we believe are material at this time. Our business, financial condition and results of operations could be materially adversely affected by any of these risks. These risks should be read in conjunction with the other information in this Annual Report on Form 10-K.

Worldwide general economic, business, and industry conditions have had, and may continue to have, an adverse effect on the Company’s results.

The global economic instability experienced in recent years had caused, among other things, declining consumer and business confidence, volatile raw material prices, instability in credit markets, high unemployment, fluctuating interest and exchange rates, and other challenges in the countries in which we operate. The Company’s business and operating results had been and could once again be adversely affected by these global economic conditions. The Company’s customers and potential customers may experience deterioration of their businesses, cash flow shortages, and difficulty obtaining financing. As discussed below, the industries we serve have in the past been adversely affected by the uncertain global economic climate due to the cyclical nature of their businesses. As a result, existing or potential customers may reduce or delay their growth and investments and their plans to purchase products and may not be able to fulfill their obligations in a timely fashion. Further, suppliers could experience similar conditions, which could affect their ability to fulfill their obligations to the Company. Adversity within capital markets may also impact the Company’s results of operations by negatively affecting the amount of expense the Company records for its pension and other postretirement benefit plans. Actuarial valuations used to calculate income or expense for the plans reflect assumptions about financial market and other economic conditions – the most significant of which are the discount rate and the expected long-term rate of return on plan assets. Such actuarial valuations may change based on changes in key economic indicators. Global economic markets remain uncertain, and there can be no assurance that market conditions will improve in the near future. Future weakness in the global economy could materially and adversely affect our business and operating results.

Our customers’ businesses are cyclical or have changing regional demands. Our operations are subject to these trends and we may not be able to mitigate these risks.

Our Performance Materials segment’s sales are predominantly derived from the metalcasting market. The metalcasting market is dependent upon the demand for castings for automobile components, farm and construction equipment, oil and gas production equipment, power generation turbine castings, and rail car components. Many of these types of equipment are sensitive to fluctuations in demand during periods of recession or difficult economic conditions, which ultimately may affect the demand for our Performance Materials segment’s products and services.

In the paper industry, which is served by our Paper PCC product line, production levels for uncoated freesheet within North America and Europe, our two largest markets are projected to continue to decrease. The reduced demand for premium writing paper products has also caused recent paper mill closures.

Our Refractories segment primarily serves the steel industry. European steel production continues to be affected by global volatility and overcapacity in the market. North American steel tariffs have stabilized current production in the United States, however, the tariffs are subject to change.

Demand for our Energy Services segment's products and services is affected by the level of exploration, development, and production activity of, and the corresponding capital spending by, oil and natural gas companies, which are heavily influenced by the benchmark price of these commodities. Oil and natural gas prices decreased significantly in 2014 and 2015, with West Texas Intermediate (WTI) oil spot prices declining from a high of $108 per barrel in June 2014 to a low of $26 per barrel in February 2016. This has caused oil and natural gas companies to reduce their capital expenditures and production and exploration activities. This has the effect of decreasing the demand and increasing competition for the services we provide. In addition, the performance of our Energy Services segment is affected by changes in technologies, locations of customers' targeted reserves, and competition in various geographic markets.

Our Environmental Products and Building Materials products sales are predominantly derived from the commercial construction and infrastructure markets. In addition, our Processed Minerals and Specialty PCC product lines are affected by the domestic building and construction markets, as well as the automotive market.

Demand for our products is subject to trends in these markets. During periods of economic slowdown, our customers often reduce their capital expenditures and defer or cancel pending projects. Such developments occur even amongst customers that are not experiencing financial difficulties. In addition, these trends could cause our customers to face liquidity issues or bankruptcy, which could deteriorate the aging of our accounts receivable, increase our bad debt exposure and possibly trigger impairment of assets or realignment of our businesses. The Company has taken steps to reduce its exposure to variations in its customers' businesses, including by diversifying its portfolio of products and services; through geographic expansion, and by structuring most of its long-term satellite PCC contracts to provide a degree of protection against declines in the quantity of product purchased, since the price per ton of PCC generally rises as the number of tons purchased declines. In addition, many of the Company's product lines lower its customers' costs of production or increase their productivity, which should encourage them to use its products. However, there can be no assurance that these efforts will mitigate the risks of our dependence on these industries. Continued weakness in the industries we serve has had, and may in the future have, an adverse effect on sales of our products and our results of operations. A continued or renewed economic downturn in one or more of the industries or geographic regions that the Company serves, or in the worldwide economy, could cause actual results of operations to differ materially from historical and expected results.

The Company’s results could be adversely affected if it is unable to effectively achieve and implement its growth initiatives.

Sales and income growth of the Company depends upon a number of uncertain events, including the outcome of the Company's strategies of increasing its penetration into geographic markets such as Brazil, Russia, India and China as well as other Asian and Eastern European countries; increasing its penetration into product markets such as the market for papercoating pigments and the market for groundwood paper pigments; increasing sales to existing PCC customers by increasing the amount of PCC used per ton of paper produced; developing, introducing and selling new products such as the FulFill® family of products for the paper industry. Difficulties, delays or failure of any of these strategies could affect the future growth rate of the Company. Our strategy also anticipates growth through future acquisitions. However, our ability to identify and consummate any future acquisitions on terms that are favorable to us may be limited by the number of attractive acquisition targets, internal demands on our resources and our ability to obtain financing. Our success in integrating newly acquired businesses will depend upon our ability to retain key personnel, avoid diversion of management’s attention from operational matters, and integrate general and administrative services. In addition, future acquisitions could result in the incurrence of additional debt, costs and contingent liabilities. Integration of acquired operations may take longer, or be more costly or disruptive to our business, than originally anticipated, and it is also possible that expected synergies from future acquisitions may not materialize. We also may incur costs and divert management attention with regard to potential acquisitions that are never consummated.

Servicing the Company’s debt will require a significant amount of cash. This could reduce the Company’s flexibility to respond to changing business and economic conditions or fund capital expenditures or working capital needs. Our ability to generate cash depends on many factors beyond our control.

At December 31, 2018, the Company had outstanding borrowings of $1.0 billion pursuant to our senior secured credit facility. This financing will require a significant amount of cash to make interest payments. Further, the interest rate on a significant portion of our borrowings under our senior secured credit facility is based on LIBOR interest rates, which could result in higher interest expense in the event of an increase in interest rates. Our ability to pay interest on our debt and to satisfy our other debt obligations will depend in part upon our future financial and operating performance and upon our ability to renew or refinance borrowings. Prevailing economic conditions and financial, business, competitive, regulatory and other factors, many of which are beyond our control, will affect our ability to make these payments. We cannot guarantee that our business will generate sufficient cash flow from operations or that

future borrowings will be available to us in an amount sufficient to enable us to fund our liquidity needs. If we are unable to generate sufficient cash flow to meet our debt service obligations, we will have to pursue one or more alternatives, such as reducing or delaying capital or other expenditures, refinancing debt, selling assets, or raising equity capital. Further, the requirement to make significant interest payments may reduce the Company's flexibility to respond to changing business and economic conditions or fund capital expenditure or working capital needs and may increase the Company's vulnerability to adverse economic conditions.

Our senior secured credit facility contains various covenants that limit our ability to take certain actions and our revolving credit facility, if used, also requires us to meet financial maintenance tests, failure to comply with which could have a material adverse effect on us.

The agreement governing our senior secured credit facility contains a number of significant covenants that, among other things, limit our ability to: incur additional debt or liens, consolidate or merge with any other person, alter the business we conduct, make investments, use the proceeds of asset sales or sale/leaseback transactions, enter into hedging arrangements, pay dividends or make certain other restricted payments, create dividend or other payment restrictions with respect to subsidiaries, and enter into transactions with affiliates. In addition, our revolving credit facility, if used, requires us to comply with specific financial ratios, including a maximum net leverage ratio, under which we are required to achieve specific financial results. Commencing with the second quarter of 2018, we had borrowings under our revolving credit facility, and are therefore required to comply with such financial ratios. Our ability to comply with these provisions may be affected by events beyond our control. A breach of any of these covenants would result in a default under the agreements. In the event of any default, our lenders could elect to declare all amounts borrowed under the agreements, together with accrued interest thereon, to be due and payable. In such an event, we cannot assure you that we would have sufficient assets to pay debt then outstanding under the agreements governing our debt. Any future refinancing of the senior secured credit facility is likely to contain similar restrictive covenants.

The Company’s sales of PCC could be adversely affected by our failure to renew or extend long term sales contracts for our satellite operations.

The Company's sales of PCC to paper customers are typically pursuant to long-term evergreen agreements, initially ten years in length, with paper mills where the Company operates satellite PCC plants. Sales pursuant to these contracts represent a significant portion of our worldwide Paper PCC sales, which were $378.5 million in 2018, or approximately 21% of the Company’s net sales. The terms of many of these agreements have been extended or renewed in the past, often in connection with an expansion of the satellite plant. However, failure of a number of the Company's customers to renew or extend existing agreements on terms as favorable to the Company as those currently in effect, or at all, could have a substantial adverse effect on the Company's results of operations, and could also result in impairment of the assets associated with the PCC plant.

The Company’s sales could be adversely affected by consolidation in customer industries, principally paper, foundry and steel.

Several consolidations in the paper industry have taken place in recent years and such consolidation could continue in the future. These consolidations could result in partial or total closure of some paper mills where the Company operates PCC satellites. Such closures would reduce the Company's sales of PCC, except to the extent that they resulted in shifting paper production and associated purchases of PCC to another location served by the Company. Similarly, consolidations have occurred in the foundry and steel industries. Such consolidations in the major industries we serve concentrate purchasing power in the hands of a smaller number of manufacturers, enabling them to increase pressure on suppliers, such as the Company. This increased pressure could have an adverse effect on the Company's results of operations in the future.

The Company is subject to stringent regulation in the areas of environmental, health and safety, and tax, and may incur unanticipated costs or liabilities arising out of claims for various legal, environmental and tax matters or product stewardship issues.

The Company’s operations are subject to international, federal, state and local governmental environmental, health and safety, tax and other laws and regulations. We have expended, and may be required to expend in the future, substantial funds for compliance with such laws and regulations. In addition, future events, such as changes to or modifications of interpretations of existing laws and regulations, or enforcement polices, or further investigation or evaluation of the

potential environmental impacts of operations or health hazards of certain products, may affect our mining rights or give rise to additional compliance and other costs that could have a material adverse effect on the Company. Further, certain of our customers are subject to various federal and international laws and regulations relating to environmental and health and safety matters, especially our Energy Services customers who are subject to drilling permits, waste water disposal and other regulations. To the extent that these laws and regulations affecting our customers change, demand for our products and services could also change and thereby affect our financial results. State, national, and international governments and agencies have been evaluating climate-related legislation and regulation that would restrict emissions of greenhouse gases in areas in which we conduct business, and some such legislation and regulation have already been enacted or adopted. Enactment of climate-related legislation or adoption of regulation that restrict emissions of greenhouse gases in areas in which we conduct business could have an adverse effect on our operations or demand for our products. Our manufacturing processes, particularly the manufacturing process for PCC, use a significant amount of energy and, should energy prices increase as a result of such legislation or regulation, we may not be able to pass these increased costs on to purchasers of our products. We cannot predict if or when currently proposed or additional laws and regulations regarding climate change or other environmental or health and safety concerns will be enacted or adopted.

The Company is also subject to income tax laws and regulations in the United States and various foreign jurisdictions. Significant judgment is required in evaluating and estimating our provision and accruals for these taxes. Our income tax liabilities are dependent upon the location of earnings among these different jurisdictions. Our income tax provision and income tax liabilities could be adversely affected by the jurisdictional mix of earnings, changes in valuation of deferred tax assets and liabilities and changes in tax treaties, laws and regulations, including the U.S. Tax Cuts and Jobs Act of 2017, which effected significant changes to the U.S. corporate income tax system.

The Company is currently a party in various litigation matters and tax and environmental proceedings and faces risks arising from various unasserted litigation matters, including, but not limited to, product liability, patent infringement, antitrust claims, and claims for third party property damage or personal injury stemming from alleged environmental torts. Failure to appropriately manage safety, human health, product liability and environmental risks associated with the Company's products and production processes could adversely impact the Company's employees and other stakeholders, the Company's reputation and its results of operations. Public perception of the risks associated with the Company's products and production processes could impact product acceptance and influence the regulatory environment in which the Company operates. While the Company has procedures and controls to manage these risks, carries liability insurance, which it believes to be appropriate to its businesses, and has provided reserves for current matters, which it believes to be adequate, an unanticipated liability, arising out of a current matter or proceeding or from the other risks described above, could have a material adverse effect on the Company's financial condition or results of operations.

Delays or failures in new product development could adversely affect the Company's operations.

The Company's future business success will depend in part upon its ability to maintain and enhance its technological capabilities, to respond to changing customer needs, and to successfully anticipate or respond to technological changes on a cost-effective and timely basis. The Company is engaged in a continuous effort to develop new products and processes in all of its product lines. Difficulties, delays or failures in the development, testing, production, marketing or sale of such new products could cause actual results of operations to differ materially from our expected results.

The Company's ability to compete is dependent upon its ability to defend its intellectual property against inappropriate disclosure and infringement.

The Company's ability to compete is based in part upon proprietary knowledge, both patented and unpatented. The Company's ability to achieve anticipated results depends in part on its ability to defend its intellectual property against inappropriate disclosure as well as against infringement. In addition, development by the Company's competitors of new products or technologies that are more effective or less expensive than those the Company offers could have a material adverse effect on the Company's financial condition or results of operations.

The Company's operations could be impacted by the increased risks of doing business abroad.

The Company does business in many areas internationally. Approximately 47% of our sales in 2018 were derived from outside the United States and we have significant production facilities which are located outside of the United States. We have in recent years expanded our operations in emerging markets, and we plan to continue to do so in the future, particularly in China, India, Brazil, the Middle East, and Eastern Europe. Some of our operations are located in areas that have experienced political or economic instability, including Indonesia, Malaysia, Nigeria, Egypt, Russia, Saudi Arabia, Turkey, Brazil, Thailand, China and South Africa. The UK's decision to exit the European Union (referred to as Brexit) has caused additional volatility in the markets and currency exchange rates. Market conditions and exchange rates could continue to be volatile in the near term as this decision is implemented. As the Company expands its operations overseas, it faces increased risks of doing business abroad, including inflation, fluctuation in interest rates, changes in applicable laws and regulatory requirements, export and import restrictions, tariffs, nationalization, expropriation, limits on repatriation of funds, civil unrest, terrorism, unstable governments and legal systems, and other factors. Many of these risks are beyond our control and can lead to sudden, and potentially prolonged, changes in demand for our products, difficulty in enforcing agreements, and losses in the realizability of our assets. Adverse developments in any of the areas in which we do business could cause actual results to differ materially from historical and expected results. In addition, a significant portion of our raw material purchases and sales outside the United States are denominated in foreign currencies, and liabilities for non-U.S. operating expenses and income taxes are denominated in local currencies. Accordingly, reported sales, net earnings, cash flows and fair values have been and, in the future, will be affected by changes in foreign currency exchange rates. Our overall success as a global business depends, in part, upon our ability to succeed in differing legal, regulatory, economic,

social and political conditions. We cannot assure you that we will implement policies and strategies that will be effective in each location where we do business.

The Company's operations are dependent on the availability of raw materials and access to ore reserves at its mining operations. Increases in costs of raw materials, energy, or shipping could adversely affect our financial results.

The Company depends in part on having an adequate supply of raw materials for its manufacturing operations, particularly lime and carbon dioxide for the PCC product line, and magnesia and alumina for its Refractory operations. Purchase prices and availability of these critical raw materials are subject to volatility. At any given time, we may be unable to obtain an adequate supply of these critical raw materials on a timely basis, on price and other terms, or at all. While most such raw materials are readily available, the Company has purchased approximately 42% of its magnesia requirements from sources in China over the past five years. The price and availability of magnesia have fluctuated in the past and they may fluctuate in the future. Price increases for certain other of our raw materials, including petrochemical products, as well as increases in energy prices, have also affected our business. Our production processes consume a significant amount of energy, primarily electricity, diesel fuel, natural gas and coal. We use diesel fuel to operate our mining and processing equipment and our freight costs are heavily dependent upon fuel prices and surcharges. Energy costs also affect the cost of raw materials. On a combined basis, these factors represent a large exposure to petrochemical and energy products which may be subject to significant price fluctuations. The contracts pursuant to which we construct and operate our satellite PCC plants generally adjust pricing to reflect the pass-through of increases in costs resulting from inflation, including energy. However, there is a time lag before such price adjustments can be implemented. The Company and its customers will typically negotiate reasonable price adjustments in order to recover these escalating costs, but there can be no assurance that we will be able to recover increasing costs through such negotiations.

The Company also depends on having adequate access to ore reserves of appropriate quality at its mining operations. There are numerous uncertainties inherent in estimating ore reserves including subjective judgments and determinations that are based on available geological, technical, contract and economic information.

The Company relies on shipping bulk cargos of bentonite from the United States, Turkey and China to customers, as well as our own subsidiaries, and we are sensitive to our ability to recover these shipping costs. In the last few years, bulk cargo shipping rates have been very volatile, and, to a lesser extent, the availability of bulk cargo containers have been suspect. If we cannot secure our container requirements or offset additional shipping costs with price increases to customers, our profitability could be impacted. We are also subject to other shipping risks. In particular, rail service interruptions have affected our ability to ship, and the availability of rail service, and our ability to recover increased rail costs, may be beyond our control.

The Company operates in very competitive industries, which could adversely affect our profitability.

The Company has many competitors. Some of our principal competitors have greater financial and other resources than we have. Accordingly, these competitors may be better able to withstand economic downturns and changes in conditions within the industries in which we operate and may have significantly greater operating and financial flexibility than we do. We also face competition for some of our products from alternative products, and some of the competition we face comes from competitors in lower-cost production countries like China and India. As a result of the competitive environment in the markets in which we operate, we currently face and will continue to face pressure on the sales prices of our products from competitors, which could reduce profit margins.

Production facilities are subject to operating risks and capacity limitations that may adversely affect the Company's financial condition or results of operations.

The Company is dependent on the continued operation of its production facilities. Production facilities are subject to hazards associated with the manufacturing, handling, storage, and transportation of chemical materials and products, including pipeline leaks and ruptures, explosions, fires, inclement weather and natural disasters, mechanical failure, unscheduled downtime, labor difficulties, transportation interruptions, and environmental risks. We maintain property, business interruption and casualty insurance but such insurance may not cover all risks associated with the hazards of

our business and is subject to limitations, including deductibles and maximum liabilities covered. We may incur losses beyond the limits, or outside the coverage, of our insurance policies. Further, from time to time, we may experience capacity limitations in our manufacturing operations. In addition, if we are unable to effectively forecast our customers' demand, it could affect our ability to successfully manage operating capacity limitations. These hazards, limitations, disruptions in supply and capacity constraints could adversely affect financial results.

Operating results for some of our segments are seasonal.

Our Energy Services Segment and certain product lines within our Performance Materials segment are affected by seasonal weather patterns. A majority of our Energy Services revenues are derived from the Gulf of Mexico and surrounding states, which are susceptible to hurricanes that typically occur June 1st through November 30th. Actual or threatened hurricanes can result in volatile demand for sevices provided by our Energy Services segment. Our Environmental Products and Building Materials product lines within our Performance Materials segment are affected by weather patterns which determine the feasibility of construction activities. Typically, less construction activity occurs in winter months and thus this segment's revenues tend to be greatest in the second and third quarters when weather patterns in our geographic markets are more conducive to construction activities. Our Processed Minerals product line is subject to similar seasonal patterns.

Our operations are subject to cyber-attacks that could have a material adverse impact on our business, consolidated results of operations, and consolidated financial condition.

Our operations are becoming increasingly dependent on digital technologies and services. We use these technologies for internal purposes, including data storage, processing, and transmissions, as well as in our interactions with customers and suppliers. Digital technologies are subject to the risk of cyber-attacks. If our systems for protecting against cybersecurity risks prove not to be sufficient, we could be adversely affected by, among other things: loss of or damage to intellectual property, proprietary or confidential information, or customer, supplier, or employee data; interruption of our business operations; and increased costs required to prevent, respond to, or mitigate cybersecurity attacks. These risks could harm our reputation and our relationships with customers, suppliers, employees, and other third parties, and may result in claims against us. In addition, these risks could have a material adverse effect on our business, consolidated results of operations, and consolidated financial condition.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

The Company's corporate headquarters, sales offices, research laboratories, plants, mines and other facilities are owned by the Company except as otherwise noted. Set forth below is certain information relating to the Company's principal plants and office and research facilities.

Location	Facility	Product Line	Segment
United States			
Alabama, Sandy Ridge	Plant; Mine	Metalcasting, basic minerals and specialty products	Performance Materials
Arizona, Pima County	Plant; Mine (1)	Limestone	Specialty Minerals
California, Lucerne Valley	Plant; Mine	Limestone	Specialty Minerals
Connecticut, Canaan	Plant; Mine	Limestone, Metallurgical Wire/Calcium	Specialty Minerals; Refractories
Georgia, Cartersville	Plant	Environmental products and other building materials products	Performance Materials
Illinois, Belvidere	Plant	Metalcasting products	Performance Materials
Illinois, Hoffman Estates	Research laboratories; Administrative office (2)	All Company Products	All Segments
Indiana, Portage	Plant	Refractories/Shapes	Refractories
Indiana, Troy	Plant	Metalcasting products	Performance Materials
Iowa, Shell Rock	Plant	Metalcasting products	Performance Materials
Louisiana, Baton Rouge	Plant	Monolithic Refractories	Refractories
Louisiana, Lafayette	Plant	Personal Care Products	Performance Materials
Louisiana, New Iberia	Operations base (2)	Filtration and Well testing services	Energy Services
Massachusetts, Adams	Plant; Mine	Limestone, Lime, PCC	Specialty Minerals
Michigan, Albion	Plant	Metalcasting products	Performance Materials
Mississippi, Aberdeen	Plant	Performance additive products	Performance Materials
Montana, Dillon	Plant; Mine	Talc	Specialty Minerals
Nebraska, Scottsbluff	Transportation terminal		Performance Materials
New York, New York	Headquarters (2)	All Company Products	Headquarters
North Dakota, Gascoyne	Plant; Mine	Metalcasting, basic minerals and specialty products	Performance Materials
Ohio, Archbold	Plant	Metalcasting products	Performance Materials
Ohio, Bryan	Plant	Monolithic Refractories	Refractories
Ohio, Dover	Plant	Monolithic Refractories/Shapes	Refractories
		All Company Products	All Segments

Pennsylvania, Bethlehem	Administrative Office; Research laboratories; Sales Offices		
Pennsylvania, Easton	Administrative Office; Research laboratories; Plant; Sales Offices	All Company Products	All Segments
Pennsylvania, Slippery Rock	Plant; Sales Offices	Monolithic Refractories/Shapes	Refractories
Pennsylvania, York	Plant	Metalcasting and pet care products	Performance Materials
Tennessee, Chattanooga	Plant	Metalcasting products	Performance Materials
Texas, Bay City	Plant	Talc	Specialty Minerals
Texas, Houston	Research laboratories (2)	Filtration and well testing services	Energy Services
Texas, Houston	Administrative Office (2)	Filtration and well testing services	Energy Services
Wisconsin, Neenah	Plant	Metalcasting products	Performance Materials
Wyoming, Colony	Plant; Mine	Metalcasting, pet litter, personal care, specialty and basic minerals products	Performance Materials
Wyoming, Lovell	Plant; Mine	Basic minerals, Specialty and pet care products; Environmental and building materials products	Performance Materials

Location	Facility	Product Line	Segment
International			
Australia, Brisbane	Sales Office/Administrative Office	Metalcasting, specialty and pet care products	Performance Materials
Australia, Carlingford	Sales Office (2)	Monolithic Refractories	Refractories
Australia, Gurulmundi	Plant; Mine	Metalcasting, specialty and pet care products	Performance Materials
Australia, Perth	Operations base (2)	Filtration services	Energy Services
Austria, Rottersdorf	Plant	Pet care products	Performance Materials
Belgium, Brussels	Administrative Office	Monolithic Refractories	Refractories
Brazil, Macae	Operations base (2)	Filtration services	Energy Services
Brazil, Sao Jose dos Campos	Sales Office (2)/Administrative Office	PCC	Specialty Minerals
Canada, Pt. Claire	Administrative Office	PCC/Monolithic Refractories	Specialty Minerals; Refractories
China, Beijing	Sales Office/Administrative Office	Metalcasting, specialty, fabric care and pet care products	Performance Materials
China, Chao Yang, Liaoning	Plant; Mine	Metalcasting and fabric care products	Performance Materials
China, Shanghai	Administrative Office/Sales Office	PCC/Monolithic Refractories	Specialty Minerals; Refractories
China, Suzhou	Plant	Environmental and building materials products	Performance Materials
China, Suzhou	Plant/Sales Office/Research laboratories	PCC/Monolithic Refractories	Specialty Minerals; Refractories
China, Tianjin	Plant; Mine; Research laboratories	Metalcasting and fabric care products	Performance Materials
Germany, Duisburg	Plant/Sales Office/Research laboratories	Laser Scanning Instrumentation/ Probes/Monolithic Refractories	Refractories
India, Chennai	Plant	Metalcasting products	Performance Materials
India, Mumbai	Sales Office (2)/Administrative Office	PCC/Monolithic Refractories/ Metallurgical Wire	Specialty Minerals; Refractories
Indonesia, Jakarta	Operations base (2)	Filtration services	Energy Services
Ireland, Cork	Plant; Administrative Office (2)/ Research laboratories	Monolithic Refractories	Refractories
Italy, Brescia	Sales Office	Monolithic Refractories/Shapes	Refractories
Italy, Nave	Plant	Monolithic Refractories/Shapes	Refractories
Japan, Gamagori	Plant/Research laboratories	Monolithic Refractories/Shapes, Calcium	Refractories
Japan, Tokyo	Sales/Administrative Office	Monolithic Refractories	Refractories
Korea, Pyeongtaek	Plant	Environmental, building materials and other products	Performance Materials
Malaysia, Kemaman	Operations base (2)	Filtration and well testing services	Energy Services
Mexico, Villahermosa	Operations base (2)	Filtration services	Energy Services
Netherlands, Hengelo	Plant/Administrative Office	Metallurgical Wire	Refractories
Netherlands, Moerdjik	Plant/Administrative Office	Pet care products	Performance Materials
Nigeria, Port Harcourt	Operations base (2)	Well Testing services	Energy Services
Poland, Szczytno	Plant	Environmental products	

Scotland, Aberdeen	Operations base (2)	Filtration services	Performance Materials Energy Services
South Africa, Johannesburg	Sales Office/Administrative Office (2)	Monolithic Refractories	Refractories
South Africa, Pietermaritzburg	Plant	Monolithic Refractories	Refractories
South Korea, Yangbuk-Myeun, Kyeung-buk	Plant; Mine	Metalcasting products	Performance Materials
Spain, Santander	Administrative Office	Monolithic Refractories	Refractories

Location	Facility	Product Line	Segment
Thailand, Laemchabang	Plant	Metalcasting and fabric care products	Performance Materials
Turkey, Enez	Plant; Mine	Metalcasting, specialty and basic minerals products	Performance Materials
Turkey, Gebze	Plant/Research Laboratories	Monolithic Refractories/Shapes/ Application Equipment	Refractories
Turkey, Istanbul	Sales Office/Administrative Office	Monolithic Refractories	Refractories
Turkey, Kutahya	Plant	Monolithic Refractories/Shapes	Refractories
Turkey, Ordu	Plant; Mine	Pet care Products	Performance Materials
Turkey, Usak	Plant; Mine	Specialty material products	Performance Materials
United Kingdom, Birkenhead	Research laboratories (2)	Environmental products	Performance Materials
United Kingdom, Lifford	Plant	PCC, Lime	Specialty Minerals
United Kingdom, Rotherham	Plant/Sales Office	Monolithic Refractories/Shapes	Refractories
United Kingdom, Winsford	Plant, Research laboratories	Fabric care and other products	Performance Materials

(1) This plant and quarry is leased to another company.

(2) Leased by the Company. The facilities in Cork, Ireland, are operated pursuant to a 99-year lease, the term of which commenced in 1963. The Company's headquarters in New York, New York, are held under a lease which expires in 2021.

Set forth below is the location of, and the main customer served by, each of the Company's satellite PCC plants in operation or, under construction, within the Specialty Minerals segment, as of December 31, 2018. Generally, the land on which each satellite PCC plant is located is leased at a nominal amount by the Company from the host paper mill pursuant to a lease, the term of which generally runs concurrently with the term of the PCC production and sale agreement between the Company and the host paper mill.

Location	Principal Customer
United States	
Alabama, Jackson	Boise Inc.
Alabama, Selma	International Paper Company
Arkansas, Ashdown	Domtar Inc.
Maine, Jay	Verso Paper Holdings LLC
Michigan, Quinnesec	Verso Paper Holdings LLC
Minnesota, Cloquet	Sappi Ltd.
Minnesota, International Falls	Boise Inc.
New York, Ticonderoga	International Paper Company
Ohio, Chillicothe	P.H. Glatfelter Co.
South Carolina, Eastover	International Paper Company
Washington, Longview	North Pacific Paper Corporation
Wisconsin, Kimberly	Appleton Coated
Wisconsin, Park Falls	Flambeau River Papers LLC
Wisconsin, Superior	New Page Corporation

Wisconsin, Wisconsin Rapids New Page Corporation

22

Location	Principal Customer
International	
Brazil, Guaiba	CMPC - Celulose Rio Grandense
Brazil, Jacarei	Munksjo Brasil Ind e Com de Papeis Especiais Ltda.
Brazil, Luiz Antonio	International Paper do Brasil Ltda.
Brazil, Mucuri	Suzano Papel e Celulose S. A.
Brazil, Suzano	Suzano Papel e Celulose S. A.
Canada, St. Jerome, Quebec	Les Entreprises Rolland Inc
Canada, Windsor, Quebec	Domtar Inc.
China, Changshu	UPM Changshu
China, Dagang (1)	Gold East Paper (Jiangsu) Company Ltd.
China, Zhenjiang (1)	Gold East Paper (Jiangsu) Company Ltd.
China, Suzhou (1)	Gold HuaSheng Paper Company Ltd.
China, Henan	Henan Jianghe Paper Co., Ltd.
China, Shandong	Shandong Sun Paper Industry Joint Stock Company Ltd
China, Shouguang (2)	Shandong Meilun Paper Corporation
Finland, Äänekoski	M-real Corporation
Finland, Tervakoski	Trierenberg Holding
France, Alizay	Double A Paper Company Ltd.
France, Quimperle	PDM Industries
France, Saillat Sur Vienne	International Paper Company
Germany, Schongau	UPM Corporation
India, Ballarshah (1)	Ballarpur Industries Ltd.
India, Dandeli	West Coast Paper Mill Ltd.
India, Gaganapur (1)	Ballarpur Industries Ltd.
India, Kala Amb (2)	Ruchira Papers Limited
India, Saila Khurd	Kuantum Papers Ltd.
India, Rayagada (1)	JK Paper
Indonesia, Perawang (1)	PT Indah Kiat Pulp and Paper Corporation
Indonesia, Perawang 2 (2)	PT Indah Kiat Pulp and Paper Corporation
Indonesia, Pindo Deli (2)	PT Pindo Deli Pulp and Paper Mills
Japan, Shiraoi (1)	Nippon Paper Group Inc.
Malaysia, Sipitang	Ballarpur Industries Ltd.
Poland, Kwidzyn	International Paper – Kwidzyn, S.A
Portugal, Figueira da Foz (1)	Navigator Paper Figueira, S.A.
Slovakia, Ruzomberok	Mondi Business Paper SCP
South Africa, Merebank (1)	Mondi Paper Company Ltd.
Thailand, Namphong	Phoenix Pulp & Paper Public Co. Ltd.
Thailand, Tha Toom (1)	Double A Paper Company Ltd.
Thailand, Tha Toom 2 (1)	Double A Paper Company Ltd.

(1) These plants are owned through joint ventures.
(2) These plants are under construction.

The following table sets forth, for each of the quarries or mines we own or operate, our current estimate as to the amount of proven and probable reserves such quarry or mine holds, based on the most recent mine plan, its usage rate in 2018, and a conversion factor for the conversion of in-situ materials to saleable products, by major mineral category.

	2018 Tons Usage (000s)	Total Tons of Reserves (000s)	Assigned Reserves (000s)	Unassigned Reserves** (000s)	Conversion Factor	Mining Claims		
						Owned	Unpatented *	Leased
Limestone								
Adams, MA	714	23,028	23,028	—	80%	23,028	—	—
Canaan, CT	578	17,734	17,734	—				