MATERION Corp
Form 10-K
February 15, 2018

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

Form 10-K

(Mark One)
ý ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the Fiscal Year Ended December 31, 2017
OR
¨ TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the Transition Period from to
Commission File Number 1-15885

MATERION CORPORATION
(Exact name of registrant as specified in its charter)

Ohio	34-1919973
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
6070 Parkland Blvd., Mayfield Heights, Ohio	44124
(Address of principal executive offices)	(Zip Code)

Registrant's telephone number, including area code
216-486-4200
Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	Name of Each Exchange on Which Registered
Common Stock, no par value	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act:
None
(Title of Class)
Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ý No ¨
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ¨ No ý
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 ý No ¨
Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ý No ¨
Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or

information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ¨

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or 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. (Check one):

Large accelerated filer	x	Accelerated filer	¨
Non-accelerated filer	¨ (Do not check if a smaller reporting company)	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 ý

The aggregate market value of common shares, no par value, held by non-affiliates of the registrant (based upon the closing sale price on the New York Stock Exchange) on June 30, 2017 was $736,996,309.

As of February 2, 2018, there were 20,116,096 common shares, no par value, outstanding.
DOCUMENTS INCORPORATED BY REFERENCE
Portions of the Proxy Statement for the Annual Meeting of Shareholders to be held on May 2, 2018 are incorporated by reference into Part III.

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Forward-looking Statements

Portions of the narrative set forth in this document that are not statements of historical or current facts are forward-looking statements. Our actual future performance may materially differ from that contemplated by the forward-looking statements as a result of a variety of factors. These factors include, in addition to those mentioned elsewhere herein:

Actual net sales, operating rates, and margins for 2018;

The global economy;

The impact of any U.S. Federal Government shutdowns and sequestrations;

The condition of the markets which we serve, whether defined geographically or by segment, with the major market segments being: consumer electronics, industrial components, medical, automotive electronics, defense, telecommunications infrastructure, energy, commercial aerospace, and science;

Changes in product mix and the financial condition of customers;

Our success in developing and introducing new products and new product ramp-up rates;

Our success in passing through the costs of raw materials to customers or otherwise mitigating fluctuating prices for those materials, including the impact of fluctuating prices on inventory values;

Our success in identifying acquisition candidates and in acquiring and integrating such businesses, including our ability to effectively integrate the acquisition of the high-performance target materials business of the Heraeus Group;

The impact of the results of acquisitions on our ability to fully achieve the strategic and financial objectives related to these acquisitions;

Our success in implementing our strategic plans and the timely and successful completion and start-up of any capital projects;

Other financial and economic factors, including the cost and availability of raw materials (both base and precious metals), physical inventory valuations, metal financing fees, tax rates, exchange rates, interest rates, pension costs and required cash contributions and other employee benefit costs, energy costs, regulatory compliance costs, the cost and availability of insurance, credit availability, and the impact of the Company’s stock price on the cost of incentive compensation plans;

The uncertainties related to the impact of war, terrorist activities, and acts of God;

Changes in government regulatory requirements and the enactment of new legislation that impacts our obligations and operations;

The conclusion of pending litigation matters in accordance with our expectation that there will be no material adverse effects; and

- The risk factors set forth elsewhere in Item 1A of this Form 10-K.

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Item 1. BUSINESS

THE COMPANY

Materion Corporation (referred to herein as the Company, our, we, or us), through its wholly owned subsidiaries, is an integrated producer of high-performance advanced engineered materials used in a variety of electrical, electronic, thermal, and structural applications with $1.1 billion in net sales in 2017. The Company was incorporated in Ohio in 1931 and has approximately 2,700 employees. Our products are sold into numerous end markets, including consumer electronics, industrial components, defense, medical, automotive electronics, telecommunications infrastructure, energy, commercial aerospace, science, services, and appliance.

SEGMENT INFORMATION

Our businesses are organized under four reportable segments: Performance Alloys and Composites (PAC), Advanced Materials, Precision Coatings, and Other. Our Other reportable segment includes unallocated corporate costs.

Segment reporting and geographic information relating to net sales, operating profit, and assets is presented in Note C to the Consolidated Financial Statements. Additional information regarding our segments and business is presented below.

Performance Alloys and Composites

The Performance Alloys and Composites segment is comprised of the following three reporting units: Performance Alloys, Beryllium & Composites, and Technical Materials.

Performance Alloys is the largest PAC business and produces beryllium and non-beryllium containing alloy products in strip, bulk, and other custom shapes at manufacturing facilities in the United States, Europe, and Asia. This business also operates the world's largest bertrandite ore mine and refinery, which is located in Utah, providing feedstock hydroxide for its beryllium and beryllium alloy businesses and external sales.

- Bulk products are the largest of the product families and are made with copper and nickel (with or without beryllium) in plate, rod, bar, tube, and wire product forms and other customized shapes. Depending upon the application, they may provide superior strength, corrosion/wear resistance, thermal conductivity, or lubricity. While the majority of bulk products contain beryllium, a growing portion of net sales is from non-beryllium-containing alloys as a result of product diversification efforts. Applications for bulk products include oil & gas drilling and production components, bearings, bushings, welding rods, plastic mold tooling, and undersea telecommunications housing equipment. Major end markets for bulk products include industrial components, commercial aerospace, energy, and telecommunications infrastructure. Bulk products compete with companies around the world that produce alloys with similar properties. Key competitors include NGK Insulators, IBC Advanced Alloys Corp., Ningxia Orient Tantalum Industry Co., Ltd., Ulba Metallurgical, Le Bronze Industriel, KME AG & Co. KG, Aurubis AG, MKM Mansfelder Kupfer und Messing GmbH, AMPCO Metal, and Chuetsu Metal Works Ltd.
- Strip products include various thicknesses of precision strip. These beryllium and non-beryllium containing alloy products are made with copper and nickel to provide unique combinations of high conductivity, high reliability, and formability for use as connectors, contacts, springs, switches, relays, shielding, and bearings. Major end markets for strip products include consumer electronics, telecommunications infrastructure, automotive electronics, aerospace, industrial components, appliance, and medical. Strip products compete with strip from many companies around the world that produce alloys with similar properties as beryllium and non-beryllium containing alloys. Key competitors include NGK Insulators, Global Brass and Copper, Inc., Wieland Electric, Inc., Aurubis Stolberg GmbH, Diehl Metall Stiftung & Co. KG, Nippon Mining, and PMX Industries, Inc.

Strip and bulk products are manufactured at facilities in Ohio and Pennsylvania and are distributed internationally through a network of company-owned service centers, outside distributors, and agents.

- Beryllium hydroxide is produced at our milling operations in Utah from our bertrandite ore mine and purchased beryl ore. The hydroxide is used primarily as a raw material input for strip and bulk products and, to a lesser extent, beryllium products. Net sales of beryllium hydroxide to third parties from our Utah operations were less than 5% of Performance Metals' total net sales in each of the last three years.

Beryllium & Composites manufactures beryllium, beryllium aluminum, aluminum metal matrix composites (MMCs), beryllia ceramics, and bulk metallic glass materials in rod, plate, bar, strip, and customized shapes. These materials are used in applications th

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at require high stiffness and/or low density and tend to be premium priced due to their unique combination of properties. Defense and science are the largest end markets for beryllium products, while other end markets served include industrial components, commercial aerospace, medical, energy, and telecommunications infrastructure. Products are also sold for acoustics, optical scanning, and performance automotive applications. While Performance Metals is the only domestic producer of metallic beryllium, it competes primarily with designs utilizing other materials including other lightweight metals, MMCs, and organic composites. Our aluminum powder metal MMCs compete with DWA Aluminum Composites and cast MMCs made by Duralcan USA. Electronic components utilizing beryllia and alumina ceramics are used in the industrial components, medical, defense, telecommunications infrastructure, commercial aerospace, and science end markets. Direct competitors include American Beryllia Inc., CBL Ceramics Limited, and CoorsTek, Inc. Manufacturing facilities for beryllium products are located in Ohio, California, Arizona, and the United Kingdom. The majority of Beryllium product sales are direct but there are also agents and representatives that support worldwide sales.

Technical Materials produces strip metal products with clad inlay and overlay metals, including precious and base metal electroplated systems, electron beam welded systems, contour profiled systems, and solder-coated metal systems. This operating unit is located in Lincoln, Rhode Island. These specialty strip metal products provide a variety of thermal, electrical, or mechanical properties from a surface area or particular section of the material. Our cladding and plating capabilities allow for a precious metal or other base metal to be applied in continuous strip form, only where it is needed, reducing the material cost to the customer as well as providing design flexibility and performance. Major applications for these products include connectors, contacts, power lead frames, and semiconductors, while the largest end markets are automotive electronics and consumer electronics. The energy and medical end markets are smaller but offer further growth opportunities. Technical Materials' products are manufactured at our Lincoln, Rhode Island facility and are sold directly through its sales representatives. Technical Materials' major competitors include Heraeus Inc., AMI Doduco, Inc., and other North American continuous strip and plating companies.

Advanced Materials

Advanced Materials produces advanced chemicals, microelectronics packaging, precious metal, non-precious metal, and specialty metal products, including vapor deposition targets, frame lid assemblies, clad and precious metal pre-forms, high temperature braze materials, and ultra-pure wire. These products are used in semiconductor logic and memory, medical, energy, lighting, defense, optics, and wireless communications applications within the consumer electronics, industrial components, and telecommunications infrastructure end markets. Advanced Materials also has metal recovery operations and in-house refining that allow for the recycling of precious metals.

Advanced Materials products are sold directly from its facilities throughout the United States, Asia, and Europe, as well as through direct sales offices and independent sales representatives throughout the world. Principal competition includes companies such as Eastman Chemical Company, Honeywell International, Inc., Johnson Matthey plc, Praxair, Inc., Solar Applied Materials Technology Corp., Sumitomo Metals Industries, Ltd., and Tanaka Holding Co., Ltd., as well as a number of smaller regional and national suppliers.

The majority of the sales into the consumer electronics end market from this segment are vapor deposition targets, lids, wire, other related precious and non-precious metal products, and advanced chemicals for semiconductors and other microelectronic applications. These materials are used in wireless, light-emitting diode (LED), handheld devices and other applications, as well as in a number of applications within the defense end market. Since we are an up-front material supplier, changes in our consumer electronics sales levels do not necessarily correspond to changes in the end-use consumer demand in the same period due to down-stream inventory positions, the time to develop and deploy new products, and manufacturing lead times and scheduling. While our product and market development efforts allow us to capture new applications, we may lose existing applications and customers from time to time due to the rapid change in technologies and other factors.

Precision Coatings

The Precision Coatings segment includes the following reporting units:

Precision Optics produces sputter-coated precision thin film coatings and optical filter materials. Based in Westford, Massachusetts, the group has manufacturing facilities in the United States and China.

Large Area Coatings produces high-performance sputter-coated precision flexible thin film materials. Based in Windsor, Connecticut, the business manufactures and distributes coated and converted thin film material solutions primarily for medical testing and diagnosis applications.

Precision Coatings products are sold directly from its facilities throughout the United States and Asia, as well as through direct sales offices and independent sales representatives throughout the world. Principal competition includes companies such as Viavi Corporation and Saint-Gobain S.A. and a number of smaller regional and national suppliers.

Other

The Other segment is comprised of unallocated corporate costs.

OTHER GENERAL INFORMATION

Products

We are committed to providing high-quality, innovative, and reliable products that will enable our customers' technologies and fuel their own technological breakthroughs and growth.

Our products include precious and non-precious specialty metals, inorganic chemicals and powders, specialty coatings, specialty engineered beryllium and copper-based alloys, beryllium composites, ceramics and engineered clad, and plated metal systems.

We are constantly looking ahead to realign product and service portfolios toward the latest market and technology trends so that we are able to provide customers with an even broader scope of products, services, and specialized expertise. We believe we are an established leader in our markets, from consumer electronics to medical devices to highly engineered bushings and bearings for heavy industrial equipment.

Approximately 800 customers purchase our products throughout the consumer electronics, industrial components, defense, medical, automotive electronics, telecommunications infrastructure, energy, commercial aerospace, science, services, and appliance end markets. No single customer accounted for more than 10% of our total net sales for 2017.

Availability of Raw Materials

The principal raw materials we use are aluminum, beryllium, cobalt, copper, gold, nickel, palladium, platinum, ruthenium, silver, and tin. Ore reserve data can be found in Item 7 "Management's Discussion and Analysis of Financial Condition and Results of Operations." The availability of these raw materials, as well as other materials used by us, is adequate and generally not dependent on any one supplier.

Patents and Licenses

We own patents, patent applications, and licenses relating to certain of our products and processes. While our rights under these patents and licenses are of some importance to our operations, our business is not materially dependent on any one patent or license or on all of our patents and licenses as a group.

Research and Development

Active research and development programs seek new product compositions and designs as well as process innovations. Expenditures for research and development amounted to $14.0 million in 2017 and $12.8 million in both 2016 and 2015.

Backlog

The backlog of unshipped orders as of December 31, 2017, 2016, and 2015 was $204.0 million, $175.5 million, and $157.0 million, respectively. Backlog is generally represented by purchase orders that may be terminated under certain conditions. We expect that substantially all of our backlog of orders at December 31, 2017 will be filled over the next 18 months.

Acquisitions

On February 28, 2017, the Company acquired the target materials business of the Heraeus Group (HTB), of Hanau, Germany, for an initial purchase price of $16.5 million. This business operates within the Advanced Materials segment and the results of operations are included as of the date of acquisition. Refer to Note B to the Consolidated Financial Statements for additional detail on the Company's acquisition.

Regulatory Matters

We are subject to a variety of laws that regulate the manufacturing, processing, use, handling, storage, transport, treatment, emission, release, and disposal of substances and wastes used or generated in manufacturing. For decades, we have operated our facilities under applicable standards of inplant and outplant emissions and releases. The inhalation of airborne beryllium particulate may present a health hazard to certain individuals.

On January 9, 2017, the U.S. Occupational Safety and Health Administration (OSHA) published a new standard for workplace exposure to beryllium that, among other things, lowered the permissible exposure by a factor of ten and established new requirements

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for respiratory protection, personal protective clothing and equipment, medical surveillance, hazard communication, and record keeping. Other government and standard-setting organizations are also reviewing beryllium-related worker safety rules and standards, and will likely make them more stringent. The development, proposal, or adoption of more stringent standards may affect the buying decisions by the users of beryllium-containing products. If the standards are made more stringent and/or our customers or other downstream users decide to reduce their use of beryllium-containing products, our results of operations, liquidity, and financial condition could be materially adversely affected. The impact of this potential adverse effect would depend on the nature and extent of the changes to the standards, the cost and ability to meet the new standards, the extent of any reduction in customer use, and other factors. The magnitude of this potential adverse effect cannot be estimated.

Available Information

We use our Investor Relations website, http://investor.shareholder.com/materion/index.cfm, as a channel for routine distribution of important information, including news releases, analyst presentations, and financial information. As soon as reasonably practicable, we make all documents that we file with, or furnish to, the Securities and Exchange Commission (SEC), including our annual report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and any amendments to these reports, available free of charge via this website. These reports are also available on the SEC's website: http://www.sec.gov. The content on any website referred to in this Form 10-K is not incorporated by reference into this Form 10-K unless expressly noted.

Executive Officers of the Registrant

Incorporated by reference from information with respect to executive officers of Materion Corporation set forth in Item 10 in Part III of this Form 10-K.

Item 1A. RISK FACTORS

Our business, financial condition, results of operations, and cash flows can be affected by a number of factors, including, but not limited to, those set forth below and elsewhere in this Form 10-K, any one of which could cause our actual results to vary materially from recent results or from our anticipated future results. Therefore, an investment in us involves some risks, including the risks described below. The risks discussed below are not the only risks that we may experience. If any of the following risks occur, our business, results of operations, or financial condition could be negatively impacted.

The businesses of many of our customers are subject to significant fluctuations as a result of the cyclical nature of their industries and their sensitivity to general economic conditions, which could adversely affect their demand for our products and reduce our sales and profitability.

A substantial number of our customers are in the consumer electronics, industrial components, medical, automotive electronics, defense, telecommunications infrastructure, energy, commercial aerospace, and science markets. Each of these markets is cyclical in nature, influenced by a combination of factors which could have a negative impact on our business, including, among other things, periods of economic growth or recession, strength or weakness of the U.S. dollar, the strength of the consumer electronics, automotive electronics, and oil and gas industries, the rate of construction of telecommunications infrastructure equipment, and government spending on defense.

Also, in times when growth rates in our markets are lower, or negative, there may be temporary inventory adjustments by our customers that may negatively affect our business.

Because we experience seasonal fluctuations in our sales, our quarterly results will fluctuate, and our annual performance will be affected by the fluctuations.

We expect seasonal patterns to continue, which may cause our quarterly results to fluctuate. For example, the Christmas season generates increased demand from our customers that manufacture consumer products. If our revenue during any quarter were to fall below the expectations of investors or securities analysts, our share price could decline, perhaps significantly. Unfavorable economic conditions, lower than normal levels of demand, and other occurrences in any quarter could also harm our results of operations. For example, we have experienced customers building inventory in anticipation of increased demand, whereas in other periods, demand decreased because our customers had excess inventory.

A portion of our revenue is derived from the sale of defense-related products through various contracts and subcontracts. These contracts may be suspended, canceled, or delayed, which could have an adverse impact on our revenues.

In 2017, 9% of our value-added sales was derived from sales to customers in the defense end market. A portion of these customers operate under contracts with the U.S. Government, which are vulnerable to termination at any time, for convenience or default. Some of the reasons for cancellation include, but are not limited to, budgetary constraints or re-appropriation of government funds, timing of contract awards, violations of legal or regulatory requirements, and changes in political agenda. If cancellations were to occur, it would result in a reduction in our revenue. Furthermore, significant reductions to defense spending could occur over the next several years due to government spending cuts, which could have a significant adverse impact on us. For example, high-margin defense application delays and/or push-outs may adversely impact our results of operations, including quarterly earnings.

The markets for our products are experiencing rapid changes in technology.

We operate in markets characterized by rapidly changing technology and evolving customer specifications and industry standards. New products may quickly render an existing product obsolete and unmarketable. For example, for many years thermal and mechanical performance have been at the forefront of device packaging for wireless communications infrastructure devices. In recent years, a tremendous effort has been put into developing simpler packaging solutions comprised of copper and other similar components. Our growth and future results of operations depend in part upon our ability to enhance existing products and introduce newly developed products on a timely basis that conform to prevailing and evolving industry standards, meet or exceed technological advances in the marketplace, meet changing customer specifications, achieve market acceptance, and respond to our competitors' products.

The process of developing new products can be technologically challenging and requires the accurate anticipation of technological and market trends. We may not be able to introduce new products successfully or do so on a timely

basis. If we fail to develop new products that are appealing to our customers or fail to develop products on time and within budgeted amounts, we may be unable to recover our research and development costs, which could adversely affect our margins and profitability.
The availability of competitive substitute materials for beryllium-containing products may reduce our customers' demand for these products and reduce our sales.

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In certain product applications, we compete with manufacturers of non-beryllium-containing products, including organic composites, metal alloys or composites, titanium, and aluminum. Our customers may choose to use substitutes for beryllium-containing products in their products for a variety of reasons, including, among other things, the lower costs of those substitutes, the health and safety concerns relating to these products, and the risk of litigation relating to beryllium-containing products. If our customers use substitutes for beryllium-containing materials in their products, the demand for beryllium-containing products may decrease, which could reduce our sales.

Our long and variable sales and development cycle makes it difficult for us to predict if and when a new product will be sold to customers.

Our sales and development cycle, which is the period from the generation of a sales lead or new product idea through the development of the product and the recording of sales, may typically take several years, making it very difficult to forecast sales and results of operations. Our inability to accurately predict the timing and magnitude of sales of our products, especially newly introduced products, could affect our ability to meet our customers' product delivery requirements or cause our results of operations to suffer if we incur expenses in a particular period that do not translate into sales during that period, or at all. In addition, these failures would make it difficult to plan future capital expenditure needs and could cause us to fail to meet our cash flow requirements.

The availability and prices of some raw materials we use in our manufacturing operations fluctuate, and increases in raw material costs can adversely affect our operating results and our financial condition.

We manufacture advanced engineered materials using various precious and non-precious metals, including aluminum, beryllium, cobalt, copper, gold, nickel, palladium, platinum, ruthenium, silver, and tin. The availability of, and prices for, these raw materials are subject to volatility and are influenced by worldwide economic conditions, speculative action, world supply and demand balances, inventory levels, availability of substitute metals, the U.S. dollar exchange rate, production costs of U.S. and foreign competitors, anticipated or perceived shortages, and other factors. Precious metal prices, including prices for gold and silver, have fluctuated significantly in recent years. Higher prices can cause adjustments to our inventory carrying values, whether as a result of quantity discrepancies, normal manufacturing losses, differences in scrap rates, theft or other factors, which could have a negative impact on our profitability and cash flows. Also, the price of our products will generally increase in tandem with rising metal prices, as a result of changes in precious metal prices that are passed through to our customers, which could deter them from purchasing our products and adversely affect our net sales and operating profit.

Further, we maintain some precious metals and copper on a consigned inventory basis. The owners of the precious metals and copper charge a fee that fluctuates based on the market price of those metals and other factors. A significant increase in the market price or the consignment fee of precious metals, and/or copper, could increase our financing costs, which could increase our operating costs.

Utilizing precious metals in the manufacturing process creates challenges in physical inventory valuations that may impact earnings.

We manufacture precious, non-precious, and specialty metal products and also have metal cleaning operations and in-house refineries that allow for the reclaim of precious metals from internally generated or customer scrap. We refine that scrap through our internal operations and externally through outside vendors.

When taking periodic physical inventories in our refinery operations, we reconcile the actual precious metals to what was estimated prior to the physical inventory count. Those estimates are based in part on assays or samples of precious metals taken during the refining process. If those estimates are inaccurate, we may have an inventory long (more physical precious metal than what we had estimated) or short (less physical precious metal than what we had estimated). These fluctuations could have a material impact on our financial statements and may impact earnings. For example, our 2013 gross margin was reduced by a net quarterly physical inventory adjustment totaling $2.2 million at our Albuquerque, New Mexico facility within the Advanced Materials segment. Higher precious metal prices may magnify the value of any potential inventory long or short.

Because we maintain a significant inventory of precious metals, we may experience losses due to employee error and theft.

Because we manufacture products that contain precious metals, we maintain a significant amount of precious metals at certain of our manufacturing facilities. Accordingly, we are subject to the risk of precious metal shortages resulting from employee error and theft. For example, in 2013, the Company filed a claim with its insurance carrier for a theft of approximately $10.0 million of silver at its Albuquerque, New Mexico refinery, which was settled for $6.8 million in the second quarter of 2014.

While we maintain controls to prevent theft, including physical security measures, if our controls do not operate effectively or are structured ineffectively, our profitability could be adversely affected, including any charges that we might incur as a result of the shortage of our inventory and by costs associated with increased security, preventative measures, and insurance.

We have a limited number of manufacturing facilities, and damage to those facilities, or to critical pieces of equipment in these facilities, could interrupt our operations, increase our costs of doing business, and impair our ability to deliver our products on a timely basis.

Some of our facilities are interdependent. For instance, our manufacturing facility in Elmore, Ohio relies on our mining operation for its supply of beryllium hydroxide used in production of most of its beryllium-containing materials. Additionally, our Reading, Pennsylvania; Fremont, California; and Tucson, Arizona manufacturing facilities are dependent on materials produced by our Elmore, Ohio manufacturing facility, and our Wheatfield, New York manufacturing facility is dependent on our Buffalo, New York manufacturing facility. The destruction or closure of our mine, any of our manufacturing facilities, or to critical pieces of equipment within these facilities for a significant period of time as a result of harsh weather, fire, explosion, act of war or terrorism, or other natural disaster or unexpected event may interrupt our manufacturing capabilities, increase our capital expenditures and our costs of doing business, and impair our ability to deliver our products on a timely basis. In addition, many of our manufacturing facilities depend on one source for electric power and natural gas, which could be interrupted due to equipment failures, terrorism, or another cause.

If such events occur, we may need to resort to an alternative source of manufacturing or to delay production, which could increase our costs of doing business and/or result in lost sales. Our property damage and business interruption insurance may not cover all of our potential losses and may not continue to be available to us on acceptable terms, if at all.

Disruptions or volatility in global financial markets could adversely impact our financial performance.

Global economic conditions may cause volatility and disruptions in the capital and credit markets. Should global economic conditions deteriorate or access to credit markets be reduced, customers may experience difficulty in obtaining adequate financing, thereby impacting our sales. Our exposure to bad debt losses may also increase if customers are unable to pay for products previously ordered and/or delivered. Negative or uncertain financial and macroeconomic conditions may have a significant adverse impact on our sales, profitability, and results of operations. If current global economic conditions deteriorate, it could trigger an economic downturn of the same or greater severity as the one experienced in 2008 and 2009. This could have a negative impact on our sales and result in potential non-cash goodwill and asset impairment charges.

Our defined benefit pension plans and other post-employment benefit plans are subject to financial market risks that could adversely impact our financial performance.

We provide defined benefit pension plans to eligible employees. Our pension expense and our required contributions to our pension plans are directly affected by the value of plan assets, the projected rate of return on plan assets, the actual rate of return on plan assets, and the actuarial assumptions we use to measure our defined benefit pension plan obligations, including the rate at which future obligations are discounted to a present value, or the discount rate. Significant changes in market interest rates and decreases in the fair value of plan assets and investment losses on plan assets would increase funding requirements and expenses and may adversely impact our results of operations.

We provide post-employment health benefits to eligible employees. Our retiree health expense is directly affected by the assumptions we use to measure our retiree health plan obligations, including the assumed rate at which health care costs will increase and the discount rate used to calculate future obligations. For retiree health accounting purposes, we have used a graded assumption schedule to assume the rate at which health care costs will increase. We cannot predict whether changing market or economic conditions, regulatory changes, or other factors will further increase our retiree health care expenses or obligations, diverting funds we would otherwise apply to other uses.

A major portion of our bank debt consists of variable-rate obligations, which subjects us to interest rate fluctuations.

Our credit facilities are secured by substantially all of our assets (other than non-mining real property and certain other assets). Our working capital line of credit includes variable-rate obligations, which expose us to interest rate risks. If interest rates increase, our debt service obligations on our variable-rate indebtedness would increase even if the amount borrowed remained the same, resulting in a decrease in our net income. We have developed a hedging strategy to manage the risks associated with interest rate fluctuations, but our program may not effectively eliminate all of the financial exposure associated with interest rate fluctuations. Additional information regarding our market risks is contained in Item 7A "Quantitative and Qualitative Disclosures About Market Risk."

Our failure to comply with the covenants contained in the terms of our indebtedness could result in an event of default, which could materially and adversely affect our operating results and our financial condition.
The terms of our credit facilities require us to comply with various covenants, including financial covenants. In the event of a global economic downturn, it could have a material adverse impact on our earnings and cash flow, which could adversely affect our ability to comply with our financial covenants and could limit our borrowing capacity. Our ability to comply with these covenants depends, in part, on factors over that we may have no control. A breach of any of these covenants could result in an event of default under one or more of the agreements governing our indebtedness which, if not cured or waived, could give the holders of the defaulted indebtedness the right to terminate commitments to lend and cause all amounts outstanding with respect to the indebtedness to be due and payable immediately. Acceleration of any of our indebtedness could result in cross-defaults under our other debt instruments. Our assets and cash flow may be insufficient to fully repay borrowings under all of our outstanding debt instruments if some or all of these instruments are accelerated upon an event of default, in which case we may be required to seek legal protection from our creditors.
The terms of our indebtedness may restrict our operations, including our ability to pursue our growth and acquisition strategies.
The terms of our credit facilities contain a number of restrictive covenants, including restrictions in our ability to, among other things, borrow and make investments, acquire other businesses, and consign additional precious metals. These covenants could adversely affect our business by limiting our ability to plan for or react to market conditions or to meet our capital needs, as well as adversely affect our ability to pursue our growth, acquisition strategies, and other strategic initiatives.
We may not be able to complete our acquisition strategy or successfully integrate acquired businesses.
We are active in pursuing acquisitions. We intend to continue to consider further growth opportunities through the acquisition of assets or companies and routinely review acquisition opportunities. We cannot predict whether we will be successful in pursuing any acquisition opportunities or what the consequences of any acquisition would be. Future acquisitions may involve the expenditure of significant funds and management time. Depending upon the nature, size, and timing of future acquisitions, we may be required to raise additional financing, which may not be available to us on acceptable terms, or at all. Further, we may not be able to successfully integrate any acquired business with our existing businesses or recognize any expected advantages from any completed acquisition.
In addition, there may be liabilities that we fail, or are unable, to discover in the course of performing due diligence investigations on the assets or companies we have already acquired or may acquire in the future. We cannot assure that rights to indemnification by the sellers of these assets or companies to us, even if obtained, will be enforceable, collectible, or sufficient in amount, scope, or duration to fully offset the possible liabilities associated with the business or property acquired. Any such liabilities, individually or in the aggregate, could have a materially adverse effect on our business, financial condition, and results of operations.
Our products are deployed in complex applications and may have errors or defects that we find only after deployment.
Our products are highly complex, designed to be deployed in complicated applications, and may contain undetected defects, errors, or failures. Although our products are generally tested during manufacturing, prior to deployment, they can only be fully tested when deployed in specific applications. For example, we sell beryllium-copper alloy strip products in a coil form to some customers, who then stamp the alloy for its specific purpose. On occasion, it is not until such customer stamps the alloy that a defect in the alloy is detected. Consequently, our customers may discover errors after the products have been deployed. The occurrence of any defects, errors, or failures could result in installation delays, product returns, termination of contracts with our customers, diversion of our resources, increased service and warranty costs, and other losses to our customers, end users, or to us. Any of these occurrences could also result in the loss of, or delay in, market acceptance of our products, and could damage our reputation, which could reduce our sales.
In addition to the risk of unanticipated warranty or recall expenses, our customer contracts may contain provisions that could cause us to incur penalties, be liable for damages, including liquidated damages, or incur other expenses, if we experience difficulties with respect to the functionality, deployment, operation, and availability of our products and services. In the event of late deliveries, late or improper installations or operations, failure to meet product or

performance specifications or other product defects, or interruptions or delays in our managed service offerings, our customer contracts may expose us to penalties, liquidated damages, and other liabilities. In the event we were to incur contractual penalties, such as liquidated damages or other related costs that exceed our expectations, our business, financial condition, and operating results could be materially and adversely affected.

We conduct our sales and distribution operations on a worldwide basis and are subject to the risks associated with doing business outside the United States.

We sell to customers outside of the United States from our United States and international operations. We have been and are continuing to expand our geographic reach in Europe and Asia. Revenue from international operations (principally Europe and Asia) accounted for approximately 44% in 2017, 34% in 2016, and 38% in 2015 of Net sales. We anticipate that international shipments will account for a significant portion of our sales for the foreseeable future. There are a number of risks associated with international business activities, including:

- burdens to comply with multiple and potentially conflicting foreign laws and regulations, including export requirements, tariffs and other barriers, environmental health and safety requirements, and unexpected changes in any of these factors;
- difficulty in obtaining export licenses from the U.S. Government;
- political and economic instability and disruptions, including terrorist attacks;
- disadvantages of competing against companies from countries that are not subject to U.S. laws and regulations, including the Foreign Corrupt Practices Act (FCPA);
- potentially adverse tax consequences due to overlapping or differing tax structures; and
- fluctuations in currency exchange rates.

Any of these risks could have an adverse effect on our international operations by reducing the demand for our products or reducing the prices at which we can sell our products, which could result in an adverse effect on our business, financial position, results of operations, or cash flows. We may hedge our currency transactions to mitigate the impact of currency price volatility on our earnings; however, hedging activities may not be successful. For example, hedging activities may not cover the Company’s net euro and yen exposure, which could have an unfavorable impact on our results of operations.

In addition, we could be adversely affected by violations of the FCPA and similar worldwide anti-bribery laws. The FCPA and similar anti-bribery laws in other jurisdictions generally prohibit companies and their intermediaries from making improper payments to non-U.S. officials for the purpose of obtaining or retaining business. While policies mandate compliance with these anti-bribery laws, we operate in many parts of the world that have experienced governmental corruption to some degree and, in certain circumstances, strict compliance with anti-bribery laws may conflict with local customs and practices. We cannot assure you that our internal controls and procedures will always protect us from the reckless or criminal acts committed by our employees or agents. If we are found to be liable for FCPA violations or other anti-bribery laws, we could suffer from criminal or civil penalties or other sanctions, which could have a material adverse effect on our business.

Changes in laws or regulations or the manner of their interpretation or enforcement could adversely impact our financial performance and restrict our ability to operate our business or execute our strategies.

New laws or regulations, or changes in existing laws or regulations, or the manner of their interpretation or enforcement, could increase our cost of doing business and restrict our ability to operate our business or execute our strategies. In particular, there may be significant changes in U.S. laws and regulations and existing international trade agreements by the current U.S. presidential administration that could affect a wide variety of industries and businesses, including those businesses we own and operate. If the current U.S. presidential administration materially modifies U.S. laws and regulations and international trade agreements, our business, financial condition, and results of operations could be adversely affected.

We are exposed to lawsuits in the normal course of business, which could harm our business.

During the ordinary conduct of our business, we may become involved in certain legal proceedings, including those involving product liability claims, third-party lawsuits relating to exposure to beryllium, claims against us of infringement of intellectual property rights of third parties, or other litigation matters. Due to the uncertainties of litigation, we can give no assurance that we will prevail at the resolution of future claims. Certain of these matters involve types of claims that, if they result in an adverse ruling to us, could give rise to substantial liability, which could have a material adverse effect on our business, operating results, or financial condition.

Although we have insurance which may be applicable in certain circumstances, some jurisdictions preclude insurance coverage for punitive damage awards. Accordingly, our profitability could be adversely affected if any current or future claimants obtain judgments for any uninsured compensatory or punitive damages. Further, an unfavorable outcome or settlement of a pending beryllium case or adverse media coverage could encourage the commencement of additional similar litigation.

Health issues, litigation, and government regulations relating to our beryllium operations could significantly reduce demand for our products, limit our ability to operate, and adversely affect our profitability.

If exposed to respirable beryllium fumes, dusts, or powder, some individuals may demonstrate an allergic reaction to beryllium and may later develop a chronic lung disease known as chronic beryllium disease (CBD). Some people who are diagnosed with CBD do not develop clinical symptoms at all. In others, the disease can lead to scarring and damage of lung tissue, causing clinical symptoms that include shortness of breath, wheezing, and coughing. Severe cases of CBD can cause disability or death.

Further, some scientists claim there is evidence of an association between beryllium exposure and lung cancer, and certain standard-setting organizations have classified beryllium and beryllium compounds as human carcinogens.

The health risks relating to exposure to beryllium have been, and will continue to be, a significant issue confronting the beryllium-containing products industry. The health risks associated with beryllium have resulted in product liability claims, employee, and third-party lawsuits. As of December 31, 2017, we had one CBD case outstanding.

The increased levels of scrutiny by federal, state, foreign, and international regulatory authorities could lead to regulatory decisions relating to the approval or prohibition of the use of beryllium-containing materials for various uses. Concerns over CBD and other potential adverse health effects relating to beryllium, as well as concerns regarding potential liability from the use of beryllium, may discourage our customers’ use of our beryllium-containing products and significantly reduce demand for our products. In addition, adverse media coverage relating to our beryllium-containing products could damage our reputation or cause a decrease in demand for beryllium-containing products, which could adversely affect our profitability.

Our bertrandite ore mining and beryllium-related manufacturing operations and some of our customers’ businesses are subject to extensive health and safety regulations that impose, and will continue to impose, significant costs and liabilities, and future regulation could increase those costs and liabilities, or effectively prohibit production or use of beryllium-containing products.

We, as well as our customers, are subject to laws regulating worker exposure to beryllium. On January 9, 2017, OSHA published a new standard for workplace exposure to beryllium that, among other things, lowered the permissible exposure by a factor of ten and established new requirements for respiratory protection, personal protective clothing and equipment, medical surveillance, hazard communication, and recordkeeping. Materion was a participant in the development of the new standards, which fundamentally represent our current health and safety operating practices. Other government and standard-setting organizations are also reviewing beryllium-related worker safety rules and standards, and will likely make them more stringent. The development, proposal, or adoption of more stringent standards may affect buying decisions by the users of beryllium-containing products. If the standards are made more stringent and/or our customers or other downstream users decide to reduce their use of beryllium-containing products, our results of operations, liquidity, and financial condition could be materially adversely affected. The impact of this potential adverse effect would depend on the nature and extent of the changes to the standards, the cost and ability to meet the new standards, the extent of any reduction in customer use, and other factors. The magnitude of this potential adverse effect cannot be estimated.

Our bertrandite ore mining and manufacturing operations are subject to extensive environmental regulations that impose, and will continue to impose, significant costs and liabilities on us, and future regulation could increase these costs and liabilities or prevent production of beryllium-containing products.

We are subject to a variety of governmental regulations relating to the environment, including those relating to our handling of hazardous materials and air and wastewater emissions. Some environmental laws impose substantial penalties for non-compliance. Others, such as the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), impose strict, retroactive, and joint and several liability upon entities responsible for releases of hazardous substances. Bertrandite ore mining is also subject to extensive governmental regulation on matters such as permitting and licensing requirements, plant and wildlife protection, reclamation and restoration of mining properties, the discharge of materials into the environment, and the effects that mining has on groundwater quality and availability. Future requirements could impose on us significant additional costs or obligations with respect to our extraction, milling, and processing of ore. If we fail to comply with present and future environmental laws and regulations, we could be subject to liabilities or our operations could be interrupted. In addition, future environmental laws and regulations could restrict our ability to expand our facilities or extract our bertrandite ore deposits. These environmental laws and regulations could also require us to acquire costly equipment, obtain additional financial assurance, or incur other significant expenses in connection with our business, which would increase our costs of production.

Unexpected events and natural disasters at our mine could increase the cost of operating our business.

A portion of our production costs at our mine are fixed regardless of current operating levels. Our operating levels are subject to conditions beyond our control that may increase the cost of mining for varying lengths of time. These conditions include, among other things, weather, fire, natural disasters, pit wall failures, and ore processing changes. Our mining operations also involve the handling and production of potentially explosive materials. It is possible that an explosion could result in death or injuries to employees and others and material property damage to third parties and us. Any explosion could expose us to adverse publicity or liability for damages and materially adversely affect our operations. Any of these events could increase our cost of operations.

A security breach of customer, employee, supplier, or company information may have a material adverse effect on our business, financial condition, and results of operations.

In the conduct of our business, we collect, use, transmit, store, and report data on information systems and interact with customers, vendors, and employees. Increased global information technology (IT) security threats and more sophisticated and targeted computer crime pose a risk to the security of our systems and networks and the confidentiality, availability, and integrity of our data. Despite our security measures, our IT systems and infrastructure may be vulnerable to customer viruses, cyber-attacks, security breaches caused by employee error or malfeasance, or other disruptions. Any such threat could compromise our networks and the information stored there could be accessed, publicly disclosed, lost, or stolen. A security breach of our computer systems could interrupt or damage our operations or harm our reputation, resulting in a loss of sales, operating profits, and assets. In addition, we could be subject to legal claims or proceedings, liability under laws that protect the privacy of personal information and regulatory penalties if confidential information relating to customers, suppliers, employees, or other parties is misappropriated from our computer systems.

Similar security threats exist with respect to the IT systems of our lenders, suppliers, consultants, advisers, and other third parties with whom we conduct business. A security breach of those computer systems could result in the loss, theft, or disclosure of confidential information and could also interrupt or damage our operations, harm our reputation, and subject us to legal claims.

Item 1B. UNRESOLVED STAFF COMMENTS

None.

Item 2. PROPERTIES

We operate manufacturing plants, service and distribution centers, and other facilities throughout the world. During 2017, we made effective use of our productive capacities at our principal facilities. We believe that the quality and production capacity of our facilities is sufficient to maintain our competitive position for the foreseeable future. Information as of December 31, 2017, with respect to our facilities that are owned or leased, and the respective segments in which they are included, is set forth below:

Location	Owned or Leased	Approximate Number of Square Feet
Corporate and Administrative Offices		
Mayfield Heights, Ohio [1][2]	Leased	79,130
Manufacturing Facilities		
Albuquerque, New Mexico [2]	Owned/Leased	13,000/63,223
Alzenau, Germany [2]	Leased	235,550
Bloomfield, Connecticut [3]	Leased	44,800
Brewster, New York [2]	Leased	75,000
Buffalo, New York [2]	Owned	97,000
Delta, Utah [1]	Owned	100,836
Elmore, Ohio [1]	Owned/Leased	681,000/191,000
Farnborough, England [1]	Leased	10,000
Fremont, California [1]	Leased	40,000
Hanau, Germany [2]	Leased	120,000
Limerick, Ireland [2]	Leased	23,000
Lincoln, Rhode Island [1]	Owned/Leased	130,000/26,451
Lorain, Ohio [1]	Owned/Leased	55,000/10,000
Milwaukee, Wisconsin [2]	Owned	98,750
Reading, Pennsylvania [1]	Owned	128,863
Santa Clara, California [2]	Leased	5,800
Shanghai, China [3]	Leased	101,400
Singapore [2]	Leased	24,500
Subic Bay, Philippines [2]	Leased	5,000
Suzhou, China [2]	Leased	21,743
Taoyuan City, Taiwan [2]	Leased	32,523
Tucson, Arizona [1]	Owned	53,000
Tyngsboro, Massachusetts [3]	Leased	38,000
Westford, Massachusetts [3]	Leased	53,000
Wheatfield, New York [2]	Owned	35,000
Windsor, Connecticut [3]	Leased	34,700
Service, Sales, and Distribution Centers		
Elmhurst, Illinois [1]	Leased	28,500
Maastricht, The Netherlands [2]	Leased	450
Seoul, Korea [2]	Leased	13,654
Singapore [1]	Leased	2,500
Stuttgart, Germany [1]	Leased	24,800
Tokyo, Japan [1]	Leased	7,200
Warren, Michigan [1]	Leased	34,500

[1] Performance Alloys and Composites

(2) Advanced Materials
(3) Precision Coatings

In addition to the above, the Company holds certain mineral rights on 7,500 acres in Juab County, Utah, from which the beryllium-bearing ore, bertrandite, is mined by the open pit method. A portion of these mineral rights are held under lease. Ore reserve data can be found in Item 7 "Management's Discussion and Analysis of Financial Condition and Results of Operations."

Item 3. LEGAL PROCEEDINGS

Our subsidiaries and our holding company are subject, from time to time, to a variety of civil and administrative proceedings arising out of our normal operations, including, without limitation, product liability claims, health, safety, and environmental claims, and employment-related actions. Among such proceedings are cases alleging that plaintiffs have contracted, or have been placed at risk of contracting, beryllium sensitization or CBD or other lung conditions as a result of exposure to beryllium (beryllium cases). The plaintiffs in beryllium cases seek recovery under negligence and various other legal theories and demand compensatory and often punitive damages, in many cases of an unspecified sum. Spouses of some plaintiffs claim loss of consortium.

Beryllium Claims

As of December 31, 2017, our subsidiary, Materion Brush Inc., was a defendant in one beryllium case (involving four plaintiffs). The case was originally filed and dismissed during 2015, but reversed and remanded in 2016 to the trial court. The Company does not expect the resolution of this matter to have a material impact on the consolidated financial statements.

The Company was one of six defendants in a case filed on April 7, 2015 in the Superior Court of the State of California, Los Angeles County, titled Godoy et al. v. The Argen Corporation et al., BC578085. This was a survival and wrongful death complaint. The complaint alleged that the decedent worked at H. Kramer & Co. in California and alleged that he worked as a dental lab technician at various dental labs in California, and that he suffered from CBD and other injuries as a result of grinding, melting and handling beryllium-containing products. The complaint alleged causes of action for negligence, strict liability - failure to warn, strict liability - design defect, fraudulent concealment, and breach of implied warranties. Plaintiffs other than the personal representative of the decedent sought compensatory damages. The survival action brought by the decedent's designated personal representative sought all damages sustained by decedent that he would have been entitled to recover had he lived, including punitive damages. The Company filed a demurrer on May 29, 2015. At a hearing on September 29, 2015, the court granted the demurrer, dismissing all claims against the Company, without leave to amend the complaint. On February 3, 2016, the plaintiffs filed a notice of appeal. On June 23, 2016, the California Supreme Court in a case titled Ramos v. Brenntag Specialties, 2016 WL 3435777, issued a unanimous opinion disapproving the case precedent upon which the Company's successful demurrer had been based. Based on this decision, the parties stipulated that the judgment entered in favor of the defendants be reversed and the matter remanded to the trial court for further proceedings. This case has since been assigned a March 12, 2019 trial date and discovery is ongoing.

The Company has insurance coverage, which may respond, subject to an annual deductible.

Item 4. MINE SAFETY DISCLOSURES

Information concerning mine safety violations or other regulatory matters required by Section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 104 of Regulation S-K (17 CFR 229.104) is included in Exhibit 95 to this Form 10-K.

PART II

Item 5. MARKET FOR REGISTRANT’S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market Information and Dividends

The Company's common shares are listed on the New York Stock Exchange under the symbol “MTRN”. As of February 2, 2018, there were 848 shareholders of record. Refer to Note S of the Consolidated Financial Statements for a summary of dividends declared per common share and market prices with respect to common shares during each quarter of fiscal years 2017 and 2016, which information is incorporated herein by reference. Although the Company’s Board of Directors currently intends to continue the payment of regular quarterly cash dividends on the Company’s common shares, the timing and amount of future dividends will depend on the Board's assessment of our operations, financial condition, projected liabilities, the Company’s compliance with contractual restrictions in its credit agreement or any agreement governing future debt, restrictions imposed by applicable laws, and other factors.

Share Repurchases

The following table presents information with respect to repurchases of common stock made by us during the three months ended December 31, 2017.

Period	Total Number of Shares Purchased (1)	Average Price Paid per Share (1)	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs (2)	Maximum Dollar Value that May Yet Be Purchased Under the Plans or Programs (2)
September 30 through November 3, 2017	39,767	$ 50.52	—	$ 15,703,744
November 4 through December 1, 2017	1,936	50.37	—	15,703,744
December 2 through December 31, 2017	58	47.67	—	15,703,744
Total	41,761	$ 50.51	—	$ 15,703,744

(1) Represents shares surrendered to the Company by employees to satisfy tax withholding obligations on stock appreciation rights issued under the Company's stock incentive

plan.

(2) On January 14, 2014, we announced that our Board of Directors authorized the repurchase of up to $50.0 million of our common stock; this Board authorization does not have an expiration date. We did not repurchase any shares of the Company's common stock under this authorization during the fourth quarter of 2017.

Performance Graph

The following graph sets forth the cumulative shareholder return on our common shares as compared to the cumulative total return of the Russell 2000 Index, the S&P SmallCap 600 Index, and the S&P SmallCap 600 Materials Index, as Materion Corporation is a component of these indices.

	2013	2014	2015	2016	2017
Materion Corporation	$121	$140	$112	$161	$199
Russell 2000	139	146	139	169	193
S&P SmallCap 600	141	149	146	185	209
S&P SmallCap 600 - Materials	136	136	101	157	172

The above graph assumes that the value of our common shares and each index was $100 on December 31, 2012 and that all applicable dividends were reinvested.

Item 6. SELECTED FINANCIAL DATA
Materion Corporation and Subsidiaries

(Thousands except per share data)	2017	2016	2015	2014	2013
For the year					
Net sales	$1,139,447	$969,236	$1,025,272	$1,126,890	$1,166,882
Cost of sales	927,953	785,773	834,492	920,987	978,904
Gross margin	211,494	183,463	190,780	205,903	187,978
Operating profit	38,579	27,104	45,268	57,588	27,608
Interest expense - net	2,183	1,789	2,450	2,787	3,036
Income before income taxes	36,396	25,315	42,818	54,801	24,572
Income tax expense (benefit)	24,945	(425)	10,660	12,670	4,360
Net income	11,451	25,740	32,158	42,131	20,212
Earnings per share of common stock:					
Basic(1)	0.57	1.29	1.60	2.06	0.98
Diluted(1)	0.56	1.27	1.58	2.02	0.97
Dividends per share of common stock	0.395	0.375	0.355	0.335	0.315
Depreciation, depletion, and amortization	42,751	45,651	37,817	42,721	41,649
Capital expenditures	27,516	27,177	29,505	29,312	27,848
Mine development expenditures	1,560	9,861	22,585	1,247	4,776
Year-end position					
Net current assets	$283,834	$254,907	$249,616	$282,628	$266,248
Ratio of current assets to current liabilities	3.2 to 1	3.8 to 1	3.6 to 1	3.7 to 1	3.1 to 1
Property, plant, and equipment:					
At cost	891,789	861,267	833,834	800,671	782,879
Cost less depreciation, depletion, and amortization	255,578	252,631	263,629	247,588	261,893
Total assets	791,084	741,298	742,293	761,921	777,458
Long-term liabilities(2)	161,097	150,853	157,182	173,890	153,296
Long-term debt	2,827	3,605	4,276	23,196	28,780
Shareholders’ equity	494,981	494,089	482,957	459,019	464,428
Weighted-average number of shares of common stock outstanding:					
Basic	20,027	19,983	20,097	20,461	20,571
Diluted	20,415	20,213	20,402	20,852	20,943

(1) Net income per basic and diluted share for 2017 includes the impact of $17.1 million in income tax expense as a result of the Tax Cuts and Jobs Act (TCJA) signed into law on December 22, 2017. For additional information refer to Refer to Note G of the Consolidated Financial Statements.
(2) Long-term liabilities include long-term obligations relating to Retirement and post-employment benefits, Unearned income, and Other long-term liabilities.

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Item 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

OVERVIEW

We are an integrated producer of high-performance advanced engineered materials used in a variety of electrical, electronic, thermal, and structural applications. Our products are sold into numerous end markets, including consumer electronics, industrial components, defense, medical, automotive electronics, telecommunications infrastructure, energy, commercial aerospace, science, services, and appliance.

RESULTS OF OPERATIONS

(Thousands except per share data)	2017	2016	2015
Net sales	$1,139,447	$969,236	$1,025,272
Value-added sales	677,697	599,910	617,247
Gross margin	211,494	183,463	190,780
Gross margin as a % of Value-added sales	31 %	31 %	31 %
Selling, general, and administrative (SG&A) expense	146,170	129,683	129,941
SG&A expense as a % of Value-added sales	22 %	22 %	21 %
Research and development (R&D) expense	13,981	12,802	12,796
R&D expense as a % of Value-added sales	2 %	2 %	2 %
Other — net	12,764	13,874	2,775
Operating profit	38,579	27,104	45,268
Interest expense — net	2,183	1,789	2,450
Effective tax rate	68.5 %	(1.7)%	24.9 %
Net income	11,451	25,740	32,158
Diluted earnings per share	0.56	1.27	1.58

2017 Compared to 2016

Net sales were $1,139.4 million in 2017, reflecting an increase of 18% from 2016. Changes in precious metal and copper prices favorably impacted net sales in 2017 by approximately $13.1 million when compared to 2016. Net sales in the Performance Alloys and Composites segment increased $41.9 million due to higher sales volume, including shipments of raw material beryllium hydroxide. Net sales of $119.7 million during 2017 were attributable to the HTB acquisition. Excluding the HTB acquisition, net sales in the Advanced Materials segment increased $33.9 million due to higher sales volume in the consumer electronics and industrial components end markets. These favorable impacts were offset by lower sales volume in the medical end market in the Precision Coatings segment.

Value-added sales were $677.7 million in 2017, an increase of $77.8 million as compared to 2016 value-added sales of $599.9 million. Value-added sales is a non-GAAP financial measure that removes the impact of pass-through metal costs and allows for analysis without the distortion of the movement or volatility in metal prices. Internally, we manage our business on this basis, and a reconciliation of net sales to value-added sales is included herein.

Value-added sales from the HTB acquisition totaled approximately $36.5 million in 2017. Excluding the HTB acquisition, value-added sales to the consumer electronics end market, which accounted for 30% of our total value-added sales during 2017, increased $17.2 million from the prior year. Also, value-added sales in the industrial components end market increased $12.3 million from the prior year.

Gross margin was $211.5 million in 2017, or a 15% increase from the $183.5 million gross margin recorded in 2016. Gross margin expressed as a percentage of value-added sales was 31% in both 2017 and 2016. The increase in gross margin was primarily due to higher sales volume.

SG&A expenses totaled $146.2 million in 2017 as compared to $129.7 million in 2016. Expressed as a percentage of value-added sales, SG&A expenses were 22% in both 2017 and 2016. The increase is attributable to normal course of business expenses from the HTB acquisition of $5.9 million, $4.1 million of CEO transition costs, and higher variable compensation expense related to improved financial performance.

R&D expenses consist primarily of direct personnel costs for pre-production evaluation and testing of new products, prototypes, and applications. R&D expense was flat as a percentage of value-added sales at approximately 2% in both

2017 and 2016.

Other-net totaled expense of $12.8 million and $13.9 million in 2017 and 2016, respectively. In 2017, we recorded a $1.4 million gain on the sale of our service center located in Fukaya, Japan compared to an asset impairment charge of $2.6 million in 2016 for land and buildings relating to its closure. Refer to Notes D and E of the Consolidated Financial Statements for the details of the major components of Other-net and Restructuring.

Interest expense - net was $2.2 million in 2017 and $1.8 million in 2016. The lower expense in 2016 resulted from lower average outstanding debt levels.

Income tax expense for 2017 was $24.9 million versus a benefit of $0.4 million in 2016. The effective tax rate for 2017 was 68.5% compared to a negative effective tax rate of 1.7% for 2016.

On December 22, 2017, the TCJA was signed into law. The TCJA includes a number of provisions, including the lowering of the U.S. corporate tax rate from 35 percent to 21 percent, effective January 1, 2018. The TCJA also includes provisions that may partially offset the benefit of such rate reduction, including the repeal of the deduction for domestic production activities. The international provisions of the TCJA establish a territorial-style system for taxing foreign-source income of domestic multinational corporations. As a result of the TCJA, we recorded adjustments for the re-measurement of deferred tax assets (liabilities) and the deemed repatriation tax on unremitted foreign earnings and profits. Refer to Note G of the Consolidated Financial Statements for a discussion of the impact of compliance with the TCJA and a reconciliation of the statutory and effective tax rates.

2016 Compared to 2015

Net sales were $969.2 million in 2016, reflecting a decrease of 5% from 2015. The decrease in net sales in 2016 was primarily due to lower sales volume. Sales volume was lower primarily due to decreased shipments of raw material beryllium hydroxide, weaker demand in the oil and gas sector of the energy end market, and weakness in the medical, industrial components, and automotive electronics end markets. These decreases were partially offset by stronger sales in the defense, consumer electronics, and telecom infrastructure end markets and changes in precious metal and copper prices, which favorably impacted net sales in 2016 by approximately $16.2 million when compared to 2015.

Value-added sales were $599.9 million in 2016, a decrease of $17.3 million as compared to 2015 value-added sales of $617.2 million.

Value-added sales to the consumer electronics end market, our largest end market accounting for approximately 28% of our total value-added sales in 2016, increased $7.3 million or 5% in 2016 as compared to 2015. Additionally, value-added sales to the defense end market increased $6.7 million or 14% year-over-year. These increases were offset by decreased shipments of raw material beryllium hydroxide of $12.4 million and lower value-added sales in several end markets. The industrial components and automotive electronics end market sales, which collectively accounted for 24% of our total value-added sales in 2016, decreased $7.4 million or 5% compared to 2015.

Gross margin was $183.5 million in 2016, or a 4% decrease from the $190.8 million gross margin recorded in 2015. Gross margin expressed as a percentage of value-added sales was 31% in both 2016 and 2015. The decrease in gross margin was primarily due to a combination of lower sales volume and unfavorable product mix.

SG&A expenses totaled $129.7 million in 2016 as compared to $129.9 million in 2015. Expressed as a percentage of value-added sales, SG&A expenses were 22% and 21% in 2016 and 2015, respectively. Lower selling expenses of $2.0 million due to the decrease in sales volume were offset by higher stock-based and annual incentive compensation expense of $1.6 million driven by stock price fluctuation and financial performance.

R&D expenses was flat as a percentage of value-added sales at approximately 2% in both 2016 and 2015.

Other-net totaled expense of $13.9 million and $2.8 million in 2016 and 2015, respectively. In 2016, we recorded an asset impairment charge of $2.6 million for land and buildings relating to the future closure of our service center located in Fukaya, Japan. Other-net in 2015 included foreign currency hedge gains of $6.2 million compared to a foreign currency hedge loss of $0.8 million in 2016. Additionally, Other-net in 2015 included recognized gains of $5.6 million from settlement agreements for insurance and legal claims in connection with construction of our beryllium pebble facility in Elmore, Ohio. Refer to Notes D and E of the Consolidated Financial Statements for the details of the major components of Other-net and Restructuring.

Interest expense - net was $1.8 million in 2016 and $2.5 million in 2015. The lower expense in 2016 resulted from lower average outstanding debt levels.

Income tax expense for 2016 was a benefit of $0.4 million versus expense of $10.7 million in 2015. The negative effective tax rate for 2016 was 1.7% compared to an effective tax rate of 24.9% in 2015. The effects of a discrete benefit relating to dividends paid from undistributed foreign earnings, percentage depletion (a tax benefit resulting from our mining operations), the foreign

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rate differential, and other items were the primary factors for the difference between the effective and statutory rates in 2016 and 2015. Refer to Note G of the Consolidated Financial Statements for a reconciliation of the statutory and effective tax rates.

Segment Disclosures

The Company consists of four reportable segments: Performance Alloys and Composites, Advanced Materials, Precision Coatings, and Other. The Other reportable segment includes unallocated corporate costs.

Performance Alloys and Composites

(Thousands)	2017	2016	2015
Net sales	$429,442	$387,539	$394,760
Value-added sales	363,465	332,012	335,136
Operating profit	21,978	6,601	23,560

2017 Compared to 2016

Net sales from the Performance Alloys and Composites segment of $429.4 million in 2017 were 11% higher than net sales of $387.5 million in 2016 primarily due to higher sales volume primarily related to the industrial components, consumer electronics, and automotive electronics end markets and higher raw material sales of beryllium hydroxide. In addition, the impact of higher pass-through metal prices favorably impacted net sales by approximately $8.9 million.

Value-added sales of $363.5 million in 2017 were 9% higher than value-added sales of $332.0 million in 2016. Stronger demand in the consumer electronics and industrial components end markets increased value-added sales by $14.7 million compared to 2016. Also, the increase in value-added sales was driven by higher raw material sales of beryllium hydroxide of approximately $7.1 million.

Performance Alloys and Composites generated operating profit of $22.0 million, or 6% of value-added sales, in 2017 as compared to $6.6 million, or 2% of value-added sales, in 2016. Operating profit in 2017 was favorably impacted by higher sales volume, favorable product mix, and productivity improvements. Additionally, a $1.4 million gain was realized on the sale of our service center located in Fukaya, Japan. Operating profit in 2016 was negatively impacted by unfavorable product mix and manufacturing yields, the negative impact of foreign exchange rate movements, and a $2.6 million impairment charge relating to the closure of our service center located in Fukaya, Japan.

2016 Compared to 2015

Net sales from the Performance Alloys and Composites segment of $387.5 million in 2016 were 2% lower than net sales of $394.8 million in 2015. Value-added sales of $332.0 million in 2016 were 1% lower than value-added sales of $335.1 million in 2015. Value-added sales to the consumer electronics end market accounted for 21% of total segment value-added sales in 2016 compared to 18% in 2015, which was an increase of $9.3 million. This increase was primarily due to higher demand for base connector material applications. Value-added sales in the defense end market increased $5.1 million from 2015 primarily due to higher sales into satellite surveillance and missile projects. These increases were offset by lower raw material sales of beryllium hydroxide of $12.4 million and lower value-added sales of $5.8 million in the industrial components end market.

Performance Alloys and Composites generated operating profit of $6.6 million, or 2% of value-added sales, in 2016 as compared to $23.6 million, or 7% of value-added sales, in 2015. The decline in operating profit in 2016 as compared to 2015 was primarily due to unfavorable product mix and manufacturing yields, the negative impact of foreign exchange rate movements of $5.5 million, and a $2.6 million impairment charge relating to the future closure of our service center located in Fukaya, Japan.

Advanced Materials

(Thousands)	2017	2016	2015
Net sales	$590,789	$437,249	$482,288
Value-added sales	228,062	176,332	182,794
Operating profit	32,763	26,282	27,805

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2017 Compared to 2016

Net sales from the Advanced Materials segment of $590.8 million in 2017 were 35% higher than net sales of $437.2 million in 2016. Net sales of $119.7 million during 2017 were attributable to the HTB acquisition. Also, net sales increased due to a combination of new product sales growth and demand in the consumer electronics end market. In addition, the impact of higher pass-through metal prices favorably impacted net sales by approximately $1.9 million.

Value-added sales of $228.1 million were 29% higher than value-added sales of $176.3 million in 2016. This increase included value-added sales of $36.5 million attributable to our HTB acquisition. The increase in value-added sales was also driven by higher value-added sales to the consumer electronics end market. Value-added sales to the consumer electronics end market, which represents approximately 49% of total segment value-added sales in 2017, increased $11.0 million primarily due to higher demand, excluding the HTB acquisition.

Advanced Materials generated operating profit of $32.8 million in 2017 as compared to $26.3 million in 2016. Operating profit as a percentage of value-added sales was 14% in 2017 compared to 15% in 2016. The increase in operating profit in 2017 versus 2016 was primarily due to higher sales volume.

2016 Compared to 2015

Net sales from the Advanced Materials segment of $437.2 million in 2016 were 9% lower than net sales of $482.3 million in 2015 primarily due to the impact of lower volume of $55.0 million and changes in mix for customer supplied material, offset by the impact of higher pass-through metal prices of $17.6 million.

Value-added sales of $176.3 million were 4% lower than value-added sales of $182.8 million in 2015. The decrease in value-added sales was primarily driven by lower value-added sales to the consumer electronics and energy end markets. Value-added sales to the consumer electronics end market, which represents approximately 46% of total segment value-added sales in both 2016 and 2015, decreased $2.2 million primarily due to lower demand in the wireless market. Value-added sales to the energy end market decreased $2.6 million in 2016 compared to 2015 primarily due to lower demand from the solar segments of the market.

Advanced Materials generated operating profit of $26.3 million, or 15% of value-added sales, in 2016 as compared to $27.8 million, or 15% of value-added sales, in 2015. The decrease in operating profit in 2016 versus 2015 was due to lower volume and slightly unfavorable product mix, partially offset by improved manufacturing yields.

Precision Coatings

(Thousands)	2017	2016	2015
Net sales	$119,216	$144,448	$148,444
Value-added sales	90,678	97,700	101,761
Operating profit	8,445	11,635	7,483

2017 Compared to 2016

Net sales for the Precision Coatings segment were $119.2 million in 2017 as compared to $144.4 million in 2016, and value-added sales were $90.7 million in 2017 versus $97.7 million in 2016. Higher sales from new imaging and sensing applications were more than offset by lower sales in the medical end market. Sales decreased $8.4 million primarily due to lower volume in the blood glucose test strip segment of the medical end market.

The Precision Coatings segment reported an operating profit of $8.4 million, or 9% of value-added sales, in 2017 versus $11.6 million, or 12% of value-added sales, in 2016. The decrease in operating profit in 2017 versus 2016 was due to lower sales volume and the absence of a gain on the sale of equipment of $0.7 million realized during 2016.

2016 Compared to 2015

Net sales for the Precision Coatings segment were $144.4 million in 2016 as compared to $148.4 million in 2015, and value-added sales were $97.7 million in 2016 versus $101.8 million in 2015. Higher sales in the defense end market were more than offset by lower sales in the medical end market. Defense end market sales were higher due to new Paveway optical filters utilized in defense missile applications. Sales decreased $6.4 million primarily due to lower volume in the blood glucose test strip segment of the medical end market.

The Precision Coatings segment reported an operating profit of $11.6 million, or 12% of value-added sales, in 2016 versus $7.5 million, or 7% of value-added sales, in 2015. The increase is primarily due to improved yields on optical coating products, favorable product mix, cost reduction initiatives, and a gain on the sale of equipment of $0.7 million. These increases more than offset the impact of lower sales volume.

Other

(Thousands)	2017	2016	2015
Net sales	$ —	$ —	$ (220)
Value-added sales	(4,508)	(6,134)	(2,444)
Operating loss	(24,607)	(17,414)	(13,580)

2017 Compared to 2016

The Other reportable segment in total includes unallocated corporate costs.

Corporate costs of $24.6 million in 2017 increased $7.2 million as compared to $17.4 million in 2016. As a percent of total Company value-added sales, corporate costs increased to 4% in 2017 from 3% in 2016. The increase in 2017 was primarily due to costs associated with the CEO transition of $4.1 million and higher variable compensation expense relating to improved performance levels.

2016 Compared to 2015

Corporate costs of $17.4 million in 2016 increased $3.8 million as compared to $13.6 million in 2015. As a percent of total Company value-added sales, corporate costs increased to 3% in 2016 from 2% in 2015. Higher unallocated corporate costs in 2016 were primarily due to the $5.6 million insurance and legal settlement gains realized in 2015.

International Sales and Operations

We operate in worldwide markets, and our international customer base continues to expand geographically. In Asia, we have strategically located our facilities in Japan, Singapore, China, Korea, Taiwan, and the Philippines, while our European facilities are in Germany, the United Kingdom, and Ireland.

Our international operations provide a combination of manufacturing, finishing operations, local sales support, and distribution services and are designed to provide a cost-effective method of capturing the growing overseas demand for our products over the long term. We also augment our sales and distribution efforts with an established network of independent distributors and agents throughout the world.

The following table summarizes total international sales by region for the last three years:

(Thousands)	2017	2016	2015
Asia	$265,991	$193,739	$247,174
Europe	205,118	121,648	122,554
Rest of world	17,663	14,174	16,108
Total	$488,772	$329,561	$385,836
Percent of total net sales	43 %	34 %	38 %

International sales include sales from international operations and direct exports from our U.S. operations. The international sales in the above chart are included in the individual segment sales previously discussed.

Total international sales increased 48% in 2017 from 2016. The increase was primarily due to the HTB acquisition and the impact of higher sales in the consumer electronics end market in Asia.

Sales from European and certain Asian operations are primarily denominated in local currencies. Exports from the U.S. and the balance of the sales from the Asian operations are typically denominated in U.S. dollars. Local competition generally limits our ability to adjust selling prices upwards to compensate for short-term unfavorable exchange rate movements.

We have a hedge program with the objective of minimizing the short-term impact of fluctuating currency values on our consolidated operating profit. Refer to Note Q of the Consolidated Financial Statements.

Value-Added Sales - Reconciliation of Non-GAAP Financial Measure

A reconciliation of net sales to value-added sales, a non-GAAP financial measure, for each reportable segment and for the Company in total for 2017, 2016, and 2015 is as follows:

(Thousands)	2017	2016	2015
Net sales			
Performance Alloys and Composites	$429,442	$387,539	$394,760
Advanced Materials	590,789	437,249	482,288
Precision Coatings	119,216	144,448	148,444
Other	—	—	(220)
Total	$1,139,447	$969,236	$1,025,272
Less: pass-through metal costs			
Performance Alloys and Composites	$65,977	$55,527	$59,624
Advanced Materials	362,727	260,917	299,494
Precision Coatings	28,538	46,748	46,683
Other	4,508	6,134	2,224
Total	$461,750	$369,326	$408,025
Value-added sales			
Performance Alloys and Composites	$363,465	$332,012	$335,136
Advanced Materials	228,062	176,332	182,794
Precision Coatings	90,678	97,700	101,761
Other	(4,508)	(6,134)	(2,444)
Total	$677,697	$599,910	$617,247

The cost of gold, silver, platinum, palladium, and copper can be quite volatile. Our pricing policy is to directly pass the cost of these metals on to the customer in order to mitigate the impact of metal price volatility on our results from operations. Trends and comparisons of net sales are affected by movements in the market prices of these metals, but changes in net sales due to metal price movements may not have a proportionate impact on our profitability.

Internally, management reviews net sales on a value-added basis. Value-added sales is a non-GAAP financial measure that deducts the value of the pass-through metal costs from net sales. Value-added sales allow management to assess the impact of differences in net sales between periods, segments, or markets, and analyze the resulting margins and profitability without the distortion of movements in pass-through metal costs. The dollar amount of gross margin and operating profit is not affected by the value-added sales calculation. We sell other metals and materials that are not considered direct pass-throughs, and these costs are not deducted from net sales when calculating value-added sales.

Our net sales are also affected by changes in the use of customer-supplied metal. When we manufacture a precious metal product, the customer may purchase metal from us or may elect to provide its own metal, in which case we process the metal on a toll basis, and the metal value does not flow through net sales or cost of sales. In either case, we generally earn our margin based upon our fabrication efforts. The relationship of this margin to net sales can change depending upon whether or not the product was made from our metal or the customer’s metal. The use of value-added sales removes the potential distortion in the comparison of net sales caused by changes in the level of customer-supplied metal.

By presenting information on net sales and value-added sales, it is our intention to allow users of our financial statements to review our net sales with and without the impact of the pass-through metals.

FINANCIAL POSITION

Cash Flow

A summary of cash flows provided from (used in) operating, investing, and financing activities is as follows:

(Thousands)	2017	2016	2015
Net cash provided from operating activities	$67,795	$68,180	$91,010
Net cash (used in) investing activities	(43,358)	(37,355)	(52,032)
Net cash (used in) financing activities	(15,445)	(23,118)	(26,877)
Effects of exchange rate changes	1,388	(479)	(1,015)
Net change in cash and cash equivalents	$10,380	$7,228	$11,086

Net cash provided from operating activities totaled $67.8 million in 2017 versus $68.2 million in 2016. Lower net income of $14.3 million was primarily due to non-cash charges related to income taxes.

Working capital requirements provided cash of $6.5 million during 2017 compared to providing $9.5 million in 2016. Cash flows used for accounts receivable were $14.4 million higher than 2016 due to the HTB acquisition, which accounted for approximately $10.0 million of the increase. Three-month trailing days sales outstanding (DSO) was approximately 37 days at December 31, 2017 versus 41 days at December 31, 2016. Cash flows used for inventory increased $20.3 million primarily within the Performance Alloys and Composites and Advanced Materials segments to respond to anticipated orders and demand. Cash flows from accounts payable and accrued expenses provided cash of approximately $34.4 million compared to $2.8 million in the prior year primarily due to a higher accounts payable balance due to the timing of payments, higher incentive compensation accruals, and the HTB acquisition.

Price movements of precious and base metals are essentially passed to customers. Therefore, while sudden movements in the price of metals can cause a temporary imbalance in our cash receipts and payments in either direction, once prices stabilize, our cash flow tends to stabilize as well.

Net cash used in investing activities was $43.4 million in 2017 compared to $37.4 million in 2016, reflecting a $16.5 million payment for the HTB acquisition offset by lower payments for property, plant, and equipment and mine development of $8.0 million.

Net cash used in financing activities decreased $7.7 million from 2016 due to the prior year repayment of the Company's $8.3 million variable rate industrial revenue bonds with the Lorain Port Authority in Ohio.

Dividends per common share increased 5% to $0.395 per share in 2017. Total dividend payments to common shareholders were $7.9 million in 2017 and $7.5 million in 2016. In May 2017, the Board of Directors declared an increase in our quarterly dividend from $0.095 to $0.100 per share. We intend to pay a quarterly dividend on an ongoing basis, subject to a continuing strong capital structure and a determination that the dividend remains in the best interest of our shareholders.

Liquidity

We believe that cash flow from operations plus the available borrowing capacity and our current cash balance are adequate to support operating requirements, capital expenditures, projected pension plan contributions, the current dividend and share repurchase programs, environmental remediation projects, and strategic acquisitions. At December 31, 2017, cash and cash equivalents held by our foreign operations totaled $16.6 million. We do not expect restrictions on repatriation of cash held outside of the United States to have a material effect on our overall liquidity, financial condition, or the results of operations for the foreseeable future.

A summary of key data relative to our liquidity, including the outstanding debt, cash balances, available borrowing capacity, and the debt-to-debt-plus-equity ratio, as of December 31, 2017 and December 31, 2016 is as follows:

	December 31,	
(Thousands)	2017	2016
Total outstanding debt	$3,818	$4,615
Cash	41,844	31,464
Net (cash) debt	(38,026)	(26,849)
Available borrowing capacity	$254,777	$238,886
Debt-to-debt-plus-equity ratio	1 %	1 %

Net (cash) debt is a non-GAAP financial measure. We are providing this information because we believe it is more indicative of our overall financial position. It is also a measure our management uses to assess financing and other decisions. We believe that based on our typical cash flow generated from operations, we can support a higher leverage ratio in future periods.

The available borrowing capacity in the table above represents the additional amounts that could be borrowed under our revolving credit facility and other secured lines existing as of the end of each year depicted. The applicable debt covenants have been taken into account when determining the available borrowing capacity, including the covenant that restricts the borrowing capacity to a multiple of the twelve-month trailing earnings before interest, income taxes, depreciation and amortization, and other adjustments.

The Company's revolving credit agreement (Credit Agreement) expires in 2020 and is secured by substantially all of the assets of the Company and its direct subsidiaries, with the exception of non-mining real property and certain other assets. The Credit Agreement allows us to borrow money at a premium over LIBOR or prime rate and at varying maturities. The premium resets quarterly according to the terms and conditions available under the agreement. The Credit Agreement includes restrictive covenants relating to restrictions on additional indebtedness, acquisitions, dividends, and stock repurchases. In addition, the Credit Agreement includes covenants subject to a maximum leverage ratio and a minimum fixed charge coverage ratio. We were in compliance with all of our debt covenants as of December 31, 2017 and December 31, 2016. Cash on hand does not affect the covenants or the borrowing capacity under our debt agreements.

Portions of our business utilize off-balance sheet consignment arrangements to finance metal requirements. Expansion of business volumes and/or higher metal prices can put pressure on the consignment line limitations from time to time. As a result we have negotiated increases in the available capacity under existing lines, added additional lines, and extended the maturity dates of existing lines in recent years. The most recent amendment, completed in the third quarter of 2016 with our largest precious metals consignment facility, extended the maturity date from September 30, 2016 to September 30, 2019 and provided for more favorable pricing for fixed rate consignments. The available and unused capacity under the metal financing lines totaled approximately $130.0 million as of December 31, 2017. The availability is determined by Board approved levels and actual line capacity.

Contractual Obligations

A summary of payments to be made under long-term debt agreements, operating leases, significant capital leases, pension plan contributions, and material purchase commitments by year is as follows:

(Millions)	2018	2019	2020	2021	2022	There-after	Total
Total debt (1)	$0.8	$0.8	$0.9	$1.3	$—	$—	$3.8
Capital lease payments (2)	2.2	2.2	2.2	2.2	2.1	22.6	33.5
Interest payments on total debt (3)	0.2	0.2	0.1	—	—	—	0.5
Non-cancelable lease payments (4)	8.1	6.3	5.5	4.6	5.6	3.3	33.4
Pension plan contribution (5)	21.0	—	—	—	—	—	21.0
Other benefit payments	2.3	—	—	—	—	—	2.3
Other long-term liabilities (6)	1.0	0.9	2.8	0.7	0.6	0.5	6.5
Tax Cuts and Jobs Act transition	0.2	0.2	0.2	0.2	0.3	0.9	2.0
Purchase obligations	9.7	0.9	0.3	0.3	0.3	1.7	13.2
Total	$45.5	$11.5	$12.0	$9.3	$8.9	$29.0	$116.2

(1) Total debt relates to installment payments on our fixed rate industrial development revenue bonds that mature in 2021.

(2) The capital lease payments include facilities relating to our Elmore, Ohio and Alzenau, Germany sites.

(3) These amounts represent future interest payments related to our total debt.

(4) The non-cancelable lease payments represent payments under operating leases with initial lease terms in excess of one year
as of December 31, 2017.

(5)

Our domestic defined benefit pension plan is underfunded as of December 31, 2017. Contributions in future periods will be dependent upon regulatory requirements, the plan funded ratio, plan investment performance, discount rates, actuarial assumptions, plan amendments, our contribution objectives, and other factors. Federal legislation enacted during 2012 resulted in a reduction in mandatory contributions in the short term from levels under the previous regulations, but we may elect to contribute funds in excess of the mandatory levels in a given year depending upon our cash flow from operations and other considerations. In 2018, we anticipate contributing approximately $21.0 million to our domestic defined benefit plan. This estimate is in excess of the mandatory contributions. This higher contribution level is designed to minimize our PBGC premium payments, as well as to maintain the plan funded ratio in line with our long-term objectives. We also anticipate funding those contributions with cash on hand, cash generated from operations, or borrowings under our existing lines of credit. It is not practical to estimate the required contributions beyond 2018 at the present time.

(6) Other long-term liabilities include environmental remediation costs. We have an active environmental compliance program. We estimate the probable cost of identified environmental remediation projects and establish reserves accordingly. The environmental remediation reserve balance was $6.5 million at December 31, 2017 and $6.0 million at December 31, 2016. Environmental projects tend to be long term, and the associated payments are typically made over a number of years. Refer to Note R of the Consolidated Financial Statements for further discussion.

Off-balance Sheet Obligations

We maintain the majority of the precious metals and copper we use in production on a consignment basis in order to reduce our exposure to metal price movements and to reduce our working capital investment. Refer to Item 7A "Quantitative and Qualitative Disclosures about Market Risk." The notional value of off-balance sheet precious metals and copper was $320.0 million as of December 31, 2017 versus $194.8 million as of December 31, 2016. We were in compliance with all of the covenants contained in the consignment agreements as of December 31, 2017 and December 31, 2016.

ORE RESERVES

We have proven and probable reserves of beryllium-bearing bertrandite ore in Juab County, Utah. We own approximately 90 percent of the proven reserves, with the remaining reserves leased from the State of Utah. We augment our proven reserves of bertrandite ore through the purchase of imported beryl ore from time to time. This beryl ore, which is approximately four percent beryllium, is also processed at the Utah extraction facility. Approximately 88 percent of the beryllium in ore is recovered in the extraction process. Estimating the quantity and/or grade of ore reserves requires the size, shape, and depth of ore bodies to be determined by analyzing geological data such as drilling samples. Economic assumptions used to estimate reserves change from period to period, and as additional geological and operational data is generated during the course of operations, estimates of reserves may change from period to period.

The term “proven reserves” means reserves for which (a) quantity is computed from dimensions revealed in outcrops, trenches, workings, or drill holes; grade and/or quality are computed from the results of detailed sampling and (b) the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth, and mineral content of reserves are well-established and (c) for which are commercially recoverable through open-pit methods.

The term “probable reserves” means reserves for which quantity and grade and/or quality are computed from information similar to that used for proven reserves, but the sites for inspection, sampling, and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven reserves, is high enough to assume continuity between points of observation.

	Proven	Probable	Total
As of December 31, 2017			
Tonnage (in thousands)	8,119	945	9,064
Grade (% beryllium)	0.248%	0.257 %	0.249%
Beryllium pounds (in millions)	40.34	4.85	45.19
As of December 31, 2016			
Tonnage (in thousands)	7,991	739	8,730
Grade (% beryllium)	0.249%	0.269 %	0.251%
Beryllium pounds (in millions)	39.85	3.98	43.83

Based upon average production levels in recent years and our near-term production forecasts, proven reserves would last a minimum of seventy-five years. The table below details our production of beryllium at our Utah location.

(Thousands of Pounds of Beryllium)	2017	2016	2015
Domestic ore	326	339	439
Non-domestic ore	12	23	26
Unyielded total	338	362	465
Annual yield	88 %	88 %	89 %
Beryllium produced	296	318	412
% of mill capacity	47 %	42 %	55 %

CRITICAL ACCOUNTING POLICIES

The preparation of financial statements in conformity with accounting principles generally accepted in the United States requires the inherent use of estimates and management’s judgment in establishing those estimates. The following policies are considered by management to be critical because adherence to these policies relies significantly upon our judgment.

Accrued Liabilities

We have various accruals on our balance sheet that are based in part upon our judgment, including accruals for litigation, environmental remediation, and workers’ compensation costs. When a loss is probable, we establish accrual balances based on the reasonably estimable loss or range of loss as determined by a review of the available facts and circumstances by management and independent advisors and specialists, as appropriate. When no point of loss is more likely than another, the accrual is established at the low end of the estimated reasonable range. Litigation and environmental accruals are established only for identified and/or asserted claims; future claims, therefore, could give rise to increases to the accruals. The accruals are adjusted as facts and circumstances change, as well as for changes in our strategies or the pertinent regulatory requirements. Since these accruals are estimates, the ultimate resolution may be greater or less than the established accrual balance for a variety of reasons, including court decisions, additional discovery, inflation levels, cost control efforts, and resolution of similar cases. Changes to the accruals would then result in an additional charge or credit to the income statement in the period when the change is made. Refer to Note R of the Consolidated Financial Statements.

Legal claims may be subject to partial or complete insurance recovery. The accrued liability is recorded at the gross amount of the estimated cost and the insurance recoverable, if any, is recorded as an asset and is not netted against the liability. The accrued legal liability includes the estimated indemnity cost only, if any, to resolve the claim through a settlement or court verdict. The legal defense costs are not included in the accrual and are expensed in the period incurred, with the level of expense in a given year affected by the number and types of claims we are actively defending.

Non-employee claims for CBD are covered by insurance, subject to certain limitations. The insurance covers defense costs and indemnity payments (resulting from settlements or court verdicts) and is subject to various levels of deductibles. In 2017 and 2016, defense and indemnity costs were less than the deductible.

Pensions

The annual net periodic expense and benefit obligations related to the Company's defined benefit plans are determined on an actuarial basis. This determination requires critical assumptions regarding the discount rate, long-term rate of return on plan assets, increases in compensation levels, and amortization periods for actuarial gains and losses. Assumptions are determined based on Company data and appropriate market indicators, and are evaluated each year as of the plans' measurement date. Changes in the assumptions to reflect actual experience as well as the amortization of actuarial gains and losses could result in a material change in the annual net periodic expense and benefit obligations reported in the financial statements.

Beginning in 2017, the Company has elected to use a spot-rate approach to estimate the service and interest cost components of net periodic benefit cost for its defined benefit pension plans. The spot-rate approach applies separate discount rates (along the yield curve) for each projected benefit payment in the calculation. Historically, the Company used a weighted-average approach to determine the service and interest components of its net periodic benefit costs. The change was accounted for as a change in estimate and, accordingly, has been accounted for prospectively starting in 2017. The reductions in service and interest costs for 2017 associated with this change in estimate totaled approximately $1.0 million.

Our pension plan investment strategies are governed by a policy adopted by the Board of Directors. A senior management team oversees a group of outside investment analysts and brokerage firms that implement these strategies. The future return on pension assets is dependent upon the plan’s asset allocation, which changes from time to time, and the performance of the underlying investments. As a result of our review of various factors, we used an expected rate of return on plan assets assumption of 7.00% at December 31, 2017 and 7.25% at December 31, 2016. This assumption is reflective of management’s view of the long-term returns in the marketplace, as well as changes in risk profiles and available investments. Should the assets earn an average return less than the expected return assumption over time, in all likelihood the future pension expense would increase.

The impact of a change in the discount rate or expected rate of return assumption on pension expense can vary from year to year depending upon the undiscounted liability level, the current discount rate, the asset balance, other changes to the plan, and other factors. A 0.25 percentage point decrease to the discount rate would increase the 2018 projected pension expense approximately $0.9 million. A 0.25 percentage point decrease in the expected rate of return assumption would increase the 2018 projected pension expense by approximately $0.6 million.

Refer to Note N of the Consolidated Financial Statements for additional details on our pension and other post-employment benefit plans.

Last In, First Out (LIFO) Inventory

The prices of certain major raw materials that we use, including copper, nickel, gold, silver, and other precious metals, fluctuate during a given year. Where possible, such changes in material costs, in either direction, are generally reflected in selling price adjustments, particularly with precious metals and copper.

The prices of labor and other factors of production, including supplies and utilities, generally increase with inflation. Portions of these cost increases may be offset by manufacturing improvements and other efficiencies. From time to time, we will revise our billing practices to include an energy surcharge in an attempt to recover a portion of our higher energy costs from our customers.

However, market factors, alternative materials, and competitive pricing may limit our ability to offset all or a portion of a cost increase with higher prices.

We use the LIFO method for costing the majority of our domestic inventories. Under the LIFO method, inflationary cost increases are charged against the current period cost of goods sold in order to more closely match the cost with the associated revenue. The carrying value of the inventory is based upon older costs and, as a result, the LIFO cost of the inventory on the balance sheet is typically, but not always, lower than it would be under most alternative costing methods. The LIFO cost may also be lower than the current replacement cost of the inventory. The LIFO inventory value tends to be less volatile during years of fluctuating costs than the inventory value would be using other costing methods.

The LIFO impact on the income statement in any given year is dependent upon the inflation rate effect on raw material purchases and manufacturing conversion costs, the level of purchases in a given year, and changes in the inventory mix and quantities.

Deferred Taxes

We record deferred tax assets and liabilities based upon the temporary difference between the financial reporting and tax basis of assets and liabilities. If it is more likely than not that some portion or all of the deferred tax assets will not be realized, a valuation allowance is established. All available evidence, both positive and negative, is considered to determine whether a valuation allowance is needed. We review the expiration dates of certain deferred tax assets against projected income levels to determine if a valuation allowance is needed. Certain deferred tax assets do not have an expiration date. We also evaluate deferred tax assets for realizability due to cumulative operating losses by jurisdiction and record a valuation allowance as warranted. A valuation allowance may increase tax expense and reduce net income in the period it is recorded. If a valuation allowance is no longer required, it will reduce tax expense and increase net income in the period that it is reversed.

We had valuation allowances of $16.2 million associated with certain federal, state and foreign deferred tax assets as of year-end 2017, primarily for the foreign tax credit and net operating loss carryforwards.

Refer to Note G of the Consolidated Financial Statements for additional deferred tax details.

Unearned Revenue

Billings to customers in advance of the shipment of the goods are initially recorded as unearned revenue, which is a liability on our Consolidated Balance Sheets. This liability is subsequently reversed and the revenue, cost of sales, and gross margin are recorded when the goods are shipped, title passes to the customer, and all other revenue recognition criteria are satisfied. The related inventory also remains on our balance sheet until these revenue recognition criteria are met. Advanced billings are typically made in association with products with long manufacturing times and/or products paid with funds from a customer’s contract with the government. Billings in advance of the shipments allow us to collect cash earlier than billing at the time of the shipment and, therefore, the collected cash can be used to reduce our investment in working capital. The unearned revenue balance was $5.5 million as of year-end 2017.

Precious Metal Physical Inventory Counts

We take and record the results of a physical inventory count of our precious metals on a quarterly basis. Our precious metal operations include a refinery that processes precious metal-containing scrap and other materials from our customers, as well as our own internally generated scrap. We also outsource portions of our refining requirements to other vendors, particularly those materials with longer processing times. The precious metal content within these various refine streams may be in solutions, sludges, and other non-homogeneous forms and can vary over time based upon the input materials, yield rates, and other process parameters. The determination of the weight of the precious metal content within the refine streams as part of a physical inventory count requires the use of estimates and calculations based upon assays, assumed recovery percentages developed from actual historical data and other analyses, the total estimated volumes of solutions and other materials within the refinery, data from our refine vendors, and other factors. The resulting calculated weight of the precious metals in our refine operations may differ, in either direction, from what our records indicate that we should have on hand, which would then result in an adjustment to our pre-tax income in the period when the physical inventory was taken and the related estimates were made.

Derivatives

We may use derivative financial instruments to hedge our foreign currency, commodity and precious metal price, and interest rate exposures. We apply hedge accounting when an effective hedge relationship can be documented and maintained. The effective portion of the change in a cash flow hedge's fair value is recorded in other comprehensive income, a component of shareholders' equity, until the underlying hedged item matures. If a hedge does not qualify as effective, changes in its fair value are recorded against income in the current period. If a derivative is deemed to be a hedge of the fair value of a balance sheet item, the change in the derivative’s value will be recorded in income and will offset the change in the fair value of the hedged item to the extent that the hedge is effective.

We secure derivatives with the intention of hedging existing or forecasted transactions only and do not engage in speculative trading or holding derivatives for investment purposes. Hedge contracts are typically held until maturity unless there is a change in the underlying hedged transaction. Our annual budget, quarterly forecasts, monthly estimates, customer agreements, and other analyses serve as the basis for determining forecasted transactions. The use of derivatives is governed by policies established by the Audit Committee of the Board of Directors. These policies provide guidance on the allowable types of hedge contracts, the allowable duration of the contracts, the maximum allowable notional amount of the outstanding contracts, and other related matters. Hedge contracts are approved by senior financial managers at our corporate office. The amount of derivatives outstanding at a particular point in time may also be limited by the availability of credit from financial institutions.

Our practice has been to secure hedge contracts denominated in the same manner as the underlying exposure; for example, a yen exposure will only be hedged with a yen contract and not with a surrogate currency and a silver exposure will only be hedged with a silver contract and not a gold contract. We also typically secure contracts through financial institutions that support us in our Credit Agreement.

Refer to Note Q of the Consolidated Financial Statements and Item 7A “Quantitative and Qualitative Disclosures About Market Risk."

Impairment of Goodwill and Long-Lived Assets

Goodwill is reviewed annually for impairment or more frequently if impairment indicators arise. The Company conducted its annual goodwill impairment assessment as of first day of the fourth quarter.

Goodwill is assigned to the reporting unit, which is the operating segment level or one level below the operating segment. Goodwill within the Advanced Materials segment totaled $50.3 million. Within the Precision Coatings segment, goodwill totaled $17.9 million and $20.6 million relating to the Precision Optics and Large Area Coatings reporting units, respectively. The remaining $1.9 million is related to the Beryllium reporting unit within the Performance Alloys and Composites segment.

For the purpose of the goodwill impairment assessment, we have the option to perform a qualitative assessment (commonly referred to as "step zero") to determine whether further quantitative analysis for impairment of goodwill or indefinite-lived intangible assets is necessary. We opted to bypass step zero and proceeded to perform a "step one" quantitative assessment for each of our reporting units. The results of the step one indicated that no goodwill impairment existed.

In the step one, we estimated the fair value of each of our reporting units using a discounted cash flow (DCF) model. Each reporting unit prepared operating forecasts which include several assumptions including future sales growth from new products and applications, as well as assumptions regarding future industry-specific market conditions, capital expenditures, and working capital changes. These forecasts are reviewed and approved by management and serve as the basis for the assumptions used in the DCF. The DCF included three years of forecasted cash flows from this process, plus cash flows projected to be generated from the end of the forecasted period into perpetuity. In addition to the estimates of future cash flows, other significant estimates involved in the determination of fair value of the reporting units were the discount rates and growth rates used in the DCF model. The discount rates used in the DCF model consider market and industry data as well as specific risk premiums for each reporting unit. The growth rate for each reporting unit, for the purpose of calculating cash flows through perpetuity, was set after the forecasted period.

Changes in market conditions could increase the discount rate in the future, thus decreasing the fair value of the reporting unit. A hypothetical 1% increase in the discount rate, holding all other assumptions constant, would not have decreased the fair value of any reporting unit below that of its carrying value. The sales growth assumption for each reporting unit was based on future secured orders, as well as growth in certain markets due to the introduction of new products. The key uncertainty in the sales growth assumption, as discussed in Item 1A "Risk Factors," is our inability to accurately predict the timing and magnitude of sales of our products, especially newly introduced products. The assumed growth rate for cash flows beyond the forecast period was approximately 3%. A hypothetical 1% decrease in the growth rate, holding all other assumptions constant, would not have decreased the fair value of any reporting unit below that of its carrying value.

We also compared the market capitalization as of December 31, 2017 to the carrying value of our equity, noting no impairment indicators or triggering events.

We are unaware of any current market trends that are contrary to the assumptions made in the valuation of our reporting units. If actual results are not consistent with the assumptions made in the determination of the fair value of our reporting units, especially assumptions regarding future sales growth from new products and applications, it is possible that the estimated fair value of certain reporting units could fall below their carrying value and cause the reporting unit to fail step one of the goodwill impairment test.

Item 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

We are exposed to precious metal and commodity price, interest rate, foreign exchange rate, and utility cost differences. While the degree of exposure varies from year to year, our methods and policies designed to manage these exposures have remained fairly consistent over time. Generally, we attempt to minimize the effects of these exposures on our pre-tax income and cash flows through the use of natural hedges, which include pricing strategies, borrowings denominated in the same terms as the exposed asset, off-balance sheet financing arrangements, and other methods. Where we cannot use a natural hedge, we may use derivative financial instruments to minimize the effects of these exposures when practical and cost efficient. The use of off-balance sheet financing arrangements and derivative financial instruments is subject to policies approved by the Audit Committee of the Board of Directors with oversight provided by a group of senior financial managers at our corporate office.

Precious metals. We use gold and other precious metals in manufacturing various products. To reduce the exposure to market price changes, the majority of our precious metal requirements are maintained on a consigned inventory basis. We purchase the metal out of consignment from our suppliers when it is ready to ship to a customer as a finished product. Our purchase price forms the basis for the price charged to the customer for the precious metal content and, therefore, the current cost is matched to the selling price, and the price exposure is minimized.

We are charged a consignment fee by the financial institutions that own the precious metals. This fee is a function of the market price of the metal, the quantity of metal we have on hand, and the rate charged by the institution. Because of market forces and competition, the fee can only be charged to customers in a limited case-by-case basis. Should the market price of precious metals that we have on consignment increase by 20% from the prices on December 31, 2017, the additional pre-tax cost to us as a result of an increase in the consignment fee would be approximately $1.7 million on an annual basis. This calculation assumes no changes in the quantity of metal held on consignment or the underlying fee and that none of the additional fees are charged to customers.

To further limit price and financing rate exposures, under some circumstances, we will require customers to furnish their own metal for processing. Customers may also elect to provide their own material for us to process on a toll basis as opposed to purchasing our material.

The available capacity of our existing credit lines to consign precious metals is a function of the quantity and price of the metals on hand. As prices increase, a given quantity of metal will utilize a larger proportion of the existing credit lines. A significant prolonged increase in metal prices could result in our credit lines being fully utilized, and, absent securing additional credit line capacity from financial institutions, could require us to purchase precious metals rather than consign them, require customers to supply their own metal, and/or force us to turn down additional business opportunities. If we were in a significant precious metal ownership position, we might elect to use derivative financial instruments to hedge the potential price exposure. The cost to finance and potentially hedge the purchased inventory may also be higher than the consignment fee. The financial statement impact of the risk from rising metal prices impacting our credit availability cannot be estimated at the present time.

In certain circumstances, we may elect to fix the price of precious metals for a customer for a stated quantity over a specified period of time. In those cases, we may secure hedge contracts whose terms match the terms in the agreement with our customer so that the gain or loss on the contract with the customer due to subsequent movements in the precious metal price will generally be offset by a gain or loss on the hedge contract. At December 31, 2017, we had no such hedge contracts outstanding.

Copper. We also use copper in our production processes. When possible, fluctuations in the purchase price of copper are passed on to customers in the form of price adders or reductions. While over time our price exposure to copper is generally in balance, there can be a lag between the change in our cost and the pass-through to our customers, resulting in higher or lower margins in a given period.

We consign the majority of our copper inventory requirements. As with precious metals, the available capacity under the existing lines is a function of the quantity and price of metal on hand. Should the market cost of copper increase by 20% from the price as of December 31, 2017, the additional pre-tax cost to us as a result of an increase in the consignment fee would be approximately $0.3 million on an annual basis. This calculation assumes no changes in the quantity of inventory or the underlying fee and that none of the additional fees are charged to customers.

Lower of cost or market. In our manufacturing processes, we use various metals that are not widely used by others or actively traded and, therefore, there is no established efficient market for derivative financial instruments that could be used to effectively hedge the related price exposures. For certain applications, our pricing practice with respect to these metals is to establish the selling price based upon our cost to purchase the material, limiting our price exposure. However, the inventory carrying value may be exposed to market fluctuations. The inventory value is maintained at the lower of cost or market and if the market value were to drop below the carrying value, the inventory would have to be reduced accordingly and a charge recorded against cost of sales. This risk is mainly associated with long manufacturing lead-time items and with sludges and scrap materials, which generally have longer processing times to be refined or processed into a usable form for further manufacturing and are typically not covered by specific sales orders from customers. We did not record any material lower of cost or market charges in 2017, 2016, or 2015 as a result of market price fluctuations of metals in our inventories.

Interest rates. We are exposed to changes in interest rates on portions of our debt and cash balances. This interest rate exposure is managed by maintaining a combination of short-term and long-term debt and variable and fixed rate instruments. We may also use interest rate swaps to fix the interest rate on variable rate obligations, as we deem appropriate. There were no interest rate derivatives outstanding as of December 31, 2017. Excess cash is typically invested in high quality instruments that mature in 90 days or less. Investments are made in compliance with policies approved by the Board of Directors.

Foreign currencies. Portions of our international operations sell products priced in foreign currencies, mainly the euro and yen, while the majority of these products' costs are incurred in U.S. dollars. We are exposed to currency movements in that if the U.S. dollar strengthens, the translated value of the foreign currency sale and the resulting margin on that sale will be reduced. To minimize this exposure, we may purchase foreign currency forward contracts, options, and collars in compliance with approved policies. If the dollar strengthened, the decline in the translated value of our margins would be at least partially offset by a gain on the hedge contract. A decrease in the value of the dollar would result in larger margins but potentially a loss on the contract, depending upon the method used to hedge the exposure. Our current policy limits our hedges to 80% or less of the forecasted exposure.

The notional value of outstanding currency contracts was $24.3 million as of December 31, 2017. If the dollar weakened 10% against the currencies we have hedged from the December 31, 2017 exchange rates, the reduced gain and/or increased loss on the outstanding contracts as of December 31, 2017 would reduce pre-tax profits by approximately $2.4 million in 2018. This calculation does not take into account the increase in margins as a result of translating foreign currency sales at the more favorable exchange rates, any changes in margins from potential volume fluctuations caused by currency movements, or the translation effects on any other foreign currency denominated income statement or balance sheet item.

Utilities. The cost of natural gas and electricity used in our operations may vary from year to year and from season to season. We attempt to minimize these fluctuations and the exposure to higher costs by utilizing fixed price agreements of set durations, when deemed appropriate, obtaining competitive bidding between regional energy suppliers and other methods.

Economy. We are exposed to changes in global economic conditions and the potential impact those changes may have on various facets of our business. We have a program in place to closely monitor the credit worthiness and financial condition of our key providers of financial services, including our bank group and insurance carriers, as well as the credit worthiness of customers and vendors, and have various contingency plans in place.

Our bank lines are established with a number of different banks in order to mitigate our exposure with any one financial institution. All of the banks in our bank group had credit in good standing as of year-end 2017. The financial statement impact from the risk of one or more of the banks in our bank group reducing our lines due to their insolvency or other causes cannot be estimated at the present time.

Item 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Management's Report on Internal Control over Financial Reporting

The management of Materion Corporation and subsidiaries are responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). Materion Corporation and subsidiaries' internal control system was designed to provide reasonable assurance to the Company's management and Board of Directors regarding the preparation and fair presentation of published financial statements. All internal control systems, no matter how well designed, have inherent limitations. Therefore, even those systems determined to be effective can provide only reasonable assurance with respect to financial statement preparation and presentation.

Materion Corporation and subsidiaries' management assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2017. In making this assessment, it used the framework set forth by the Committee of Sponsoring Organizations of the Treadway Commission (the COSO criteria) in Internal Control - Integrated Framework (2013).

The Company completed the acquisition of the high-performance target materials business of the Heraeus Group (HTB) on February 28, 2017. As permitted by SEC guidance, the scope of our evaluation of internal control over financial reporting as of December 31, 2017 did not include the internal control over financial reporting of HTB. The results of HTB are included in our consolidated financial statements from the date of acquisition and constituted 2.7% of total assets as of December 31, 2017 and 10.5% and (2.6%) of revenues and income before income taxes, respectively, for the year ended December 31, 2017.

Based on our assessment we believe that, as of December 31, 2017, the Company's internal control over financial reporting is effective.

The effectiveness of our internal control over financial reporting as of December 31, 2017 has been audited by Ernst & Young LLP, an independent registered public accounting firm, as stated in their report.

Report of Independent Registered Public Accounting Firm

To the Shareholders and Board of Directors of Materion Corporation

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Materion Corporation and subsidiaries as of December 31, 2017 and 2016, and the related consolidated statements of income, comprehensive income, shareholders' equity and cash flows for each of the three years in the period ended December 31, 2017 and the related notes and financial statement schedule listed in the Index at Item 15(a) (collectively referred to as the “financial statements”). In our opinion, the financial statements present fairly, in all material respects, the consolidated financial position of the Company at December 31, 2017 and 2016, and the consolidated results of its operations and its cash flows for each of the three years in the period ended December 31, 2017, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company’s internal control over financial reporting as of December 31, 2017, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated February 15, 2018 expressed an unqualified opinion thereon.

Basis for Opinion

These financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on the Company’s financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company’s auditor since at least 1958, but we are unable to determine the specific year.

Cleveland, Ohio

February 15, 2018

Report of Independent Registered Public Accounting Firm
To the Shareholders and the Board of Directors of Materion Corporation

Opinion on Internal Control over Financial Reporting

We have audited Materion Corporation and subsidiaries' internal control over financial reporting as of December 31, 2017, based on criteria established in Internal Control- Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, Materion Corporation and subsidiaries (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2017, based on the COSO criteria.
As indicated in the accompanying Management's Report on Internal Control over Financial Reporting, management's assessment of and conclusion on the effectiveness of internal control over financial reporting did not include the internal controls of the high-performance target materials business of the Heraeus Group (HTB), which is included in the 2017 consolidated financial statements of the Company and constituted 2.7% of total assets, as of December 31, 2017 and 10.5% and (2.6%) of revenues and income before income taxes, respectively, for the year then ended. Our audit of internal control over financial reporting of the Company also did not include an evaluation of the internal control over financial reporting of HTB.
We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of Materion Corporation and subsidiaries as of December 31, 2017 and 2016, and the related consolidated statements of income, comprehensive income, shareholders' equity and cash flows for each of the three years in the period ended December 31, 2017 and the related notes and financial statement schedule listed in the Index at Item 15(a) (collectively referred to as the "financial statements") of the Company and our report dated February 15, 2018 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB. We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP
Cleveland, Ohio
February 15, 2018

Materion Corporation and Subsidiaries
Years Ended December 31, 2017, 2016, and 2015
Consolidated Statements of Income

(Thousands except per share amounts)	2017	2016	2015
Net sales	$1,139,447	$969,236	$1,025,272
Cost of sales	927,953	785,773	834,492
Gross margin	211,494	183,463	190,780
Selling, general, and administrative expense	146,170	129,683	129,941
Research and development expense	13,981	12,802	12,796
Other — net (Note D)	12,764	13,874	2,775
Operating profit	38,579	27,104	45,268
Interest expense — net (Note F)	2,183	1,789	2,450
Income before income taxes	36,396	25,315	42,818
Income tax expense (benefit) (Note G)	24,945	(425)	10,660
Net income	$11,451	$25,740	$32,158
Basic earnings per share:			
Net income per share of common stock	$0.57	$1.29	$1.60
Diluted earnings per share:			
Net income per share of common stock	$0.56	$1.27	$1.58
Cash dividends per share	$0.395	$0.375	$0.355
Weighted-average number of shares of common stock outstanding:			
Basic	20,027	19,983	20,097
Diluted	20,415	20,213	20,402

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

Materion Corporation and Subsidiaries
Years Ended December 31, 2017, 2016, and 2015
Consolidated Statements of Comprehensive Income

(Thousands)	2017	2016	2015
Net income	$11,451	$25,740	$32,158
Other comprehensive income:			
Foreign currency translation adjustment	1,552	(172)	(1,335)
Derivative and hedging activity, net of tax (expense) benefit of ($271), ($149), and $1,175	(1,074)	258	(1,999)
Pension and post-employment benefit adjustment, net of tax (expense) benefit of ($13,820), $4,555, and ($2,963)	(17,234)	(5,562)	4,866
Other comprehensive (loss) income	(16,756)	(5,476)	1,532
Comprehensive income	$(5,305)	$20,264	$33,690

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

Materion Corporation and Subsidiaries
Years Ended December 31, 2017, 2016, and 2015
Consolidated Statements of Cash Flows

(Thousands)	2017	2016	2015
Cash flows from operating activities:			
Net income	$11,451	$25,740	$32,158
Adjustments to reconcile net income to net cash provided from operating activities:			
Depreciation, depletion, and amortization	42,751	45,651	37,817
Amortization of deferred financing costs in interest expense	919	666	654
Stock-based compensation expense (non-cash)	4,957	3,174	5,491
(Gain) loss on sale of property, plant, and equipment	(1,150)	(648)	768
Deferred tax expense (benefit)	20,256	(9,010)	4,368
Changes in assets and liabilities net of acquired assets and liabilities:			
Decrease (increase) in accounts receivable	(18,484)	(4,096)	14,777
Decrease (increase) in inventory	(9,462)	10,791	19,372
Decrease (increase) in prepaid and other current assets	(11,606)	658	2,139
Increase (decrease) in accounts payable and accrued expenses	34,433	2,758	(17,989)
Increase (decrease) in unearned revenue	4,336	(2,590)	(1,184)
Increase (decrease) in interest and taxes payable	(514)	2,511	(910)
Increase (decrease) in long-term liabilities	(4,264)	(684)	(8,923)
Other — net	(5,828)	(6,741)	2,472
Net cash provided from operating activities	67,795	68,180	91,010
Cash flows from investing activities:			
Payments for purchase of property, plant, and equipment	(27,516)	(27,177)	(29,505)
Payments for mine development	(1,560)	(9,861)	(22,585)
Payments for acquisition	(16,504)	(1,750)	—
Proceeds from sale of property, plant, and equipment	2,222	1,433	58
Net cash (used in) investing activities	(43,358)	(37,355)	(52,032)
Cash flows from financing activities:			
Repayment of short-term debt	—	(8,305)	(653)
Proceeds from issuance of long-term debt	55,000	10,000	78,000
Repayment of long-term debt	(55,797)	(10,694)	(88,000)
Principal payments under capital lease obligations	(843)	(736)	(759)
Cash dividends paid	(7,913)	(7,496)	(7,132)
Deferred financing costs	(300)	(1,000)	(838)
Repurchase of common stock	(1,086)	(3,798)	(7,129)
Payments of withholding taxes for stock-based compensation awards	(4,506)	(1,089)	(366)
Net cash (used in) financing activities	(15,445)	(23,118)	(26,877)
Effects of exchange rate changes	1,388	(479)	(1,015)
Net change in cash and cash equivalents	10,380	7,228	11,086
Cash and cash equivalents at beginning of period	31,464	24,236	13,150
Cash and cash equivalents at end of period	$41,844	$31,464	$24,236

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

Materion Corporation and Subsidiaries
December 31, 2017 and 2016
Consolidated Balance Sheets

(Thousands)	2017	2016
Assets		
Current assets		
Cash and cash equivalents (Note A)	$41,844	$31,464
Accounts receivable (Note A)	124,014	100,817
Inventories (Notes A and I)	220,352	200,865
Prepaid and other current assets	24,733	12,138
Total current assets	410,943	345,284
Long-term deferred income taxes (Notes A and G)	17,047	39,409
Property, plant, and equipment (Notes A and J)	891,789	861,267
Less allowances for depreciation, depletion, and amortization	(636,211)	(608,636)
Property, plant, and equipment — net	255,578	252,631
Intangible assets (Notes A and K)	9,847	11,074
Other assets	6,992	5,950
Goodwill (Notes A and K)	90,677	86,950
Total Assets	$791,084	$741,298
Liabilities and Shareholders' Equity		
Current liabilities		
Short-term debt (Note L)	$777	$733
Accounts payable	49,059	32,533
Salaries and wages	42,694	29,885
Taxes other than income taxes	2,492	1,395
Other liabilities and accrued items	25,552	19,945
Income taxes (Notes A and G)	1,084	4,781
Unearned revenue	5,451	1,105
Total current liabilities	127,109	90,377
Other long-term liabilities	30,967	17,979
Retirement and post-employment benefits (Note N)	93,225	91,505
Unearned income (Note A)	36,905	41,369
Long-term income taxes (Notes A and G)	4,857	2,100
Deferred income taxes (Notes A and G)	213	274
Long-term debt (Note L)	2,827	3,605
Shareholders' equity		
Serial preferred stock (no par value; 5,000 authorized shares, none issued)	—	—
Common stock (no par value; 60,000 authorized shares, issued shares of 27,148 for both 2017 and 2016)	223,484	212,702
Retained earnings	536,116	517,903
Common stock in treasury (7,042 shares for 2017 and 7,200 shares for 2016)	(166,128)	(154,399)
Accumulated other comprehensive loss (Note O)	(102,937)	(86,181)
Other equity transactions	4,446	4,064
Total shareholders' equity	494,981	494,089
Total Liabilities and Shareholders' Equity	$791,084	$741,298

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

Materion Corporation and Subsidiaries
Years Ended December 31, 2017, 2016, and 2015
Consolidated Statements of Shareholders' Equity

(Thousands)	Common Stock	Retained Earnings	Common Stock In Treasury	Accumulated Other Comprehensive Income (Loss)	Other Equity Transactions	Total
Balance at January 1, 2015	$204,634	$474,633	$(140,938)	$ (82,237)	$ 2,927	$459,019
Net income	—	32,158	—	—	—	32,158
Other comprehensive income (loss)	—	—	—	1,532	—	1,532
Cash dividends declared	—	(7,132)	—	—	—	(7,132)
Stock-based compensation activity	4,260	—	—	—	—	4,260
Repurchase of 212 shares	—	—	(7,129)	—	—	(7,129)
Directors' deferred compensation	73	—	(492)	—	668	249
Balance at December 31, 2015	$208,967	$499,659	$(148,559)	$ (80,705)	$ 3,595	$482,957
Net income	—	25,740	—	—	—	25,740
Other comprehensive income (loss)	—	—	—	(5,476)	—	(5,476)
Cash dividends declared	—	(7,496)	—	—	—	(7,496)
Stock-based compensation activity	3,764	—	(1,762)	—	—	2,002
Repurchase of 147 shares	—	—	(3,798)	—	—	(3,798)
Directors' deferred compensation	(29)	—	(280)	—	469	160
Balance at December 31, 2016	$212,702	$517,903	$(154,399)	$ (86,181)	$ 4,064	$494,089
Net income	—	11,451	—	—	—	11,451
Other comprehensive income (loss)	—	—	—	(2,081)	—	(2,081)
Tax Cuts and Jobs Act Reclassification	—	14,675	—	(14,675)	—	—
Cash dividends declared	—	(7,913)	—	—	—	(7,913)
Stock-based compensation activity	10,750	—	(10,300)	—	—	450
Repurchase of 32 shares	—	—	(1,086)	—	—	(1,086)
Directors' deferred compensation	32	—	(343)	—	382	71
Balance at December 31, 2017	$223,484	$536,116	$(166,128)	$ (102,937)	$ 4,446	$494,981

The accompanying notes are an integral part of the consolidated financial statements.
Materion Corporation and Subsidiaries
Notes to Consolidated Financial Statements
Note A — Significant Accounting Policies
(Dollars in thousands)
Organization: Materion Corporation (the Company) is a holding company with subsidiaries that have operations in the United States, Europe, and Asia. These operations manufacture advanced engineered materials used in a variety of end markets, including consumer electronics, industrial components, defense, medical, automotive electronics, telecommunications infrastructure, energy, commercial aerospace, science, services, and appliance. The Company has four reportable segments: Performance Alloys and Composites, Advanced Materials, Precision Coatings, and Other. Other includes unallocated corporate costs.
Refer to Note C of the Consolidated Financial Statements for additional segment details. The Company is vertically integrated and distributes its products through a combination of company-owned facilities and independent distributors and agents.
Business Combinations: The Company records assets acquired and liabilities assumed at the date of acquisition at their respective fair values. Any intangible assets acquired in a business combination are recognized and reported apart from goodwill. Goodwill represents the excess purchase price over the fair value of the tangible net assets and intangible assets acquired in a business combination. Acquisition-related expenses are recognized separately from the business combination and are expensed as incurred.
The amounts reflected in Note B to the Consolidated Financial Statements are the results of the preliminary purchase price allocation and will be updated upon completion of the final valuation. The Company is required to complete the purchase price allocation within 12 months of the acquisition date. If such completion of the allocation results in a change in the preliminary values, the measurement period adjustment will be recognized in the period in which the adjustment amount is determined.
Use of Estimates: The preparation of financial statements in conformity with accounting principles generally accepted in the United States requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes. Actual results may differ from those estimates.
Consolidation: The Consolidated Financial Statements include the accounts of Materion Corporation and its subsidiaries. All of the Company's subsidiaries were wholly owned as of December 31, 2017. Intercompany accounts and transactions are eliminated in consolidation.
Cash Equivalents: All highly liquid investments with a maturity of three months or less when purchased are considered to be cash equivalents. At December 31, 2017, the Company had $18.0 million of cash equivalents invested in institutional money market funds. The carrying value of the money market funds approximates fair value due to their short-term maturities.
Accounts Receivable: An allowance for doubtful accounts is maintained for the estimated losses resulting from the inability of customers to pay amounts due. The allowance is based upon identified delinquent accounts, customer payment patterns, and other analyses of historical data and trends. The allowance for doubtful accounts was $640 and $857 at December 31, 2017 and 2016, respectfully. The Company extends credit to customers based upon their financial condition, and collateral is not generally required.
Inventories: Inventories are stated at the lower of cost or market. The cost of the majority of domestic inventories is determined using the last-in, first-out (LIFO) method to reflect a better matching of costs and revenues. The remaining inventories are stated principally at average cost.

Property, Plant, and Equipment: Property, plant, and equipment is stated on the basis of cost. Depreciation is computed principally by the straight-line method, except certain assets for which depreciation may be computed by the units-of-production method. The depreciable lives that are used in computing the annual provision for depreciation by class of asset are primarily as follows:

	Years
Land improvements	10 to 20
Buildings	20 to 40
Leasehold improvements	Life of lease
Machinery and equipment	3 to 15
Furniture and fixtures	4 to 10
Automobiles and trucks	3 to 8
Research equipment	3 to 10
Computer hardware	3 to 10
Computer software	3 to 10

An asset acquired under a capital lease will be recorded at the lesser of the present value of the projected lease payments or the fair value of the asset and will be depreciated in accordance with the above schedule. Leasehold improvements will be depreciated over the life of the improvement if it is shorter than the life of the lease. Repair and maintenance costs are expensed as incurred.

Mineral Resources and Mine Development: Property acquisition costs are capitalized as mineral resources on the balance sheet and are depleted using the units-of-production method based upon total estimated recoverable proven reserves of the beryllium-bearing bertrandite ore body. The Company uses beryllium pounds as the unit of accounting measure, and depletion expense is recorded on a pro-rata basis based upon the amount of beryllium pounds extracted as a percentage of total estimated beryllium pounds contained in all ore bodies.

Mine development costs at our open pit surface mines include drilling, infrastructure, other related costs to delineate an ore body, and the removal of overburden to initially expose an ore body. Costs incurred before mineralization is classified as proven and probable reserves are expensed and classified as Exploration expense. Capitalization of mine development project costs that meet the definition of an asset begins once mineralization is classified as proven and probable reserves.

Drilling and related costs are capitalized for an ore body where proven and probable reserves exist, and the activities are directed at obtaining additional information on the ore body or converting mineralized material to proven and probable reserves. All other drilling and related costs are expensed as incurred. Drilling costs incurred during the production phase for operational ore control are allocated to inventory costs and then included as a component of costs applicable to sales.

The costs of removing overburden and waste materials to access the ore body at an open-pit mine prior to the production phase are referred to as “development costs.” Development costs are capitalized during the development of an open-pit mine and are capitalized at each pit. These costs are amortized as the ore is extracted using the units-of-production method based upon total estimated recoverable proven reserves for the individual pit. The Company uses beryllium pounds as the unit of accounting measure for recording amortization.

To the extent that the aforementioned costs benefit an entire ore body, the costs are amortized over the estimated useful life of the ore body. Costs incurred to access specific ore blocks or areas that only provide benefit over the life of that area are amortized over the estimated life of that specific ore block area.

Goodwill and Other Intangible Assets: Goodwill is reviewed annually for impairment or more frequently if impairment indicators arise. The Company conducts its annual goodwill and indefinite-lived intangible asset impairment assessment as of the first day of the fourth quarter, or more frequently under certain circumstances. Goodwill is assigned to the reporting unit, which is the operating segment level or one level below the operating segment. Intangible assets with finite lives are amortized using the straight-line method or effective interest method, as applicable, over the periods estimated to be benefited, which is generally 20 years or less. Finite-lived intangible assets are also reviewed for impairment if facts and circumstances warrant.

Asset Impairment: In the event that facts and circumstances indicate that the carrying value of long-lived assets may be impaired, an evaluation of recoverability is performed by comparing the carrying value of the assets to the associated estimated future undiscounted cash flow. If the carrying value exceeds that cash flow, then the assets are written down to their fair values.

Derivatives: The Company recognizes all derivatives on the balance sheet at fair value. If the derivative is designated and effective as a cash flow hedge, changes in the fair value of the derivative are recognized in other comprehensive income (loss), a component of shareholders' equity, until the hedged item is recognized in earnings. If the derivative is designated as a fair value hedge, changes in fair value are offset against the change in the fair value of the hedged asset, liability, or commitment through earnings. The ineffective portion of a derivative's change in fair value, if any, is recognized in earnings immediately. If a derivative is not a hedge, changes in its fair value are adjusted through the income statement.

Asset Retirement Obligation: The Company records a liability to recognize the legal obligation to remove an asset at the time the asset is acquired or when the legal liability arises. The liability is recorded for the present value of the ultimate obligation by discounting the estimated future cash flows using a credit-adjusted risk-free interest rate. The liability is accreted over time, with the accretion charged to expense. An asset equal to the fair value of the liability is recorded concurrent with the liability and depreciated over the life of the underlying asset.

Unearned Income: Expenditures for capital equipment to be reimbursed under government contracts are recorded in property, plant, and equipment, while the reimbursements for those expenditures are recorded in unearned income, a liability on the balance sheet. When the assets subject to reimbursement are placed in service, the total cost is depreciated over the useful lives, and the unearned income liability is reduced and credited to cost of sales on the Consolidated Statements of Income ratably with the annual depreciation expense. Depreciation and amortization expense on the Consolidated Statements of Cash Flows is shown net of the associated period reduction in the unearned income liability.

Revenue Recognition: The Company generally recognizes revenue when the goods are shipped and title passes to the customer. The Company requires persuasive evidence that a revenue arrangement exists, delivery of the product has occurred, the selling price is fixed or determinable, and collectibility is reasonably assured before revenue is realized and earned. Billings in advance of the shipment of the goods are recorded as unearned revenue, which is a liability on the balance sheet. Revenue is recognized for these transactions when the goods are shipped and all other revenue recognition criteria are met.

Shipping and Handling Costs: The Company records shipping and handling costs for products sold to customers in cost of sales in the Consolidated Statements of Income.

Advertising Costs: The Company expenses all advertising costs as incurred. Advertising costs were $1,252 in 2017, $1,163 in 2016, and $1,285 in 2015.

Stock-based Compensation: The Company recognizes stock-based compensation expense based on the grant date fair value of the award over the period during which an employee is required to provide service in exchange for the award. The fair value of restricted stock units is based on the closing price of the Company's common shares on the grant date. Stock appreciation rights (SARs) are granted with an exercise price equal to the closing price of the Company's common shares on the date of grant. The fair value of SARs is determined using a Black-Scholes option-pricing model, which incorporates assumptions regarding the expected volatility, the expected option life, the risk-free interest rate, and the expected dividend yield. See Note P for additional information about stock-based compensation.

Capitalized Interest: Interest expense associated with active capital asset construction and mine development projects is capitalized and amortized over the future useful lives of the related assets.

Income Taxes: The Company uses the liability method in measuring the provision for income taxes and recognizing deferred tax assets and liabilities on the balance sheet. The Company will record a valuation allowance to reduce the deferred tax assets to the amount that is more likely than not to be realized, as warranted by current facts and circumstances. The Company applies a more-likely-than-not recognition threshold for all tax uncertainties and will record a liability for those tax benefits that have a less than 50% likelihood of being sustained upon examination by the taxing authorities.

Net Income Per Share: Basic earnings per share (EPS) is computed by dividing income available to common stockholders by the weighted-average number of common shares outstanding for the period. Diluted EPS reflects the assumed conversion of all dilutive common stock equivalents as appropriate using the treasury stock method.

New Pronouncements Adopted:

In February 2018, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) 2018-02, Income Statement - Reporting Comprehensive Income, (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income, which allows a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the newly enacted federal corporate income tax rate under the TCJA. The amount of the reclassification would be the difference between the historical corporate income tax rate and the newly enacted 21 percent corporate income tax rate. The ASU is effective for fiscal years, including interim periods within those fiscal years, beginning after December

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15, 2018 with early adoption in any interim period permitted. The Company adopted the new guidance during the fourth quarter of 2017 and elected to make the reclassification. As a result, Retained earnings increased $14,675 with a corresponding decrease to Accumulated other comprehensive income.

In March 2016, the FASB issued ASU 2016-09, Improvements to Employee Share-Based Payment Accounting, which impacts several aspects of accounting for share-based payment transactions, including income tax consequences, classification of awards as either equity or liabilities, and classification on the statement of cash flows. Under this standard, income tax benefits and deficiencies are to be recognized as income tax expense or benefit in the income statement, and the tax effects of exercised or vested awards are treated as discrete items in the reporting period in which they occur. An entity must also recognize excess tax benefits regardless of whether the benefit reduces taxes payable in the reporting period. Excess tax benefits are classified, along with other income tax cash flows, as an operating activity. In regard to forfeitures, the entity may make an entity-wide accounting policy election to either estimate the number of awards that are expected to vest or account for forfeitures as they occur. The ASU, which is required to be applied on a modified retrospective basis, is effective for fiscal years, including interim periods within those fiscal years, beginning after December 15, 2016. The Company adopted the new guidance during the first quarter of 2017. An impact of adoption was the recognition of excess tax benefits in Income tax expense rather than Shareholders' equity in 2017. As a result, the Company recognized discrete tax benefits of $2.0 million in Income tax expense during 2017. The cash flow classification requirements of ASU 2016-09 were applied retrospectively. As a result cash flows from operating activities increased by $1,006 and $782 in 2016 and 2015, respectively, with a corresponding decrease to cash flows from financing activities. None of the other provisions in this ASU had a material effect on the Company's consolidated financial statements.

New Pronouncements Issued: In August 2017, the FASB issued ASU 2017-12, Derivatives and Hedging (Topic 815): Targeted Improvements to Accounting for Hedging Activities, which amends and simplifies existing guidance to allow companies to more accurately present the economic effects of risk management activities in the financial statements. This ASU is effective for fiscal years beginning after December 15, 2018, including interim periods within those periods, with early adoption permitted. The Company is currently evaluating the impact of adopting this new guidance on its consolidated financial statements.

In March 2017, the FASB issued ASU 2017-07, Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost, which requires an employer to report the service cost component of net benefit cost in the same line item as other compensation costs arising from services rendered by pertinent employees during the period. The other components of net benefit cost are required to be presented in the income statement separately from the service cost component and outside a subtotal of income from operations. The amendments also allow only the service cost component to be eligible for capitalization. This ASU is effective for fiscal years beginning after December 15, 2017, including interim periods within those periods, with early adoption permitted. The amendments should be applied retrospectively for the presentation of service cost and other components of net benefit cost on the income statement and prospectively for the capitalization of service cost and net periodic postretirement benefits in assets. The adoption of ASU 2017-07 will result in a change to the Company's pension expense reported within Operating profit, which will be offset by a corresponding change in Other non-operating expense, net to reflect the impact of presenting the interest cost, expected return on plan assets, amortization of prior service credit, and net actuarial loss components of net periodic benefit costs outside of Operating profit. The Company does not expect ASU 2017-07 to have a material effect on its financial condition or liquidity.

In February 2016, the FASB issued ASU 2016-02, Leases, which eliminates the off-balance-sheet accounting for leases. The new guidance will require lessees to report their operating leases as both an asset and liability on the balance sheet and disclose key information about leasing arrangements. The ASU, which is required to be applied on a modified retrospective basis, will be effective for fiscal years, including interim periods within those fiscal years, beginning after December 15, 2018. The Company is currently evaluating the impact of adopting this new guidance on its consolidated financial statements.

In May 2014, the FASB issued ASU 2014-09, Revenue from Contracts with Customers, which supersedes previous revenue recognition guidance. The new standard requires that a company recognize revenue when it transfers promised goods or services to customers in an amount that reflects the consideration the Company expects to receive in exchange for those goods or services. Companies will need to use more judgment and estimates than under the guidance currently in effect, including estimating the amount of variable revenue to recognize over each identified performance obligation.

The Company will adopt the new standard using the modified retrospective method as of January 1, 2018. Prior periods will not be retrospectively adjusted. This approach will be applied to all contracts not completed as of January 1, 2018. In addition to the enhanced footnote disclosures related to customer contracts, the new standard will impact the Company's timing of revenue recognition for certain contracts and subcontracts with the United States government that contain termination for convenience clauses. However, this impact will not have a material impact to our consolidated financial statements.

No other recently issued ASUs are expected to have a material effect on the Company's results of operations, financial condition, or liquidity.

Note B — Acquisitions

On February 28, 2017, the Company acquired the target materials business of the Heraeus Group (HTB), of Hanau, Germany, for $16.5 million. This business manufactures precious and non-precious metal target materials for the architectural and automotive glass, electronic display, photovoltaic, and semiconductor markets at facilities in Germany, Taiwan, and the United States. This business operates within the Advanced Materials segment, and the results of operations are included as of the date of acquisition.

The Company will make adjustments to the purchase price allocation prior to completion of the measurement period, as necessary. Only items identified as of the acquisition date will be considered for subsequent adjustment. The purchase price allocation for the acquisition is as follows:

(Thousands)	Amount
Assets:	
Inventories	$7,221
Prepaid and other current assets	2,270
Long-term deferred income taxes	14
Property, plant, and equipment	6,501
Intangible assets	3,649
Goodwill	3,574
Total assets acquired	$23,229
Liabilities:	
Other liabilities and accrued items	$984
Other long-term liabilities	449
Retirement and post-employment benefits	5,292
Total liabilities assumed	$6,725
Total purchase price	$16,504

As part of the acquisition, the Company recorded approximately $3.6 million of goodwill. Goodwill was calculated as the excess of the purchase price over the estimated fair values of the tangible net assets and intangible assets acquired. Also, the Company acquired approximately $3.6 million of other intangible assets, which will be amortized using the straight-line method over an average life of about 10 years. The following table reports the intangible assets by asset category and useful life:

(Thousands)	Value at Acquisition	Useful Life
Customer relationships	$ 2,274	15 years
Technology	1,375	3 years
Total	$ 3,649	

Note C — Segment Reporting and Geographic Information

The Company has the following operating segments: Performance Alloys and Composites, Advanced Materials, Precision Coatings, and Other. The Company's operating segments represent components of the Company for which separate financial information is available that is utilized on a regular basis by the Chief Executive Officer, the Company's Chief Operating Decision Maker, in determining how to allocate the Company's resources and evaluate performance. The segments are determined based on several factors, including the availability of discrete financial information and the Company's organizational and management structure.

Performance Alloys and Composites produces strip and bulk form alloy products, strip metal products with clad inlay and overlay metals, beryllium-based metals, beryllium, and aluminum metal matrix composites, in rod, sheet, foil, and a variety of customized forms, beryllia ceramics, and bulk metallic glass materials.

Advanced Materials produces advanced chemicals, microelectric packaging, precious metal, non-precious metal, and specialty metal products, including vapor deposition targets, frame lid assemblies, clad and precious metal preforms, high temperature braze materials, and ultra-fine wire.
Precision Coatings produces thin film coatings, optical filter materials, sputter-coated, and precision-converted thin film materials.
The Other reportable segment includes unallocated corporate costs and assets.
Financial information for reportable segments was as follows:

(Thousands)	Performance Alloys and Composites	Advanced Materials	Precision Coatings	Other	Total
2017					
Net sales	$ 429,442	$590,789	$119,216	$—	$1,139,447
Intersegment sales	114	58,056	—	—	58,170
Value-added sales	363,465	228,062	90,678	(4,508)	677,697
Operating profit (loss)	21,978	32,763	8,445	(24,607)	38,579
Depreciation, depletion, and amortization	23,209	7,354	9,721	2,467	42,751
Expenditures for long-lived assets	10,427	13,318	3,048	2,283	29,076
Assets	418,798	202,389	97,504	72,393	791,084
2016					
Net sales	$ 387,539	$437,249	$144,448	$—	$969,236
Intersegment sales	240	70,457	—	—	70,697
Value-added sales	332,012	176,332	97,700	(6,134)	599,910
Operating profit (loss)	6,601	26,282	11,635	(17,414)	27,104
Depreciation, depletion, and amortization	27,059	6,644	9,945	2,003	45,651
Expenditures for long-lived assets	26,604	4,931	3,176	2,327	37,038
Assets	422,787	133,682	108,788	76,041	741,298
2015					
Net sales	$ 394,760	$482,288	$148,444	$(220)	$1,025,272
Intersegment sales	768	63,669	—	—	64,437
Value-added sales	335,136	182,794	101,761	(2,444)	617,247
Operating profit (loss)	23,560	27,805	7,483	(13,580)	45,268
Depreciation, depletion, and amortization	19,748	6,995	9,951	1,777	38,471
Expenditures for long-lived assets	38,562	5,286	6,399	1,843	52,090
Assets	425,759	131,104	118,953	66,477	742,293

Intersegment sales are eliminated in consolidation.
The primary measure of evaluating segment performance is operating profit. In addition to net sales, value-added sales is also reviewed. Value-added sales represents a non-GAAP financial measure which removes the impact of pass-through metal costs and allows for analysis without the distortion of the movement or volatility in pass-through metal prices. Value-added sales is a metric of particular importance to the Advanced Materials segment, since a significant portion of Advanced Materials' net sales are based on the value of precious metals which can fluctuate significantly from period to period.
From a segment assets perspective, segments are evaluated based upon a return on assets metric, which includes inventory (excluding the impact of LIFO), accounts receivable, and property, plant, and equipment.

Other geographic information includes the following:

(Thousands)	2017	2016	2015
Net sales			
United States	$650,675	$639,675	$639,436
Asia	265,991	193,739	247,174
Europe	205,118	121,648	122,554
All other	17,663	14,174	16,108
Total	$1,139,447	$969,236	$1,025,272
Long-lived assets by country deployed			
United States	$227,412	$240,309	$249,976
All other	28,166	12,322	13,653
Total	$255,578	$252,631	$263,629

Net sales are based on the location of the selling group. No individual country, other than the United States, or customer accounted for 10% or more of the Company’s net sales for the years presented.

Long-lived assets are comprised of property, plant, and equipment based on physical location.

Note D — Other-net

Other-net is summarized for 2017, 2016, and 2015 as follows:

	(Income) Expense		
(Thousands)	2017	2016	2015
Metal consignment fees	$8,782	$6,409	$7,074
Amortization of intangible assets	4,629	4,498	5,112
Foreign currency exchange/translation (gain) loss	(722)	1,525	(5,461)
Impairment and other cost reduction initiatives	255	2,586	—
Net (gain) loss on disposal of fixed assets	(1,150)	(648)	768
Recovery from insurance	—	—	(3,800)
Legal settlement	—	—	(1,825)
Other items	970	(496)	907
Total	$12,764	$13,874	$2,775

Note E — Restructuring

In 2017, the Company completed cost reduction actions in order to align costs with commensurate business levels. These actions were accomplished through elimination of vacant positions, consolidation of roles, and staff reduction. Costs associated with these actions within the Other and Precision Coatings segments included severance associated with approximately twenty-three employees and other related costs.

In 2016, the Company initiated a plan to close the Fukaya, Japan service center, which is a part of the Performance Alloys and Composites segment. Costs associated with the plan included severance associated with approximately thirteen employees and related facility exit costs.

These costs are presented in the Consolidated Statements of Income as follows:

(Thousands)	2017	2016	2015
Cost of sales	$463	$—	$ —
Selling, general, and administrative (SG&A) expense	1,310	—	—
Other-net	255	2,586	—
Total	$2,028	$2,586	$ —

Remaining severance payments related to these initiatives of $0.3 million are reflected within Other liabilities and accrued items in the Consolidated Balance Sheets. The Company does not expect to incur additional costs related to these initiatives.

Note F — Interest

The following chart summarizes the interest incurred, capitalized, and paid for 2017, 2016, and 2015:

(Thousands)	2017	2016	2015
Interest incurred	$2,608	$2,219	$2,685
Less: Capitalized interest	425	430	235
Total net expense	$2,183	$1,789	$2,450
Interest paid	$1,646	$1,611	$2,042

The difference in expense for 2017, 2016, and 2015 was primarily due to changes in the level of outstanding debt and capital leases and the average borrowing rate. Amortization of deferred financing costs within interest expense was $0.9 million in 2017, $0.7 million in 2016, and $0.7 million in 2015.

Note G — Income Taxes

On December 22, 2017, the TCJA was signed into law. The TCJA includes a number of provisions, including the lowering of the U.S. corporate tax rate from 35 percent to 21 percent, effective January 1, 2018. The TCJA also includes provisions that may partially offset the benefit of such rate reduction, including the repeal of the deduction for domestic production activities. The international provisions of the TCJA establish a territorial-style system for taxing foreign-source income of domestic multinational corporations. At December 31, 2017, the Company has not completed the accounting for the tax effects of enactment of the TCJA; however, as described below, the Company recorded adjustments for the re-measurement of deferred tax assets (liabilities) and the deemed repatriation tax on unremitted foreign earnings and profits. For the items for which the Company was able to determine a reasonable estimate, a provisional amount of $17.1 million was recognized and included as a component of income tax expense. The Company will continue to assess the provision for income taxes as future guidance is issued. Any revisions will be treated in accordance with the measurement period guidance outlined in Staff Accounting Bulletin No. 118 (SAB 118).

On December 22, 2017, SAB 118 was issued to address the application of U.S. GAAP in situations where a registrant does not have the necessary information available, prepared, or analyzed in reasonable detail to complete the accounting for certain income tax effects of the TCJA. In accordance with SAB 118, the Company has determined that the $5.0 million of the deferred tax expense recorded in connection with the remeasurement of certain deferred tax assets and liabilities and the $6.1 million of current tax expense recorded in connection with the transition tax on the mandatory deemed repatriation of foreign earnings were provisional amounts and reasonable estimates at December 31, 2017. Additional work is necessary for a more detailed analysis of historical foreign earnings as well as potential correlative adjustments. Any subsequent adjustments to these amounts will be recorded to current tax expense in the quarter of 2018 when the analysis is complete.

The one-time transition tax is based on the Company's total post-1986 earnings and profits (E&P) that were previously deferred from U.S. income taxes. The Company recorded a provisional amount for the one-time transition tax liability for its foreign subsidiaries, resulting in an increase in income tax expense of $6.1 million. The Company has not yet completed the calculation of the total post-1986 E&P for these foreign subsidiaries. Further, the transition tax is based in part on the amount of those earnings held in cash and other specified assets. This amount may change when the Company finalizes the calculation of post-1986 foreign E&P previously deferred from U.S. federal taxation and finalize the amounts held in cash or other specified assets. No additional income taxes have been provided for any remaining undistributed foreign earnings not subject to the transition tax, or any additional outside basis difference inherent in these entities, as these amounts continue to be indefinitely reinvested in foreign operations.

The Company will continue to assess the impact of the TCJA to determine the impact on any remaining undistributed foreign earnings and any basis differences in our foreign jurisdictions.

While the TCJA provides for a territorial tax system, beginning in 2018, it includes a new U.S. tax, the global intangible low-taxed income (GILTI). The GILTI provisions require the Company to include in its U.S. income tax return foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary's tangible assets. The Company may be subject to incremental U.S. tax on GILTI income. The Company has not provided any deferred tax impacts of GILTI in its consolidated financial statements for the year ended December 31, 2017 and will continue to further assess this portion of the TCJA.

Income before income taxes and income tax expense (benefit) are comprised of the following:

(Thousands)	2017	2016	2015
Income before income taxes:			
Domestic	$28,327	$13,934	$31,748
Foreign	8,069	11,381	11,070
Total income before income taxes	$36,396	$25,315	$42,818
Income tax expense:			
Current income tax expense:			
Domestic	$1,912	$6,505	$3,556
Foreign	2,777	2,080	2,736
Total current	$4,689	$8,585	$6,292
Deferred income tax expense (benefit):			
Domestic	$19,935	$(8,842)	$4,565
Foreign	321	(168)	(197)
Total deferred	$20,256	$(9,010)	$4,368
Total income tax expense (benefit)	$24,945	$(425)	$10,660

The domestic deferred tax expense of $19.9 million consists of $5.0 million relating to the TCJA reduction of the U.S. corporate income tax rate from 35 percent to 21 percent. The Company's U.S. deferred tax assets and liabilities were remeasured to reflect this tax rate change.

A reconciliation of the U.S. federal statutory income tax rate to the Company's effective income tax rate is as follows:

	2017	2016	2015
U.S. federal statutory rate	35.0 %	35.0 %	35.0 %
State and local income taxes, net of federal tax effect	2.3	(0.4)	1.7
Effect of excess of percentage depletion over cost depletion	(10.0)	(10.6)	(7.1)
Manufacturing production deduction	(0.8)	(3.3)	(0.9)
Foreign rate differential	(3.4)	(5.9)	(4.2)
Tax Cuts and Jobs Act impact	47.1	—	—
Research and development tax credit	(2.6)	(6.6)	(1.6)
Foreign tax credit	(1.1)	(28.1)	(4.8)
Foreign repatriation	1.3	13.7	5.9
Incremental fixed asset basis	(3.4)	—	—
Adjustment to unrecognized tax benefits	2.8	3.2	(1.1)
Stock compensation - excess tax benefits	(1.9)	—	—
Valuation allowance	2.4	0.1	(0.9)
Other items	0.8	1.2	2.9
Effective tax rate	68.5 %	(1.7)%	24.9 %

Pursuant to the TCJA, the Company remeasured certain deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21%. The Company continues to analyze and interpret the Act, which could

potentially affect the measurement of these balances or potentially give rise to new deferred tax amounts. The provisional amount recorded related to the remeasurement of our deferred tax balance was $5.0 million.

Due to the adoption of ASU 2016-09 in 2017, all excess tax benefits and deficiencies related to share-based payment transactions are recognized as income tax expense in the Company's Consolidated Statements of Income. This will result in volatility in the Company's effective tax rate.

The Company had domestic and foreign income tax payments of $8.1 million, $3.0 million, and $6.0 million in 2017, 2016, and 2015, respectively.

Deferred tax assets and (liabilities) are determined based on temporary differences between the financial reporting and tax basis of assets and liabilities. Deferred tax assets and (liabilities) recorded in the Consolidated Balance Sheets consist of the following:

	December 31,	
(Thousands)	2017	2016
Asset (liability)		
Post-employment benefits other than pensions	$2,787	$4,808
Other reserves	4,223	9,333
Deferred compensation	5,054	10,243
Environmental reserves	1,452	2,231
Inventory	4,636	5,876
Pensions	14,307	23,540
Alternative minimum tax credit	—	1,390
Net operating loss and credit carryforwards	6,374	5,607
Research and development tax credit carryforward	2,466	627
Foreign tax credit carryforward	9,481	4,545
Subtotal	50,780	68,200
Valuation allowance	(16,246)	(3,990)
Total deferred tax assets	34,534	64,210
Depreciation	(10,250)	(13,064)
Amortization	(2,900)	(5,073)
Capitalized interest expense	(112)	(242)
Mine development	(3,621)	(6,683)
Derivative instruments and hedging activities	(817)	(13)
Total deferred tax liabilities	(17,700)	(25,075)
Net deferred tax asset	$16,834	$39,135

The Company had deferred income tax assets offset with a valuation allowance for certain state and foreign net operating losses, the foreign tax credit, and state investment tax credit carryforwards. As of December 31, 2017, the Company recorded a valuation allowance of $9.5 million related to foreign tax credits that are not likely to be realized as a result of the TCJA, which is the primary incremental amount in 2017. The Company intends to maintain a valuation allowance on these deferred tax assets until a realization event occurs to support reversal of all or a portion of the allowance.

At December 31, 2017, for income tax purposes, the Company had foreign net operating loss carryforwards of $6.9 million that do not expire, and $8.6 million that expire in calendar years 2018 through 2025, of which $1.0 million expires within the next twelve months. The Company also had state net operating loss carryforwards of $21.7 million that expire in calendar years 2018 through 2037 and state tax credits of $3.2 million that expire in calendar years 2018 through 2033. A valuation allowance of $6.7 million has been provided against certain foreign and state loss

carryforwards and state tax credits due to uncertainty of their realization.
The Company has an alternative minimum tax credit of $1.9 million that is fully refundable by 2022, research and development tax credits of $2.5 million that expire in calendar year 2036, and foreign tax credits of $9.5 million, comprised of $3.7 million, $2.1 million, and $3.7 million that expire in calendar years 2025, 2026, and 2027, respectively.

The Company files income tax returns in the U.S. federal jurisdiction, and in various state, local, and foreign jurisdictions. With limited exceptions, the Company is no longer subject to U.S. federal examinations for years before 2015, state and local examinations for years before 2012, and foreign examinations for tax years before 2010.

A reconciliation of the Company's unrecognized tax benefits for the year-to-date periods ending December 31, 2017 and 2016 is as follows:

(Thousands)	2017	2016
Balance at January 1	$2,048	$1,285
Additions to tax provisions related to the current year	163	35
Additions to tax positions related to prior years	1,210	878
Reduction to tax positions related to prior years	(121)	—
Lapses on statutes of limitations	(356)	(150)
Balance at December 31	$2,944	$2,048

At December 31, 2017, the Company had $2.9 million of unrecognized tax benefits, of which $2.4 million would affect the Company's effective tax rate if recognized. It is reasonably possible that the amount of unrecognized tax benefits will change in the next twelve months; however, an estimate of the range of reasonably possible adjustments cannot be made.

The Company recognizes interest and penalties related to unrecognized tax benefits on the income tax expense line in the accompanying Consolidated Statements of Income. Accrued interest and penalties are included on the related tax liability line in the Consolidated Balance Sheets. The amount of interest and penalties, net of related federal tax benefits, recognized in earnings was immaterial during 2017, 2016, and 2015. As of December 31, 2017 and 2016, accrued interest and penalties, net of related federal tax benefits, were immaterial.

Note H — Earnings Per Share

The following table sets forth the computation of basic and diluted EPS:

(Thousands except per share amounts)	2017	2016	2015
Numerator for basic and diluted EPS:			
Net income	$11,451	$25,740	$32,158
Denominator:			
Denominator for basic EPS:			
Weighted-average shares outstanding	20,027	19,983	20,097
Effect of dilutive securities:			
Stock appreciation rights	174	74	156
Restricted stock units	96	88	91
Performance-based restricted stock units	118	68	58
Diluted potential common shares	388	230	305
Denominator for diluted EPS:			
Adjusted weighted-average shares outstanding	20,415	20,213	20,402
Basic EPS	$0.57	$1.29	$1.60
Diluted EPS	$0.56	$1.27	$1.58

SARs totaling 124,319 in 2017, 818,268 in 2016, and 376,550 in 2015 were excluded from the diluted EPS calculation as their effect would have been anti-dilutive.

Note I — Inventories

Inventories in the Consolidated Balance Sheets are summarized as follows:

	December 31,	
(Thousands)	2017	2016
Raw materials and supplies	$42,958	$36,233
Work in process	187,719	169,327
Finished goods	34,418	38,147
Subtotal	265,095	243,707
Less: LIFO reserve balance	44,743	42,842

Inventories	$220,352	$200,865

The liquidation of LIFO inventory layers reduced cost of sales by $0.8 million in 2017, $4.1 million in 2016, and $6.1 million in 2015.

Note J — Property, Plant, and Equipment

Property, plant, and equipment on the Consolidated Balance Sheets is summarized as follows:

	December 31,	
(Thousands)	2017	2016
Land	$4,874	$5,548
Buildings	137,196	135,729
Machinery and equipment	626,186	609,894
Software	40,575	39,550
Construction in progress	29,963	19,111
Allowances for depreciation	(615,134)	(593,531)
Subtotal	223,660	216,301
Capital leases	10,912	10,913
Allowances for depreciation	(2,741)	(2,492)
Subtotal	8,171	8,421
Mineral resources	4,979	4,979
Mine development	37,103	35,543
Allowances for amortization and depletion	(18,335)	(12,613)
Subtotal	23,747	27,909
Property, plant, and equipment — net	$255,578	$252,631

The Company received $63.5 million from the U.S. Department of Defense (DoD), in previous periods, for reimbursement of the DoD's share of the cost of equipment. This amount was recorded in property, plant, and equipment and the reimbursements are reflected in Unearned income on the Consolidated Balance Sheets. The equipment was placed in service during 2012, and its full cost is being depreciated in accordance with Company policy. The unearned income liability is being reduced ratably with the depreciation expense recorded over the life of the equipment.

Unearned income was reduced by $4.5 million and $4.6 million in 2017 and 2016, respectively, and credited to cost of sales in the Consolidated Statements of Income, offsetting the impact of the depreciation expense on the associated equipment on the Company's cost of sales and gross margin.

We recorded depreciation and depletion expense of $38.1 million in 2017, $41.2 million in 2016, and $32.8 million in 2015. The expense is net of the above-referenced reductions in the unearned income liability. Depreciation, depletion, and amortization as shown on the Consolidated Statement of Cash Flows is also net of the reduction in the unearned income liability in 2017, 2016, and 2015. The net book value of capitalized software was $8.3 million and $9.8 million at December 31, 2017 and December 31, 2016, respectively. Depreciation expense related to software was $2.4 million in 2017, $2.4 million in 2016, and $2.3 million in 2015.

Note K — Intangible Assets and Goodwill

Intangible Assets

The cost and accumulated amortization of intangible assets subject to amortization as of December 31, 2017 and 2016, is as follows:

	2017		2016	
(Thousands)	Gross Carrying Amount	Accumulated Amortization	Gross Carrying Amount	Accumulated Amortization
Customer relationships	$40,751	$ (36,949)	$38,428	$ (33,823)
Technology	13,467	(11,495)	12,092	(10,516)
Licenses and other	4,519	(2,672)	4,519	(2,441)
Total	$58,737	$ (51,116)	$55,039	$ (46,780)

During 2017, the Company acquired $2.3 million in customer relationships and $1.4 million in technology intangible assets, with useful lives of fifteen and three years, respectively. During 2016, the Company acquired $1.7 million in finite-lived intangible assets, consisting primarily of licenses and other, with a weighted-average life of nine years.

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The aggregate amortization expense relating to intangible assets for the year ended December 31, 2017 and estimated amortization expense for each of the five succeeding years is as follows:

(Thousands)	Amortization Expense
2017	$ 4,629
2018	1,932
2019	1,089
2020	642
2021	620
2022	620

Intangible assets also includes deferred financing costs relating to the Company's revolving credit and consignments lines of $2.2 million and $2.8 million at December 31, 2017 and 2016, respectively.

Goodwill

Goodwill arises from the purchase price for acquired businesses exceeding the fair value of tangible and intangible assets acquired less assumed liabilities. In 2017, the Company acquired HTB for total consideration of $16.5 million and recorded goodwill of $3.6 million. HTB is included in the Advanced Materials segment. In 2016, the Company acquired one business for total consideration of $2.0 million. The business acquired is included in the Precision Coatings segment. The Company recorded $0.3 million of goodwill related to this acquisition.

Goodwill is reviewed annually for impairment or more frequently if impairment indicators arise. The Company conducts its annual goodwill impairment assessment as of first day of the fourth quarter, or more frequently under certain circumstances. Goodwill is assigned to the reporting unit, which is the operating segment level or one level below the operating segment. The balance of goodwill at December 31, 2017 and 2016 was $90.7 million and $87.0 million, respectively, and assigned to the following segments:

(Thousands)	2017	2016
Performance Alloys and Composites	$1,899	$1,899
Advanced Materials	50,296	46,570
Precision Coatings	38,482	38,481
Total	$90,677	$86,950

The results of the Company's 2017, 2016, and 2015 goodwill impairment assessments indicated that no goodwill impairment existed.

Note L — Debt

Long-term debt in the Consolidated Balance Sheets is summarized as follows:

	December 31,	
(Thousands)	2017	2016
Revolving credit agreement	$—	$—
Fixed rate industrial development revenue bonds payable in annual installments through 2021	3,818	4,615
Total debt outstanding	3,818	4,615
Current portion of long-term debt	(777)	(733)
Gross long-term debt	3,041	3,882
Unamortized deferred financing fees	(214)	(277)
Long-term debt	$2,827	$3,605

Maturities on long-term debt instruments as of December 31, 2017 are as follows:

(Thousands)	
2018	$777
2019	823
2020	868
2021	1,350
2022	—
Thereafter	—
Total	$3,818

In 2015, the Company entered into an Amended and Restated Credit Agreement (Credit Agreement) that matures in 2020 and provides for a $375.0 million revolving credit facility comprised of sub-facilities for revolving loans, swing-line loans, letters of credit, and foreign borrowings. The Credit Agreement provides the Company and its subsidiaries with additional capacity to enter into facilities for the consignment, borrowing, or leasing of precious metals and copper, and provides enhanced flexibility to finance acquisitions and other strategic initiatives.The Credit Agreement also provides for an uncommitted incremental facility whereby, under certain conditions, the Company may be able to borrow additional term loans in an aggregate amount not to exceed $300.0 million. The Credit Agreement is secured by substantially all of the assets of the Company and its direct subsidiaries, with the exception of non-mining real property and certain other assets. The Credit Agreement allows the Company to borrow money at a premium over LIBOR or prime rate and at varying maturities. The premium resets quarterly according to the terms and conditions available under the Credit Agreement.

The Credit Agreement includes restrictive covenants relating to restrictions on additional indebtedness, acquisitions, dividends, and stock repurchases. In addition, the Credit Agreement includes covenants subject to a maximum leverage ratio and a minimum fixed charge coverage ratio. The Company was in compliance with all of its debt covenants as of December 31, 2017 and December 31, 2016.

At December 31, 2017 and 2016, respectively, there was $27.3 million and $28.5 million outstanding against the letters of credit sub-facility. The Company pays a variable commitment fee that may reset quarterly (0.20% as of December 31, 2017) of the available and unborrowed amounts under the revolving credit line.

The following table summarizes the Company’s short-term lines of credit.

	December 31, 2017			December 31, 2016		
(Thousands)	Total	Outstanding	Available	Total	Outstanding	Available
Domestic	$347,746	$ —	$347,746	$346,522	$ —	$346,522
Foreign	6,182	—	6,182	8,907	—	8,907
Total	$353,928	$ —	$353,928	$355,429	$ —	$355,429

While the available borrowings under the individual existing credit lines total $353.9 million, the covenants in the domestic Credit Agreement restrict the aggregate available borrowings to $254.8 million as of December 31, 2017. The domestic line is committed and includes all sub-facilities in the $375.0 million maximum borrowing under the Credit Agreement. The Company has various foreign lines of credit all of which are uncommitted, unsecured, and renewed annually. The average interest rate on short-term debt was 4.90% at both December 31, 2017 and 2016.

In April 2011, the Company entered into an agreement with the Toledo-Lucas County Port Authority and the Dayton–Montgomery County Port Authority in Ohio to co-issue $8.0 million in taxable development revenue bonds, with a fixed amortization term that will mature in 2021. The interest rate on these bonds was fixed at 4.90%, and the unamortized balance of the bonds was $3.8 million at December 31, 2017.

In November 2016, the Company repaid the entire $8.3 million of variable rate industrial revenue bonds with the Lorain Port Authority in Ohio, at maturity.

Note M — Leasing Arrangements

The Company leases warehouse and manufacturing real estate, and manufacturing and computer equipment under operating leases with terms ranging up to 25 years. Operating lease expense amounted to $9.3 million, $8.6 million, and $8.3 million during 2017, 2016, and 2015, respectively. The future estimated minimum payments under capital leases and non-cancelable operating leases with initial lease terms in excess of one year at December 31, 2017, are as follows:

(Thousands)	Capital Leases	Operating Leases
2018	$2,172	$ 8,096
2019	2,172	6,297
2020	2,172	5,471
2021	2,172	4,605
2022	2,172	5,636
2023 and thereafter	22,609	3,281
Total minimum lease payments	33,469	$ 33,386
Amounts representing interest	20,661	
Present value of net minimum lease payments	$12,808	

During 2017, in connection with the HTB acquisition, the Company entered into an agreement to relocate the German operations from Hanau, Germany to a new, leased facility in Alzenau, Germany. In order for this manufacturing facility to meet the Company's operating specifications, both the landlord and the Company are making structural improvements to the facility, and as a result, the Company has concluded that it is the deemed owner of the building for accounting purposes only during the construction period. Accordingly, as of December 31, 2017, the Company recorded an asset of $12 million in Property, Plant, and Equipment as construction in progress, representing its estimate of construction costs incurred to date, and a corresponding liability, recorded as a component of Other long-term liabilities. The future estimated minimum payments related to this lease are included in the above table under the caption of Capital Leases.

Note N — Pensions and Other Post-Employment Benefits

The obligation and funded status of the Company's pension and other post-employment benefit plans are shown below. The Pension Benefits column aggregates defined benefit pension plans in the U.S., Germany, and England, and the U.S. supplemental retirement plans. The Other Benefits column includes the domestic retiree medical and life insurance plan.

	Pension Benefits		Other Benefits	
(Thousands)	2017	2016	2017	2016
Change in benefit obligation				
Benefit obligation at beginning of year	$276,801	$259,957	$14,334	$15,200
Acquisition	7,645	—	—	—
Service cost	8,760	8,060	91	105
Interest cost	9,949	10,820	398	562
Plan amendments	3,804	—	—	—
Actuarial loss (gain)	18,549	11,833	444	(191)
Benefit payments from fund	(13,072)	(10,509)	—	—
Benefit payments directly by Company	(387)	(1,116)	(1,107)	(1,362)
Expenses paid from assets	(1,133)	(611)	—	—
Foreign currency exchange rate changes	2,812	(1,633)	6	20
Benefit obligation at end of year	313,728	276,801	14,166	14,334
Change in plan assets				
Fair value of plan assets at beginning of year	199,992	184,750	—	—
Acquisition	2,353	—	—	—
Actual return on plan assets	29,428	11,575	—	—
Employer contributions	16,338	16,136	—	—
Employee contributions	162	—	—	—
Benefit payments from fund	(13,072)	(10,509)	—	—
Expenses paid from assets	(1,133)	(611)	—	—
Foreign currency exchange rate changes	908	(1,349)	—	—
Fair value of plan assets at end of year	234,976	199,992	—	—
Funded status at end of year	$(78,752)	$(76,809)	$(14,166)	$(14,334)
Amounts recognized in the Consolidated Balance Sheets consist of:				
Other assets	$1,797	$1,148	$—	$—
Other liabilities and accrued items	(2,490)	(2,538)	(1,412)	(1,392)
Retirement and post-employment benefits	(78,059)	(75,419)	(12,754)	(12,942)
	$(78,752)	$(76,809)	$(14,166)	$(14,334)
Amounts recognized in other comprehensive income (before tax) consist of:				
Net actuarial loss (gain)	$119,114	$121,719	$24	$(420)
Net prior service (credit) cost	3,688	(390)	(8,044)	(9,541)
	$122,802	$121,329	$(8,020)	$(9,961)
Amortizations expected to be recognized during next fiscal year (before tax):				
Amortization of net loss	$8,077	$6,591	$—	$—
Amortization of prior service credit	(123)	(485)	(1,497)	(1,497)
	$7,954	$6,106	$(1,497)	$(1,497)
Additional information				
Accumulated benefit obligation for all defined benefit pension plans	$302,942	$265,159	$—	$—

For defined benefit pension plans with benefit obligations in excess of plan assets:				
Aggregate benefit obligation	304,814	271,199	—	—
Aggregate fair value of plan assets	227,115	193,242	—	—
For defined benefit pension plans with accumulated benefit obligations in excess of plan assets:				
Aggregate accumulated benefit obligation	296,878	259,982	—	—
Aggregate fair value of plan assets	227,115	193,242	—	—

Components of net benefit cost and other amounts recognized in other comprehensive income (OCI)

(Thousands)	Pension Benefits 2017	2016	2015	Other Benefits 2017	2016	2015
Net benefit cost						
Service cost	$8,760	$8,060	$9,195	$91	$105	$115
Interest cost	9,949	10,820	10,446	398	562	554
Expected return on plan assets	(14,933)	(14,241)	(13,611)	—	—	—
Amortization of prior service cost (benefit)	(274)	(460)	(450)	(1,497)	(1,497)	(1,497)
Recognized net actuarial loss	6,636	6,005	7,537	—	—	—
Net periodic cost	10,138	10,184	13,117	(1,008)	(830)	(828)
Settlements	—	120	—	—	—	—
Total net benefit cost	$10,138	$10,304	$13,117	$(1,008)	$(830)	$(828)

(Thousands)	Pension Benefits 2017	2016	2015	Other Benefits 2017	2016	2015
Change in other comprehensive income						
OCI at beginning of year	$121,329	$112,518	$121,341	$(9,961)	$(11,267)	$(12,261)
Increase (decrease) in OCI:						
Recognized during year — prior service cost (credit)	274	460	450	1,497	1,497	1,497
Recognized during year — net actuarial (losses) gains	(6,636)	(6,005)	(7,537)	—	—	—
Occurring during year — prior service cost	3,804	—	—	—	—	—
Occurring during year — net actuarial losses (gains)	4,055	14,279	(1,697)	444	(191)	(503)
Other adjustments	—	120	—	—	—	—
Foreign currency exchange rate changes	(24)	(43)	(39)	—	—	—
OCI at end of year	$122,802	$121,329	$112,518	$(8,020)	$(9,961)	$(11,267)

Summary of key valuation assumptions

In determining the projected benefit obligation and the net benefit cost, as of a December 31 measurement date, the Company used the following weighted-average assumptions:

	Pension Benefits 2017	2016	2015	Other Benefits 2017	2016	2015
Weighted-average assumptions used to determine benefit obligations at fiscal year end						
Discount rate	3.53%	4.02%	4.27%	3.43%	3.68%	3.88%
Rate of compensation increase	3.93%	4.04%	4.05%	4.00%	4.00%	4.00%
Weighted-average assumptions used to determine net cost for the fiscal year						
Discount rate	3.93%	4.22%	4.00%	3.68%	3.88%	3.50%
Expected long-term return on plan assets	6.89%	6.90%	7.15%	N/A	N/A	N/A
Rate of compensation increase	3.91%	3.93%	3.95%	4.00%	4.00%	4.00%

Discount Rate. The discount rate used to determine the present value of the projected and accumulated benefit obligation at the end of each year is established based upon the available market rates for high quality, fixed income investments whose maturities match the plan's projected cash flows.
Beginning in 2017, the Company has elected to use a spot-rate approach to estimate the service and interest cost components of net periodic benefit cost for its defined benefit pension plans. The spot-rate approach applies separate discount rates for each projected benefit payment in the calculation. Historically, the Company used a weighted-average approach to determine the service and interest cost components. The change was accounted for as a change in estimate and, accordingly, was accounted for prospectively starting in 2017. The reductions in service and interest costs for 2017 associated with this change in estimate totaled approximately $1.0 million.
Expected Long-Term Return on Plan Assets. Management establishes the domestic expected long-term rate of return assumption by reviewing historical trends and analyzing the current and projected market conditions in relation to the plan's asset allocation and risk management objectives. Consideration is given to both recent plan asset performance as well as plan asset performance over various long-term periods of time, with an emphasis on the assumption being a prospective, long-term rate of return. Management consults with and considers the opinions of its outside investment advisers and actuaries when establishing the rate and reviews assumptions with the Audit Committee of the Board of Directors.
Rate of Compensation Increase. The rate of compensation increase assumption was 4.0% in both 2017 and 2016 for the domestic defined benefit pension plan and the domestic retiree medical plan.
Assumptions for the defined benefit pension plans in Germany and England are determined separately from the U.S. plan assumptions, based on historical trends and current and projected market conditions in Germany and England. The plan in Germany is unfunded.

Assumed health care trend rates at fiscal year end	2017	2016
Health care trend rate assumed for next year	6.75%	7.00%
Rate that the trend rate gradually declines to (ultimate trend rate)	5.00%	5.00%
Year that the rate reaches the ultimate trend rate	2025	2025

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

	1-Percentage-Point Increase		1-Percentage-Point Decrease	
(Thousands)	2017	2016	2017	2016
Effect on total of service and interest cost components	$ 8	$ 13	$ (8)	$ (12)
Effect on post-employment benefit obligation	212	259	(198)	(241)

Plan Assets
The following tables present the fair values of the Company's defined benefit pension plan assets as of December 31, 2017 and 2016 by asset category. The Company has some investments that are valued using net asset value (NAV) as the practical expedient and have not been classified in the fair value hierarchy. Refer to Note Q of the Consolidated Financial Statements for definitions of the fair value hierarchy.

	December 31, 2017			
(Thousands)	Total	Level 1	Level 2	Level 3
Cash	$10,604	$10,604	$ —	$ —
Equity securities:				
U.S. (a)	54,376	53,659	717	—
International (b)	39,010	35,016	3,994	—
Emerging markets (c)	15,843	15,586	257	—
Fixed-income securities:				
Intermediate-term bonds (d)	34,187	25,653	8,534	—
Short-term bonds (e)	612	—	612	—
Global bonds (f)	7,492	4,986	2,506	—
Other types of investments:				
Real estate fund (g)	6,617	6,284	333	—
Alternative strategies (h)	9,948	9,893	55	—
Accrued interest and dividends	114	114	—	—
Total	178,803	161,795	17,008	—
Investments measured at NAV:				
Pooled investment fund (i)	21,378			
Multi-strategy hedge funds (j)	3,970			
Common/Collective trusts (k)	8,942			
Intermediate-term bonds (d)	21,771			
Private equity funds	112			
Total assets at fair value	$234,976			

	December 31, 2016			
(Thousands)	Total	Level 1	Level 2	Level 3
Cash	$10,124	$10,124	$ —	$ —
Equity securities:				
U.S. (a)	53,983	53,358	625	—
International (b)	30,732	27,304	3,428	—
Emerging markets (c)	11,792	11,562	230	—
Fixed-income securities:				
Intermediate-term bonds (d)	48,138	29,429	18,709	—
Short-term bonds (e)	3,150	—	3,150	—
Global bonds (f)	2,121	—	2,121	—
Other types of investments:				
Real estate fund (g)	5,929	5,639	290	—
Alternative strategies (h)	9,036	8,981	55	—
Accrued interest and dividends	107	107	—	—
Total	175,112	146,504	28,608	—
Investments measured at NAV:				
Pooled investment fund (i)	20,418			
Multi-strategy hedge funds (j)	4,320			
Private equity funds	142			
Total assets at fair value	$199,992			

(a) Mutual funds that invest in various sectors of the U.S. market.

(b) Mutual funds that invest in non-U.S. companies primarily in developed countries that are generally considered to be value stocks.

(c) Mutual funds that invest in non-U.S. companies in emerging market countries.

(d) Includes a mutual fund that employs a value-oriented approach to fixed income investment management and a mutual fund that invests primarily in investment-grade debt securities.

(e) Includes a mutual fund that seeks a market rate of return for a fixed-income portfolio with low relative volatility of returns, investing generally in U.S. and foreign debt securities maturing in five years or less.
(f) Mutual funds that invest in domestic and foreign sovereign securities, fixed income securities, mortgage-backed and asset-backed bonds, convertible bonds, high-yield bonds, and emerging market bonds.
(g) Includes a mutual fund that typically invests at least 80% of its assets in equity and debt securities of companies in the real estate industry or related industries or in companies which own significant real estate assets at the time of investment.
(h) Includes a mutual fund that tactically allocates assets to global equity, fixed income, and alternative strategies.
(i) Includes a fund that invests in a broad portfolio of hedge funds.
(j) Includes a hedge fund that employs multiple strategies to multiple asset classes with low correlations. Capital may be withdrawn from the multi-strategy hedge fund partnership on a monthly basis with a ten-day notice period.
(k) Common/collective trust is valued based on the NAV per unit of the funds. The common/collective trust's investment objective is to invest in fixed income and equity securities to provide income and/or total investment return through investments in U.S. and non-U.S. securities. The common/collective trust requires that the plan provide a 30-day notice to redeem any number of units from the trust.

The Company's domestic defined benefit pension plan investment strategy, as approved by the Governance and Organization Committee of the Board of Directors, is to employ an allocation of investments that will generate returns equal to or better than the projected long-term growth of pension liabilities so that the plan will be self-funding. The return objective is to maximize investment return to achieve and maintain a 100% funded status over time, taking into consideration required cash contributions. The allocation of investments is designed to maximize the advantages of diversification while mitigating the risk and overall portfolio volatility to achieve the return objective. Risk is defined as the annual variability in value and is measured in terms of the standard deviation of investment return. Under the Company's investment policies, allowable investments include domestic equities, international equities, fixed income securities, cash equivalents, and alternative securities (which include real estate, private venture capital investments, hedge funds, and tactical asset allocation). Ranges, in terms of a percentage of the total assets, are established for each allowable class of security. Derivatives may be used to hedge an existing security or as a risk reduction strategy. Current asset allocation guidelines are to invest 30% to 60% in equity securities, 20% to 50% in fixed income securities and cash, and up to 25% in alternative securities. Management reviews the asset allocation on a quarterly or more frequent basis and makes revisions as deemed necessary.
None of the plan assets noted above are invested in the Company's common stock.

Cash Flows

Employer Contributions. The Company expects to contribute $21.0 million to its domestic defined benefit pension plan and $1.4 million to its other benefit plans in 2018.

Effective in 2016, all plan participants with an accrued benefit may elect an immediate payout in lieu of their future monthly annuity if the lump sum amount does not exceed $100,000.
Estimated Future Benefit Payments. The following benefit payments, which reflect expected future service, as appropriate, are expected to be paid:

(Thousands)	Pension Benefits	Other Benefits	
		Gross Benefit Payment	Net of Medicare Part D Subsidy
2018	$ 13,820	$ 1,412	$ 1,390
2019	12,827	1,478	1,458
2020	13,048	1,507	1,489
2021	13,681	1,426	1,410

2022	15,156	1,257	1,244
2023 through 2027	83,342	4,953	4,909

Other Benefit Plans

In addition to the plans shown above, the Company also has certain foreign subsidiaries with accrued unfunded pension and other post-employment arrangements. The liability for these arrangements was $2.1 million at December 31, 2017 and $2.4 million at December 31, 2016, and was included in retirement and post-employment benefits in the Consolidated Balance Sheets.

The Company also sponsors defined contribution plans available to substantially all U.S. employees. The Company's annual defined contribution expense, including the expense for the enhanced defined contribution plan, was $4.5 million in 2017, $3.6 million in 2016, and $3.1 million in 2015.

Note O — Accumulated Other Comprehensive Income

Changes in the components of accumulated other comprehensive income, including amounts reclassified out, for 2017, 2016, and 2015, and the balances in accumulated other comprehensive income as of December 31, 2017, 2016, and 2015 are as follows:

(Thousands)	Gains and Losses On Cash Flow Hedges Foreign Currency	Precious Metals	Total	Pension and Post-Employment Benefits	Foreign Currency Translation	Total
Balance at December 31, 2014	$3,578	$—	$3,578	$(81,662)	$(4,153)	$(82,237)
Other comprehensive income (loss) before reclassifications	2,995	—	2,995	2,249	(1,335)	3,909
Amounts reclassified from accumulated other comprehensive income	(6,169)	—	(6,169)	5,580	—	(589)
Other comprehensive income (loss) before tax	(3,174)	—	(3,174)	7,829	(1,335)	3,320
Deferred taxes on current period activity	(1,175)	—	(1,175)	2,963	—	1,788
Other comprehensive income (loss) after tax	(1,999)	—	(1,999)	4,866	(1,335)	1,532
Balance at December 31, 2015	$1,579	$—	$1,579	$(76,796)	$(5,488)	$(80,705)
Balance at December 31, 2015	$1,579	$—	$1,579	$(76,796)	$(5,488)	$(80,705)
Other comprehensive income (loss) before reclassifications	(377)	—	(377)	(14,165)	(172)	(14,714)
Amounts reclassified from accumulated other comprehensive income	784	—	784	4,048	—	4,832
Other comprehensive income (loss) before tax	407	—	407	(10,117)	(172)	(9,882)
Deferred taxes on current period activity	149	—	149	(4,555)	—	(4,406)
Other comprehensive income (loss) after tax	258	—	258	(5,562)	(172)	(5,476)
Balance at December 31, 2016	$1,837	$—	$1,837	$(82,358)	$(5,660)	$(86,181)
Balance at December 31, 2016	$1,837	$—	$1,837	$(82,358)	$(5,660)	$(86,181)
Other comprehensive income (loss) before reclassifications	(1,180)	(463)	(1,643)	(8,279)	1,552	(8,370)
Amounts reclassified from accumulated other comprehensive income	632	208	840	4,865	—	5,705
Other comprehensive income (loss) before tax	(548)	(255)	(803)	(3,414)	1,552	(2,665)
Deferred taxes on current period activity	330	(59)	271	13,820	—	14,091
Other comprehensive income (loss) after tax	(878)	(196)	(1,074)	(17,234)	1,552	(16,756)
Balance at December 31, 2017	$959	$(196)	$763	$(99,592)	$(4,108)	$(102,937)

Reclassifications from accumulated other comprehensive income of gains and losses on foreign currency cash flow hedges are recorded in Other-net in the Consolidated Statements of Income while gains and losses on precious metal cash flow hedges are recorded in Cost of sales in the Consolidated Statements of Income. Refer to Note Q for additional details on cash flow hedges.

Reclassifications from accumulated other comprehensive income for pension and post-employment benefits are included in the computation of the net periodic pension and post-employment benefit expense. Refer to Note N for additional details on pension and other post-employment expenses.

Note P — Stock-based Compensation

Stock incentive plans (the 2006 Stock Incentive Plan and the 2006 Non-employee Director Equity Plan) were approved at the May 2006 annual meeting of shareholders. These plans authorize the granting of option rights, stock appreciation rights (SARs), performance-restricted shares, performance shares, performance units, and restricted shares. The 2006 Stock Incentive Plan and the 2006 Non-employee Director Equity Plan were amended to, among other things, add additional shares to the plans. These amendments were last approved by shareholders at the May 2017 annual meeting.

Stock-based compensation expense, which includes awards settled in shares and in cash and is recognized as a component of SG&A expense, was $7.7 million, $6.7 million, and $6.2 million in 2017, 2016, and 2015, respectively. The Company derives a tax deduction measured by the excess of the market value over the grant price at the date stock-based awards vest or are exercised. The Company recognized $2.0 million and $0.4 million of tax benefits in 2017 and 2015, respectively, compared to less than $0.1 million of tax expense in 2016 relating to the issuance of common stock for the exercise/vesting of equity awards.

The following sections provide information on awards settled in shares.

SARs. The Company grants SARs to certain employees. Upon exercise of vested SARs, the participant will receive a number of shares of common stock equal to the spread (the difference between the market price of the Company's common shares at the time of exercise and the strike price established on the grant date) divided by the common share price. The strike price of the SARs is equal to the market value of the Company's common shares on the day of the grant. The number of SARs available to be issued is established by plans approved by the shareholders. The vesting period and the life of the SARs are established at the time of grant. The exercise of the SARs is generally satisfied by the issuance of treasury shares. The SARs generally vest three years from the date of grant. SARs granted prior to 2011 expire in ten years, while the SARs granted in 2011 and later expire in seven years.

The following table summarizes the Company's SARs activity during 2017:

(Shares in thousands)	Number of SARs	Weighted-average Exercise Price Per Share	Aggregate Intrinsic Value (thousands)	Weighted-average Remaining Term (Years)
Outstanding at December 31, 2016	1,142	$ 29.58		
Granted	97	35.26		
Exercised	(560)	28.19		
Cancelled	(63)	36.90		
Outstanding at December 31, 2017	616	30.97	$ 10,858	4.1
Vested and expected to vest as of December 31, 2017	616	30.97	10,858	4.1
Exercisable at December 31, 2017	190	30.53	3,441	2.1

A summary of the status and changes of shares subject to SARs and the related average price per share follows:

(Shares in thousands)	Number of SARs	Weighted-average Grant Date Fair Value
Nonvested as of December 31, 2016	500	$ 10.82
Granted	97	10.89
Vested	(132)	12.48
Cancelled	(39)	10.35
Nonvested as of December 31, 2017	426	$ 10.54

As of December 31, 2017, $0.9 million of expense with respect to non-vested SARs has yet to be recognized as expense over a weighted-average period of approximately 20 months. The total fair value of shares vested during each of 2017 and 2016 was $1.7 million, compared to $2.7 million in 2015.

The weighted-average grant date fair value for 2017, 2016, and 2015 was $10.89, $8.07, and $13.27, respectively. The fair value will be amortized to compensation cost on a straight-line basis over the three-year vesting period, or earlier if the employee is retirement eligible as defined in the Plan. Stock-based compensation expense relating to SARs was $1.4 million in 2017, $0.9 million in 2016, $2.0 million in 2015.

The fair value of the SARs was estimated on the grant date using the Black-Scholes pricing model with the following assumptions:

	2017	2016	2015
Risk-free interest rate	1.92%	1.25%	1.47%
Dividend yield	1.1 %	1.4 %	0.9 %
Volatility	34.0%	38.0%	42.8%
Expected lives (in years)	5.6	5.7	5.0

The risk-free rate of return was based on U.S. Treasury yields with a maturity equal to the expected life of the award. The dividend yield was based on the Company's historical dividend rate and stock price. The expected volatility of stock was derived by referring to changes in the Company's historical common stock prices over a time-frame similar to the expected life of the award. In addition to considering the vesting period and contractual term of the award for the expected life assumption, the Company analyzes actual historical exercise experience for previously granted awards.

Restricted Stock Units. The Company may grant restricted stock units to employees and non-employee directors of the Company. These units are restricted and vest over a designated period of time as defined at the date of the grant and are forfeited should the holder's employment terminate during the restriction period. The fair market value of the restricted shares is determined on the date of the grant and is amortized over the restriction period. The restriction period is typically three years unless the recipient is retirement eligible.

The fair value of the restricted stock units settled in stock is based on the closing stock price on the date of grant. The weighted-average grant date fair value for 2017, 2016, and 2015 was $34.95, $25.96, and $37.17, respectively.

Cash-settled RSUs are accounted for as liability-based compensation awards and adjusted based on the closing price of Materion's common stock over the vesting period of three years.

Stock-based compensation expense relating to restricted stock units was $2.1 million in 2017, $1.3 million in 2016, and $2.1 million in 2015. The unamortized compensation cost on the outstanding restricted stock was $1.2 million as of December 31, 2017 and is expected to be amortized over a weighted-average period of 20 months. The total fair value of shares vested during 2017, 2016, and 2015 was $2.0 million, $1.9 million, and $2.3 million.

The following table summarizes the stock-settled restricted stock unit activity during 2017:

(Shares in thousands)	Number of Shares	Weighted-average Grant Date Fair Value
Outstanding at December 31, 2016	141	$ 30.54
Granted	62	34.95
Vested	(64)	30.75
Forfeited	(2)	30.36
Outstanding at December 31, 2017	137	$ 32.45

Long-term Incentive Plans. Under long-term incentive compensation plans, executive officers and selected other employees receive restricted stock unit awards based upon the Company's performance over the defined period, typically three years. Total units earned for grants made in 2017, 2016, and 2015, may vary between 0% and 200% of the units granted based on the attainment of performance targets during the related three-year period and continued service. For executive officers, attainment up to 100% is paid in Materion common shares and is equity classified, while the remainder is classified as a liability award and settled in cash. For all other employees, the entire award is settled in cash. Vesting of performance-based awards is contingent upon the attainment of threshold performance objectives.

The following table summarizes the activity related to equity-based, performance-based restricted stock units during 2017:

(Shares in thousands)	Number of Shares	Weighted-average Grant Date Fair Value
Outstanding at December 31, 2016	186	$ 27.47
Granted	65	30.28
Vested	(25)	26.02
Forfeited	(3)	25.38
Outstanding at December 31, 2017	223	$ 28.49

Compensation expense is based upon the performance projections for the three-year plan period, the percentage of requisite service rendered, and the fair market value of the Company’s common shares on the date of grant. The offset to the compensation expense for the portion of the award to be settled in shares is recorded within shareholders’ equity and was $1.5 million for 2017, $1.0 million for 2016, and $1.4 million for 2015.

Directors' Deferred Compensation. Non-employee directors may defer all or part of their compensation into the Company’s common stock. The fair value of the deferred shares is determined at the share acquisition date and is recorded within shareholders’ equity. Subsequent changes in the fair value of the Company’s common shares do not impact the recorded values of the shares.

The following table summarizes the stock activity for the directors' deferred compensation plan during 2017:

(Shares in thousands)	Number of Shares	Weighted-average Grant Date Fair Value
Outstanding at December 31, 2016	155	$ 25.52
Granted	15	35.34
Distributed	(6)	38.94
Outstanding at December 31, 2017	164	$ 25.96

During the years ended December 31, 2017, 2016, and 2015, the weighted-average grant date fair value was $35.34, $24.46, and $37.08, respectively.

Note Q — Fair Value Information and Derivative Financial Instruments

The Company measures and records financial instruments at fair value. A hierarchy is used for those instruments measured at fair value that distinguishes between assumptions based upon market data (observable inputs) and the Company's assumptions (unobservable inputs). The hierarchy consists of three levels:

Level 1 — Quoted market prices in active markets for identical assets and liabilities;

Level 2 — Inputs other than Level 1 inputs that are either directly or indirectly observable; and

Level 3 — Unobservable inputs developed using estimates and assumptions developed by the Company, which reflect those that a market participant would use.

The following table summarizes the financial instruments measured at fair value in the Consolidated Balance Sheets at December 31, 2017 and 2016:

		Fair Value Measurements		
(Thousands)	Total	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Observable Inputs (Level 2)	Other Significant Unobservable Inputs (Level 3)
December 31, 2017				
Financial Assets				
Deferred compensation investments	$2,310	$2,310	$ —	$ —
Foreign currency forward contracts	254	—	254	—
Precious metal swaps	14	—	14	—
Total	$2,578	$2,310	$ 268	$ —
Financial Liabilities				
Deferred compensation liability	$2,310	$2,310	$ —	$ —
Foreign currency forward contracts	201	—	201	—
Precious metal swaps	269	—	269	—
Total	$2,780	$2,310	$ 470	$ —
December 31, 2016				
Financial Assets				
Deferred compensation investments	$1,734	$1,734	$ —	$ —
Foreign currency forward contracts	691	—	691	—
Precious metal swaps	—	—	—	—
Total	$2,425	$1,734	$ 691	$ —
Financial Liabilities				
Deferred compensation liability	$1,734	$1,734	$ —	$ —
Foreign currency forward contracts	1	—	1	—
Precious metal swaps	—	—	—	—
Total	$1,735	$1,734	$ 1	$ —

The Company uses a market approach to value the assets and liabilities for financial instruments in the table above. Outstanding contracts are valued through models that utilize market observable inputs, including both spot and forward prices, for the same underlying currencies and metals. The Company's deferred compensation investments and liabilities are based on the fair value of the investments corresponding to the employees’ investment selections, primarily in mutual funds, based on quoted prices in active markets for identical assets. Deferred compensation investments are primarily presented in Other assets. Deferred compensation liabilities are primarily presented in Other long-term liabilities.

The carrying values of the other working capital items and debt in the Consolidated Balance Sheets approximate fair values at December 31, 2017 and 2016.

The Company uses derivative contracts to hedge portions of its foreign currency exposures and may also use derivatives to hedge a portion of its precious metal exposures. The objectives and strategies for using derivatives in these areas are as follows:

Foreign Currency. The Company sells a portion of its products to overseas customers in their local currencies, primarily the euro and yen. The Company secures foreign currency derivatives, mainly forward contracts and options, to hedge these anticipated sales transactions. The purpose of the hedge program is to protect against the reduction in the dollar value of foreign currency sales from adverse exchange rate movements. Should the dollar strengthen significantly, the decrease in the translated value of the foreign currency sales should be partially offset by gains on the hedge contracts. Depending upon the methods used, the hedge contracts may limit the benefits from a weakening U.S. dollar.

The use of forward contracts locks in a firm rate and eliminates any downside from an adverse rate movement as well as any benefit from a favorable rate movement. The Company may from time to time choose to hedge with options or a tandem of options known as a collar. These hedging techniques can limit or eliminate the downside risk but can allow for some or all of the benefit from a favorable rate movement to be realized. Unlike a forward contract, a premium is paid for an option; collars, which are a combination of a put and call option, may have a net premium but can be structured to be cash neutral. The Company will primarily hedge with forward contracts due to the relationship between the cash outlay and the level of risk.

Precious Metals. The Company maintains the majority of its precious metal production requirements on consignment in order to reduce its working capital investment and the exposure to metal price movements. When a precious metal product is fabricated and ready for shipment to the customer, the metal is purchased out of consignment at the current market price. The price paid by the Company forms the basis for the price charged to the customer. This methodology allows for changes in either direction in the market prices of the precious metals used by the Company to be passed through to the customer and reduces the impact changes in prices could have on the Company's margins and operating profit. The consigned metal is owned by financial institutions who charge the Company a financing fee based upon the current value of the metal on hand.

In certain instances, a customer may want to establish the price for the precious metal at the time the sales order is placed rather than at the time of shipment. Setting the sales price at a different date than when the material would be purchased potentially creates an exposure to movements in the market price of the metal. Therefore, in these limited situations, the Company may elect to enter into a forward contract to purchase precious metal. The forward contract allows the Company to purchase metal at a fixed price on a specific future date. The price in the forward contract serves as the basis for the price to be charged to the customer. By doing so, the selling price and purchase price are matched, and the Company's price exposure is reduced.

The Company refines precious metal-containing materials for its customers and typically will purchase the refined metal from the customer at current market prices. In limited circumstances, the customer may want to fix the price to be paid at the time of the order as opposed to when the material is refined. The customer may also want to fix the price for a set period of time. The Company may then elect to enter into a hedge contract, either a forward contract or a swap, to fix the price for the estimated quantity of metal to be purchased, thereby reducing the exposure to adverse movements in the price of the metal.

The Company may from time to time elect to purchase precious metal and hold in inventory rather than on consignment due to potential credit line limitations or other factors. These purchases are typically held for a short duration. A forward contract will be secured at the time of the purchase to fix the price to be used when the metal is transferred back to the consignment line, thereby limiting any price exposure during the time when the metal was owned.

A team consisting of senior financial managers reviews the estimated exposure levels, as defined by budgets, forecasts, and other internal data, and determines the timing, amounts, and instruments to use to hedge exposures. Management analyzes the effective hedged rates and the actual and projected gains and losses on the hedging transactions against the program objectives, targeted rates, and levels of risk assumed. Foreign currency contracts are typically layered in at different times for a specified exposure period in order to minimize the impact of market rate movements.

The use of derivatives is governed by policies adopted by the Audit Committee of the Board of Directors. The Company will only enter into a derivative contract if there is an underlying identified exposure. Contracts are typically held to maturity. The Company does not engage in derivative trading activities and does not use derivatives for speculative purposes. The Company only uses hedge contracts that are denominated in the same currency or metal as the underlying exposure.

All derivatives are recorded on the balance sheet at fair value. If the derivative is designated and effective as a cash flow hedge, changes in the fair value of the derivative are recognized in other comprehensive income (OCI) until the hedged item is recognized in earnings. The ineffective portion of a derivative’s fair value, if any, is recognized in earnings immediately. If a derivative is not a hedge, changes in the fair value are adjusted through income. The fair values of the outstanding derivatives are recorded on the balance sheet as assets (if the derivatives are in a gain position) or liabilities (if the derivatives are in a loss position). The fair values will also be classified as short-term or long-term depending upon their maturity dates.

The following table summarizes the notional amount and the fair value of the Company’s outstanding derivatives not designated as hedging instruments and balance sheet classification as of December 31, 2017 and 2016:

(Thousands)	December 31, 2017 Notional Amount	December 31, 2017 Fair Value	December 31, 2016 Notional Amount	December 31, 2016 Fair Value
Prepaid expenses				
Foreign currency forward contracts - euro	$13,981	$127	$ —	$ —
Total	$13,981	$127	$ —	$ —

These outstanding foreign currency derivatives were related to intercompany loans. Other-net included foreign currency losses relating to these derivatives of $1.1 million in 2017.

The following table summarizes the notional amount and the fair value of the Company’s outstanding derivatives designated as cash flow hedges and balance sheet classification at December 31, 2017 and 2016:

(Thousands)	December 31, 2017 Notional Amount	December 31, 2017 Fair Value	December 31, 2016 Notional Amount	December 31, 2016 Fair Value
Prepaid expenses				
Foreign currency forward contracts - yen	$5,673	$91	$2,418	$239
Foreign currency forward contracts - euro	5,026	36	6,493	452
	10,699	127	8,911	691
Other assets				
Precious metal swaps	880	14	—	—
Other liabilities and accrued items				
Foreign currency forward contracts - euro	13,583	(201)	537	(1)
Precious metal swaps	10,067	(255)	—	—
	23,650	(456)	537	(1)
Other long-term liabilities				
Precious metal swaps	789	(14)	—	—
Total	$36,018	$(329)	$9,448	$690

All of these contracts were designated and effective as cash flow hedges. No ineffectiveness expense was recorded in 2017, 2016, or 2015.

The fair value of derivative contracts recorded in accumulated other comprehensive loss totaled $0.3 million as of December 31, 2017, compared to $0.7 million in accumulated other comprehensive income as of December 31, 2016. Deferred losses of $0.3 million at December 31, 2017 are expected to be reclassified to earnings within the next 18-month period.

Note R — Contingencies and Commitments

Chronic Beryllium Disease (CBD) Claims

The Company is a defendant from time to time in proceedings in various state and federal courts brought by plaintiffs alleging that they have contracted CBD or related ailments as a result of exposure to beryllium. Plaintiffs in CBD cases seek recovery under theories of negligence and various other legal theories and seek compensatory and punitive damages, in many cases of an unspecified sum. Spouses, if any, often claim loss of consortium.

Employee cases, in which plaintiffs have a high burden of proof, have historically involved relatively small losses to the Company. Third-party plaintiffs (typically employees of customers) face a lower burden of proof than do the Company's employees, but these cases have generally been covered by varying levels of insurance. Management has vigorously contested the CBD cases brought against the Company.

Non-employee claims for CBD are covered by insurance, subject to certain limitations. The insurance covers defense costs and indemnity payments (resulting from settlements or court verdicts) and is subject to various levels of deductibles. In 2017 and 2016, defense and indemnity costs were less than or equal to the deductible.

One CBD case, originally filed and dismissed during 2015, but reversed and remanded in 2016 to the trial court, was outstanding as of December 31, 2017 and 2016. The Company does not expect the resolution of this matter to have a material impact on the consolidated financial statements.

Although it is not possible to predict the outcome of any pending litigation, the Company provides for costs related to litigation matters when a loss is probable, and the amount is reasonably estimable. Litigation is subject to many uncertainties, and it is possible that some of the actions could be decided unfavorably in amounts exceeding the Company's reserves. An unfavorable outcome or settlement of a CBD case or adverse media coverage could encourage the commencement of additional similar litigation. The Company is unable to estimate its potential exposure to unasserted claims.

Based upon currently known facts and assuming collectibility of insurance, the Company does not believe that resolution of the current or potential future beryllium proceedings will have a material adverse effect on the financial condition or cash flow of the Company. However, the Company's results of operations could be materially affected by unfavorable results in one or more cases.

Insurance Recoverable

The Company collected $5.6 million during 2015 as part of settlement agreements with contractors and insurance companies for outstanding disputes regarding construction of the Company's beryllium pebble facility located in Elmore, Ohio. The benefit of these settlements was recorded in Other-net in the Consolidated Statements of Income.

Environmental Proceedings

The Company has an active program for environmental compliance that includes the identification of environmental projects and estimating the impact on the Company's financial performance and available resources. Environmental expenditures that relate to current operations, such as wastewater treatment and control of airborne emissions, are either expensed or capitalized as appropriate. The Company records reserves for the probable costs for identified environmental remediation projects. The Company's environmental engineers perform routine ongoing analyses of the remediation sites and will use outside consultants to assist in their analyses from time to time. Accruals are based upon their analyses and are established based on the reasonably estimable loss or range of loss. The accruals are revised for the results of ongoing studies, changes in strategies, inflation, and for differences between actual and projected costs. The accruals may also be affected by rulings and negotiations with regulatory agencies. The timing of payments often lags the accrual, as environmental projects typically require a number of years to complete.

The environmental reserves recorded represent the Company's best estimate of what is reasonably possible and cover existing or currently foreseen projects based upon current facts and circumstances. The Company does not believe that it is reasonably possible that the cost to resolve environmental matters for sites where the investigative work and work plan development are substantially complete will be materially different than what has been accrued while the ultimate loss contingencies for sites that are in the preliminary stages of investigation cannot be reasonably determined at the present time. As facts and circumstances change, the ultimate cost may be revised, and the recording of additional costs may be material in the period in which the additional costs are accrued. The Company does not believe that the ultimate liability for environmental matters will have a material impact on its financial condition or liquidity due to the nature of known environmental matters and the extended period of time during which environmental remediation normally takes place.

The undiscounted reserve balance at the beginning of the year, the amounts expensed and paid, and the balance at December 31, 2017 and 2016 are as follows:

(Thousands)	2017	2016
Reserve balance at beginning of year	$6,041	$5,714
Expensed	1,006	851
Paid	(548)	(524)
Reserve balance at end of year	$6,499	$6,041
Ending balance recorded in:		
Other liabilities and accrued items	$987	$874
Other long-term liabilities	5,512	5,167

The majority of spending in 2017 and 2016 was for various remediation projects at the Elmore, Ohio plant site.

Asset Retirement Obligations

The following represents a roll forward of our asset retirement obligation liability related to our mine located in Utah for the years ended December 31, 2017 and 2016:

(Thousands)	2017	2016
Asset retirement obligation at beginning of period	$1,084	$610
Accretion expense	83	49
Change in liability	—	425
Asset retirement obligation at end of period	$1,167	$1,084

Other

The Company is subject to various legal or other proceedings that relate to the ordinary course of its business. The Company believes that the resolution of these proceedings, individually or in the aggregate, will not have a material adverse impact upon the Company’s consolidated financial statements.

At December 31, 2017, the Company has outstanding letters of credit totaling $27.3 million related to workers’ compensation, consigned precious metal guarantees, environmental remediation issues, and other matters. The majority of the Company's outstanding letters of credit expire in 2018 and are expected to be renewed.

Note S — Quarterly Data (Unaudited)

The following tables summarize selected quarterly financial data for the years ended December 31, 2017 and 2016:

(Thousands except per share amounts)	2017 First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Net sales	$240,669	$295,842	$294,268	$308,668	$1,139,447
Gross margin	42,996	54,557	55,203	58,738	211,494
Percent of net sales	17.9 %	18.4 %	18.8 %	19.0 %	18.6 %
Net income (loss)	$3,050	$7,313	$9,320	$(8,232)	$11,451
Net income (loss) per share of common stock:					
Basic[1]	$0.15	$0.37	$0.47	$(0.41)	$0.57
Diluted[1][2]	0.15	0.36	0.46	(0.41)	0.56
Cash dividends per share of common stock	0.095	0.100	0.100	0.100	0.395
Stock price range:					
High	$41.10	$38.85	$43.43	$52.10	
Low	31.05	33.00	36.60	42.10	

	2016 First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Net sales	$235,511	$249,776	$249,619	$234,330	$969,236
Gross margin	43,357	45,306	50,755	44,045	183,463
Percent of net sales	18.4 %	18.1 %	20.3 %	18.8 %	18.9 %
Net income	$5,368	$5,549	$8,045	$6,778	$25,740
Net income per share of common stock:					
Basic	$0.27	$0.28	$0.40	$0.34	$1.29
Diluted	0.27	0.27	0.40	0.33	1.27
Cash dividends per share of common stock	0.090	0.095	0.095	0.095	0.375
Stock price range:					
High	$28.26	$31.83	$32.28	$41.23	
Low	20.62	22.36	24.18	28.50	

[1] Net income (loss) per basic and diluted share for the fourth quarter 2017 includes the impact of $17.1 million in income tax expense as a result of the TCJA signed into law on December 22, 2017. For additional information refer to Refer to Note G of the Consolidated Financial Statements.

[2] Since the Company reported a net loss for the fourth quarter of 2017, the effects of potential common shares were excluded from diluted earnings per share, as their inclusion would have been anti-dilutive.

The Company follows a 13-week quarterly accounting cycle pursuant to which the first three fiscal quarters end on a Friday and the fiscal year always ends on December 31.

Item 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

Item 9A. CONTROLS AND PROCEDURES

a) Evaluation of Disclosure Controls and Procedures

The Company carried out an evaluation under the supervision and with participation of the Company's management, including the chief executive officer and chief financial officer, of the effectiveness of the design and operation of disclosure controls and procedures as of December 31, 2017 pursuant to Rule 13a-15(b) and 15d-15(b) under the Securities Exchange Act of 1934, as amended (Exchange Act). Based on that evaluation, management, including the chief executive officer and chief financial officer, concluded that disclosure controls and procedures are effective as of December 31, 2017.

b) Management’s Report on Internal Control over Financial Reporting

The Report of Management on Internal Control over Financial Reporting and of the Report of Independent Registered Public Accounting Firm thereon are set forth in Item 8 of this Form 10-K and are incorporated herein by reference.

c) Changes in Internal Control over Financial Reporting

There have been no changes in our internal control over financial reporting identified in connection with the evaluation required by Rule 13a-15(d) and 15d-15(d) of the Exchange Act that occurred during the three months ended December 31, 2017 that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting.

Item 9B. OTHER INFORMATION

None.

PART III

Item 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information under “Election of Directors” in Materion Corporation's Proxy Statement for the 2018 Annual Meeting of Shareholders (Proxy Statement), to be filed with the Securities and Exchange Commission pursuant to Regulation 14A, is incorporated herein by reference.

A listing of executive officers, their ages, positions, and offices held over the past five years, is as follows:

Name	Age	Positions and Offices Held
Jugal K. Vijayvargiya	49	President and Chief Executive Officer (March 2017-Present); President Delphi Electronics and Safety, a global technology solutions provider to the automotive and transportation sectors (prior to March 2017)
Joseph P. Kelley	45	Vice President, Finance and Chief Financial Officer (January 2015-Present); Vice President, Finance (October 2013-Present); Vice President, Finance for the Advanced Materials Group (prior to October 2013)
Gregory R. Chemnitz	60	Vice President, General Counsel and Secretary (January 2017-Present); Vice President, General Counsel (prior to January 2017)

The information required by Item 10 with respect to directors, the Audit Committee of the Board of Directors, and Audit Committee financial experts is incorporated herein by reference from the section entitled “Corporate Governance; Committees of the Board of Directors — Audit Committee” and “— Audit Committee Expert, Financial Literacy and Independence” in the Proxy Statement.

The information required by Item 10 regarding compliance with Section 16(a) of the Exchange Act is incorporated herein by reference from the section entitled “Section 16(a) Beneficial Ownership Reporting Compliance” in the Proxy Statement.

We have adopted a Policy Statement on Significant Corporate Governance Issues and a Code of Conduct Policy that applies to our chief executive officer and senior financial officers, including the principal financial and accounting officer, controller, and other persons performing similar functions, in compliance with applicable New York Stock Exchange and Securities and Exchange Commission requirements. The aforementioned materials and any amendments thereto, along with the charters of the Audit, Governance and Organization, and Compensation Committees of our Board of Directors, which also comply with applicable requirements, are available on our website at http://materion.com, and copies are also available upon request by any shareholder to Secretary, Materion Corporation, 6070 Parkland Boulevard, Mayfield Heights, Ohio 44124.

Item 11. EXECUTIVE COMPENSATION

Incorporated by reference from the sections of the Proxy Statement entitled “Executive Compensation” and “2017 Director Compensation."

Item 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information required under Item 12 regarding security ownership is incorporated by reference from the section entitled "Security Ownership of Certain Beneficial Owners and Management" in the Proxy Statement. The securities authorized for issuance information required by Item 12 is set forth in the table below.

Equity Compensation Plan Information

The table below sets forth information as of December 31, 2017:

Plan Category	Number of Securities to be Issued Upon Exercise of Outstanding Options, Warrants and Rights	Weighted-average Exercise Price of Outstanding Options, Warrants and Rights(3)	Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans(4)
Equity compensation plans approved by security holders:			
2006 Stock Incentive Plan(1)	919,798	$ 30.97	1,438,174
2006 Non-employee Director Equity Plan(2)	18,656	NA	140,408
Equity compensation plans not approved by security holders:			
None	—	—	—
Total	938,454	NA	1,578,582

NA = Not applicable because restricted stock unit awards do not have an exercise price.

(1) Consists of stock appreciation rights, restricted stock units, and performance-based restricted stock units awarded under our 2006 Stock Incentive Plan.

(2) Consists of restricted stock units awarded under our 2006 Non-employee Director Equity Plan.

(3) Represents the weighted-average exercise price of outstanding stock appreciation rights.

(4) Represents the number of shares of common stock available to be awarded as of December 31, 2017.

Item 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

Incorporated by reference from the sections of the Proxy Statement entitled "Related Party Transactions" and "Corporate Governance; Committees of the Board of Directors — Director Independence."

Item 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

Incorporated by reference from the section of the Proxy Statement entitled "Ratification of Independent Registered Public Accounting Firm."

PART IV

Item 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) 1. Financial Statements and Supplemental Information
See Index to Consolidated Financial Statements in Item 8 of this Form 10-K.

(a) 2. Financial Statement Schedules
The following consolidated financial information for the years ended December 31, 2017, 2016, and 2015 is submitted herewith:
Schedule II — Valuation and qualifying accounts.
All other schedules for which provision is made in the applicable accounting regulations of the Securities and Exchange Commission are not required under the related instructions or are inapplicable, and therefore have been omitted.

(a) 3. Exhibits
All documents referenced below were filed pursuant to the Exchange Act by Materion Corporation, file number 001-15885, unless otherwise noted.

3.1	Amended and Restated Articles of Incorporation of Materion Corporation (filed as Exhibit 3.2 to the Company's Quarterly Report on Form 10-Q for the period ended on June 27, 2014), incorporated herein by reference.
3.2	Amended and Restated Code of Regulations (filed as Exhibit 3.1 to the Company’s Quarterly Report on Form 10-Q for the period ended June 27, 2014), incorporated herein by reference.
4.1	Second Amended and Restated Credit Agreement dated June 20, 2013, among Materion Corporation, Materion Advanced Materials Technologies and Services Netherlands B.V., JPMorgan Chase Bank, N.A. and other lenders from time to time party thereto (filed as Exhibit 10.1 to the Company's Form 8-K filed on June 25, 2013), incorporated herein by reference.
4.2	Amendment No. 1 to the Second Amended and Restated Credit Agreement dated December 18, 2015, among Materion Corporation, Materion Advanced Materials Technologies and Services Netherlands B.V., JPMorgan Chase Bank, N.A. and other lenders from time to time party thereto (filed as Exhibit 10.1 to the Company's Form 8-K filed on December 21, 2015), incorporated herein by reference.
	Pursuant to Regulation S-K, Item 601(b)(4), the Company agrees to furnish to the Securities and Exchange Commission, upon its request, a copy of the instruments defining the rights of holders of long-term debt of the Company that are not being filed with this report.
10.1	Third Amended and Restated Precious Metals Agreement dated October 1, 2010, between Brush Engineered Materials Inc. and other borrowers and The Bank of Nova Scotia (filed as Exhibit 4.2 to the Company’s Form 8-K filed on October 4, 2010), incorporated herein by reference.
10.2	Amendment No. 1 to the Third Amended and Restated Precious Metals Agreement dated March 31, 2011, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 10.1 to the Company’s Form 8-K filed on April 6, 2011), incorporated herein by reference.
10.3	Amendment No. 2 to the Third Amended and Restated Precious Metals Agreement dated August 18, 2011, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 10.1 to the Company’s Form 8-K filed on August 22, 2011), incorporated herein by reference.
10.4	Amendment No. 3 to the Third Amended and Restated Precious Metals Agreement dated October 17, 2011, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 10.1 to the Company’s Form 8-K filed on October 18, 2011), incorporated herein by reference.
10.5	Amendment No. 4 to the Third Amended and Restated Precious Metals Agreement dated September 13, 2013, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 10.1 to the Company's Form 8-K filed on September 18, 2013), incorporated herein by reference.
10.6	

	Amendment No. 5 to the Third Amended and Restated Precious Metals Agreement dated January 13, 2015, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 4i to the Company's Annual Report on Form 10-K for the year ended December 31, 2014), incorporated herein by reference.
10.7	Amendment No. 6 to the Third Amended and Restated Precious Metals Agreement dated April 10, 2015, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 4.1 to the Company's Form 10-Q for the period ended April 3, 2015), incorporated herein by reference.
10.8	Amendment No. 7 to Third Amended and Restated Precious Metals Agreement dated as of September 30, 2016, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 10.1 to the Company's Form 8-K filed on October 6, 2016), incorporated herein by reference.

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10.9	Amendment No. 8 to Third Amended and Restated Precious Metals Agreement dated as of February 28, 2017, among Materion Corporation and other borrowers and The Bank of Nova Scotia (filed as Exhibit 99.2 to the Company's Form 8-K filed on March 1, 2017), incorporated herein by reference.
10.10	The Bank of Nova Scotia Consignment Agreement with Materion Advanced Materials Germany GMBH dated as of February 28, 2017 (filed as Exhibit 99.1 to the Company's Form 8-K filed on March 1, 2017), incorporated herein by reference.
10.11	Form of Indemnification Agreement entered into by the Company and its executive officers (filed as Exhibit 10a to the Company’s Annual Report on Form 10-K for the year ended December 31, 2008), incorporated herein by reference.
10.12	Form of Indemnification Agreement entered into by the Company and its directors (filed as Exhibit 10b to the Company’s Annual Report on Form 10-K for the year ended December 31, 2008), incorporated herein by reference.
10.13*	Amended and Restated Form of Severance Agreement for Executive Officers (filed as Exhibit 10.2 to the Company’s Quarterly Report on Form 10-Q for the period ended June 27, 2008), incorporated herein by reference.
10.14*	Amendment No. 1 to Amended and Restated Severance Agreement, dated May 4, 2011 (filed as Exhibit 10.2 to the Company’s Quarterly Report on Form 10-Q for the period ended July 1, 2011), incorporated herein by reference.
10.15*	Amended and Restated Form of Severance Agreement for Key Employees (filed as Exhibit 10.1 to the Company’s Quarterly Report on Form 10-Q for the period ended June 27, 2008), incorporated herein by reference.
10.16*	Form of Severance Agreement for Key Employees (filed as Exhibit 10f to the Company's Annual Report on Form 10-K for the year ended December 31, 2015), incorporated herein by reference.
10.17*	Severance Agreement for Jugal Vijayvargiya dated as of March 3, 2017 (filed as Exhibit 10.2 to the Company's Form 8-K filed on March 3, 2017), incorporated herein by reference.
10.18*	CEO Offer Letter for Jugal Vijayvargiya dated as of March 1, 2017 (filed as Exhibit 10.1 to the Company's Form 8-K filed on March 3, 2017), incorporated herein by reference.
10.19*	Form of Trust Agreement between the Company and Key Trust Company of Ohio, N.A. (formerly Ameritrust Company National Association) on behalf of the Company’s executive officers (filed as Exhibit 10e to the Company’s Annual Report on Form 10-K for the year ended December 31, 1994), incorporated herein by reference.
10.20*	2015 Management Incentive Plan (filed as Exhibit 10i to the Company's Annual Report on Form 10-K filed for the year ended December 31, 2014), incorporated herein by reference.
10.21*	2016 Management Incentive Plan (filed as Exhibit 10j to the Company's Annual Report on Form 10-K filed for the year ended December 31, 2015), incorporated herein by reference.
10.22*	Materion Corporation 2006 Stock Incentive Plan (as Amended and Restated as of May 3, 2017) (filed as Exhibit 4.3 to the Registration Statement on Form S-8 (Registration No. 333-217633), incorporated herein by reference.
10.23*	Form of 2014 Performance-Based Restricted Stock Units (Cash-settled) (filed as Exhibit 10y to the Company's Annual Report on Form 10-K for the year ended December 31, 2013), incorporated herein by reference.
10.24*	Form of 2014 Performance-Based Restricted Stock Units (Stock-settled) (filed as Exhibit 10z to the Company's Annual Report on Form 10-K for the year ended December 31, 2013), incorporated herein by reference.
10.25*	Form of 2016 Restricted Stock Units Agreement (Cash-settled) (filed as Exhibit 10t to the Company's Annual Report on Form 10-K for the year ended December 31, 2015), incorporated herein by reference.
10.26*	Form of 2016 Restricted Stock Units Agreement (Stock-settled) (filed as Exhibit 10u to the Company's Annual Report on Form 10-K for the year ended December 31, 2015), incorporated herein by reference.

10.27*	. Form of 2016 Performance-Based Restricted Stock Units (Cash-settled) (filed as Exhibit 10v to the Company's Annual Report on Form 10-K for the year ended December 31, 2015), incorporated herein by reference.
10.28*	. Form of 2016 Performance-Based Restricted Stock Units (Stock-settled) (filed as Exhibit 10w to the Company's Annual Report on Form 10-K for the year ended December 31, 2015), incorporated herein by reference.
10.29*	. Form of 2009 Stock Appreciation Rights Agreement (filed as Exhibit 10ag to the Company’s Annual Report on Form 10-K for the year ended December 31, 2008), incorporated herein by reference.
10.30*	Form of 2010 Stock Appreciation Rights Agreement (filed as Exhibit 10.34 to the Company’s Annual Report on Form 10-K for the year ended December 31, 2009), incorporated herein by reference.
10.31*	Form of 2011 Stock Appreciation Rights Agreement (filed as Exhibit 10.3 to the Company’s Form 8-K filed on March 3, 2011), incorporated herein by reference.
10.32*	Form of 2016 Stock Appreciation Rights Agreement (filed as Exhibit 10ad to the Company's Annual Report on Form 10-K for the year ended December 31, 2015), incorporated herein by reference.
10.33*	. Materion Corporation Supplemental Retirement Benefit Plan (filed as Exhibit 10.1 to the Company’s Form 8-K filed on September 19, 2011), incorporated herein by reference.
10.34*	Amendment No. 1 to the Supplemental Retirement Benefit Plan (filed as Exhibit 10al to the Company's Annual Report on Form 10-K for the year ended December 31, 2012), incorporated herein by reference.

10.35*	Amendment No. 2 to the Supplemental Retirement Benefit Plan (filed as Exhibit 10ah to the Company's Annual Report on Form 10-K for the year ended December 31, 2013), incorporated herein by reference.
10.36*	Materion Corporation 2006 Non-employee Director Equity Plan (as Amended and Restated as of May 3, 2017) (filed as Exhibit 4.3 to the Registration Statement on Form S-8 (Registration No. 333-217618), incorporated herein by reference.
10.37*	Amended and Restated Executive Deferred Compensation Plan II (filed as Exhibit 10.1 to the Company’s Quarterly Report on Form 10-Q for the period ended March 28, 2008), incorporated herein by reference.
10.38*	Amendment No. 1 to the Amended and Restated Executive Deferred Compensation Plan II (filed as Exhibit 10bf to the Company’s Annual Report on Form 10-K for the year ended December 31, 2008), incorporated herein by reference.
10.39*	Amendment No. 2 to the Amended and Restated Executive Deferred Compensation Plan II (filed as Exhibit 10.2 to the Company’s Quarterly Report on Form 10-Q for the period ended July 3, 2009), incorporated herein by reference.
10.40*	Amendment No. 3 to the Amended and Restated Executive Deferred Compensation Plan II, dated July 6, 2011 (filed as Exhibit 10.3 to the Company’s Quarterly Report on Form 10-Q for the period ended July 1, 2011), incorporated herein by reference.
10.41*	Materion Corporation Restoration & Deferred Compensation Plan, dated March 4, 2015 (filed as Exhibit 10.1 to the Company's Form 8-K filed on March 10, 2015), incorporated herein by reference.
10.42*	Trust Agreement between the Company and Fidelity Investments dated September 26, 2006 for certain deferred compensation plans for Non-employee Directors of the Company (filed as Exhibit 99.4 to the Current Report on Form 8-K filed by the Company on September 29, 2006), incorporated herein by reference.
10.43*	Trust Agreement between the Company and Fidelity Management Trust Company, dated June 25, 2009 relating to the Executive Deferred Compensation Plan II (filed as Exhibit 10.1 to the Company’s Quarterly Report on Form 10-Q for the period ended July 3, 2009), incorporated herein by reference.
(21)#	Subsidiaries of the Registrant.
(23)#	Consent of Ernst & Young LLP.
(24)#	Powers of Attorney.
(31.1)#	Certification of Chief Executive Officer required by Rule 13a-14(a) or 15d-14(a).
(31.2)#	Certification of Chief Financial Officer required by Rule 13a-14(a) or 15d-14(a).
(32)#	Certifications of Chief Executive Officer and Chief Financial Officer required by 18 U.S.C. Section 1350.
(95)#	Mine Safety Disclosure Pursuant to Section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act for the Fiscal Year Ended December 31, 2017.

(101.INS)#	XBRL Instance Document.
(101.SCH)#	XBRL Taxonomy Extension Schema Document.
(101.CAL)#	XBRL Taxonomy Extension Calculation Linkbase Document.
(101.DEF)#	XBRL Taxonomy Extension Definition Linkbase Document.
(101.LAB)#	XBRL Taxonomy Extension Label Linkbase Document.
(101.PRE)#	XBRL Taxonomy Extension Presentation Linkbase Document.
*	Denotes a compensatory plan or arrangement.
#	Filed herewith.

Item 16. FORM 10-K SUMMARY
None.

SIGNATURES
Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.
MATERION CORPORATION

By:	/s/ Jugal K. Vijayvargiya Jugal K. Vijayvargiya President and Chief Executive Officer

February 15, 2018
Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

/s/ Jugal K. Vijayvargiya Jugal K. Vijayvargiya	President and Chief Executive Officer and Director (Principal Executive Officer)	February 15, 2018
/s/ Joseph P. Kelley Joseph P. Kelley	Vice President, Finance and Chief Financial Officer (Principal Financial and Accounting Officer)	February 15, 2018
* Joseph P. Keithley	Director	February 15, 2018
* Vinod M. Khilnani	Director	February 15, 2018
* William B. Lawrence	Director	February 15, 2018
* N. Mohan Reddy	Director	February 15, 2018
* Craig S. Shular	Director	February 15, 2018
* Darlene J. S. Solomon	Director	February 15, 2018
* Robert B. Toth	Director	February 15, 2018
*	Director	

Geoffrey Wild	February 15, 2018

* Joseph P. Kelley, by signing his name hereto, does sign and execute this report on behalf of each of the above-named officers and directors of Materion Corporation, pursuant to Powers of Attorney executed by each such officer and director filed with the Securities and Exchange Commission.

	By:	/s/ Joseph P. Kelley
		Joseph P. Kelley
February 15, 2018		Attorney-in-Fact

Materion Corporation and Subsidiaries
Schedule II—Valuation and Qualifying Accounts
Years Ended December 31, 2017, 2016, and 2015

Column A	Column B	Column C ADDITIONS		Column D		Column E
(Thousands)	Balance at Beginning of Period	Charged to Costs and Expenses	Charged to Other Accounts	Deduction		Balance at End of Period
Year ended December 31, 2017						
Deducted from asset accounts:						
Allowance for doubtful accounts receivable	$ 857	$ 84	$ —	$ 301	(A)	$ 640
Inventory reserves and obsolescence	14,407	3,521	—	4,752	(B)	13,176
Year ended December 31, 2016						
Deducted from asset accounts:						
Allowance for doubtful accounts receivable	$ 1,197	$ (34)	$ —	$ 306	(A)	$ 857
Inventory reserves and obsolescence	7,869	10,564	—	4,026	(B)	14,407
Year ended December 31, 2015						
Deducted from asset accounts:						
Allowance for doubtful accounts receivable	$ 1,578	$ 692	$ —	$ 1,073	(A)	$ 1,197
Inventory reserves and obsolescence	8,193	3,842	—	4,166	(B)	7,869

Note (A) - Bad debts written-off, net of recoveries
Note (B) - Inventory write-off