ENTEGRIS INC
Form 10-K
February 15, 2018
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM 10-K

(Mark One)
x 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
o TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from to
Commission file number: 001-32598

Entegris, Inc.
(Exact name of registrant as specified in its charter)

Delaware	41-1941551
(State or Other Jurisdiction of Incorporation or Organization)	(I.R.S. Employer Identification No.)

129 Concord Road, Billerica, Massachusetts 01821
(Address of principal executive offices and zip code)
(978) 436-6500
(Registrant’s telephone number, including area code)
Securities registered pursuant to Section 12(b) of the Act:

Title of Class	Name of Exchange on which Registered
Common Stock, $0.01 Par Value	The Nasdaq Global Select Market

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

Indicate by check mark if the registrant is a well known seasoned issuer, as defined in Rule 405 of the Securities Act. x Yes o No
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. o Yes x No
Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes x No o
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 x No o
Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405) 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 Form 10-K or any amendment to this Form 10-K. o

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

Large Accelerated Filer	x	Accelerated Filer	o
Non-Accelerated Filer	o (Do not check if a smaller reporting company)	Smaller reporting company	o
		Emerging growth company	o

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If an emerging growth company, indicate by check mark if registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ¨
Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ¨ No ý
The aggregate market value of voting stock held by non-affiliates of the registrant, based on the last sale price of the Common Stock on July 1, 2017, the last business day of registrant's most recently completed second fiscal quarter, was $3,091,161,474. Shares held by each officer and director of the registrant and by each person who owned 10 percent or more of the outstanding Common Stock have been excluded from this computation in that such persons may be deemed to be affiliates of the registrant. This determination of affiliate status for this purpose is not necessarily a conclusive determination for other purposes.
As of February 12, 2018, 141,141,239 shares of the registrant's Common Stock were outstanding.
DOCUMENTS INCORPORATED BY REFERENCE
Portions of the registrant's Definitive Proxy Statement for its 2018 Annual Meeting of Stockholders scheduled to be held on May 9, 2018, or the 2018 Proxy Statement, which will be filed with the Securities and Exchange Commission, or SEC, not later than 120 days after December 31, 2017, are incorporated by reference into Part III of this Annual Report on Form 10-K. With the exception of the portions of the 2018 Proxy Statement expressly incorporated into this Annual Report on Form 10-K by reference, such document shall not be deemed filed as part of this Annual Report on Form 10-K.

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PART I

Item 1. Business.

OUR COMPANY

Entegris, Inc. (“Entegris”, “the Company”, “us”, “we”, or “our”) is a leading global developer, manufacturer and supplier of microcontamination control products, specialty chemicals and advanced materials handling solutions for manufacturing processes in the semiconductor and other high-technology industries. Our mission is to leverage our unique breadth of capabilities to create value for our customers by developing mission-critical solutions to maximize manufacturing yields, reduce manufacturing costs and enable higher device performance.

Semiconductors, or integrated circuits, are key components in modern electronic devices. Smartphones, cloud computing, the Internet of Things, artificial intelligence and other applications require faster, more powerful and more energy efficient semiconductors. In response to these requirements and the growing demand from these applications, semiconductor makers have been adding more capacity and semiconductor manufacturing technology has rapidly been moving to smaller dimensions, adopting new device architectures, such as FinFET transistors and 3D-NAND, and utilizing new and innovative manufacturing materials to increase transistor and bit density. As the technology node becomes increasingly complex, to enable improvements and to maximize yields, manufacturers require the effective development and application of new materials, a reliable and consistent supply of high-value materials, and contamination-free transportation, storage and delivery of these materials, seamlessly integrated into the semiconductor manufacturing process, at ever-increasing levels of purity and contaminant control. Additionally, the effective management and maintenance of the entire materials handling system, from initial production of process chemistry, to transportation and dispensing onto the wafer, has grown in importance to enhanced device yield.

Entegris is uniquely positioned to rapidly respond to these challenges. We deliver advanced materials and high-purity chemistries, free from contamination, with optimized packaging and delivery solutions and in-process filtration and purification solutions that ensure high-value liquid chemistries and gases are free from contaminants before reaching the wafer. Our technology portfolio includes approximately 20,000 standard and customized products and solutions to achieve the highest levels of purity and performance that are essential to the manufacture of semiconductors, flat panel displays, light emitting diodes, or LEDs, high-purity chemicals, solar cells, gas lasers, optical and magnetic storage devices, and critical components for aerospace, glass manufacturing and biomedical applications. The majority of our products are consumed at various times throughout the manufacturing process, with demand driven in part by the level of semiconductor and other manufacturing activity.

Our business is organized and operated in three operating segments which align with the key elements of the advanced semiconductor manufacturing ecosystem. The Specialty Chemicals and Engineered Materials, or SCEM, segment provides high-performance and high-purity process chemistries, gases, and materials, and safe and efficient delivery systems to support semiconductor and other advanced manufacturing processes. The Microcontamination Control, or MC, segment offers solutions to filter and purify critical liquid chemistries and gases used in semiconductor manufacturing processes and other high-technology industries. The Advanced Materials Handling, or AMH, segment develops solutions to monitor, protect, transport, and deliver critical liquid chemistries, wafers and other substrates for a broad set of applications in the semiconductor industry and other high-technology industries. While these segments have separate products and technical know-how, they share a global generalist sales force, common business systems and processes, technology centers, and strategic and technology roadmaps. We leverage our expertise from these three segments to create new and increasingly integrated solutions for our customers.

THE SEMICONDUCTOR ECOSYSTEM

The manufacture of semiconductors requires hundreds of highly complex and sensitive manufacturing steps, during which a variety of materials are repeatedly applied to a silicon wafer to build integrated circuits on the wafer surface. We serve the semiconductor ecosystem by providing specialty materials and chemicals utilized in many process steps, offering a broad range of products to monitor, protect, transport, and deliver these critical process materials during the manufacturing process and providing systems to purify liquid chemistry and gases throughout the manufacturing process. The areas of the semiconductor ecosystem that rely most heavily on our products and solutions are described below.

Deposition. Deposition processes include physical vapor deposition (PVD), where a thin film is deposited on a wafer surface in a low-pressure gas environment, chemical vapor deposition (CVD), where a thin film is deposited on a wafer surface by exposing it to one or more volatile precursors which react with the wafer surface, atomic-layer deposition (ALD), where a thin film is deposited on a wafer surface by exposing it to one or more precursors which react through a series of sequential, self-limiting reactions, and electro-plating, where a metal layer, such as copper, is deposited using chemical baths. Our advanced precursor materials and electro-plating chemicals are utilized to meet the semiconductor industry's composition, uniformity and

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thickness needs of deposited films. Our filtration and purification products are used to remove contaminants during the deposition process, consequently reducing defects on wafers. These products are critical to ensuring device performance and the manufacturing yields of semiconductor manufacturers.

Chemical Mechanical Planarization (CMP). CMP is a polishing process used by semiconductor manufacturers to planarize, or flatten, many of the layers of material that have been deposited upon silicon wafers. We offer a broad range of products used by semiconductor manufacturers during and immediately following the CMP process. Our formulated cleaning chemistries remove residue from wafer surfaces after the CMP process, and prevent subsequent corrosion. Our filtration and purification systems are used to filter liquid slurries and cleaning chemistries in order to remove select particles and contaminants that can cause defects on a wafer's surface. Our roller brushes are used in conjunction with our cleans chemistries to clean the wafer after completion of the CMP process in order to prepare the wafer for subsequent operations and our pad conditioners are used to prepare the surface of the CMP polishing pad prior to every polishing cycle.

Photolithography. Photolithography is a process repeated many times that uses light to print complex circuit patterns onto the wafer. To print the projected optical pattern, the wafer is coated with a thin film of light-sensitive material, called photoresist. Light is projected to expose the photoresist, which is then developed (somewhat like photographic film) to create a stenciled image pattern. Our liquid filtration and liquid packaging and dispense systems play a vital role in assuring the pure, accurate and uniform dispense of photoresists onto the wafer so that manufacturers can achieve acceptable yields in the manufacturing process, and our gas microcontamination control systems eliminate airborne contaminants that can disrupt effective photolithography processes.

Etch and Resist Strip. During the etch process, specific areas of the thin film that have been deposited on the surface of a wafer are removed to leave a desired circuit pattern. After the etch process, the hardened resist needs to be completely removed. Our formulated chemical solutions remove photo resists and post-etch residues and our gas filters and purifiers help assure the purity of the process gas streams used in the etch process. Our precision-engineered coatings provide barriers to corrosive chemistries in the etch environment, protect surfaces from erosion and minimize particle generation.

Ion Implant. Ion implantation is a key technology for forming transistors and is used many times during semiconductor fabrication. During ion implantation, wafers are bombarded by a beam of electrically-charged ions, called dopants, which change the electrical properties of the exposed surface films. Our Safe Delivery Source® (SDS®) and VAC® (Vacuum Actuated Cylinders) gas delivery systems assure the safe, effective and efficient delivery of the toxic gases necessary for the implant process. In addition, our proprietary low temperature plasma coating processes for core components are critical elements of ion implantation equipment.

Wet Cleaning. Ultra-high purity chemicals of precise composition are used to clean the wafers before and after several of the processes described above, to pattern circuit images and to remove photoresists after etch. The cleaning chemicals must be maintained at very high purity levels without the presence of foreign material such as particles, ions or organic contaminants in order to maintain manufacturing yields and avoid defective products. Our proprietary formulated cleaning chemistries are used in these wet cleaning processes and our liquid filters and purifiers ensure the purity of these chemicals.

Wafer Solutions. Our wafer and reticle carriers are high-purity "micro-environments" that carry wafers between manufacturing process steps. These products protect wafers from damage or abrasion and minimize contamination during transportation and automated processing. Front-end wafer processing can involve hundreds of steps and take several weeks. Protection of the processed wafer is essential, as a batch of fully processed 200 mm or 300 mm wafers transported in one of our products can be worth over a million dollars.

Chemical Containers. Semiconductor manufacturing and other high-technology processes utilize large volumes of high-purity, corrosive and hazardous chemicals. Our ultrahigh purity chemical container products, such as drums, flexible packaging and associated coded connection systems, maintain chemical purity, maximize utilization and ensure safe transport, containment and dispense of valuable, ultraclean process fluids, from storage by the chemical manufacturer to point-of-use. Our FluoroPure® containers and NOWPak® liner-based systems maximize chemical retrieval and minimize chemical waste, which lowers our semiconductor manufacturer customers' costs. Our portfolio of bottles, canisters, closures and accessories enhance tool productivity, increase yields and reduce operating costs.

Relatedly, our ultrapure valves, fitting, tubings, and sensing and control products are used to distribute these chemicals around the fab and in wet process tools.

Other Markets. Many of the processes used to manufacture semiconductors are also used to manufacture photovoltaic cells, LEDs, flat panel displays and magnetic storage devices resulting in the need for similar filtration, purification, control and measurement capabilities. We seek to leverage our products, technologies and expertise to address these important market opportunities.

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INDUSTRY TRENDS

Emerging Applications. The market for semiconductors has grown significantly over the past few decades and we expect this trend to continue. We believe that the smartphone, Internet of Things and emerging applications in cloud computing, machine learning and artificial intelligence, autonomous vehicles, cryptocurrency, and virtual reality will drive growth in the demand for semiconductors, drive wafer starts and create significant opportunities for our products. Existing applications in data processing, wireless communications, broadband infrastructure, personal computers, handheld electronic devices and other consumer electronics, are also expected to drive demand for semiconductors, and in turn, our products.

Manufacturing Complexity and Architecture. The emerging applications described above require more powerful, faster and more energy efficient semiconductors. Semiconductor architectures are changing, with transistor design increasing in complexity, the use of multilayered patterning, vertical structures such as FinFET and 3D-NAND, and shrinking dimensions. These advanced architectures require an increase in the number of process steps required to manufacture these semiconductors. We believe that demand for our materials and consumable products will be driven by the increase in process steps and the associated lithography, deposition, CMP, and etch and clean required to manufacture leading edge semiconductors. Additionally, new materials have played a significant role in enabling improved devices performance and we expect this trend to continue. As dimensions get smaller, new materials will be required for transistor connectivity. For example, leading edge semiconductor manufacturers are moving towards atomic layer scale, where the precision of the manufacturing process and purity of the materials is extremely important to maintain the device integrity. These materials need to be supplied and delivered at ever-increasing levels of purity and control, from point-of-production to point-of-use and dispense on the wafer. We expect the trend for new materials supplied at high levels of purity to drive the demand for our advanced materials and our products and solutions designed to purify, monitor, protect, transport, and deliver critical materials. To address the challenges of the advanced technology nodes, we collaborate with our customers to develop new materials, to enhance our filtration and purification capabilities and to introduce advanced materials packaging and monitoring capabilities.

Material Handling Solutions. Our semiconductor customers have become increasingly focused on materials handling solutions that enable them to safely store, handle, process and transport critical materials throughout the manufacturing process to minimize the potential for damage or degradation to their materials and to protect their investment in processed wafers. We believe that these trends provide opportunities for us to utilize our unique breadth of capabilities to provide innovative materials, materials management, purification, wafer transport, and process solutions to semiconductor customers to enable them to successfully manage this growing complexity.

Reliance on Trusted Suppliers. Our customers require that their key materials suppliers demonstrate greater capabilities, such as sustainability, scalability, flexible manufacturing, quality control, supply chain management, and the ability to effectively collaborate on solutions to problems. We have responded to these demands by deploying resources to enable us to align with their requirements and drive operational excellence. For example, in 2016 and 2017, to enhance local development and collaboration and to strengthen relationships with our key customers, we expanded our technology centers in South Korea and Taiwan, adding to our research and development capabilities. We believe these trends will allow us to leverage our manufacturing, operational and technical capabilities, along with our broad technology portfolio, to become an increasingly important strategic supplier to our customers.

Continued Consolidation. Our customer base within the semiconductor industry has consolidated through mergers and acquisitions. As a result, the importance of maintaining and developing strong and close relationships with our customers becomes even more essential. While continuing to strengthen these relationships, we also seek to further broaden our customer base by leveraging our products, technologies and expertise in serving semiconductor applications to address adjacent market opportunities, including in manufacturing processes for flat panel displays, high-purity chemicals, solar cells, optical magnetic storage devices and products for life sciences.

Manufacturing in China. An additional factor that could spur future industry growth is sustained semiconductor industry development in China, which has experienced recent growth in semiconductor production. Expansion and growth of the semiconductor industry in China could increase the need and demand for our products.

OUR COMPETITIVE STRENGTHS

Technology Leadership. We are committed to being able to provide our customers with innovative solutions for their manufacturing needs. For example, we have introduced sub-10 nanometer and 7 nanometer filtration products, advanced deposition materials for next generation transistor and interconnect technologies, advanced reticle pods for extreme ultra-violet, or EUV, photolithography applications, advanced 300 mm wafer carriers and advanced coatings to meet the rigorous demands of the advanced technology nodes faced by our customers. As described in further detail below in “Engineering, Research and Development”, this commitment to technology leadership is demonstrated by our ER&D expenditures in 2017, 2016 and 2015 of $107.0 million, $107.0 million and $105.9 million, respectively.

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Comprehensive and Diverse Product Offerings. As semiconductor manufacturers are driving towards more advanced technology nodes, our customers are seeking suppliers who can provide a broad range of reliable, flexible and cost-effective products and materials, as well as the technological and application design expertise necessary to enhancing their productivity, quality, and yield. We believe our comprehensive offering of materials and products creates a competitive advantage as it enables us to meet a broad range of customer needs and provide a single source of product offerings for semiconductor device and equipment manufacturers as they seek to consolidate their supplier relationships and pursue advanced technology nodes. Additionally, our broad product and solution portfolio allows us to serve many aspects of the semiconductor manufacturing ecosystem and to create synergies among certain of our products. For example, our microenvironment and fluidics products are utilized when a fab is being built to move wafers and materials throughout the fab, our chemistries and gas products are consumed during operation of the fab, and our contamination control products ensure the purity of chemistries and gases throughout the fab and its supply chain.

Global Presence. We have established a global infrastructure of design, manufacturing, distribution, service and technical support facilities to meet the needs of our global customers. We have, for example, expanded our manufacturing operations and increased our investment in advanced technology centers in Taiwan and South Korea to support our important customers in these regions, established new sales and service offices in China in anticipation of a growing semiconductor manufacturing base in that country, and expanded our presence in Singapore to enhance our global and regional management of supply chain and manufacturing processes. We service our customer relationships in Asia, North America, Europe and the Middle East predominantly via direct sales and support personnel and to a lesser extent through selected independent sales representatives and distributors.

Advanced Manufacturing. We have established leading-edge manufacturing plants located in the United States, Malaysia, Japan, South Korea and Taiwan that possess the advanced manufacturing capabilities described under “Manufacturing” below.

Strong Relationships with Broad Customer Base. We have strong relationships with our customers, which include leading semiconductor manufacturers, original equipment manufacturers, or OEMs, and semiconductor materials suppliers. These relationships provide us with significant collaboration opportunities at the product design stage, which facilitate our ability to introduce new products and applications. For example, we work with our key customers in the development of advanced manufacturing processes to identify and respond to their requests for current and future generations of products for emerging applications requiring cleaner materials, as well as systems that maintain the integrity and stability of materials during transport through the manufacturing process. We believe that our customer base will continue to be an important source of new product development opportunities. Due to the specialized nature of our products, manufacturing complexity, qualification requirements in customers’ fabrication processes, high customer re-formulation and qualification change costs, and extensive proprietary products, we believe our supply position with our customers is strong.

Strong Financial Performance and Cash Flow Generation. We have a strong financial profile with net income of $85.1 million, operating margin of 18.0% and Adjusted EBITDA margin of 26.6% for the fiscal year ended December 31, 2017. In addition to servicing our debt obligations and effecting our capital allocation strategy, we expect that our financial profile will allow us to invest in the research and development and advanced manufacturing capabilities necessary to maintain and expand our technology leadership and to drive organic growth. Additionally, as we have done in the past, we expect that our cash flow generation will enable us to grow inorganically through smaller acquisitions of product lines or technology that expand upon our product portfolio or through larger acquisitions where we act as a consolidator in the industry and increase our scale and strengthen our position as a leading supplier to our customers. For an explanation of Adjusted EBITDA and Adjusted EBITDA Margin and a reconciliation to GAAP net income, see "Non-GAAP Information" in Management’s Discussion and Analysis of Financial Condition and Results of Operations in Part II, Item 7 of this Annual Report on Form 10-K.

OUR BUSINESS STRATEGY

We intend to build upon our position as a leading worldwide developer, manufacturer and supplier of advanced specialty materials, filtration and purification solutions, delivery systems, and materials packaging solutions to expand our core business and to grow in other high value-added manufacturing process markets. Our strategy includes the

following key elements:
Commitment to Technology Leadership. We continuously improve our products and develop new products as our customers’ needs evolve. As semiconductor devices become smaller and more powerful, and new materials and processes are deployed to produce them, we seek to expand our technological capabilities by developing advanced products that address the requirements for greater purification, protection and transport of high value-added materials and by developing advanced chemical materials for use in critical fabrication processes.
Leveraging our Expertise. We leverage our broad expertise across our portfolio of advanced materials, materials handling and purification capabilities to create innovative new solutions to address unmet customer needs. For example, our industry-leading post-CMP cleaning chemistry is developed and manufactured by our SCEM segment, with collaboration from our MC

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segment, packaged with our ultra clean container and connector system made by our AMH segment, and delivered to the process tools through fluid handling systems also made by our AMH segment. Furthermore, in the process tool, these chemistries may go through one or several purification systems made by our MC segment to eliminate particles and contaminants. Another example of the results of this strategy is our advanced deposition materials business, where we leverage our ability to synthesize unique molecules, our knowledge of how to purify these materials, and our capability to safely transport these materials and deliver them onto the wafer at the highest throughput. We believe one of our competitive advantages is our diverse and unique expertise in areas of increasing importance to semiconductor manufacturers, such as developing advanced materials and ensuring the purity of high-value materials, and our ability to work collaboratively across our three segments, which enables us to quickly and effectively develop optimized and complimentary solutions for our customers.

Operational Excellence. Our strategy is to continue to develop our advanced manufacturing capabilities into a competitive advantage with our customers by focusing on the following priorities:

- use of manufacturing equipment and facilities incorporating leading-edge technology including advanced cleanroom and cleaning procedures;
- implementation of standardized manufacturing systems stressing optimization of equipment effectiveness, predictive maintenance, and direct labor productivity;
- implementation of automated quality systems that provide both process monitoring and process control throughout the manufacturing process as well as predictive quality data to mitigate against potential quality excursions;
- implementation of supply chain management systems that assure a reliable and responsive supply of high-quality raw materials;
- conduct of manufacturing operations to assure the safety of our employees and of the individuals using our products; and
- maintaining an agile manufacturing organization that is capable of rapid design and development of prototypes of new and derivative products, as well as promptly responding to customer feedback concerning prototypes so that we quickly commercialize and ramp production acceptable to our customers.

Continued Focus on Customers. We view the strong relationships we have with our customers, which include leading semiconductor manufacturers, OEMs, and semiconductor materials suppliers, as critical to our long term success. We intend to reinforce and further strengthen these relationships, through, among other things, collaborations and joint development. Customer intimacy enables us to respond rapidly and thoroughly to their manufacturing challenges and enables us to bring forth new products that serve an existing need.

Adjacent Markets. We leverage our expertise in the semiconductor industry by developing products for other industries that employ similar technologies and production processes and that utilize materials integrity management, high-purity fluids and integrated dispense systems. For example, outside of the semiconductor industry, our products are used in manufacturing processes for flat panel displays, high-purity chemicals, solar cells, optical magnetic storage devices and products for life sciences. We plan to continue to identify and develop products that address needs in adjacent markets. We believe that by utilizing our technology to provide manufacturing solutions across multiple industries, we are able to increase the total available market for our products and reduce, to an extent, our exposure to the cyclicality of the semiconductor industry.

Strategic Acquisitions, Partnerships and Related Transactions. We will continue to pursue strategic acquisitions and business partnerships that enable us to address gaps in our product offerings, secure new customers, diversify into complementary product markets, broaden our technological capabilities and product offerings, access local or regional markets and achieve benefits of increased scale. Our 2014 acquisition of ATMI, Inc., or ATMI, is an example of this strategy, bringing a whole new portfolio of technologies and materials products to serve our semiconductor customers. Another example is our 2017 acquisition of the water and chemical filtration product line for microelectronics applications from W. L. Gore & Associates, Inc., or Gore, where we acquired a synergistic product line that leverages our existing platform and expands our served markets. Further, as the dynamics of the markets that we serve shift, we will reevaluate our existing businesses and in the event that we conclude that a business is not able to provide value-added solutions to its markets in a manner that contributes to achieving our financial objectives, we expect to restructure or replace that business. Finally, we are continuously evaluating opportunities for strategic alliances, such

as our strategic alliance with Enthone, joint development programs and collaborative marketing efforts with key customers and other industry leaders. For example, in connection with our strategic commitment to support the growing semiconductor and related microelectronics industries in China, in 2017, we entered into agreements with local partners to expand our capability to manufacture our specialty chemical and deposition products locally and shorten our supply chain for our customers in China.

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OUR SEGMENTS

As discussed, our business is organized and operated in three operating segments which align with the key elements of the advanced semiconductor manufacturing ecosystem: Specialty Chemicals and Engineered Materials, or SCEM; Microcontamination Control, or MC; and Advanced Materials Handling, or AMH. We leverage our expertise from these three segments to create new and increasingly integrated solutions for our customers. The following is a detailed description of our three segments:

SPECIALTY CHEMICALS AND ENGINEERED MATERIALS SEGMENT

The SCEM segment provides high-performance and high-purity process chemistries, gases, and materials that enable enhanced device performance. These materials are utilized in critical semiconductor manufacturing processes such as deposition, cleaning, and integration of complex materials. Advanced materials, delivered at high purity, are critical to enabling the performance of leading-edge logic and memory applications. We believe the growing demand in the 3D-NAND market, challenges with metallization schemes and the need for specialized cleaning solutions will drive consumption for materials in our SCEM segment. In conjunction with products from our MC and AMH segments, the materials in our SCEM segment provide unique solutions to safely and efficiently deliver critical materials to support semiconductor and other advanced manufacturing processes.

Specialty Gas Products. Our specialty gas solutions provide advanced safety and process capabilities to semiconductor manufacturers. Our SDS cylinders store and deliver hazardous gases, such as arsine, phosphine, germanium and boron trifluoride, at sub-atmospheric pressure through the use of our proprietary carbon-based adsorbent materials. These products minimize potential leaks during transportation and use and allow more gas to be stored in the cylinder, features which provide significant safety, environmental and productivity benefits over traditional high-pressure cylinders. New generations of SDS products further increase the gas storage capacity, reducing tool down time, therefore, resulting in significant cost savings for our customers. We also offer VAC, a complementary technology to SDS, where select implant gases are stored under high pressure but delivered sub-atmospherically.

Specialty Materials Products. Our specialty materials include specialized graphite, silicon carbide and a variety of unique, high purity coatings for dry or plasma etch, chemical vapor deposition and ion implant applications. Our POCO® premium graphite is used to make precision consumable electrodes for electrical discharge machining, hot glass contact materials for glass product manufacturing and forming, and other consumable products for various industrial applications, including aerospace, optical, medical devices and printing. Our high-performance specialty coatings, such as our Pegasus™ coatings, provide corrosion and erosion resistance, minimize particle generation and prevent contamination on critical components in a semiconductor etch environment and other high-technology manufacturing operations. Our specialty materials and coatings provide customized solutions for applications challenged with unique temperature, corrosive, chemical or process environments, such as electrostatic chucks used to hold wafers during processing, plasma etch chamber components, aircraft bearings, and ultrasonic transducers.

Advanced Deposition Materials Products. Our advanced deposition materials include advanced liquid, gaseous and solid precursors which are incorporated in chemical vapor deposition (CVD) and atomic layer deposition (ALD) processes by the semiconductor industry, including organometallic precursors for the deposition of tungsten, titanium, cobalt and aluminum containing films and organosilane precursors for the deposition of silicon oxide and silicon nitride films. These precursors are designed in close collaboration with OEM process tool manufacturers as well as device makers to produce application specific solutions that are compatible with complex integrations of material solutions used to build the semiconductor device. We offer containers that allow for reliable storage and delivery of low volatility solid and liquid precursors required in ALD processes. When combined with our proprietary corrosion resistant coatings and filtration solutions from our MC segment, our advanced deposition materials enable the industry’s highest purity levels, resulting in improved device performance.

Surface Preparation and Integration Products. We offer a range of materials used to prepare the surface of a semiconductor wafer during the manufacturing process and to integrate with materials being used on the wafer. We also provide advanced plating solutions, such as our Viaform® product (a trademark of and exclusively licensed from Enthone Inc., or Enthone, a subsidiary of Platform Specialty Products Corporation), which includes inorganic and proprietary organic molecules that provide the wiring for copper interconnects. We also offer CMP cleaning solutions for applications such as semiconductor post-etch residue removal, wafer etching, organics removal, negative resist

removal, edge bead removal, and corrosion prevention. Our wet chemistries solutions, combined with filtration solutions from our MC segment and fluid handling solutions from our AMH segment, provide enhanced purity, which results in improvements in our customers' processes. Our consumable PVA roller brush products are used to clean the wafer following the CMP process and our pad conditioners, based on our silicon carbide capabilities, lengthen CMP pad life.

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MICROCONTAMINATION CONTROL SEGMENT

The MC segment offers solutions to purify critical liquid chemistries and gases used in semiconductor manufacturing processes and other high-technology industries. The design and performance of our liquid and gas filtration and purification products are critical to the semiconductor manufacturing process because they remove contamination and directly reduce defects and improve manufacturing yield. Our proprietary filters remove organic and inorganic nanometer-sized contaminants from the different fluids and gases used in the manufacturing process, including photolithography, deposition, planarization and surface etching and cleaning. As our customers leverage leading edge lithography tools and multi-patterning technology to enable each subsequent generation of products, our filtration and purification products are utilized to achieve necessary levels of purity and contamination control. We believe demand for purification and filtration products is being driven by the continuous node shrink in logic semiconductors and the ramp in the 3D-NAND market, as the risk of yield loss grows with the incremental manufacturing steps needed for the production of these devices. We utilize expertise from the AMH segment in polymer science and from the SCEM segment in chemical manufacturing to develop differentiated filtration and purification solutions for our customers.

Liquid Microcontamination Control Products. We offer a variety of unique products that are optimized to control contaminants in our customers' liquid processes. For example, our Torrento® series of filters is used for the filtration of aggressive acid and base chemistries for both semiconductor fabs as well as specialty chemical manufacturers including our SCEM segment. Manufacturers of high purity chemicals as well as semiconductor fabs use our Trinzik® products for the filtration of chemicals as well as ultra-pure water. Our Impact® series of filters are used in point-of-use photochemical dispense applications, including those provided by our AMH segment, where the delivery of superior flow rate performance and reduced microbubble formation is critical.

Gas Microcontamination Control Products. Our gas filters reduce outgassing and improve corrosion resistance. Our purifiers chemically react with and absorb contaminants, such as oxygen and water, to prevent contamination, and our vent diffusers reduce particle contamination and processing cycle times. Our GateKeeper® gas purifiers leverage technology developed from our SCEM segment and effectively remove gaseous contaminants down to part-per-trillion levels. Our Chambergard™ gas diffusers provide semiconductor equipment manufacturers with the capability to rapidly vent their tools to atmosphere without adding particles to the wafers under process. These products are used in, or alongside, critical processing tools to improve yield and reduce tool downtime. In addition, we provide filters used to eliminate airborne molecular contamination from critical process tool areas or cleanrooms in the fab, improving process yield.

ADVANCED MATERIALS HANDLING SEGMENT

The AMH segment develops solutions to monitor, protect, transport, and deliver critical liquid chemistries, wafers and substrates for a broad set of applications in the semiconductor industry and other high-technology industries. These systems and products improve our customers' yields by protecting wafers from abrasion, degradation and contamination during manufacturing and transportation and by assuring the consistent, clean and safe delivery of advanced chemicals from the chemical manufacturer to the point-of-use in the semiconductor fab. As advanced semiconductor fabs are built, demand is driven for our wafer handling and fluid handling products. As those fabs move into production, we see demand for wafer carrying and fluid containment solutions offered by this segment. The AMH segment collaborates closely with the SCEM segment in developing products that are compatible with advanced chemistries to enhance yield, while integrating liquid filtration technology from our MC segment to deliver consistent and pure chemistry.

Wafer Solutions. We lead the market with our high-volume line of Ultrapak® and Crystalpak® products for wafers ranging from 100 to 200 mm, which ensure the clean and secure transport of wafers from the wafer manufacturers to the semiconductor fab. We also offer a front-opening shipping box, or FOSB, for the transportation and automated interface of 300 mm wafers. We lead the market for 300mm front opening unified pods, or FOUPs, wafer transport and process carriers, and standard mechanical interface pods, or SMIF pods, for 200mm wafer applications. These microenvironment products safely and accurately deliver wafers within the semiconductor fab environment to the various process fabrication steps.

Chemical Containers. We have a broad portfolio of flexible and rigid polymer packaging and container products, from low-volume containers to transport high-value photoresist chemistries, such as our NOWPak® products, to large

intermediate bulk containers (IBCs) to safely and efficiently transport chemicals in bulk, such as our FluoroPure® products. Our connection systems provide for safe and efficient chemical dispense from the container in the fab. Chemical companies utilize our packaging products to ensure the purity of chemistries shipped to semiconductor fabs, resulting in enhance yields. We optimize the compatibility and performance of these products on chemistries through close collaboration with our SCEM segment.

Fluidics. We are a leader in high-purity fluid transfer products such as valves, measurement, fittings, tubing, pipe, custom fabricated products and associated connection systems, such as our PrimeLock® connections, for high-purity chemical applications and our proprietary digital flow control technology improves the uniformity of chemicals applied on wafers. Our IntelliGen® integrated

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high-precision liquid dispense systems enable the uniform application of advanced chemistries during the wafer fabrication process, integrating our valve control expertise with filter device technologies from our MC segment, so that filtering and dispensing of photochemicals can occur at different rates, conserving high-value chemistry and reducing defects on wafers. Our comprehensive product lines provide our semiconductor manufacturers, process tool makers and chemical customers with a single-source provider for their high-purity chemical management needs throughout the manufacturing process.

OUR CUSTOMERS AND MARKETS

Our most significant customers include semiconductor device manufacturers, semiconductor equipment makers, gas and chemical manufacturing companies, leading wafer grower companies and manufacturers of high-precision electronics. We also sell our products to flat panel display equipment makers, materials suppliers and panel manufacturers, and manufacturers of hard disk drive components and devices.

Our other high-technology markets include manufacturers and suppliers in the solar and life science industries, electrical discharge machining customers, glass and glass container manufacturers, aerospace manufacturers and manufacturers of biomedical implantation devices.

In 2017, 2016 and 2015, net sales to our top ten customers accounted for 47%, 45% and 44%, respectively, of combined net sales. In 2017, 2016 and 2015, Taiwan Semiconductor Manufacturing Company Limited, accounted for $168 million, $162 million and $134 million of net sales, respectively, or approximately 13%, 14% and 12% of our net sales, respectively, including sales from each of our three reporting segments. In addition, in 2017, Samsung Electronics Co. accounted for $141 million of net sales or approximately 10% of our net sales, including sales from all of the Company's segments.

International net sales represented 79%, 78% and 77%, respectively, of net sales in 2017, 2016 and 2015.

Approximately 2,200 customers purchased products from us during 2017. For the fiscal year ended December 31, 2017, our revenue breakdown by customer segment was as follows: semiconductor manufacturers 50%; OEMs 13%; electronic materials customers 13%; other semiconductor customers 13%; and non-semiconductor customers 12%.

We may enter into supply agreements with our customers. These agreements generally have a term of one to three years, but do not contain any long-term purchase commitments. Instead, we work closely with our customers to develop non-binding forecasts of the future volume of orders. However, customers may cancel their orders, change production quantities from forecasted volumes or delay production for a number of reasons beyond our control.

SALES, MARKETING AND SUPPORT

We sell our products worldwide, primarily through our direct sales force and strategic independent distributors located in all major semiconductor markets. Independent distributors are also used in other semiconductor market territories and for specific market segments. As of December 31, 2017, our sales and marketing force consisted of approximately 520 employees worldwide.

Our unique capabilities and long-standing industry relationships have provided us with the opportunity for significant collaboration with our customers at the product design stage, which has facilitated our ability to introduce new materials and new solutions that meet our customers’ needs. We are constantly identifying for our customers a variety of materials, purification and process control challenges that may be addressed by our product solutions. Our sales representatives provide our customers with worldwide technical support and information about our products and materials.

We believe that our technical support services are important to our sales and marketing efforts. These services include assisting in defining a customer’s needs, evaluating alternative products and materials, designing a specific system to perform the desired operation, training users and assisting customers in compliance with relevant government regulations. Additionally, our field applications engineers, located in all of the major markets we serve, work directly with our customers on product qualification and process improvements in their facilities. We maintain a network of service centers, applications laboratories and technology centers located in all key markets internationally and in the United States to support our products and our customers with their advanced development needs, provide local technical service and ensure fast turnaround time.

COMPETITION

The market for our products is highly competitive. While price is an important factor, we compete primarily on the basis of the following factors:

- technical expertise;
- product quality and performance;
- advanced manufacturing capabilities;
- total cost of ownership;
- historical customer relationships;
- breadth of product line;
- breadth of geographic presence;
- customer service and support; and
- after-sales service.

We believe that we compete favorably with respect to all of the factors listed above. We believe that our key competitive strengths include our broad product line, our strong research and development infrastructure and investment, our manufacturing excellence, our advanced quality control systems, the low total cost of ownership of our products, our ability to provide our customers with quick order fulfillment and our applications expertise in semiconductor manufacturing processes. However, our competitive position varies depending on the market segment and specific product areas within these segments. While we have longstanding relationships with a number of semiconductor and other electronic device manufacturers, we also face significant competition from companies that also have longstanding relationships with other semiconductor and electronic device manufacturers and, as a result, have been able to have their products specified by those customers for use in manufacturers' fabrication facilities.

The competitive landscape is varied, from multinational companies to small regional or regionally-focused companies. While product quality and technology remain critical, overall, industry trends are indicating a shift to localized, cost-competitive and consolidated supply chains.

Because of the unique breadth of our capabilities, we believe that there are no global competitors that compete with us across the full range of our product offerings. Many of our competitors are local companies that participate in only a few products or in specific geographies. While there are other larger, broad-based materials suppliers, many are concentrated in specific product areas, such as filtration, specialty chemicals or materials handling. Key competitors include Pall Corporation (part of Danaher Corporation), Shin-Etsu Polymer Co., Ltd., Gemu Valves, Inc., Tokyo Keiso Co., Ltd., Mersen, Versum Materials, Inc., DuPont Electronic Technologies, Dow Chemical Company, Air Liquide, Praxair, Inc., SAES Pure Gas, Inc., Donaldson Company, Inc. and Parker Hannifin Corp.

ENGINEERING, RESEARCH AND DEVELOPMENT

We believe that technology is important to the success of our businesses, and we plan to continue to devote significant resources to engineering, research and development (R&D), balancing efforts between shorter-term market needs and longer-term investments. Our aggregate engineering, research and development expenses in 2017, 2016 and 2015 were $107.0 million, $107.0 million and $105.9 million, respectively. As of December 31, 2017, we had approximately 430 employees in engineering, research and development. We have supplemented and may continue to supplement our internal research and development efforts by licensing technology from unaffiliated third parties and/or acquiring rights with respect to products incorporating externally owned technologies. Our R&D expenses consist of personnel and other direct and indirect costs for internally funded project development, including the use of outside service providers.

We believe we have a rich pipeline of development projects. For example, our engineering, research and development efforts have been focusing on growth opportunities in areas such as bulk photochemical filtration, new boron mixtures for ion implant, new precursors for deposition, specialty coatings for key applications and new cleans chemistries. Our engineering, research and development efforts are directed toward developing and improving our technology platforms for semiconductor and advanced processing applications and identifying and developing products for new applications, often working directly with our customers to address their particular needs.

We have engineering, research and development capabilities in California, Colorado, Connecticut, Massachusetts, Minnesota, Texas, Japan, South Korea, Taiwan, Singapore and Malaysia to meet the global needs of our customers. We use sophisticated methodologies to research, develop and characterize our materials and products. Our capabilities to test and characterize our materials and products are focused on continuously reducing risks and threats to the integrity of the critical materials that our customers use in their manufacturing processes.

We participate in Semiconductor Equipment and Materials International (SEMI®), an association of semiconductor equipment suppliers, as well as collaborate with leading universities and industry consortia, such as the University of

California and the Interuniversity Microelectronics Centre (imec®). We undertake this work to extend the reach of our internal R&D and to gain access to leadership ideas and concepts beyond the time horizon of our internal development activities.

PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

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As of December 31, 2017, we own approximately 2,250 active patents worldwide, of which about 690 are United States patents and about 1,170 are pending patent applications globally. In addition, we license certain patents owned by third parties. We rely on a combination of patent, copyright, trademark and trade secret laws and license agreements to establish and protect our proprietary rights. We refresh our intellectual property on an ongoing basis through continued innovation. While we license and will continue to license technology used in the manufacture and distribution of products from third parties, we do not consider any particular patent or license to be material to our business.

We vigorously protect and defend our intellectual property. We require each of our employees, including our executive officers, to enter into standard agreements pursuant to which the employee agrees to keep confidential all of our proprietary information and to assign to us all inventions made while employed by us. We also require all outside scientific collaborators, sponsored researchers, and other advisors and consultants who are provided confidential information to execute confidentiality agreements upon the commencement of the consulting or collaboration relationship in question. These agreements generally provide that all confidential information developed or made known to the entity or individual during the course of the entity's or individual's relationship with the Company is to be kept confidential and not disclosed to third parties except in specific limited circumstances.

MANUFACTURING

Our customers rely on our products and materials to assure the integrity of the critical materials used in their manufacturing processes by providing purity, cleanliness, consistent performance, dimensional precision and stability. Our ability to meet our customers' expectations, combined with our substantial investments in worldwide manufacturing capacity, position us to respond to the increasing demands from our customers for yield-enhancing materials and solutions.

To meet our customers' needs worldwide, we have established an extensive global manufacturing network with facilities in the United States, Japan, Taiwan, Malaysia and South Korea. Because we work in an industry where contamination control is paramount, we maintain Class 100 to Class 10,000 cleanrooms for manufacturing and assembly. We believe that our worldwide advanced manufacturing capabilities are important competitive advantages. These include:

- engineered polymer conversion and processing;
- advanced membrane modification and cleaning;
- chemical distillation, synthesis and purification;
- gas delivery systems;
- high-purity gas handling and transfilling;
- high-purity materials packaging;
- membrane casting;
- cartridge manufacturing and assembly;
- specialty coating capabilities;
- solids and powders compounding and handling;
- graphite synthesis;
- blow molding;
- rotational molding;
- machining; and
- assembly.

We have made significant investments in systems and equipment to create innovative products and tool designs, including metrology and 3D printing capabilities for rapid analysis and production prototype of products. In addition, we use contract manufacturers for certain of our gas purification systems and certain electronic materials products both in the U.S. and Asia.

RAW MATERIALS

Our products are made from a wide variety of raw materials that are generally available from multiple sources of supply. However, while we seek to have several sources of supply for all of these materials, certain materials included in our products, such as certain filtration membranes in our MC segment, petroleum coke and specialty and commodity chemicals in our SCEM segment and polymer resins in our AMH segment, are obtained from a single source or a limited group of suppliers or from suppliers in a single country. We have entered into multi-year supply agreements with a number of suppliers for the purchase of raw materials in the interest of supply assurance and to control costs.

GOVERNMENTAL REGULATION

Our operations are subject to federal, state and local regulatory requirements relating to environmental, waste management and health and safety matters, including measures relating to the release, use, storage, treatment,

transportation, discharge, disposal and remediation of contaminants, hazardous substances and wastes, as well as practices and procedures applicable to the construction and operation of our plants. Although some risk of costs and liabilities related to these matters is inherent in our business, as with many similar businesses, we believe that our business is operated in substantial compliance with applicable regulations. However, new, modified or more stringent requirements or enforcement policies could be adopted, which could adversely affect us. While we expect that capital expenditures will be necessary to assure that any new manufacturing facility is in compliance with environmental and health and safety laws, we do not expect these expenditures to be material.

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EMPLOYEES

As of December 31, 2017, we had approximately 3,900 employees. Given the variability of business cycles in the semiconductor industry and the quick response time required by our customers, it is critical that we be able to quickly adjust the size of our production staff to maximize efficiency. Therefore, we use skilled temporary labor as required. None of our employees are represented by a labor union or covered by a collective bargaining agreement other than statutorily mandated programs in certain European countries.

FINANCIAL INFORMATION ABOUT OUR OPERATING SEGMENTS

For a discussion of revenue and segment profitability with respect to each of our reporting segments, see Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations - Segment Analysis below, which is incorporated herein by reference. See also note 15 to our consolidated financial statements. Approximately 79%, 78% and 77% of our net sales were made to customers outside North America in 2017, 2016 and 2015, respectively. Industry and geographic segment information is also discussed in note 15 to the Entegris, Inc. consolidated financial statements included in response to Item 8 below, which is incorporated herein by reference.

OUR HISTORY

The Company was incorporated in Delaware on March 17, 2005 in connection with a merger between Entegris, Inc., a Minnesota corporation, and Mykrolis Corporation, a Delaware corporation. On April 30, 2014, the Company acquired ATMI, based in Danbury, CT. Entegris has been helping its customers solve their critical materials challenges and enhance their manufacturing yields for over 50 years, tracing its corporate origins back to Fluoroware, Inc., which began operating in 1966.

AVAILABLE INFORMATION

Our Internet address is www.entegris.com. On this web site, under the "Investors-Financial Information-SEC Filings" section, we post the following filings as soon as reasonably practicable after they are electronically filed with, or furnished to, the U.S. Securities and Exchange Commission (SEC): our annual, quarterly, and current reports on Forms 10-K, 10-Q, and 8-K; our proxy statements; any amendments to those reports or statements, and Form SD. All such filings are available on our web site free of charge. The SEC also maintains a web site (www.sec.gov) that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC. The content on our website, and any other website, as referred to in this Form 10-K is not incorporated by reference into this Form 10-K unless expressly noted.

Item 1A. Risk Factors.

You should carefully consider the following risks and other information in this Annual Report on Form 10-K in evaluating us and our common stock. Any of the following risks could materially and adversely affect our financial condition, results of operations or cash flows. Our operations could be affected by various risks, many of which are beyond our control. Based on current information, we believe that the following list identifies the most significant risk factors that could affect our financial condition, results of operations or cash flows. There may be additional risks and uncertainties that adversely affect our financial condition, results of operations or cash flows in the future that are not presently known, are not currently believed to be material, or are not identified below because they are common to all businesses. Past financial performance may not be a reliable indicator of future performance and historical trends should not be used to anticipate results or trends in future periods. For more information, see "Cautionary Statement" in Item 7 of this Annual Report on Form 10-K.

Risks Related to Our Business and Industry

WORLDWIDE ECONOMIC AND INDUSTRY CONDITIONS MAY CAUSE DEMAND FOR OUR PRODUCTS TO DECREASE AND MAY ADVERSELY AFFECT OUR BUSINESS.

Worldwide economic and industry conditions may adversely affect our business. Our revenue is primarily dependent upon demand from semiconductor manufacturers, which is driven by the current and anticipated demand for semiconductors and products utilizing semiconductors. While we believe drivers for semiconductor demand, such as smartphones, cloud computing, the Internet of Things, artificial intelligence and other applications, have broadened and provide for a more stable overall industry environment, historically, the semiconductor industry has been, and may in the future be, highly cyclical with periodic significant downturns, resulting in significantly decreased expenditures by semiconductor manufacturers. We are unable to predict the ultimate duration or severity of any future

downturns for the semiconductor industry. We have in the past experienced significant revenue deterioration and operating losses due to a severe downturn in the semiconductor industry. The semiconductor industry is also affected by seasonal shifts in demand. Even moderate cyclicality or seasonality can cause our operating results to fluctuate significantly from one period to the next.

Furthermore, since we must continue to maintain a satisfactory level of engineering, research and development expenditures, continue to invest in our infrastructure and maintain the ability to respond to any significant increases in demand, if they occur, lower sales volume in periods of reduced demand can have a large impact on our profitability. Changes in order patterns have an immediate impact on our revenues because we typically do not have significant backlog. During downturns, our revenue is reduced and there is likely to be an increase in pricing pressure and shifts in product and customer mix, all of which may affect gross margin and net income. Such fluctuations in our results could cause our stock price to decline significantly. We believe that period-to-period comparisons of our results of operations may not be meaningful, and you should not rely upon them as indicators of our future performance.

OUR DEPENDENCE ON SINGLE AND LIMITED SOURCE SUPPLIERS OR AN INTERRUPTION IN OUR ORDINARY SOURCES OF SUPPLY COULD AFFECT OUR ABILITY TO MANUFACTURE OUR PRODUCTS AND HAVE AN ADVERSE EFFECT ON OUR RESULTS OF OPERATIONS.

We rely on single or limited source suppliers for raw materials, such as plastic polymers, filtration membranes, petroleum coke and other materials, which are critical to the manufacturing of our products. If we lost one of these sources, it may be difficult for us to find an alternative supplier and we would need to qualify this new source through our customers' rigorous qualification processes. Although we seek to reduce dependence on these sole and limited source suppliers, the partial or complete loss of these sources could interrupt our manufacturing operations and result in an adverse effect on our results of operations.

At times, we have experienced a limited supply of certain raw materials, as well as the need to substitute raw materials, resulting in delays, increased costs and risks associated with qualifying products made from such new raw materials with our customers. Events such as an industry-wide increase in demand for, or the discontinuation of, raw materials used in our products could affect our ability to acquire sufficient quantities and our manufacturing operations may be interrupted. For example, global demand for fluoropolymers increased unexpectedly in 2017 due to greater requirements from certain markets. While we were able to maintain our supply of this raw material and prevent delays in customer shipments by holding forecast reviews with our key suppliers and securing higher levels of fluoropolymers inventory, no assurances can be made that future raw materials shortages will not affect our operations. Additionally, our suppliers may not have the capacity to meet increases in our demand for raw materials, making it difficult for us to meet demand from our customers. Furthermore, prices for our raw materials can vary widely. While we have long-term arrangements with certain key suppliers that fix our price for the purchase of certain raw materials, if the cost of our raw materials increases and we are unable to correspondingly increase the sales price of our products or find other cost savings, our profit margins will decline.

A SIGNIFICANT AMOUNT OF OUR SALES IS CONCENTRATED ON A LIMITED NUMBER OF KEY CUSTOMERS AND, THEREFORE, OUR NET SALES AND PROFITABILITY MAY MATERIALLY DECLINE IF WE LOST ONE OR MORE OF THESE CUSTOMERS.

Sales to a limited number of large customers constitute a significant portion of our overall revenue, shipments, cash flows, collections, and profitability. Our top ten customers accounted for 47%, 45% and 44% of our net sales in 2017, 2016 and 2015, respectively. Our customers could stop using our products in their manufacturing processes with limited advance notice to us and suffer little or no penalty for doing so. The cancellation, reduction or deferral of purchases of our products by even a single customer could significantly reduce our revenues in any particular quarter. If we were to lose any of our significant customers, if our products are not specified for these customers' products or production processes, or if we suffer a material reduction in their purchase orders, our revenue could decline and our business, financial condition and results of operations could be materially and adversely affected. Due to the long design and development cycle and lengthy customer product qualification periods required for most of our new products, we may be unable to quickly replace these customers, if at all.

Furthermore, the semiconductor industry has been undergoing, and is expected to continue to undergo, consolidation. If any of our customers merge or are acquired, we may experience lower overall sales from the merged or surviving companies. In addition, our principal customers also hold considerable purchasing power and may be able to negotiate requirements that result in decreased pricing, increased costs, and/or lower margins for us, and limitations on our ability to share jointly developed technology with others.

We could also lose our key customers or significant sales to our key customers because of factors beyond our control, such as a significant disruption in our customers' businesses generally or in a specific product line, a change in the manufacturing sourcing policies or practices of these customers or the timing of customer inventory adjustments. For example, our customers' aggressive management of inventory has adversely affected revenue in our SCEM segment in the past and may adversely affect future results of operations.

IF WE ARE UNABLE TO CONTINUE OUR TECHNOLOGICAL INNOVATION AND INTRODUCTION OF NEW PRODUCTS, WE WILL NOT BE ABLE TO SUCCESSFULLY COMPETE.

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The semiconductor industry is subject to rapid technological change, changing customer requirements and frequent new product introductions. As a result, the life cycle of our products is difficult to determine. We believe that our future success will depend upon our ability to continue to develop mission-critical solutions to maximize our customers' manufacturing yields and enable higher performance of end-market materials or devices. This requires that we successfully anticipate and respond to technological changes in manufacturing processes in a cost-effective and timely manner. A failure to develop new products or enhancements to our existing products or the inability to timely manufacture and ship these products or enhancements in sufficient volume could harm our business prospects and significantly reduce our sales. In addition, if new products have reliability or quality problems, we may experience reduced orders, higher manufacturing costs, delays in acceptance and payment, additional service and warranty expense, and damage to our reputation.

COMPETITION FROM NEW OR EXISTING COMPANIES COULD HARM OUR FINANCIAL CONDITION, RESULTS OF OPERATIONS AND CASH FLOW.

We operate in a highly competitive industry. We compete against many domestic and foreign companies, some of which have substantially greater manufacturing, financial, research and development, and marketing resources than we do. In addition, some of our competitors may have better-established customer relationships than we do, which may enable them to have their products specified for use more frequently and more quickly by these customers. We also face competition from smaller, regional companies, which focus on serving those customers in their same region. Another source of competition is from the manufacturing engineering teams of our customers, who continually evaluate the benefits of internal manufacturing versus outsourcing. If we are unable to maintain our competitive position, we could experience downward pressure on prices, fewer customer orders, reduced margins, the inability to take advantage of new business opportunities and a loss of market share, which could have a material adverse effect on our results of operations. Further, we expect that existing and new competitors will improve the design of their existing products and will introduce new products with enhanced performance characteristics. The introduction of new products or more efficient production of existing products by our competitors could diminish our market share and increase pricing pressure on our products.

IF WE ARE UNABLE TO OBTAIN FUTURE BUSINESS OPPORTUNITIES ASSOCIATED WITH NEW PRODUCT INITIATIVES AND RELATED INVESTMENTS, OUR REVENUE AND PROFITABILITY MAY DECLINE.

In the semiconductor market, while the development period for a product can be very long, the first company to introduce an innovative product meeting an identified customer need will often have a significant advantage over offerings of competitive products. For this reason, we may make significant cash expenditures to research, develop, engineer and market new products and make significant capital investments in technology and manufacturing capacity in advance of future business developing and without any purchase commitment from our customers. For example, to support new product and technology development, we incurred $107.0 million, $107.0 million and $105.9 million for engineering, research and development expense in 2017, 2016 and 2015, respectively.

Following development, it may take a number of years for sales of a new product to reach a substantial level, if ever. A product concept may never progress beyond the development stage or may only achieve limited acceptance in the marketplace. If this occurs, we do not receive a direct return on our expenditures, we may not realize any indirect benefits, we may lose market share and our revenue and profitability may decline. For example, from 2011 to 2014, our capital expenditures relating to developing the capability to manufacture shippers and FOUPs for 450 mm wafers were approximately $16.5 million. However, major semiconductor manufacturers have announced that they would not initiate 450 mm manufacturing in the foreseeable future. As a result, we have taken impairment charges related to certain 450 mm-related equipment and are exiting a location dedicated to 450 mm wafer handling solutions. We cannot assure you that the new products and technology we choose to develop and market in the ordinary course of our business will be successful.

WE MAY ACQUIRE OTHER BUSINESSES, FORM JOINT VENTURES OR DIVEST BUSINESSES, WHICH COULD NEGATIVELY AFFECT OUR FINANCIAL PERFORMANCE.

As part of our business strategy, and as we have done in the past, we expect to address gaps in our product offerings, adjust our portfolio of businesses to meet our ongoing strategic objectives, and diversify into complementary markets

through acquisitions, joint ventures or other types of collaborations. As a result, we may enter markets in which we have no or limited prior experience and may encounter difficulties in divesting businesses that no longer meet our objectives. Competition for acquiring attractive businesses in our industry is substantial. We may experience difficulty in identifying suitable acquisition candidates or in completing selected transactions at appropriate valuations, in a timely manner, on a cost-effective basis or at all, and we may not realize the anticipated benefits of any such transaction. Alternatively, we may be required to undertake multiple transactions at the same time in order to take advantage of acquisition opportunities that do arise. This could strain our ability to effectively execute and integrate these transactions. Further, we may not be able to successfully integrate any acquisitions that we do make into our existing business operations, and we could assume unknown or contingent liabilities or experience negative effects on our reported results of operations from dilutive results from operations and/or from future potential impairment of acquired assets, including goodwill, related to future acquisitions. For example, if we fail to successfully integrate the water and chemical filtration product line for microelectronics applications we acquired in 2017 from Gore, we may not meet our revenue and bottom line objectives for these

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filtration products. We may experience difficulties in retaining key employees or customers of an acquired business, and our management's attention could be diverted from other business issues.

MANUFACTURING INTERRUPTIONS OR DELAYS, FAILURES TO ACCURATELY FORECAST CUSTOMER DEMAND OR TO RESPOND TO SHIFTS IN DEMAND, AND THE RISKS ASSOCIATED WITH THE MANUFACTURE OF HAZARDOUS MATERIALS, IN PARTICULAR SPECIALTY CHEMICALS, COULD ADVERSELY AFFECT OUR BUSINESS, FINANCIAL CONDITION AND RESULTS OF OPERATIONS.

Our manufacturing processes are complex and require the use of expensive and technologically sophisticated equipment and materials. These processes are frequently modified to improve manufacturing yields and product quality. We have, on occasion, experienced manufacturing difficulties, such as occasional critical equipment breakdowns or the introduction of impurities in the manufacturing process, which could cause lower manufacturing yields, make our products unmarketable and/or delay deliveries to customers. In addition, modification to the manufacturing process of our products may require that the affected product be re-qualified by our customers, which can increase our costs and delay our ability to sell this product to our customers. We could experience these or other manufacturing difficulties, which might result in a loss of customers and exposure to warranty and product liability claims.

A number of our product lines are manufactured at only one or two facilities in different countries, and any disruption could impact our sales until another facility could commence or expand production of such products. We have in the past, we may in the future, move the manufacture of certain product lines from one of our plants to another, usually to enhance efficiency and cost effectiveness of our manufacturing operations and to better serve customers located in various countries. Production may be disrupted and we may not be able to meet customer orders if we fail to efficiently and effectively transfer and re-establish the manufacturing processes in the destination plant. This may cause us to lose credibility with our customers and harm our business. Even if we successfully move our manufacturing processes, there is no assurance that we will achieve anticipated cost savings and efficiencies.

Our ability to increase sales of our products, particularly our capital equipment products, depends in part upon our ability to ramp up our manufacturing capacity for such products in a timely manner, often in as little as a few months, and to quickly mobilize our supply chain. If we are unable to expand our manufacturing capacity on a timely basis, manage such expansion effectively or obtain an increase in required raw materials from our supply chain, our customers could seek such products from our competitors, and our market share could be reduced. Because demand shifts in the semiconductor industry are rapid and difficult to foresee, we may not be able to increase capacity quickly enough to respond to any such increase in demand.

We typically operate our business on a just-in-time shipment basis with a modest level of backlog and we order supplies and plan production based on internal forecasts of demand. We have, in the past, and may again in the future, fail to accurately forecast demand for our products, in terms of both volume and product type. This has led to, and may in the future lead to, delays in product shipments, disappointment of customer expectations, or, alternatively, an increased risk of excess and obsolescence of our inventory. If we fail to accurately forecast demand for our products, our business, financial condition and operating results could be materially and adversely affected.

Our operations involve, and we are exposed to the risks associated with, the use and the manufacture of hazardous materials, in particular, specialty chemical manufacturing, and the related storage and transportation of raw materials, products and waste in our manufacturing facilities or distribution centers. In addition, a failure of one of our products at a customer site could interrupt the business operations of the customer. For example, while we believe that our SDS and VAC delivery systems are the safest available in the industry, as with any products involved in the transport and storage of toxic gases, if a leak were to occur during transport or during storage at our customers' location, serious damage could result including injury or death to any person exposed to those toxic gases creating significant product liability for us. There can be no assurance that our insurance will be adequate to satisfy any such liabilities and our financial results or financial condition could be adversely affected.

LOSS OF OUR KEY PERSONNEL, WHO HAVE SIGNIFICANT EXPERIENCE IN THE SEMICONDUCTOR INDUSTRY AND TECHNOLOGICAL EXPERTISE, COULD HARM OUR BUSINESS, WHILE OUR INABILITY TO ATTRACT AND RETAIN NEW QUALIFIED PERSONNEL COULD INHIBIT OUR ABILITY TO OPERATE AND GROW OUR BUSINESS SUCCESSFULLY.

Many of our key personnel have significant experience in the semiconductor industry and deep technical expertise. The loss of the services of one or several of our key employees or an inability to attract, train and retain qualified and skilled employees, specifically research and development and engineering personnel, could inhibit our ability to operate and grow our business successfully. As the semiconductor industry has experienced growth in recent years, the competition between industry participants for qualified talent, particularly those with significant experience in the semiconductor industry, has intensified. As a result, the difficulty and costs associated with attracting and retaining key employees has risen and may rise further in the future rise.

IF WE ARE UNABLE TO PROTECT OUR INTELLECTUAL PROPERTY AND TECHNOLOGY, IF OUR COMPETITORS WERE TO DEVELOP SIMILAR OR SUPERIOR INTELLECTUAL PROPERTY OR

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TECHNOLOGY, OR, IF OUR INTELLECTUAL PROPERTY OR TECHNOLOGY VIOLATE THIRD-PARTY RIGHTS, OUR BUSINESS AND PROSPECTS COULD BE HARMED.

Our future success and competitive position depend in part upon our ability to obtain and maintain proprietary technology. We rely, in part, on patent, trade secret and trademark law to protect many of our major product platforms. We have obtained a number of patents relating to our products and have filed applications for additional patents. We cannot assure you that any of our pending patent applications will be approved, in key jurisdictions or at all, that we will develop additional proprietary technology that is patentable, that any patents owned by or issued to us will provide us with competitive advantages or that these patents will not be challenged, invalidated, circumvented, and rendered unenforceable or otherwise compromised by third parties. In addition, if we do not obtain intellectual property protection in the international jurisdictions we serve, our competitiveness in these markets could be significantly impaired, which could limit our growth and future revenue. While we routinely enter into confidentiality agreements with our employees and with third parties to protect our proprietary information and technology, these agreements may not be enforceable or they may be breached by such employees or third parties, and we may not have adequate remedies for such breaches. Furthermore, our confidential and proprietary information and technology could be independently developed by or become otherwise known to third parties and third parties could design around our patents.

Competitors may misappropriate our intellectual property, and disputes as to ownership of intellectual property may arise. We may institute litigation in order to enforce our patents, copyrights or other intellectual property rights, to protect our trade secrets, to determine the validity and scope of the proprietary rights of others or to defend against claims of infringement. Such litigation could result in substantial costs and diversion of resources and could negatively affect our sales, profitability and prospects regardless of whether we are able to successfully enforce our rights. For example, in January 2011, we settled multiple patent litigations with Pall Corporation (which was acquired by Danaher Corporation in 2015). We prosecuted and defended these cases vigorously and incurred substantial costs in pursuing them. It may become necessary for us to initiate other costly patent litigation against our competitors in order to protect and/or perfect our intellectual property rights. We cannot predict how any existing or future litigation will be resolved or what its impact will be on us.

Our commercial success depends, in part, on our ability to avoid infringing or misappropriating any patents or other proprietary rights owned by third parties. If we are found to infringe or misappropriate a third party’s patent or other proprietary rights, we could be required to pay damages to such third party, alter our products or processes, obtain a license from the third party or cease activities utilizing such proprietary rights, including making or selling products utilizing such proprietary rights. If we are required to obtain a license from a third party, there can be no assurance that we will be able to do so on commercially favorable terms or at all.

OUR RESULTS OF OPERATIONS COULD BE ADVERSELY AFFECTED BY CLIMATE CHANGE OR NATURAL CATASTROPHES IN THE LOCATIONS IN WHICH WE, OUR CUSTOMERS OR OUR SUPPLIERS OPERATE, SUCH AS THE MARCH 2011 EARTHQUAKE AND TSUNAMI IN JAPAN, HURRICANE HARVEY IN EAST TEXAS, HURRICANE IRMA IN FLORIDA IN 2017 AND THE WILDFIRES IN COLORADO SPRINGS, COLORADO AND CALIFORNIA IN 2012 AND 2017.

We have manufacturing and other operations in locations subject to severe weather and natural catastrophes which could disrupt operations, such as typhoons in Taiwan and China, earthquakes and tsunamis in Japan in 2011, hurricanes in east Texas (Hurricane Harvey) and in Florida (Hurricane Irma), each in 2017, and wildfires in Colorado Springs, Colorado in 2012 and in California in 2017. In addition, our suppliers and customers also have operations in such locations. A natural disaster that results in a prolonged disruption to our operations, or our customers’ or suppliers’ operations, may adversely affect our results of operations and financial condition. Also, climate change poses both regulatory and physical risks that could harm our results of operations or affect the way we conduct our businesses. While our business continuity plans enabled us to mitigate the impact to our operations of the events described above, there can be no assurance that such plans will be effective in the future or that such catastrophes will not disrupt our ability to manufacture and deliver products to our customers, resulting in an adverse impact on our business and results of operations.

WE MAY BE SUBJECT TO INFORMATION TECHNOLOGY SYSTEM FAILURES, NETWORK DISRUPTIONS AND BREACHES IN DATA SECURITY, WHICH COULD DAMAGE OUR REPUTATION AND ADVERSELY AFFECT OUR FINANCIAL CONDITION, RESULTS OF OPERATIONS AND CASH FLOWS.

In the ordinary course of our business, we collect and store sensitive data, including our intellectual property, confidential information, proprietary business information and that of our customers, suppliers and business partners and personally identifiable information of our employees in our data centers and on our networks. The secure processing, maintenance and transmission of this information is critical to our operations. Information technology system failures, network disruptions and breaches of data security from cyber-attacks, employee error or social media use on our computers or through failure of our internet service providers and other cloud computing service providers to successfully secure their own systems could disrupt our operations, cause customer communication and order management issues, cause the unintentional disclosure of customer, employee and proprietary information, and cause disruption in our transaction processing, which could affect our reputation and reporting of financial results.

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While our management has implemented network security procedures, virus protection software, intrusion prevention systems, access control, emergency recovery processes and internal control measures, there can be no assurance that a system failure or data security breach will not occur and have a material adverse effect on our financial condition results of operations and cash flows.

WITH A SIGNIFICANT AMOUNT OF OUR SALES AND MANUFACTURING ACTIVITY OCCURRING OUTSIDE THE UNITED STATES, WE ARE EXPOSED TO THE RISKS OF OPERATING A GLOBAL BUSINESS.

Sales to customers outside the United States accounted for approximately 79%, 78% and 77% of our net sales in 2017, 2016 and 2015, respectively. We anticipate that international sales will continue to account for a majority of our net sales. In addition, a number of our key domestic customers derive a significant portion of their revenues from sales in international markets. We also manufacture a significant portion of our products outside the United States and are dependent on international suppliers for many of our parts and raw materials. We intend to continue to pursue opportunities in both sales and manufacturing internationally. Our international operations are subject to a number of risks and potential costs that could adversely affect our revenue and profitability, including:

- unexpected changes in regulatory requirements that could impose additional costs on our operations or limit our ability to operate our business;
- challenges in hiring and integrating workers in different countries;
- management of a diverse workforce with different experience levels, languages, cultures, customs, business practices and worker expectations, along with differing employment practices and labor issues;
- maintenance of appropriate business processes, procedures and internal controls, and compliance with, legal, environmental, health and safety, anti-corruption and other regulatory requirements;
- development of relationships with local customers, suppliers and governments;
- fluctuating pricing and availability of raw materials and supply chain interruptions;
- expense and complexity of complying with U.S. and foreign import and export regulations, including the ability to obtain required import and export licenses;
- liability for foreign taxes assessed at rates higher than those applicable to our domestic operations;
- unanticipated government actions, such as trade wars, or laws, rules, regulations and policies that favor domestic companies over nondomestic companies, including customer or government efforts to provide for the development and growth of local competitors;
- customer or government efforts to encourage operations and sourcing in a particular country, such as Korea and China; and
- political and economic instability and uncertainty.

In the past, we have incurred costs or experienced disruptions due to the factors described above and we expect to do so in the future. For example, in response to recent explosions at gas storage facilities in Singapore and China, the import of gas canisters and chemicals viewed as dangerous have come under increased regulatory scrutiny by governmental officials. As a result, we have established partnerships with local suppliers. However, this increased regulation may impair the ability of our SCEM segment to import those products into Singapore and China and may cause us to lose sales. Also, in the past, our operations in Asia, and particularly South Korea, Taiwan and Japan, have been negatively impacted as a result of regional economic instability. There have historically been strained relations between China and Taiwan and there are continuing tensions between North Korea and other countries, including South Korea and the United States. Any adverse developments in those relations could significantly disrupt the worldwide production of semiconductors, which may lead to reduced sales of our products.

WE ARE SUBJECT TO A VARIETY OF ENVIRONMENTAL LAWS AND REGULATIONS THAT COULD CAUSE US TO INCUR SIGNIFICANT LIABILITIES AND EXPENSES.

Failure to comply with the wide variety of federal, state, local and non-U.S. regulatory requirements relating to the release, use, storage, treatment, transportation, discharge, disposal and remediation, of, and human exposure to, hazardous chemicals, which have tended to become stricter over time, could result in future liabilities or the suspension of production or shipment. For example, the Frank R. Lautenberg Chemical Safety for the 21st Century Act modified the Toxic Control Substances Act, or TSCA, by requiring the Environmental Protection Agency, or the

EPA, to prioritize and evaluate the environmental and health risks of existing chemicals and provides EPA with greater authority to regulate chemicals posing unreasonable risks. According to this statute, the EPA is required to make an affirmative finding that a new chemical will not pose an unreasonable risk before such chemical can go into production. As a result, TSCA has been updated so that it operates in a similar fashion to the Registration, Evaluation, and Authorization of Chemicals, or REACH, legislation in Europe. Regulations similar to REACH have been enacted in South Korea and Taiwan. These laws and regulations, among others, increase the complexity and costs of transporting our products from the country in which they are manufactured, to the location of our customer. Any further changes to these and similar regulations in the countries in which we operate or sell into could restrict our ability to expand our facilities or to build or acquire new facilities, require us to acquire costly control equipment, cause us to incur expenses associated with remediation of contamination, modify

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our manufacture or shipping processes, or otherwise increase our cost of doing business and have a negative impact on our financial condition, results of operations and cash flows.

The nature of our business exposes us to risk of liability for environmental contamination if hazardous materials are released into the environment, which could result in substantial losses, reputational harm, increase in our insurance cost or otherwise adversely impact our results of operations.

CHANGES IN TAXATION OR ADVERSE TAX RULINGS COULD ADVERSELY AFFECT OUR RESULTS OF OPERATIONS.

We have facilities in many foreign countries and, as a result, are subject to taxation at various rates and audit by a number of taxing authorities. Our results of operations could be affected by changes in applicable tax rates or audits by the taxing authorities in countries in which we operate or in the countries from which we purchase raw materials, changes in laws and regulations governing calculation and location of earned profit and taxation thereof, changes in laws and regulations affecting our ability to realize deferred tax assets on our balance sheet and changes in laws and regulations relating to the repatriation of cash into the United States. Each quarter we forecast our tax liability based on our forecast of our performance for the year. If that performance forecast changes, our forecasted tax liability may change.

We have undertaken a number of complex internal reorganizations of our foreign subsidiaries in order to rationalize and streamline our foreign operations, focus our management efforts on certain local opportunities and take advantage of favorable business conditions in certain localities. While we have exercised diligence in undertaking this internal reorganization, there can be no assurance that this reorganization, or any future internal reorganization, will not result in adverse tax consequences in the United States or in foreign countries in which we have operations. This could adversely impact our profitability from foreign operations and result in a material reduction in our results of operations.

The U.S. Tax Cuts and Jobs Act of 2017 (the “Tax Cuts and Jobs Act”) significantly changes how the U.S. taxes corporations. The Tax Cuts and Jobs Act requires complex computations to be performed that were not previously required in U.S. tax law, significant judgments to be made in interpretation of the provisions of the Tax Cuts and Jobs Act and significant estimates in calculations, and the preparation and analysis of information not previously relevant or regularly produced. The U.S. Treasury Department, the IRS, and other standard-setting bodies could interpret or issue guidance on how provisions of the Tax Cuts and Jobs Act will be applied or otherwise administered that is different from our interpretation. As we complete our analysis of the Tax Cuts and Jobs Act, collect and prepare necessary data, and interpret any additional guidance, we may make adjustments to provisional amounts that we have recorded that may materially impact our provision for income taxes in the period in which the adjustments are made.

FLUCTUATIONS IN THE VALUE OF THE U.S. DOLLAR IN RELATION TO OTHER CURRENCIES MAY LEAD TO LOWER NET INCOME AND SHAREHOLDERS’ EQUITY OR MAY CAUSE US TO RAISE PRICES, WHICH COULD RESULT IN REDUCED NET SALES.

Foreign currency exchange rate fluctuations could have an adverse effect on our net sales, results of operations and shareholders’ equity. Foreign currency fluctuations against the U.S. dollar could require us to increase prices to foreign customers, which could result in lower net sales by us to such customers. Alternatively, if we do not adjust the prices for our products in response to foreign currency fluctuations, our profitability could decline. In addition, sales made by our foreign subsidiaries are generally denominated in the currency of the country in which these products are sold, and the currency we receive in payment for such sales could be less valuable at the time of receipt versus the time of sale as a result of foreign currency exchange rate fluctuations.

VOLATILITY IN THE GLOBAL ECONOMY COULD ADVERSELY AFFECT OUR RESULTS.

Financial markets in the United States, Europe and Asia have experienced extreme disruption in the recent past. Such disruption included, among other things, volatility in securities prices, severely diminished liquidity and credit availability, rating downgrades of sovereign debt, declining valuation of certain investments, declines in consumer confidence, declines in economic growth, volatility in unemployment rates, and uncertainty about economic stability. Such conditions have had a significant adverse impact on our industry, our financial condition and results of operations. There may be further changes in the global economy, which could lead to further challenges in our business and negatively impact our financial results. For example, the U.K. vote in favor of leaving the European

Union may cause instability and uncertainty in European economies and may negatively impact the outlook for the global economy. Tightness of credit in financial markets could adversely affect the ability of our customers and suppliers to obtain financing for significant purchases and operations and could result in a decrease in orders and spending for our products and services. We are unable to predict the likely duration and severity of any disruption in regional or global financial markets and adverse economic conditions and the effects they may have on our business and financial condition. If uncertain economic conditions return or deteriorate, our business and results of operations could be further materially and adversely affected.

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Risks Related to Our Indebtedness

WE HAVE A SUBSTANTIAL AMOUNT OF INDEBTEDNESS, WHICH COULD ADVERSELY AFFECT OUR FINANCIAL HEALTH AND OUR ABILITY TO OBTAIN FINANCING IN THE FUTURE, REACT TO CHANGES IN OUR BUSINESS AND MAKE PAYMENTS ON THE INDEBTEDNESS.

As of December 31, 2017, we have approximately $683.9 million of indebtedness outstanding, including our 4.625% senior unsecured notes due April 1, 2026 (the "Notes") and our senior secured term loan facility due 2021 (the "Term Loan"). In addition, we have approximately $75 million of unutilized capacity under our senior secured asset-based revolving credit facility, which is subject to a borrowing base (the "ABL Facility").

Our high level of debt could have important consequences, including:

- making it more difficult for us to satisfy our obligations with respect to the Notes, the Term Loan and the ABL Facility;
- limiting our ability to obtain additional financing to fund future working capital, capital expenditures, acquisitions or other general corporate purposes;
- requiring a substantial portion of our cash flow to be dedicated to debt service payments instead of other purposes, thereby reducing the amount of cash flow available for working capital, capital expenditures, acquisitions and other general corporate purposes;
- increasing our vulnerability to adverse changes in general economic, industry and competitive conditions;
- exposing us to the risk of increased interest rates as certain of our borrowings, including borrowings under the Term Loan and the ABL Facility, include variable interest rates;
- limiting our flexibility in planning for and reacting to changes in the industry in which we compete;
- preventing us from raising funds necessary to repurchase all Notes tendered to us upon the occurrence of certain change of control repurchase events, which could constitute a default under the indenture governing the Notes;
- placing us at a disadvantage compared to other, less leveraged competitors or competitors with comparable debt at more favorable interest rates; and
- increasing our cost of borrowing.

In addition, the indenture that governs the Notes and the credit agreements governing our Term Loan and our ABL Facility contain restrictive covenants that will limit our ability to engage in activities that may be in our long-term best interest. Our failure to comply with those covenants could result in an event of default which, if not cured or waived, could result in the acceleration of substantially all of our debt.

DESPITE OUR CURRENT LEVEL OF INDEBTEDNESS, WE MAY STILL BE ABLE TO INCUR SUBSTANTIALLY MORE DEBT, WHICH COULD FURTHER EXACERBATE THE RISKS TO OUR FINANCIAL CONDITION DESCRIBED ABOVE AND PREVENT US FROM FULFILLING OUR OBLIGATIONS UNDER OUR EXISTING INDEBTEDNESS.

We may incur significant additional indebtedness in the future. Although the indenture that governs the Notes and the credit agreements governing our Term Loan and our ABL Facility contain restrictions on the incurrence of additional indebtedness, these restrictions are subject to a number of qualifications and exceptions, such as indebtedness to finance working capital, capital expenditures, investments or acquisitions, or for other purposes, and the additional indebtedness incurred in compliance with these restrictions could be substantial. For example, our Term Loan provides that we have the right to request additional loans and commitments, and to the extent that the aggregate amount of such additional loans and commitments exceeds $225 million, the incurrence thereof will be subject to our secured net leverage ratio being less than a specified ratio, or in the case of unsecured loans or other unsecured debt, or loans or other debt secured by junior liens, our total net leverage ratio being less than a specified ratio. If we incur any additional indebtedness that ranks equally with the Notes, subject to collateral arrangements, the holders of that debt will be entitled to share ratably with the holders of the Notes and the lenders under the Term Loan and the ABL Facility in any proceeds distributed in connection with any insolvency, liquidation, reorganization, dissolution or other winding up of our Company. These restrictions also will not prevent us from incurring obligations that do not constitute indebtedness. In addition, the indenture governing the Notes does not limit the Company's ability to incur unsecured indebtedness and the restrictions in the indenture on our ability to incur additional secured indebtedness is subject to a number of significant exceptions and qualifications and the amount of such secured indebtedness could be

substantial. Further, although the indenture governing the Notes limits the incurrence of indebtedness by a non-guarantor subsidiary unless such subsidiary also guarantees the Notes, such limitation is subject to a number of significant exceptions and qualifications and the amount of indebtedness incurred in compliance with the indenture could be substantial. If new debt is added to our current debt levels, the related risks that the Company now faces could intensify.

WE MAY NOT BE ABLE TO GENERATE SUFFICIENT CASH TO SERVICE OUR INDEBTEDNESS AND MAY BE FORCED TO TAKE OTHER ACTIONS, WHICH MAY NOT BE SUCCESSFUL, TO SATISFY OUR OBLIGATIONS UNDER OUR INDEBTEDNESS.

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We may be unable to maintain a level of cash flow from operating activities sufficient to permit us to pay the principal of, premium, if any, and interest on our indebtedness. Our ability to make scheduled payments on or to refinance our debt obligations depends on our financial condition and operating performance and the condition of the capital markets, which are subject to prevailing economic, industry and competitive conditions, as well as certain financial, business, legislative, political regulatory and other factors beyond our control. If our cash flow and capital resources are insufficient to fund our debt service obligations, we could face substantial liquidity problems, be forced to reduce or delay investments and capital expenditures, dispose of material assets or operations, seek additional debt or equity capital or restructure or refinance our indebtedness, and our financial position and results of operations could be materially and adversely affected.

Any refinancing of our debt could be at higher interest rates and may require us to comply with more onerous covenants, which could further restrict our business operations. We may not be able to effect any such alternative measures on commercially reasonable terms or at all and, even if successful, those alternative actions may not allow us to meet our scheduled debt service obligations. Our ability to dispose of assets and use the proceeds from those dispositions is restricted by the agreements governing our indebtedness and we may not be able to consummate those dispositions or to obtain proceeds in an amount sufficient to meet any debt service obligations then due.

If we cannot make scheduled payments on our debt, we will be in default and holders of the Notes could declare all outstanding principal and interest to be due and payable, the lenders under the Term Loan and the ABL Facility could terminate their commitments to loan money, our secured lenders could foreclose against the assets securing their borrowings and we could be forced into bankruptcy or liquidation.

THE TERMS OF THE CREDIT AGREEMENTS GOVERNING OUR TERM LOAN AND OUR ABL FACILITY RESTRICT OUR CURRENT AND FUTURE OPERATIONS, PARTICULARLY OUR ABILITY TO RESPOND TO CHANGES OR TO CONDUCT OUR BUSINESS OR RAISE ADDITIONAL FUNDS.

The credit agreements governing our Term Loan and our ABL Facility contain a number of restrictive covenants that impose significant operating and financial restrictions on us and may limit our ability to engage in acts that may be in our long-term best interest, including restrictions on our ability to:

- incur certain liens;
- incur additional indebtedness and guarantee indebtedness;
- pay dividends or make other distributions in respect of, or repurchase or redeem, capital stock;
- prepay, redeem or repurchase certain debt;
- make investments, loans, advances and acquisitions;
- sell or otherwise dispose of assets, including capital stock of our subsidiaries;
- enter into transactions with affiliates;
- alter the businesses we conduct;
- enter into agreements restricting our subsidiaries' ability to pay dividends; and
- consolidate, merge or sell all or substantially all of our assets.

In addition, the restrictive covenants in the credit agreement governing our ABL Facility may, at certain times, require us to maintain a fixed charge coverage ratio. Our ability to meet this financial ratio can be affected by events beyond our control.

Our failure to comply with these covenants could result in an event of default that, if not cured or waived, could result in the acceleration of some or all of our indebtedness, which could lead to bankruptcy, reorganization or insolvency. These restrictions may affect our ability to grow in accordance with our plans and could adversely affect our ability to:

- finance our operations;
- make needed capital expenditures;
- make strategic acquisitions or investments or enter into joint ventures;
- withstand a future downturn in our business, the industry or the economy in general;
- compete effectively and engage in business activities, including future opportunities, that may be in our best interest; and
- plan for or react to market conditions or otherwise execute our business strategies.

Risks Related to Owning our Common Stock

THE PRICE OF OUR COMMON STOCK HAS BEEN VOLATILE IN THE PAST AND MAY BE VOLATILE IN THE FUTURE.

The price of our common stock has been volatile in the past and may be volatile in the future. In 2017, the closing price of our stock on The NASDAQ Global Select Market, or NASDAQ, ranged from a low of $18.10 to a high of $32.80, and, as in past years, the price of our common stock may show greater volatility.

The trading price of our common stock is subject to significant volatility in response to various factors, some of which are beyond our control or may be unrelated to our operating results, and which may adversely affect the market price of our common stock, including the following: the failure to meet the published expectations of securities analysts; changes in financial estimates by securities analysts; press releases or announcements by, or changes in market values of, comparable companies; volatility in the markets for high-technology stocks, general stock market price and volume fluctuations, which are particularly common among securities of high-technology companies; stock market price and volume fluctuations attributable to inconsistent trading volume levels; the public perception of equity values of publicly traded companies and the other risks and uncertainties described in this Annual Report on Form 10-K and in our other filings with the SEC. Future decreases in our stock price may adversely impact our ability to raise sufficient additional capital in the future, if needed.

THERE CAN BE NO ASSURANCE THAT WE WILL CONTINUE TO DECLARE CASH DIVIDENDS OR REPURCHASE OUR SHARES AT ALL OR IN ANY PARTICULAR AMOUNTS

Our Board of Directors initiated a quarterly dividend in November 2017. Our intent to continue to pay quarterly dividends and to repurchase our shares is subject to capital availability and periodic determinations by our Board of Directors that such actions are in the best interest of our stockholders and are in compliance with all laws and applicable agreements. Future dividends and share repurchases may also be affected by, among other factors, our views on potential future capital requirements for investments in acquisitions and the funding of our research and development; legal risks; changes in federal and state income tax laws or corporate laws; contractual restrictions, such as financial or operating covenants in our debt arrangements; availability of onshore cash flow; and changes to our business model. Our dividend payments and share repurchases may change from time to time, and we cannot provide assurance that we will continue to declare dividends or repurchase shares at all or in any particular amounts. A reduction or suspension in our dividend payments could have a negative effect on the price of our common stock.

PROVISIONS IN OUR CHARTER DOCUMENTS AND DELAWARE LAW MAY DELAY OR PREVENT AN ACQUISITION OF US, WHICH COULD DECREASE THE VALUE OF YOUR SHARES.

Our restated certificate of incorporation and by-laws and Delaware law contain provisions that could make it harder for a third party to acquire us without the consent of our board of directors. These provisions include limitations on actions by our stockholders by written consent.

Our restated certificate of incorporation makes us subject to the anti-takeover provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits publicly held Delaware corporations to which it applies from engaging in a “business combination” with an “interested stockholder” for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the business combination is approved in a prescribed manner. This provision could discourage others from bidding for our shares of common stock and could, as a result, reduce the likelihood of an increase in the price of our common stock that would otherwise occur if a bidder sought to buy our common stock.

Our restated certificate of incorporation provides that our board of directors is authorized to issue from time to time, without further stockholder approval, up to 5,000,000 shares of preferred stock in one or more series and to fix and designate the rights, preferences, privileges and restrictions of the preferred stock, including dividend rights, conversion rights, voting rights, redemption rights and terms of redemption and liquidation preferences. Such shares of preferred stock could have preferences over our common stock with respect to dividends and liquidation rights. Our issuance of preferred stock may have the effect of delaying or preventing a change in control. Our issuance of preferred stock could decrease the amount of earnings and assets available for distribution to the holders of common stock or could adversely affect the rights and powers, including voting rights, of the holders of common stock. The issuance of preferred stock could have the effect of decreasing the market price of our common stock.

YOUR PERCENTAGE OWNERSHIP IN US MAY BE DILUTED BY FUTURE ISSUANCES OF CAPITAL STOCK, WHICH COULD REDUCE YOUR INFLUENCE OVER MATTERS ON WHICH STOCKHOLDERS VOTE.

Subject to applicable NASDAQ standards, our board of directors has the authority, without action or vote of our stockholders, to issue all or any part of our authorized but unissued shares. Issuances of common stock or the exercise of employee stock options would dilute your percentage ownership interest, which will have the effect of reducing

your influence over matters on which our stockholders vote. In addition, we may issue substantial quantities of our common stock in order to effect acquisitions which would also dilute your ownership interest. If the issuances are made at prices that reflect a discount from the then current trading price of our common stock, your interest in the book value of our common stock might be diluted.

Item 1B. Unresolved Staff Comments.

Not Applicable.

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Item 2. Properties.

Our principal executive offices are located in Billerica, Massachusetts. We also have manufacturing, research and equipment cleaning facilities in the United States, Japan, France, Taiwan, South Korea, Singapore and Malaysia. Information about our principal facilities is set forth below:

Location	Principal Function	Approximate Square Feet	Leased/ Owned	Reporting Segment
Bedford, Massachusetts	Research & Manufacturing	80,000	Owned	MC & SCEM
Billerica, Massachusetts[(1)]	Executive Offices, Research & Manufacturing	175,000	Leased	MC & SCEM
Bloomington, MN	Research & Manufacturing	68,000	Leased	AMH
Burnet, TX	Research & Manufacturing	77,000	Owned	SCEM
Chaska, Minnesota	Executive Offices, Research & Manufacturing	186,000	Owned	AMH
Colorado Springs, CO	Manufacturing	82,000	Owned	AMH
Colorado Springs, CO	Manufacturing	40,000	Leased	AMH
Danbury, CT	Research & Manufacturing	73,000	Leased	SCEM
Decatur, Texas	Manufacturing	359,000	Owned	SCEM
Hsin-chu, Taiwan	Executive Offices, Sales Research & Manufacturing	109,000	Leased	MC, SCEM & AMH
Yangmei City, Taiwan	Manufacturing	40,000	Leased	AMH
JangAn, South Korea	Manufacturing	127,000	Owned	SCEM & AMH
Kulim, Malaysia	Manufacturing	195,000	Owned	SCEM & AMH
Montpellier, France	Cleaning Services	53,000	Owned	AMH
Russellville, Arkansas	Manufacturing	113,127	Leased	SCEM
Suwon, South Korea	Executive Offices & Research	42,000	Leased	MC & SCEM
Tokyo, Japan	Executive Offices, Sales & Research	27,000	Leased	MC, SCEM & AMH
Wonju City, South Korea	Manufacturing	39,000	Owned	AMH
Yonezawa, Japan	Manufacturing	185,000	Owned	MC & AMH

(1) This lease has been extended through September 30, 2026 and is subject to one five-year renewal option.

We lease approximately 13,000 square feet of research and development and manufacturing office space located in San Diego, California, approximately 31,000 square feet of manufacturing space located in Franklin, Massachusetts, an aggregate of approximately 23,000 square feet of manufacturing space in Anseong, South Korea, approximately 15,000 square feet of office space in Round Rock, Texas, and approximately 3,300 square feet of office space in Tempe, Arizona.

We lease approximately 12,000 square feet for our Asia manufacturing management offices in Singapore. In addition, we maintain a worldwide network of sales, service, repair or cleaning centers in the United States, Germany, France, Israel, Japan, Malaysia, Taiwan, Singapore, China and South Korea. Leases for our facilities expire through December 2024. We currently expect to be able to extend the terms of expiring leases or to find suitable replacement facilities on reasonable terms.

We believe that our facilities are well-maintained and suitable for their respective operations. All of our facilities are generally utilized within a normal range of production volume.

Item 3. Legal Proceedings.

As of December 31, 2017, we were not involved in any legal proceedings that we believe will have a material impact on our consolidated financial position, results of operations or cash flows. From time to time the Company may be a party to litigation involving claims against the Company arising in the ordinary course of our business. We are not aware of any material potential litigation or claims against us which would have a material adverse effect upon our financial statements.

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Item 4. Mine Safety Disclosures.

Not applicable.

EXECUTIVE OFFICERS OF THE REGISTRANT

The following is a list of our Executive Officers and their ages, as of the date of this this Annual Report on Form 10-K.

Name	Age	Office	First Appointed To Office*
Bertrand Loy	52	President & Chief Executive Officer	2001
Gregory B. Graves	57	Executive Vice President, Chief Financial Officer & Treasurer	2002
Todd Edlund	55	Executive Vice President & Chief Operating Officer	2007
Sue Lee	41	Senior Vice President, Secretary & General Counsel	2016
Sue Rice	59	Senior Vice President, Human Resources	2017
Corey Rucci	58	Senior Vice President, Business Development	2014
Gregory Marshall	60	Senior Vice President, Quality, EH&S and Entegris Business Support	2011
Stuart Tison	54	Senior Vice President & General Manager, Specialty Chemicals and Engineered Materials	2016
Clint Haris	45	Senior Vice President & General Manager, Microcontamination Control	2016
William Shaner	50	Senior Vice President & General Manager, Advanced Materials Handling	2007
Bruce W. Beckman	50	Senior Vice President, Finance	2018
Michael D. Sauer	52	Vice President, Controller & Chief Accounting Officer	2011

* With either the Company or a predecessor company

Bertrand Loy has been our Chief Executive Officer, President and a director since November 2012. Mr. Loy served as our Executive Vice President and Chief Operating Officer since 2008. From August 2005 until July 2008, he served as our Executive Vice President and Chief Administrative Officer in charge of our global supply chain and manufacturing operations. He served as the Vice President and Chief Financial Officer of Mykrolis from January 2001 until August 2005. Prior to that, Mr. Loy served as the Chief Information Officer of Millipore Corporation during 1999 and 2000. From 1995 until 1999, he served as the Division Controller and Head of Manufacturing for Millipore's Laboratory Water Division. From 1989 until 1995, Mr. Loy served Sandoz Pharmaceuticals (now Novartis) in a variety of financial, audit and controller positions located in Europe, Central America and Japan. Mr. Loy served as a director of BTU International, Inc. (supplier of advanced thermal processing equipment) until its acquisition in January 2015. He also serves as a director of Harvard Bioscience, Inc. (scientific equipment) since November 2014 and has been a director for SEMI (Semiconductor Equipment and Materials International) (global high-technology manufacturing trade association) since July 2013.

Gregory B. Graves has served as our Executive Vice President and Chief Financial Officer since July 2008. Prior to that he served as Senior Vice President and Chief Financial Officer since April 2007. Prior to April 2007, he served as Senior Vice President, Strategic Planning & Business Development since the effectiveness of the merger with Mykrolis. Mr. Graves served as the Chief Business Development Officer of Entegris Minnesota since September 2002 and from September 2003 until August 2004 he also served as Senior Vice President of Finance. Prior to joining Entegris Minnesota, Mr. Graves held positions in investment banking and corporate development, including at U.S. Bancorp Piper Jaffray from June 1998 to August 2002 and at Dain Rauscher from October 1996 to May 1998. Since May 2017, Mr. Graves has served as a director of Power Plug Inc. (energy solutions provider).

Todd Edlund has been our Executive Vice President and Chief Operating Officer since July 2016. Prior to that he was our Senior Vice President and Chief Operating Officer since November 2014. After the merger with ATMI, Mr. Edlund served as Senior Vice President and General Manager of our Critical Materials Handling business and prior to the merger with ATMI, he was the Vice President and General Manager of our Contamination Control Solutions

division since December 2007. He served as the Vice President and General Manager of our Liquid Systems business unit from 2005 to 2007, and prior to that as Entegris Minnesota's Vice President of Sales for semiconductor markets from 2003 to 2005. Prior to 2003, Mr. Edlund held a variety of positions with our predecessor companies since 1995. Sue Lee has been our Senior Vice President, Secretary and General Counsel since April 2016. Prior to joining Entegris, Ms. Lee was general counsel and corporate secretary with CYREN, a network security firm since 2013. From 2010 to 2013, Ms. Lee served as general counsel for Harmonix Music Systems, a former MTV company. Prior to that, Ms. Lee was vice president of business

and legal affairs for MTV Networks and counsel at Genzyme Corporation. Prior to going in-house in 2005, Ms. Lee was an attorney at the law firm, Cleary Gottlieb Steen & Hamilton, in New York.

Sue Rice joined us as our Senior Vice President of Human Resources in September 2017. Prior to that, Ms. Rice served as Senior Vice President and Chief Human Resources Officer for Thermo Fisher Scientific from 2013 to 2017, Region Vice President HR Asia Pacific & Emerging Markets from 2009 to 2013 and Group Vice President, HR Analytical Technologies Group from 2006 to 2009. Prior to that, Ms. Rice held senior human resource positions with Fidelity Human Resources Services Company and Sherbrooke Associates.

Gregory Marshall has been our Senior Vice President, Quality, EH&S and Entegris Business Support since August 2016. Prior to that Mr. Marshall served as our Vice President, Quality and EH&S since March 2010 and our Global Director of Quality since the merger with Mykrolis Corporation, prior to which he served as the Director of Quality for Mykrolis. Prior to joining Mykrolis, Mr. Marshall served as the Director of US Quality for Kokusai Semiconductor Equipment Corporation.

Corey Rucci has served as our Senior Vice President, Business Development since January 2018, having served as Vice President, Business Development since February 2014. Prior to that he served as Vice President and General Manager of our Specialty Materials Division since 2011 and as General Manager of Poco Graphite, Inc. (POCO) since 2008 when we acquired POCO. Prior to joining Entegris, Mr. Rucci served POCO as the President and Chief Operating Officer since 2007, Chief Operating Officer since 2005, Chief Financial Officer since 2001 and Vice President of Business Development since 1998. Prior to that he worked at UNOCAL Corp. for 17 years in a variety of accounting, marketing and business development roles.

Stuart Tison has been our Senior Vice President, Specialty Chemicals and Engineered Materials since July 2016. Prior to that, Mr. Tison served as Vice President, Specialty Gas Solutions since February 2015, as Vice President, Business Development since January 2010 and as Vice President, Corporate Development since July 2007. Prior to that he served Celerity, Inc. as Vice President, Engineering and served Entegris predecessor companies Mykrolis and Millipore in a variety of sales, marketing, business development and engineering roles.

Clint Haris has been our Senior Vice President, Microcontamination Control since July 2016. Prior to that, Mr. Haris served as our Vice President, Liquid Microcontamination Control since August 2014. Prior to joining Entegris, Mr. Haris served in a variety of executive roles at Brooks Automation Inc. including Senior Vice President, Life Science Systems from 2010 to 2014 and Senior Vice President and General Manager, Systems Solutions from 2009 to 2010.

William Shaner has been our Senior Vice President, Advanced Materials Handling since July 2016. Prior to that, Mr. Shaner served as our Senior Vice President, Global Operations since February 2014 and as our Vice President and General Manager, Microenvironments division since 2007. He has served in a variety of sales, marketing, business development and engineering roles since joining Entegris in 1995.

Bruce W. Beckman has been our Senior Vice President, Finance since February 2018. Prior to that, Mr. Beckman served as Vice President, Finance since joining Entegris in 2015. From 1990 to 2015, Mr. Beckman worked in numerous capacities for General Mills, Inc., including Vice President, Finance, Meals Division and Director of Corporate Planning & Analysis.

Michael D. Sauer has been our Vice President, Controller and Chief Accounting Officer since June 2012. Prior to that, he served as the Corporate Controller since 2008. From the time of the merger with Mykrolis until April 2008, Mr. Sauer served as Director of Treasury and Risk Management. Mr. Sauer joined Fluoroware, Inc., a predecessor to Entegris Minnesota in 1988 and held a variety of finance and accounting positions until 2001 when he became the Director of Business Development for Entegris Minnesota, the successor to Fluoroware, serving in that position until the merger with Mykrolis.

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PART II

Item 5. Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities.

Market Information and Holders:

Entegris’ Common Stock, $0.01 par value, trades on the NASDAQ Global Select Market under the symbol “ENTG”. The following table sets forth the high and low sales prices of the Company shares for each full quarterly period during 2017 and 2016. As of February 12, 2018 there were 1,130 shareholders of record. On February 12, 2018, the last sale price reported on the Nasdaq Global Select Market for our common stock was $31.10 per share.

	2017		2016	
	Low	High	Low	High
First quarter	$17.65	$23.85	$10.37	$13.80
Second quarter	$21.90	$27.20	$12.79	$14.77
Third quarter	$21.78	$28.85	$13.97	$17.73
Fourth quarter	$28.20	$32.80	$14.73	$18.95

Dividend Policy:

Holders of our common stock are entitled to receive dividends when and if they are declared by our board of directors. During 2017, our board of directors declared a cash dividend of $0.07 per share during the fourth quarter of 2017, which was paid and totaled $9.9 million.

Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of our board of directors. Furthermore, the credit agreements governing our Term Loan and our ABL Facility contain restrictions that may limit our ability to pay dividends.

Issuer Sales of Unregistered Securities During the Past Three Years:

None

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Comparative Stock Performance

The following graph compares the cumulative total shareholder return on the common stock of Entegris, Inc. from December 31, 2012 through December 31, 2017 with the cumulative total return of (1) The NASDAQ Composite Index, and (2) The Philadelphia Semiconductor Index, assuming $100 was invested at the close of trading December 31, 2012 in Entegris, Inc. common stock, the NASDAQ Composite Index and the Philadelphia Semiconductor Index and that all dividends are reinvested.

	December 31, 2012	December 31, 2013	December 31, 2014	December 31, 2015	December 31, 2016	December 31, 2017
Entegris, Inc.	$100.00	$126.25	$143.90	$144.55	$194.99	$332.42
NASDAQ Composite	100.00	140.12	160.78	171.97	187.22	242.71
Philadelphia Semiconductor Index	100.00	141.84	186.38	183.36	237.14	333.28

Issuer Purchases of Equity Securities:

On February 13, 2017, the Company’s Board of Directors authorized a repurchase program covering up to an aggregate of $100 million of the Company’s common stock in open market transactions and in accordance with one or more pre-arranged stock trading plans to be established in accordance with Rule 10b5-1 under the Securities Exchange Act of 1934, as amended. The authorization expires on February 15, 2019. This repurchase program represents a further renewal of the repurchase program originally authorized by the Board of Directors on February 5, 2016, which expired February 15, 2017, and that had been subsequently renewed to February 15, 2018.

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The following table provides information concerning shares of the Company's Common Stock $0.01 par value purchased during the three months ended December 31, 2017:

Period	(a) Total Number of Shares Purchased	(b) Average Price Paid per Share	(c) Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	(d) Maximum Number (or Approximate Dollar Value) of Shares that May Yet Be Purchased Under the Plans or Programs
October 1 through November 4, 2017	137,500	$30.27	137,500	$70,265,481
November 5 through December 2, 2017	95,500	$31.58	95,500	$67,249,688
December 3 through December 31, 2017	92,962	$30.36	92,962	$64,427,356
Total	325,962	$30.68	325,962	$64,427,356

The Company issues restricted stock unit awards (RSUs) under its equity incentive plans. In the consolidated financial statements, the Company treats shares of common stock withheld for tax purposes on behalf of its employees in connection with the vesting of RSUs as common stock repurchases because they reduce the number of shares that would have been issued upon vesting. These withheld shares of common stock are not considered common stock repurchases under the Company's authorized common stock repurchase plan and accordingly are not included in the common stock repurchase totals in the preceding table.

Item 6. Selected Financial Data.

The table that follows presents selected financial data for each of the last five years from the Company's consolidated financial statements and should be read in conjunction with the Company's Consolidated Financial Statements and the related Notes and with "Management's Discussion and Analysis of Financial Condition and Results of Operations" included elsewhere in this Annual Report on Form 10-K. The selected financial data set forth below as of December 31, 2017 and 2016 and for the years ended December 31, 2017, 2016 and 2015 are derived from our audited financial statements included in this Annual Report on Form 10-K. All other selected financial data set forth below is derived from our audited financial statements not included in this Annual Report on Form 10-K. Our historical results are not necessarily indicative of our results of operations to be expected in the future.

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(In thousands, except per share amounts)	Year ended December 31, 2017	Year ended December 31, 2016	Year ended December 31, 2015	Year ended December 31, 2014	Year ended December 31, 2013
Operating Results					
Net sales	$1,342,532	$1,175,270	$1,081,121	$962,069	$693,459
Gross profit	608,985	508,691	470,231	376,683	294,214
Selling, general and administrative expenses	216,194	201,901	198,914	231,833	137,123
Engineering, research and development expenses	106,951	106,991	105,900	87,711	55,320
Amortization of intangible assets	44,023	44,263	47,349	37,067	9,347
Contingent consideration fair value adjustment	—	—	—	(1,282)	(1,813)
Operating income	241,817	155,536	118,068	21,354	94,237
Income (loss) before income taxes and equity in net loss of affiliate	184,731	119,999	92,185	(13,392)	96,195
Income tax expense (benefit)	99,665	22,852	10,202	(21,572)	21,669
Net income	85,066	97,147	80,296	7,887	74,526
Earnings Per Share Data					
Diluted earnings per share	$0.59	$0.68	$0.57	$0.06	$0.53
Weighted average shares outstanding – diluted	143,518	142,050	141,121	140,062	139,618
Operating Ratios – % of net sales					
Gross profit	45.4 %	43.3 %	43.5 %	39.2 %	42.4 %
Selling, general and administrative expenses	16.1	17.2	18.4	24.1	19.8
Engineering, research and development expenses	8.0	9.1	9.8	9.1	8.0
Amortization of intangible assets	3.3	3.8	4.4	3.9	1.3
Contingent consideration fair value adjustment	—	—	—	(0.1)	(0.3)
Operating income	18.0	13.2	10.9	2.2	13.6
Income (loss) before income taxes and equity in net loss of affiliate	13.8	10.2	8.5	(1.4)	13.9
Effective tax rate	54.0	19.0	11.1	161.1	22.5
Net income	6.3	8.3	7.4	0.8	10.7
Cash Flow Statement Data					
Depreciation and amortization	$102,231	$99,886	$101,654	$83,704	$38,815
Capital expenditures	93,597	65,260	71,977	57,733	60,360
Net cash provided by operating activities	293,373	207,555	120,918	126,423	109,402
Net cash used in investing activities	(112,455)	(66,686)	(63,638)	(860,295)	(47,029)
Net cash provided by (used in) financing activities	27,251	(81,747)	(92,787)	747,648	(3,895)
Balance Sheet and Other Data					
Current assets	$1,057,608	$800,131	$708,787	$763,604	$612,305
Current liabilities	290,971	261,571	175,550	262,520	97,585
Working capital	766,637	538,560	533,237	501,084	514,720
Current ratio	3.63	3.06	4.04	2.91	6.27
Long-term debt, including current maturities	674,380	584,677	656,044	753,012	—
Shareholders’ equity	993,018	899,218	802,883	748,441	756,843
Total assets	1,976,172	1,699,532	1,646,697	1,748,307	875,294
Return on average shareholders’ equity – %	9.0 %	11.4 %	10.4 %	1.0 %	10.3 %
Shares outstanding at end of year	141,283	141,320	140,716	139,793	138,734

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

The following discussion and analysis of the Company's consolidated financial condition and results of operations should be read along with the consolidated financial statements and the accompanying notes to the consolidated financial information included elsewhere in this Annual Report on Form 10-K. This discussion contains forward-looking statements that involve numerous risks and uncertainties, including, but not limited to, those described in the "Cautionary Statements" sections of this Item 7 below. The Company's actual results may differ materially from those contained in any forward-looking statements. You should review the Item 1A "Risk Factors" of this Annual Report on Form 10-K for a discussion of important factors that could cause actual results to differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

Cautionary Statements

This Annual Report on Form 10-K and the documents incorporated by reference in this Annual Report on Form 10-K contain "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. The words "believe," "expect," "anticipate," "intends," "estimate," "forecast," "project," "should," "may," "will," "would" or the n and similar expressions are intended to identify such forward-looking statements. These forward-looking statements include those about future period guidance; projected sales, net income, net income per diluted share, non-GAAP EPS, non-GAAP net income and other financial metrics; our performance relative to our markets; market and technology trends, including the duration and drivers of any growth trends; the development of new products and the success of their introductions; the focus of our engineering, research and development projects; our ability to execute on our business strategies; our capital allocation strategy, which may be modified at any time for any reason, including share repurchases, dividends, debt repayments and potential acquisitions; the effect of the Tax Cuts and Jobs Act; future capital and other expenditures; the Company's expected tax rate; the impact of accounting pronouncements; and other matters. These forward-looking statements are based on current management expectations and assumptions only as of the date of this Annual Report on Form 10-K, are not guarantees of future performance and involve substantial risks and uncertainties that are difficult to predict and that could cause actual results to differ materially from the results expressed in, or implied by, these forward-looking statements. These risks and uncertainties include, but are not limited to, the risk factors and additional information described in this Annual Report on Form 10-K under the caption "Risk Factors," elsewhere in this Annual Report on Form 10-K and in our other periodic filings. Except as required under the federal securities laws and the rules and regulations of the SEC, we undertake no obligation to update publicly any forward-looking statements contained herein.

Overview

This overview is not a complete discussion of the Company's financial condition, changes in financial condition and results of operations; it is intended merely to facilitate an understanding of the most salient aspects of its financial condition and operating performance and to provide a context for the detailed discussion and analysis that follows, and must be read in its entirety in order to fully understand the Company's financial condition and results of operations.

The Company is a leading global developer, manufacturer and supplier of microcontamination control products, specialty chemicals and advanced materials handling solutions for manufacturing processes in the semiconductor and other high-technology industries. Our mission is to leverage our unique breadth of capabilities to create value for our customers by developing mission-critical solutions to maximize manufacturing yields, reduce manufacturing costs and enable higher device performance.

Our technology portfolio includes approximately 20,000 standard and customized products and solutions to achieve the highest levels of purity and performance that are essential to the manufacture of semiconductors, flat panel displays, light emitting diodes, or LEDs, high-purity chemicals, solar cells, gas lasers, optical and magnetic storage devices, and critical components for aerospace, glass manufacturing and biomedical applications. The majority of our products are consumed at various times throughout the manufacturing process, with demand driven in part by the level of semiconductor and other manufacturing activity. The Company's customers consist primarily of semiconductor manufacturers, semiconductor equipment and materials suppliers as well as thin film transistor-liquid crystal display (TFT-LCD) and hard disk manufacturers, which are served through direct sales efforts, as well as sales and

distribution relationships, in the United States, Asia, Europe and the Middle East.

Our business is organized and operated in three operating segments which align with the key elements of the advanced semiconductor manufacturing ecosystem. The Specialty Chemicals and Engineered Materials, or SCEM, segment provides high-performance and high-purity process chemistries, gases, and materials, and safe and efficient delivery systems to support semiconductor and other advanced manufacturing processes. The Microcontamination Control, or MC, segment offers solutions to filter and purify critical liquid chemistries and gases used in semiconductor manufacturing processes and other high-technology industries. The Advanced Materials Handling, or AMH, segment develops solutions to monitor, protect, transport, and deliver critical liquid chemistries, wafers and other substrates for a broad set of applications in the semiconductor

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industry and other high-technology industries. While these segments have separate products and technical know-how, they share a global generalist sales force, common business systems and processes, technology centers, and strategic and technology roadmaps. We leverage our expertise from these three segments to create new and increasingly integrated solutions for our customers. See note 15 to the consolidated financial statements for additional information on the Company's three segments.

Key operating factors Key factors, which management believes have the largest impact on the overall results of operations of the Company, include:

- Level of sales Since a significant portion of the Company's product costs (except for raw materials, purchased components and direct labor) are largely fixed in the short-to-medium term, an increase or decrease in sales affects gross profits and overall profitability significantly. Also, increases or decreases in sales and operating profitability affect certain costs such as incentive compensation and commissions, which are highly variable in nature. The Company's sales are subject to the effects of industry cyclicality, technological change, substantial competition, pricing pressures and foreign currency fluctuation.
- Variable margin on sales The Company's variable margin on sales is determined by selling prices and the costs of manufacturing and raw materials. This is affected by a number of factors, which include the Company's sales mix, purchase prices of raw material (especially polymers, membranes, stainless steel and purchased components), domestic and international competition, direct labor costs, and the efficiency of the Company's production operations, among others.
- Fixed cost structure The Company's operations include a number of large fixed or semi-fixed cost components, which include salaries, indirect labor and benefits, facility costs, lease expenses, and depreciation and amortization. It is not possible to vary these costs easily in the short-term as volumes fluctuate. Accordingly, increases or decreases in sales volume can have a large effect on the usage and productivity of these cost components, resulting in a large impact on the Company's profitability.

Overall Summary of Financial Results for the Year Ended December 31, 2017

Total net sales for the year ended December 31, 2017 were $1,342.5 million, up $167.3 million, or 14%, from sales of $1,175.3 million for the year ended December 31, 2016.

Exclusive of unfavorable foreign currency translation effects of $0.9 million, the Company's sales increased 14%, reflecting an increase in overall demand for the Company's products from semiconductor industry customers, particularly in the sale of gas microcontamination filters, liquid chemistry filtration solutions and certain specialty materials products. The sales increase in 2017 was driven primarily by higher volume and the effect of selling price erosion was nominal. Semiconductor industry demand in 2017 was driven by improved demand from device makers, as wafer starts and semiconductor unit production increased, higher industry fab utilization rates, and increased capital spending levels. The Company believes sales of its products in 2017 exceeded the overall semiconductor industry growth rate.

The Company's gross profit rose by $100.3 million for the year ended December 31, 2017, to $609.0 million, up from $508.7 million for the year ended December 31, 2016. Accordingly, the Company reported a 45.4% gross margin rate compared to 43.3% in 2016. The gross profit and gross margin figures in 2017 and 2016 included impairment charges of $6.1 million and $6.3 million, respectively, related to certain equipment-related impairment and severance charges. Excluding those charges, the Company's gross margin for 2017 was 45.8% and for 2016 was 43.8%.

The Company's selling, general and administrative (SG&A) and engineering, research and development (ER&D) expenses increased slightly in 2017, mainly reflecting higher compensation costs of $7.5 million and impairment charges related to certain acquired intangible assets of $3.9 million.

The Company's income tax expense increased significantly in 2017, primarily reflecting a one-time charge of $66.7 million related to the impact of the Tax Cuts and Jobs Act that was enacted into legislation in December 2017.

As a result of the aforementioned and other factors discussed below, net income for 2017 was $85.1 million, or $0.59 per diluted share, compared to net income of $97.1 million, or $0.68 per diluted share, in 2016.

On April 24, 2017, the Company acquired the microelectronic water and chemical filtration product line of W.L. Gore & Associates, Inc. for $20.0 million in cash as described in note 2 to the consolidated financial statements. The acquisition of these products complements our portfolio of advanced liquid filtration solutions. It also reflects our

strategy to grow our served markets through the deployment of capital for strategic accretive acquisitions that augment our internal development initiatives.

On October 18, 2017, the Company's Board of Directors declared an initial quarterly cash dividend of $0.07 per share to be paid on November 22, 2017 to shareholders of record on the close of business on November 1, 2017. Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of the Company's Board of Directors.

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In November 2017, the Company issued $550 million aggregate principal amount of 4.625% senior unsecured notes due February 10, 2026 (the “2026 Notes”). The Company used the net proceeds of the offering to redeem all of its 6.000% senior unsecured notes due 2022 (the “2022 Notes”), of which an aggregate principal amount of $360 million was currently outstanding as of immediately prior to the redemption, to pay fees and expenses related to the redemption and for general corporate purposes. The Company redeemed the 2022 Notes, at its option, at the redemption price of 104.5% (expressed as percentage of principal amount), plus accrued and unpaid interest of $2.5 million. The redemption of the 2022 Notes resulted in a loss on extinguishment of debt of $20.7 million.

During 2017, the Company’s operating activities provided cash flow of $293.4 million. Cash and cash equivalents, and short-term investments were $625.4 million at December 31, 2017 compared with $406.4 million at December 31, 2016. The Company had long-term borrowings, including current maturities, of $674.4 million at December 31, 2017 compared with $584.7 million at December 31, 2016.

Subsequent Events

On January 22, 2018, the Company acquired Particle Sizing Systems, LLC ("PSS"), a company focused on particle sizing instrumentation for liquid applications in both semiconductor and life science industries. The total purchase price of the acquisition was approximately $37 million in cash, subject to customary working capital adjustments. The acquisition of PSS does not constitute a material business combination.

On February 13, 2018, the Company’s Board of Directors authorized a repurchase program covering up to an aggregate of $100 million of the Company’s common stock, during a period of twenty-four months, in open market transactions and in accordance with one or more pre-arranged stock trading plans to be established in accordance with Rule 10b5-1 under the Securities Exchange Act of 1934, as amended. This repurchase program represents a further renewal of the repurchase program originally authorized by the Board of Directors on February 5, 2016 and first renewed on February 15, 2017.

Critical Accounting Policies

Management’s discussion and analysis of financial condition and results of operations are based upon the Company’s consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States. The preparation of these consolidated financial statements requires the Company to make estimates, assumptions and judgments that affect the reported amounts of assets, liabilities, revenues and expenses and related disclosure of contingent assets and liabilities. At each balance sheet date, management evaluates its estimates, including, but not limited to, those related to long-lived assets (property, plant and equipment, and identified intangibles), goodwill, income taxes and business combinations. The Company bases its estimates on historical experience and various other assumptions that are believed to be reasonable under the circumstances. If management made different judgments or utilized different estimates, this could result in material differences in the amount and timing of the Company’s results of operations for any period. In addition, actual results could be different from the Company’s current estimates, possibly resulting in increased future charges to earnings.

The critical accounting policies affected most significantly by estimates, assumptions and judgments used in the preparation of the Company’s consolidated financial statements are discussed below.

Impairment of Long-Lived Assets As of December 31, 2017, the Company had $359.5 million of net property, plant and equipment and $182.4 million of net intangible assets. The Company routinely considers whether indicators of impairment of the value of its long-lived assets, particularly its manufacturing equipment, and its intangible assets, are present. A long-lived asset (asset group) shall be tested for recoverability whenever events or changes in circumstances (triggering events) indicate that its carrying amount may not be recoverable. The following are examples of such events or changes in circumstances:

a. A significant decrease in the market price of a long-lived asset (asset group);
b. A significant adverse change in the extent or manner in which a long-lived asset (asset group) is being used or in its physical condition;
c. A significant adverse change in legal factors or in the business climate that could affect the value of a long-lived asset (asset group), including an adverse action or assessment by a regulator;

d. An accumulation of costs significantly in excess of the amount originally expected for the acquisition or construction of a long-lived asset (asset group);

e. A current-period operating or cash flow loss combined with a history of operating or cash flow losses or a projection or forecast that demonstrates continuing losses associated with the use of a long-lived asset (asset group); and

f. A current expectation that, more likely than not, a long-lived asset (asset group) will be sold or otherwise disposed of significantly before the end of its previously estimated useful life.

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If such indicators are present, it is determined whether the sum of the estimated undiscounted cash flows attributable to the asset group in question is less than its carrying value. If less, an impairment loss is recognized based on the excess of the carrying amount of the assets in the group over its respective fair value. Fair value is determined by discounting estimated future cash flows, appraisals or other methods deemed appropriate. If the asset groups determined to be impaired are to be held and used, the Company recognizes an impairment charge to the extent the fair value attributable to the asset group is less than the assets' carrying value. The fair value of the assets then becomes the assets' new carrying value, which is depreciated or amortized over the remaining estimated useful life of the assets.

The Company's long-lived assets are grouped with other assets and liabilities at the lowest level (asset groups) for which the identifiable cash flows are largely independent of the cash flows of other assets and liabilities. As described above, the evaluation of the recoverability of long-lived assets requires the Company to make significant estimates and assumptions. These estimates and assumptions primarily include, but are not limited to, the identification of the asset group at the lowest level of independent cash flows, the primary asset of the group and long-range forecasts of revenue and costs, reflecting management's assessment of general economic and industry conditions, operating income, depreciation and amortization and working capital requirements.

Due to the inherent uncertainty involved in making estimates, actual results could differ from those estimates. In addition, changes in the underlying assumptions would have a significant impact on the conclusion that an asset group's carrying value is recoverable, or the determination of any impairment charge if it was determined that the asset values were indeed impaired. The Company continually monitors circumstances and events to determine whether asset impairment testing is warranted. It is possible that in the future the Company may conclude that there is impairment of certain of its long-lived assets, and that significant impairment charges of long-lived assets may occur in future periods.

Goodwill Goodwill is not subject to amortization and is tested for impairment annually and whenever events or changes in circumstances indicate that impairment may have occurred. The Company performs its annual impairment test as of August 31. The Company first assesses qualitative factors to determine whether it is more likely than not (that is, a likelihood of more than 50%) that the fair value of a reporting unit is less than its carrying amount, including goodwill. If, after assessing qualitative factors, the Company determines that it is more likely than not that the fair value of a reporting unit is less than its carrying amount, then a two-step impairment test is performed to identify potential goodwill impairment and measure the amount of goodwill impairment loss to be recognized, if any.

As of August 31, 2017, the Company's assessment of qualitative factors informed its conclusion that it was more likely than not that a goodwill impairment did not occur. The significant qualitative factors considered include a significant increase in the Company's share price, increasing revenues and operating cash flow for each of the Company's reporting units combined with solid demand in the semiconductor industry driven by the Internet of Things, virtual reality, autonomous car and artificial intelligence/machine learning applications. The Company noted that a significant number of its very largest customers purchase from all of the Company's reporting units. For example, approximately 25 customers, accounting for over 60% of net sales, purchase from all of the Company's reporting units.

Income Taxes In the preparation of the Company's consolidated financial statements, the income tax expense, deferred tax assets and liabilities, and reserves for unrecognized tax benefits reflect management's best assessment of estimated current and future taxes to be paid. The Company is subject to income taxes in both the United States and numerous foreign jurisdictions. Significant judgments and estimates are required in determining consolidated income tax expense.

Deferred income taxes arise from temporary differences between the tax basis of assets and liabilities and their reported amounts in the consolidated financial statements, which will result in taxable or deductible amounts in the future. In evaluating the Company's ability to recover its deferred tax assets within the jurisdiction from which they arise, management considers all available positive and negative evidence, including scheduled reversals of deferred tax liabilities, projected future taxable income, tax-planning strategies, and results of recent operations. In projecting future taxable income, the Company begins with historical results adjusted for the results of discontinued operations and incorporates assumptions about the amount of future state, federal and foreign pretax operating income adjusted for items that do not have tax consequences. The assumptions about future taxable income require significant

judgment and are consistent with the plans and estimates management is using to manage the underlying business. In evaluating the objective evidence that historical results provide, the Company considers three years of cumulative operating income.

The Company has deferred tax assets related to certain federal and state credit carryforwards, and foreign net operating loss carryforwards of $18.0 million and $31.8 million as of December 31, 2017 and 2016, respectively. Management believes it is more likely than not that the benefit from a portion of these carryforwards will not be realized. In recognition of this risk, the Company provided a valuation allowance of $17.5 million and $14.7 million as of December 31, 2017 and 2016, respectively, relating to these carryforwards. If the Company’s assumptions change and it determines it will be able to realize these carryforwards, the tax benefits relating to any reversal of the valuation allowance on the deferred tax assets will be recognized as a reduction of income tax expense.

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The calculation of tax liabilities involves dealing with uncertainties in the application of complex tax laws and regulations in a multitude of jurisdictions across our global operations. A tax benefit from an uncertain tax position may be recognized when it is more likely than not that the position will be sustained upon examination, including resolutions of any related appeals or litigation processes, on the basis of the technical merits. Resolution of these uncertainties in a manner inconsistent with management's expectations could have a material impact on the Company's financial condition and operating results.

U.S. Tax Reform

On December 22, 2017, the Tax Cuts and Jobs Act of 2017 (the "Tax Cuts and Jobs Act") was signed into law making significant changes to the Internal Revenue Code. Changes include, but are not limited to, a corporate tax rate decrease from 35 percent to 21 percent effective for tax years beginning after December 31, 2017, the transition of U.S international taxation from a worldwide tax system to a territorial system, and a one-time transition tax on the mandatory deemed repatriation of cumulative foreign earnings as of December 31, 2017. The Company has calculated its best estimate of the impact of the Tax Cuts and Jobs Act in its year end income tax provision in accordance with management's understanding of the Tax Cuts and Jobs Act and guidance available as of the date of this filing and as a result has recorded $66.7 million as additional income tax expense in the fourth quarter of 2017, the period in which the legislation was enacted. The amount related to the remeasurement of deferred tax assets and liabilities, based on the rates at which they are expected to reverse in the future, was a benefit of $10.2 million. Included in this benefit are provisional amounts related to certain deferred tax assets and liabilities where the necessary information is not available, prepared or analyzed. Examples of this include fixed assets and compensation. The provisional expense related to the one-time transition tax on the mandatory deemed repatriation of foreign earnings was $73.0 million based on cumulative foreign earnings of $943.7 million. Additional expense of $4.0 million was recorded related to no longer asserting that a significant portion of the Company's earnings are considered indefinitely reinvested overseas.

Business Acquisitions

The Company accounts for acquired businesses using the acquisition method of accounting which requires that the assets acquired and liabilities assumed be recorded at the date of acquisition at their respective fair values. The judgments made in determining the estimated fair value assigned to each class of assets acquired and liabilities assumed, as well as asset lives, can materially impact net income. Accordingly, for significant items, the Company typically obtains assistance from a third-party valuation firm.

There are several methods that can be used to determine the fair value of assets acquired and liabilities assumed in a business combination. For intangible assets, the Company normally utilizes the "income method." This method starts with a forecast of all of the expected future net cash flows attributable to the subject intangible asset. These cash flows are then adjusted to present value by applying an appropriate discount rate that reflects the risk factors associated with the cash flow streams. Some of the more significant estimates and assumptions inherent in the income method (or other methods) include the projected future cash flows (including timing) and the discount rate reflecting the risks inherent in the future cash flows.

Estimating the useful life of an intangible asset also requires judgment. For example, different types of intangible assets will have different useful lives, influenced by the nature of the asset, competitive environment, and rate of change in the industry. Certain assets may even be considered to have indefinite useful lives. All of these judgments and estimates can significantly impact the determination of the amortization period of the intangible asset, and thus net income.

Results of Operations

Year ended December 31, 2017 compared to year ended December 31, 2016

The following table sets forth the results of operations and the relationship between various components of operations, stated as a percent of net sales, for the years ended December 31, 2017 and 2016. The Company's historical financial data was derived

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from its consolidated financial statements and related notes included elsewhere in this annual report.

(Dollars in thousands)	2017	% of net sales	2016	% of net sales
Net sales	$1,342,532	100.0 %	$1,175,270	100.0 %
Cost of sales	733,547	54.6	666,579	56.7
Gross profit	608,985	45.4	508,691	43.3
Selling, general and administrative expenses	216,194	16.1	201,901	17.2
Engineering, research and development expenses	106,951	8.0	106,991	9.1
Amortization of intangible assets	44,023	3.3	44,263	3.8
Operating income	241,817	18.0	155,536	13.2
Interest expense	32,343	2.4	36,846	3.1
Interest income	(715)	(0.1)	(318)	—
Other expense (income), net	25,458	1.9	(991)	(0.1)
Income before income taxes	184,731	13.8	119,999	10.2
Income tax expense	99,665	7.4	22,852	1.9
Net income	$85,066	6.3	$97,147	8.3

Net sales For the year ended December 31, 2017, net sales were $1,342.5 million, up $167.3 million, or 14%, from sales for the year ended December 31, 2016. An analysis of the factors underlying the increase in net sales is presented in the following table:

(In thousands)	
Net sales in 2016	$1,175,270
Organic growth associated with volume and pricing	164,505
Increase associated with liquid filtration product line acquisition	3,643
Decrease associated with effect of foreign currency translation	(886)
Net sales in 2017	$1,342,532

The Company's sales increase was due to strong across-the-board demand for the Company's products from semiconductor industry customers, reflecting both higher industry fab utilization and semiconductor industry capital spending compared to the year-ago period. This sales increase reflected improved sales of gas microcontamination filters, liquid chemistry filtration solutions and certain specialty materials products. Exclusive of the sales of the acquired liquid filtration product line of $3.6 million of revenue for 2017 and the unfavorable currency translation effects of $0.9 million for the year, mainly due to the weakening of the Japanese yen relative to the U.S. dollar, the Company's sales grew 14% in 2017 when compared to 2016.

On a geographic basis, in 2017, total sales to Taiwan were 22%, to North America were 21%, to South Korea were 16%, to Japan were 13%, to China were 11%, to Europe were 9% and to Southeast Asia were 8%. In 2016, total sales to Taiwan were 25%, to North America were 22%, to Japan were 13%, to South Korea were 12%, to China were 10%, to Europe were 9%, and to Southeast Asia were 9%. From 2016 to 2017, net sales to customers in South Korea, China, Europe, North America, Japan and Southeast Asia increased 49%, 26%, 14%, 13%, 9%, and 6%, respectively, while net sales to customers in Taiwan were down 1%.

Demand drivers for the Company's business primarily consist of semiconductor fab utilization and production (unit-driven) as well as capital spending for new or upgraded semiconductor fabrication equipment and facilities (capital-driven). The Company analyzes sales of its products by these two key drivers. Sales of unit-driven products represented 74% of total sales and sales of capital-driven products represented 26% of total sales in 2017. This compares to a unit-driven to capital-driven ratio of 76%:24% for 2016.

Gross profit Gross profit for 2017 increased by $100.3 million, to $609.0 million, an increase of 20% from $508.7 million for 2016. The gross margin rate for 2017 was 45.4% versus 43.3% for 2016. The gross profit and gross margin improvements reflect the improved factory utilization associated with strong sales levels, a slightly favorable sales mix and the absence of the qualification and start-up costs incurred at the Company's i2M center in the prior year period. These factors were partly offset by modest price erosion for certain products in response to normal competitive pressures. In addition, the gross profit and gross margin figures include impairment charges of $6.1 million and $6.3

million for the years ended December 31, 2017 and 2016, respectively, related to equipment-related and severance charges.

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Selling, general and administrative expenses
Selling, general and administrative expense (SG&A) consists primarily of payroll and related expenses for the sales and administrative staff, professional fees (including accounting, legal and technology costs and expenses), and sales and marketing costs. SG&A expenses for 2017 increased $14.3 million, or 7%, to $216.2 million from $201.9 million in 2016. SG&A expenses, as a percent of net sales, decreased to 16.1% from 17.2% a year earlier, reflecting the increase in net sales.
An analysis of the factors underlying the increase in SG&A is presented in the following table:

(In thousands)	
Selling, general and administrative expenses in 2016	$201,901
Employee costs	7,455
Impairment charge related to acquired intangible assets	3,866
Other increases, net	2,972
Selling, general and administrative expenses in 2017	$216,194

Engineering, research and development expenses
Engineering, research and development (ER&D) expenses related to the support of current product lines and the development of new products and manufacturing technologies was $107.0 million in both 2017 and 2016. ER&D expenses as a percent of net sales were 8.0% compared to 9.1% a year ago, reflecting the increase in net sales.
The Company’s overall ER&D efforts will continue to focus on the support or extension of current product lines, the development of its technologies to create differentiated and high-value products for the most advanced and demanding semiconductor applications and leveraging its unique and diverse technology portfolio to develop innovative, integrated solutions for unmet customer needs. The Company expects ER&D costs to stay relatively stable as a percentage of net sales.
Amortization of intangible assets Amortization of intangible assets was $44.0 million in 2017 compared to $44.3 million for 2016. The decline reflects the absence of amortization expense for certain identifiable trademark intangible assets acquired in the ATMI merger that became fully amortized in early 2017, offset by additional amortization expense from the liquid filtration product line acquisition in 2017.
Interest expense Interest expense was $32.3 million and $36.8 million in the years ended December 31, 2017 and 2016, respectively. Interest expense includes interest associated with debt outstanding and the amortization of debt issuance costs associated with such borrowings. The decrease in 2017 reflects lower average outstanding borrowings due to the Company's payments on the Term Loan in 2017.
Other expense (income), net Other expense, net, was $25.5 million in 2017 compared to other income, net, of $1.0 million in 2016.
In 2017, other expense, net, included an impairment charge of $2.8 million, a loss of extinguishment of debt of $20.7 million associated with the redemption of the Company's 2022 Notes (see note 7 to the Company's consolidated financial statements), and foreign currency transaction losses of $2.3 million.
In 2016, other income, net, included foreign currency transaction gains of $0.6 million and other gains of $0.4 million.
Income tax expense The Company recorded income tax expense of $99.7 million in 2017 compared to income tax expense of $22.9 million in 2016. The Company’s effective tax expense rate was 54.0% in 2017, compared to an effective tax rate of 19.0% in 2016.
The increase in the effective tax rate in 2017 from 2016 and the variance in both years from the U.S. statutory rate of 35% reflects several factors. The increase in the effective rate is primarily due to the recognition of the one-time mandatory repatriation transition tax of $73.0 million on the net accumulated earnings and profits of the Company’s foreign subsidiaries and $4.0 million of incremental tax related to no longer asserting that a significant portion of the Company’s undistributed earnings are considered indefinitely invested overseas. This increase was partially offset by the remeasurement of the U.S. deferred taxes for $10.2 million to reflect the lower U.S. federal tax rate and an increase in the federal research and development tax credit. The effective tax rates in both years reflect a greater concentration in the Company's geographic composition of income toward jurisdictions with lower tax rates than in the U.S.

Net income Net income was $85.1 million, or $0.59 per diluted share, in 2017 compared to net income of $97.1 million, or $0.68 per diluted share, in 2016. The decrease reflects the Company's aforementioned operating results described in greater detail above.

Non-GAAP Measures Information The Company’s consolidated financial statements are prepared in conformity with accounting principles generally accepted in the United States (GAAP). The Company also utilizes certain non-GAAP financial

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measures as a complement to financial measures provided in accordance with GAAP in order to better assess and reflect trends affecting the Company's business and results of operations. See "Non-GAAP Information" included below in this section for additional detail, including the reconciliation of GAAP measures to the Company's non-GAAP measures.

The Company's non-GAAP financial measures are Adjusted EBITDA and Adjusted Operating Income, together with related measures thereof, and non-GAAP Earnings Per Share (EPS).

Adjusted EBITDA increased 35% to $357.1 million in 2017, compared to $263.7 million in 2016. Adjusted EBITDA, as a percent of net sales, was 26.6% in 2017 compared to 22.4% in 2016. Adjusted Operating Income increased 44% to $298.9 million in 2017, compared to $208.0 million in 2016. Adjusted Operating Income, as a percent of net sales, was 22.3% in 2017 compared to 17.7% in 2016. Non-GAAP Earnings Per Share increased 53% to $1.44 in 2017, compared to $0.94 in 2016. The improvement in the Adjusted EBITDA and Adjusted Operating Income reflect the increase in net sales and related increase in gross profit. In addition, Non-GAAP Earnings Per Share was positively affected by a lower adjusted effective tax rate.

Segment Analysis

The following table and discussion concern the results of operations of the Company's three reportable segments for the years ended December 31, 2017 and 2016.

(In thousands)	2017	2016
Specialty Chemicals and Engineered Materials		
Net sales	$485,470	$428,328
Segment profit	132,859	96,060
Microcontamination Control		
Net sales	$436,225	$362,658
Segment profit	160,715	110,042
Advanced Materials Handling		
Net sales	420,837	384,284
Segment profit	77,971	73,452

Specialty Chemicals and Engineered Materials (SCEM)

For the year ended December 31, 2017, SCEM net sales increased to $485.5 million, up 13%, from $428.3 million in the comparable period last year. The sales increase primarily reflects strong product sales for specialty gases, glass forming products and advanced deposition materials.

SCEM reported a segment profit of $132.9 million for the year ended December 31, 2017 compared to a $96.1 million segment profit in the year-ago period. The increase in the SCEM's profit in 2017 was primarily due to increased sales, partially offset by higher operating expenses of 3%.

Microcontamination Control (MC)

For the year ended December 31, 2017, MC net sales increased to $436.2 million, up 20%, from $362.7 million in the comparable period last year. The sales increase primarily reflects strength in photolithography applications, gas filter products, and liquid chemistry filters for wet, etch and clean driven by strong industry tool shipments.

MC reported a segment profit of $160.7 million for the year ended December 31, 2017 compared to a $110.0 million segment profit in the year-ago period. The increase in the MC's profit in 2017 reflects increased sales and the absence of the qualification and start-up costs incurred at the Company's i2M center in the year-ago period, partially offset by higher operating expenses of 1%.

Advanced Materials Handling (AMH)

For the year ended December 31, 2017, AMH net sales increased 10% to $420.8 million, from $384.3 million in 2016. The increase primarily reflects strong sales of wafer and reticle handling, wafter shipping and fluid handling products.

AMH reported a segment profit of $78.0 million in 2017, up 6% from $73.5 million in 2016. The increase in the AMH's profit in 2017 was due to higher sales, partially offset by a 7% increase in operating expenses. Results in 2017 include impairment and severance charges of $7.5 million compared to $6.8 million a year ago.

Unallocated general and administrative expenses

Unallocated general and administrative expenses for the year ended December 31, 2017 totaled $85.7 million compared to $79.8 million for the year ended December 31, 2016. The $6.0 million increase includes the $3.9 million impairment charge related to certain acquired intangible assets.

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Results of Operations

Year ended December 31, 2016 compared to year ended December 31, 2015

The following table sets forth the results of operations and the relationship between various components of operations, stated as a percent of net sales, for the years ended December 31, 2016 and 2015. The Company’s historical financial data was derived from its consolidated financial statements and related notes included elsewhere in this annual report.

(Dollars in thousands)	2016	% of net sales	2015	% of net sales
Net sales	$1,175,270	100.0 %	$1,081,121	100.0 %
Cost of sales	666,579	56.7	610,890	56.5
Gross profit	508,691	43.3	470,231	43.5
Selling, general and administrative expenses	201,901	17.2	198,914	18.4
Engineering, research and development expenses	106,991	9.1	105,900	9.8
Amortization of intangible assets	44,263	3.8	47,349	4.4
Operating income	155,536	13.2	118,068	10.9
Interest expense	36,846	3.1	38,667	3.6
Interest income	(318)	—	(429)	—
Other income, net	(991)	(0.1)	(12,355)	(1.1)
Income before income taxes and equity in net loss of affiliate	119,999	10.2	92,185	8.5
Income tax expense	22,852	1.9	10,202	0.9
Equity in net loss of affiliate	—	—	1,687	0.2
Net income	$97,147	8.3	$80,296	7.4

Net sales For the year ended December 31, 2016, net sales were $1,175.3 million, up $94.1 million, or 9%, from sales for the year ended December 31, 2015. An analysis of the factors underlying the increase in net sales is presented in the following table:

(In thousands)	
Net sales in 2015	$1,081,121
Organic growth associated with volume and pricing	80,375
Increase associated with effect of foreign currency translation	13,774
Net sales in 2016	$1,175,270

The Company's sales increase was due to improved demand for the Company's products from semiconductor industry customers, reflecting both higher industry fab utilization and semiconductor industry capital spending compared to the year-ago period. This sales increase reflected improved sales of 300mm transport modules, liquid chemistry filtration solutions and certain specialty materials products. Exclusive of favorable currency translation effects of $13.8 million for the year, mainly due to the strengthening of the Japanese yen relative to the U.S. dollar, the Company's sales grew 7% in 2016 when compared to 2015.

On a geographic basis, in 2016, total sales to North America were 22%, to Asia Pacific were 56%, to Europe were 9% and to Japan were 13%. In 2015, total sales to North America were 23%, to Asia Pacific were 55%, to Europe were 10% and to Japan were 12%. From 2015 to 2016, net sales to customers in Japan and Asia Pacific increased, 19%, and 12%, respectively, while net sales to customers in North America and Europe were flat.

Demand drivers for the Company’s business primarily consist of semiconductor fab utilization and production (unit-driven) as well as capital spending for new or upgraded semiconductor fabrication equipment and facilities (capital-driven). The Company analyzes sales of its products by these two key drivers. Sales of unit-driven products represented 76% of total sales and sales of capital-driven products represented 24% of total sales in 2016. This compares to a unit-driven to capital-driven ratio of 78%:22% for 2015.

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Gross profit Gross profit for 2016 increased by $38.5 million, to $508.7 million, an increase of 8% from $470.2 million for 2015. The gross margin rate for 2016 was 43.3% versus 43.5% for 2015. An analysis of the factors underlying the increase in gross profit is presented in the following table:

(In thousands)	
Gross profit in 2015	$470,231
Growth associated with volume and pricing	44,717
Decrease associated with impairment of equipment and severance related to organization realignment	(6,257)
Gross profit in 2016	$508,691

The gross profit improvements primarily reflect the growth associated with volume and pricing, offset by charges related to the impairment of equipment and severance related to the organization realignment. Excluding the latter item, the Company's gross margin in 2016 was 43.8%.

Selling, general and administrative expenses

Selling, general and administrative expense (SG&A) consists primarily of payroll and related expenses for the sales and administrative staff, professional fees (including accounting, legal and technology costs and expenses), and sales and marketing costs. SG&A expenses for 2016 increased $3.0 million, or 2%, to $201.9 million from $198.9 million in 2015. SG&A expenses, as a percent of net sales, decreased to 17.2% from 18.4% a year earlier, reflecting the increase in net sales.

An analysis of the factors underlying the increase in SG&A is presented in the following table:

(In thousands)	
Selling, general and administrative expenses in 2015	$198,914
Integration costs recorded in prior year	(12,667)
Professional fees	2,335
Employee costs	12,962
Other increases, net	357
Selling, general and administrative expenses in 2016	$201,901

Engineering, research and development expenses

Engineering, research and development (ER&D) expenses related to the support of current product lines and the development of new products and manufacturing technologies increased by $1.1 million, or 1%, to $107.0 million in 2016 compared to $105.9 million in 2015. ER&D expenses as a percent of net sales were 9.1% compared to 9.8% a year ago, reflecting the increase in net sales, offset by the increase in ER&D expenditure levels, primarily due to higher employee costs.

Amortization of intangible assets Amortization of intangible assets was $44.3 million in 2016 compared to $47.3 million for 2015. The decline reflects the absence of amortization expense for certain identifiable non-compete intangible assets acquired in the ATMI merger that became fully amortized in early 2016.

Interest expense Interest expense was $36.8 million and $38.7 million in the years ended December 31, 2016 and 2015, respectively. Interest expense includes interest associated with debt outstanding issued to help fund the acquisition of ATMI in 2014 and the amortization of debt issuance costs associated with such borrowings.

The decrease in 2016 reflects lower outstanding borrowings due to the Company's payments on the Term Loan in 2016, offset partly by higher amortization of debt issuance costs due to the acceleration of actual and expected payments on the Company's Term Loan.

Other income, net Other income, net, was $1.0 million in 2016 compared to other expense, net, of $12.4 million in 2015.

In 2016, other income, net, included foreign currency transaction gains of $0.6 million and other gains of $0.4 million. In 2015, other income, net, included foreign currency transaction gains of $9.1 million and a gain of $3.4 million related to the sale of an equity investment.

Income tax expense The Company recorded income tax expense of $22.9 million in 2016 compared to income tax expense of $10.2 million in 2015. The Company’s effective tax expense rate was 19.0% in 2016, compared to an effective tax rate of 11.1% in 2015.

The increase in the effective tax rate in 2016 from 2015 and the variance in both years from the U.S. statutory rate of 35% reflects several factors. The effective tax rates in both years reflects a greater concentration in the Company's geographic

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composition of income toward jurisdictions with lower tax rates than in the U.S. In addition, the 2015 effective tax rate reflects the benefit of the Malaysian tax holiday which expired December 31, 2015.

Net income Net income was $97.1 million, or $0.68 per diluted share, in 2016 compared to net income of $80.3 million, or $0.57 per diluted share, in 2015. The significant increase reflects the Company's aforementioned operating results described in greater detail above.

Non-GAAP Measures Information The Company’s consolidated financial statements are prepared in conformity with accounting principles generally accepted in the United States (GAAP). The Company also utilizes certain non-GAAP financial measures as a complement to financial measures provided in accordance with GAAP in order to better assess and reflect trends affecting the Company’s business and results of operations. See “Non-GAAP Information” included below in this section for additional detail, including the reconciliation of GAAP measures to the Company’s non-GAAP measures.

The Company’s non-GAAP financial measures are Adjusted EBITDA and Adjusted Operating Income, together with related measures thereof, and non-GAAP Earnings Per Share (EPS).

Adjusted EBITDA increased 13% to $263.7 million in 2016, compared to $232.4 million in 2015. Adjusted EBITDA, as a percent of net sales, was 22.4% in 2016 compared to 21.5% in 2015. Adjusted Operating Income increased 17% to $208.0 million in 2016, compared to $178.1 million in 2015. Adjusted Operating Income, as a percent of net sales, was 17.7% in 2016 compared to 16.5% in 2015. Non-GAAP Earnings Per Share increased 11% to $0.94 in 2016, compared to $0.85 in 2015. The improvement in the Adjusted EBITDA and Adjusted Operating Income reflect the increase in net sales and related increase in gross profit. In addition, Non-GAAP Earnings Per Share was positively affected by a lower adjusted effective tax rate.

Segment Analysis

The following table and discussion concern the results of operations of the Company’s three reportable segments for the years ended December 31, 2016 and 2015.

(In thousands)	2016	2015
Specialty Chemicals and Engineered Materials		
Net sales	$428,328	$418,878
Segment profit	96,060	100,370
Microcontamination Control		
Net sales	$362,658	$315,817
Segment profit	110,042	83,076
Advanced Materials Handling		
Net sales	384,284	346,426
Segment profit	73,452	66,419

Specialty Chemicals and Engineered Materials (SCEM)

For the year ended December 31, 2016, SCEM net sales increased to $428.3 million, up 2%, from $418.9 million in the comparable period last year. The sales increase primarily reflects strong product sales for advanced deposition materials, with flat sales across the segment's other product lines.

SCEM reported a segment profit of $96.1 million for the year ended December 31, 2016 compared to a $100.4 million segment profit in the year-ago period. The decrease in the SCEM's profit in 2016 reflects lower margins reflecting unfavorable product mix and higher operating expenses of 2%.

Microcontamination Control (MC)

For the year ended December 31, 2016, MC net sales increased to $362.7 million, up 15%, from $315.8 million in the comparable period last year. The sales increase primarily reflects strength in liquid chemistry filters for wet, etch and clean and bulk photo applications and strength in gas filter products driven by strong industry tool shipments.

MC reported a segment profit of $110.0 million for the year ended December 31, 2016 compared to a $83.1 million segment profit in the year-ago period. The increase in the MC's profit in 2016 reflects the higher sales and improved plant utilization offset by higher operating expenses of 2%.

Advanced Materials Handling (AMH)

For the year ended December 31, 2016, AMH net sales increased 11% to $384.3 million, from $346.4 million in 2015. The increase primarily reflects strong sales of 300mm transport modules, fluid handling solutions and containers. AMH reported a segment profit of $73.5 million in 2016, up 11% from $66.4 million in 2015. The increase in the AMH's profit in 2016 was due to higher sales and its associated slightly favorable sales mix, offset by a 10% increase in operating expenses.

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Unallocated general and administrative expenses

Unallocated general and administrative expenses for the year ended December 31, 2016 totaled $79.8 million compared to $84.4 million for the year ended December 31, 2015. The $4.7 million decline includes the absence of integration expenses of $12.7 million, offset by the increased employee and severance costs and higher professional fees noted above.

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Quarterly Results of Operations

The following table presents selected data from the Company's consolidated statements of operations for the eight quarters ended December 31, 2017. This unaudited information has been prepared on the same basis as the audited consolidated financial statements appearing elsewhere in this annual report. All adjustments that management considers necessary for the fair presentation of the unaudited information have been included in the quarters presented.

QUARTERLY STATEMENTS OF OPERATIONS DATA

	2016				2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
(In thousands)								
Net sales	$267,024	$303,052	$296,692	$308,502	$317,377	$329,002	$345,591	$350,562
Gross profit	114,706	139,205	122,980	131,800	139,596	150,303	155,407	163,679
Selling, general and administrative expenses	47,956	53,597	51,614	48,734	50,492	52,985	57,699	55,018
Engineering, research and development expenses	25,902	28,146	25,720	27,223	27,239	27,221	26,002	26,489
Amortization of intangible assets	11,289	11,062	10,974	10,938	10,945	11,007	11,051	11,020
Operating income	29,559	46,400	34,672	44,905	50,920	59,090	60,655	71,152
Net income (loss)	16,212	32,890	21,947	26,098	32,514	39,991	40,902	(28,341)

	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
(Percent of net sales)								
Net sales	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
Gross profit	43.0	45.9	41.5	42.7	44.0	45.7	45.0	46.7
Selling, general and administrative expenses	18.0	17.7	17.4	15.8	15.9	16.1	16.7	15.7
Engineering, research and development expenses	9.7	9.3	8.7	8.8	8.6	8.3	7.5	7.6
Amortization of intangibles	4.2	3.7	3.7	3.5	3.4	3.3	3.2	3.1
Operating income	11.1	15.3	11.7	14.6	16.0	18.0	17.6	20.3
Net income (loss)	6.1	10.9	7.4	8.5	10.2	12.2	11.8	(8.1)

The Company's quarterly results of operations have been, and will likely continue to be, subject to significant fluctuations due to a myriad of factors, many of which are beyond the Company's control. The variability in sales, and

its corresponding effect on gross profit, are generally the most important factors underlying the changes in the Company's operating income and net income over the past eight quarters.

Liquidity and Capital Resources

The Company has historically financed its operations and capital requirements through cash flow from its operating activities, long-term loans, lease financing and borrowings under domestic and international short-term lines of credit. In fiscal 2000 and 2009, the Company raised capital via public offerings of its common stock.

Operating activities

Net cash flow provided by operating activities totaled $293.4 million for the year ended December 31, 2017. Cash generated by the Company's operations included net income of $85.1 million, as adjusted for the impact of various non-cash charges, most notably depreciation and amortization of $102.2 million, and share-based compensation expense of $15.3 million. These operating cash flows were partly offset by changes in operating assets and liabilities, mainly due to an increase in accounts receivables and inventories, an increase in accounts payable and accrued liabilities, and an increase in income taxes payable and refundable income taxes, primarily from the Tax Cuts and Jobs Act.

Working capital was $766.6 million at December 31, 2017, which included $625.4 million in cash and cash equivalents, an increase from $538.6 million as of December 31, 2016, which included $406.4 million in cash and cash equivalents.

Accounts receivable increased by $17.8 million during 2017, or $15.4 million after accounting for the effect of foreign currency translation. The net increase reflects the year-over-year increase in fourth quarter sales of the Company's products. The Company's days sales outstanding measure (DSO) stood at 48 days at December 31, 2017 compared to 49 days at the beginning of the year.

Inventories at December 31, 2017 increased by $14.6 million from a year earlier, or $20.2 million after accounting for foreign currency translation and the provision for excess and obsolete inventory. The net increase reflects higher levels of all categories of inventory, due to higher sales and production activity.

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Accounts payable and accrued liabilities were $23.0 million higher than a year ago, or $16.0 million higher after accounting for the effect of foreign currency translation. The increase reflects higher accounts payable associated with increased levels of business activity and higher accrued bonuses in 2017.

Investing activities Cash flow used in investing activities totaled $112.5 million in 2017.

Acquisition of property and equipment totaled $93.6 million, which primarily reflected investments in equipment and tooling. Capital expenditures in 2017 generally reflected more normalized capital spending levels. The Company expects its capital expenditures in 2018 to be approximately $100 to $110 million.

On April 24, 2017, the Company acquired the microelectronic water and chemical filtration product line of W.L. Gore & Associates, Inc. The purchase price for the product line included cash considerations of $20.0 million, funded from the Company's existing cash on hand. The transaction is described in further detail in note 2 to the Company's consolidated financial statements.

Financing activities Cash flow provided by financing activities totaled $27.3 million during 2017.

In November 2017, the Company issued debt with a principal amount of $550 million of 4.625% senior unsecured notes due February 10, 2026 (the "2026 Notes"). The Company used the net proceeds of the offering to redeem all of the Company's 6.0% Senior Unsecured Notes due 2022 (the "2022 Notes"), to pay fees and expenses related to the redemption and for general corporate purposes. Debt issuance costs of $7.1 million paid to third parties are capitalized as debt issuance costs.

The Company redeemed its $360 million aggregate principal amount of 2022 Notes, at its option, at the redemption price of 104.5% (expressed as percentage of principal amount), plus accrued and unpaid interest of $2.5 million. The redemption of the 2022 Notes resulted in a loss of extinguishment of debt of $20.7 million.

The Company made payments of $100.0 million on its senior secured term loan facility due 2021 (the "Term Loan"). On April 30, 2014, the Company entered into the Term Loan that provided senior secured financing of $460 million. Borrowings under the Term Loan bear interest at a rate per annum equal to, at the Company’s option, a base rate (such as prime rate or LIBOR) plus, an applicable margin. The Company may voluntarily prepay outstanding loans under the Term Loan at any time. During the first quarter of 2017, the Company and its lenders agreed to an amendment of the credit agreement governing the Term Loan that decreases the applicable margin for the Company’s term loan from 2.75% to 2.25% per annum for LIBOR borrowings, with a LIBOR floor of 0.0%, and from 1.75% to 1.25% per annum for base rate borrowings, with a base rate floor of 1.00%. The principal amount outstanding under the Term Loan at December 31, 2017 was $133.9 million. Based on management's plans and intent, the Company reflects $100 million of the Term Loan as current maturities of long-term debt in its consolidated balance sheet as of December 31, 2017.

The Company has a senior secured asset-based revolving credit facility maturing April 30, 2019 (the "ABL Facility") that provides financing of $75 million, subject to a borrowing base. As of December 31, 2017, the Company had no outstanding borrowings and $0.2 million undrawn on outstanding letters of credit under the ABL Facility.

Through December 31, 2017, the Company was in compliance with all applicable financial covenants included in the terms of indenture governing its 2026 Notes and the credit agreements governing its Term Loan and ABL Facility.

The Company also has a line of credit with two banks that provide for borrowings of Japanese yen for the Company’s Japanese subsidiary equivalent to an aggregate of approximately $10.7 million. There were no outstanding borrowings under these lines of credit at December 31, 2017.

In addition, the Company repurchased shares of the Company's common stock during 2016 at a total cost of $28.0 million under the stock repurchase program authorized by the Company's Board of Directors. In the fourth quarter of 2017, the Company declared and paid an initial quarterly cash dividend of $0.07 per share, totaling $9.9 million. The Company received proceeds of $5.6 million in connection with common shares issued under the Company’s stock plans less $5.9 million paid for taxes related to the net share settlement of equity awards.

At December 31, 2017, the Company’s shareholders’ equity stood at $993.0 million, up 10% from $899.2 million at the beginning of the year. The 2017 increase reflects net income of $85.1 million, additional paid-in capital of $15.3 million associated with the Company’s share-based compensation expense and favorable foreign currency translation effects of $29.3 million mainly associated with the weakening of the U.S. dollar versus the Korean won. These increases to shareholders’ equity were partly offset by cash dividends paid of $9.9 million and the repurchase and

retirement of the Company's stock of $28.0 million.

As of December 31, 2017, the Company’s sources of available funds were its cash and cash equivalents of $625.4 million, funds available under the ABL Facility and international credit facilities and cash flow generated from operations. As of December 31, 2017, the amount of cash and cash equivalents held in certain of our foreign operations totaled approximately $356.5 million. As a result of U.S. tax reform, the $356.5 million held by our non-U.S. subsidiaries was subject to current tax in

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the U.S. in 2017. As of December 31, 2017, we had not repatriated any of these funds to the U.S. However, to the extent we repatriate these funds to the U.S., we will be required to pay income taxes in certain U.S. states and applicable foreign withholding taxes on those amounts during the period when such repatriation occurs. We have accrued provisional taxes for the tax effect of repatriating the funds to the U.S.

The Company believes its existing balances of domestic cash and cash equivalents and operating cash flows will be sufficient to meet the Company's domestic cash needs arising in the ordinary course of business for the next twelve months. If available liquidity is not sufficient to meet the Company's operating and debt service obligations as they come due, management would need to pursue alternative arrangements through additional equity or debt financing in order to meet the Company's cash requirements. There can be no assurance that any such financing would be available on commercially acceptable terms, or at all.

New Accounting Pronouncements

Recently adopted accounting pronouncements Refer to note 1 to the Company's consolidated financial statements for a discussion of accounting pronouncements implemented in 2017. Other than the adoption of ASU 2016-09, there were no recently issued accounting pronouncements adopted in 2017.

Recently issued accounting pronouncements Refer to note 1 of the Company's consolidated financial statements for a discussion of accounting pronouncements recently issued but not yet adopted.

Contractual Obligations

The following table summarizes the maturities of the Company's significant financial obligations as of December 31, 2017:

(In thousands)	Total	2018	2019	2020	2021	2022	Thereafter
Long-term debt[1]	$683,850	$—	$—	$—	$133,850	$—	$550,000
Interest[2]	223,396	30,549	30,549	30,549	27,141	25,438	79,170
Pension obligations	6,774	102	103	205	186	437	5,741
Capital lease obligations	6,000	750	1,000	1,000	1,000	1,000	1,250
Capital purchase obligations[3]	2,259	2,259	—	—	—	—	—
Operating leases	42,557	9,805	7,663	5,015	4,911	3,369	11,794
Total	$964,836	$43,465	$39,315	$36,769	$167,088	$30,244	$647,955

Unrecognized tax benefits[4]

[1]Debt obligations are classified based on their stated maturity date, regardless of their classification on the Company's consolidated balance sheets.

[2]Interest projections on both variable and fixed rate long-term debt are based on interest rates effective as of December 31, 2017 and do not include $9.5 million for net unamortized discounts and debt issuance costs.

[3]Capital purchase obligations represent commitments for the construction or purchase of property, plant and equipment. They were not recorded as liabilities on the Company's consolidated balance sheet as of December 31, 2017, as the Company had not yet received the related goods or taken title to the property.

[4]The Company had $12.6 million of total gross unrecognized tax benefits at December 31, 2017. The timing of any payments associated with these unrecognized tax benefits will depend on a number of factors. Accordingly, the Company cannot make reasonably reliable estimates of the amount and period of potential cash settlements, if any, with taxing authorities and are not included in the table above.

Non-GAAP Information The Company's consolidated financial statements are prepared in conformity with accounting principles generally accepted in the United States (GAAP).

The Company also provides certain non-GAAP financial measures as a complement to financial measures provided in accordance with GAAP in order to better assess and reflect trends affecting the Company's business and results of operations. Regulation G, "Conditions for Use of Non-GAAP Financial Measures," and other regulations under the Securities Exchange Act of 1934, as amended, define and prescribe the conditions for use of certain non-GAAP financial information. The Company provides non-GAAP financial measures of Adjusted EBITDA and Adjusted Operating Income together with related measures thereof, and non-GAAP Earnings Per Share (EPS).

Adjusted EBITDA, a non-GAAP term, is defined by the Company as net income before (1) equity in net loss of affiliate, (2) income tax expense, (3) interest expense (4) interest income (5) other expense (income), net, (6) integration costs, (7)

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severance related to organizational realignment, (8) impairment of equipment and intangibles, (9) amortization of intangible assets and (10) depreciation. Adjusted Operating Income, another non-GAAP term, is defined by the Company as Adjusted EBITDA exclusive of the depreciation addback noted above. The Company also utilizes non-GAAP measures whereby Adjusted EBITDA and Adjusted Operating Income are each divided by the Company's net sales to derive Adjusted EBITDA Margin and Adjusted Operating Margin, respectively.

Non-GAAP EPS, a non-GAAP term, is defined by the Company as net income before (1) integration costs, (2) severance (3) impairment of equipment and intangibles, (4) loss on debt extinguishment (5) net gain on impairment/sale of short-term and equity investment, (6) amortization of intangible assets, (7) the tax effect of those adjustments to net income and discrete tax items and (8) the tax effect of the Tax Cuts and Jobs Act.

The integration costs adjustments underlying Adjusted EBITDA and Non-GAAP EPS relate specifically to the 2014 ATMI acquisition.

The Company provides supplemental non-GAAP financial measures to better understand and manage its business and believes these measures provide investors and analysts additional and meaningful information for the assessment of the Company's ongoing results. Management also uses these non-GAAP measures to assist in the evaluation of the performance of its business segments and to make operating decisions.

Management believes the Company's non-GAAP measures help indicate the Company's baseline performance before certain gains, losses or other charges that may not be indicative of the Company's business or future outlook and offer a useful view of business performance in that the measures provide a more consistent means of comparing performance. The Company believes the non-GAAP measures aid investors' overall understanding of the Company's results by providing a higher degree of transparency for such items and providing a level of disclosure that will help investors understand how management plans, measures and evaluates the Company's business performance.

Management believes that the inclusion of non-GAAP measures provides consistency in its financial reporting and facilitates investors' understanding of the Company's historical operating trends by providing an additional basis for comparisons to prior periods.

Management uses Adjusted EBITDA and Adjusted Operating Income to assist it in evaluations of the Company's operating performance by excluding items that management does not consider as relevant in the results of its ongoing operations. Internally, these non-GAAP measures are used by management for planning and forecasting purposes, including the preparation of internal budgets; for allocating resources to enhance financial performance; for evaluating the effectiveness of operational strategies; and for evaluating the Company's capacity to fund capital expenditures, secure financing and expand its business.

In addition, and as a consequence of the importance of these non-GAAP financial measures in managing its business, the Company's Board of Directors uses non-GAAP financial measures in the evaluation process to determine management compensation.

The Company believes that certain analysts and investors use Adjusted EBITDA, Adjusted Operating Income and non-GAAP EPS as supplemental measures to evaluate the overall operating performance of firms in the Company's industry. Additionally, lenders or potential lenders use Adjusted EBITDA measures to evaluate the Company's creditworthiness.

The presentation of non-GAAP financial measures is not meant to be considered in isolation, as a substitute for, or superior to, financial measures or information provided in accordance with GAAP. Management strongly encourages investors to review the Company's consolidated financial statements in their entirety and to not rely on any single financial measure.

Management notes that the use of non-GAAP measures has limitations:

First, non-GAAP financial measures are not standardized. Accordingly, the methodology used to produce the Company's non-GAAP financial measures is not computed under GAAP and may differ notably from the methodology used by other companies. For example, the Company's non-GAAP measure of Adjusted EBITDA may not be directly comparable to EBITDA or an adjusted EBITDA measure reported by other companies.

Second, the Company's non-GAAP financial measures exclude items such as amortization and depreciation that are recurring. Amortization of intangibles and depreciation have been, and will continue to be for the foreseeable future, a significant recurring expense with an impact upon the Company's results of operations, notwithstanding the lack of

immediate impact upon cash flows.
Third, there is no assurance the Company will not have future restructuring activities, gains or losses on sale of equity investments, contingent consideration fair value adjustments or similar items and, therefore, may need to record additional charges (or credits) associated with such items, including the tax effects thereon. The exclusion of these items from the Company’s non-GAAP measures should not be construed as an implication that these costs are unusual, infrequent or non-recurring.

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Management considers these limitations by providing specific information regarding the GAAP amounts excluded from these non-GAAP financial measures and evaluating these non-GAAP financial measures together with their most directly comparable financial measures calculated in accordance with GAAP. The calculations of Adjusted EBITDA, Adjusted operating income, and non-GAAP EPS, and reconciliations between these financial measures and their most directly comparable GAAP equivalents are presented below in the accompanying tables.
The reconciliation of GAAP measures to Adjusted Operating Income and Adjusted EBITDA for the years ended December 31, 2017, 2016 and 2015 are presented below:

(Dollars in thousands)	2017	2016	2015
Net sales	$1,342,532	$1,175,270	$1,081,121
Net income	$85,066	$97,147	$80,296
Adjustments to net income			
Equity in net loss of affiliate	—	—	1,687
Income tax expense	99,665	22,852	10,202
Interest expense	32,343	36,846	38,667
Interest income	(715)	(318)	(429)
Other expense (income), net	25,458	(991)	(12,355)
GAAP – Operating income	241,817	155,536	118,068
Integration costs	—	—	12,667
Severance related to organizational realignment	2,700	2,405	—
Impairment of equipment and intangibles [1]	10,400	5,826	—
Amortization of intangible assets	44,023	44,263	47,349
Adjusted operating income	298,940	208,030	178,084
Depreciation	58,208	55,623	54,305
Adjusted EBITDA	$357,148	$263,653	$232,389
Adjusted operating margin	22.3%	17.7%	16.5%
Adjusted EBITDA – as a % of net sales	26.6%	22.4%	21.5%

[1]Includes product line impairment charges of $5,330 and $5,826 classified as cost of sales for the years ended December 31, 2017 and 2016, respectively.

Includes intangible impairment charge of $3,866 classified as selling general and administrative expense for the year ended December 31, 2017.

Includes product line impairment charge of $320 classified as selling general and administrative expense for the year ended December 31, 2017.

Includes product line impairment charge of $884 classified as engineering, research and development expense for the year ended December 31, 2017.
The reconciliation of GAAP measures to Non-GAAP Earnings per Share for the years ended December 31, 2017, 2016 and 2015 are presented below:

(Dollars in thousands)	2017	2016	2015
Net income	$85,066	$97,147	$80,296
Adjustments to net income:			
Integration costs	—	—	12,667
Severance	2,700	2,405	—
Impairment of equipment and intangibles[1]	13,200	5,826	—
Loss on debt extinguishment	20,687	—	—
Net gain on impairment/sale of short-term investment or equity investment	—	(156)	(1,449)
Amortization of intangible assets	44,023	44,263	47,349
Tax effect of adjustments to net income and discrete tax items [2]	(26,046)	(16,637)	(18,248)
Tax effect of Tax Cuts and Jobs Act	66,713	—	—
Non-GAAP net income	$206,343	$132,848	$120,615
Diluted earnings per common share	$0.59	$0.68	$0.57
Effect of adjustments to net income	$0.85	$0.25	$0.29
Diluted non-GAAP earnings per common share	$1.44	$0.94	$0.85

[1]Includes product line impairment charges of $5,330 and $5,826 classified as cost of sales for the years ended December 31, 2017 and 2016, respectively.

Includes intangible impairment charge of $3,866 classified as selling general and administrative expense for the year ended December 31, 2017.

Includes product line impairment charge of $320 classified as selling general and administrative expense for the year ended December 31, 2017.

Includes product line impairment charge of $884 classified as engineering, research and development expense for the year ended December 31, 2017.

Includes product line impairment charge of $2,800 classified as other expense for the year ended December 31, 2017.
[2]The tax effect of the non-GAAP adjustments was calculated using the applicable marginal tax rate during the respective years.

Item 7A. Quantitative and Qualitative Disclosure About Market Risks
Entegris' principal financial market risks are sensitivities to interest rates and foreign currency exchange rates. The Company's interest-bearing cash equivalents and short-term investments are subject to interest rate fluctuations. The Company's cash equivalents are instruments with maturities of three months or less. A 100 basis point change in interest rates would potentially increase or decrease annual net income by approximately $3.1 million annually.
The cash flows and results of operations of the Company's foreign-based operations are subject to fluctuations in foreign exchange rates. The Company occasionally uses derivative financial instruments to manage the foreign currency exchange rate risks associated with its foreign-based operations. At December 31, 2017, the Company had no net exposure to any foreign currency forward contracts.
Item 8. Financial Statements and Supplementary Data.
The information called for by this item is set forth in the Consolidated Financial Statements covered by the Report of Independent Registered Public Accounting Firm at the end of this report.
Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure.
This item is not applicable.
Item 9A. Controls and Procedures.
DISCLOSURE CONTROLS AND PROCEDURES

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Management evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended, (the Exchange Act)), as of December 31, 2017, the end of the fiscal period covered by this report on Form 10-K. The Securities and Exchange Commission, or SEC, rules define the term “disclosure controls and procedures” to mean a company’s controls and other procedures that are designed to ensure that information required to be disclosed in the reports it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time period specified in the SEC’s rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in its reports filed under the Exchange Act is accumulated and communicated to the company’s management, including its principal executive and principal financial officers, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure.

Based on the evaluation of the effectiveness of our disclosure controls and procedures by our management team with the participation of the Chief Executive Officer and the Chief Financial Officer, our Chief Executive Officer and our Chief Financial Officer have concluded that, as of the end of the period covered by this report, our disclosure controls and procedures were effective to provide reasonable assurance that information required to be disclosed in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC rules and forms and is accumulated and communicated to management, including the principal executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure.

CHANGES IN INTERNAL CONTROL OVER FINANCIAL REPORTING

There was no change in the Company’s internal control over financial reporting during the most recently completed fiscal quarter that has materially affected, or is reasonably likely to materially affect, internal controls over financial reporting.

MANAGEMENT’S ANNUAL REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

Management is responsible for establishing and maintaining an adequate system of internal control over financial reporting of the Company. This system of internal financial reporting controls is designed to provide reasonable assurance that assets are safeguarded and transactions are properly recorded and executed in accordance with management’s authorization. The design, monitoring and revision of the system of internal financial reporting controls involves, among other things, management’s judgments with respect to the relative cost and expected benefits of specific control measures. The effectiveness of the control system is supported by the selection, retention and training of qualified personnel and an organizational structure that provides an appropriate division of responsibility and formalized procedures. The system of internal accounting controls is periodically reviewed and modified in response to changing conditions. Designated Company employees regularly monitor the adequacy and effectiveness of internal accounting controls.

Because of its inherent limitations, a system of internal control over financial reporting can provide only reasonable assurance and may not prevent or detect misstatements. Further, because of changes in conditions, the effectiveness of internal controls over financial reporting may vary over time. Our system contains control-monitoring mechanisms, and actions are taken to correct deficiencies as they are identified.

Management conducted an evaluation of the effectiveness of the system of internal control over financial reporting based on the framework in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO 2013). Based on this evaluation, management concluded that the Company’s system of internal control over financial reporting was effective as of December 31, 2017.

KPMG LLP, the independent registered public accounting firm which audited the consolidated financial statements included in this annual report, has issued an attestation report on our internal control over financial reporting.

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Report of Independent Registered Public Accounting Firm
The Board of Directors and Stockholders
Entegris, Inc.:

Opinion on Internal Control Over Financial Reporting

We have audited Entegris, Inc. and subsidiaries' (the Company) internal control over financial reporting as of December 31, 2017, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2017, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2017 and 2016, the related consolidated statements of operations, comprehensive income, equity, and cash flows for each of the years in the three-year period ended December 31, 2017, and the related notes (collectively, the consolidated financial statements), and our report dated February 14, 2018 expressed an unqualified opinion on those consolidated financial statements.

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" appearing under Item 9A of the Company's December 31, 2017 Annual Report on Form 10-K. 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 of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included 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/ KPMG LLP

Minneapolis, Minnesota

February 14, 2018

Item 9B. Other Information.

None.

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PART III

Item 10. Directors, Executive Officers and Corporate Governance.

Except as set forth below, the information required by this Item 10 has been omitted from this report, and is incorporated by reference to the sections “Section 16(a) Beneficial Ownership Reporting Compliance,” “Election of Directors,” “Corporate Governance” in our definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on May 9, 2018, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2017 fiscal year.

Information called for by this item with respect to registrant’s executive officers is set forth under “Executive Officers of the Registrant” in Part I of this report.

At their first meeting following the August 10, 2005 merger described under "Our History" in Item 1 of Part I above, our Board of Directors adopted a code of business ethics, The Entegris, Inc. Code of Business Ethics, applicable to all of our executives, directors and employees as well as a set of corporate governance guidelines. The Entegris, Inc. Code of Business Ethics was amended by the Entegris Board of Directors on July 30, 2014. The amended Entegris, Inc. Code of Business Ethics, the Corporate Governance Guidelines and the charters for our Audit & Finance Committee, Governance & Nominating Committee and our Management Development & Compensation Committee all appear on our website at http://www.Entegris.com under “Investors - Corporate Governance”. The Entegris Code of Business Ethics, Corporate Governance Guidelines and committee charters are also available in print to any shareholder that requests a copy. Copies may be obtained by contacting Sue Lee, our Senior Vice President, Secretary and General Counsel through our corporate headquarters. The Company intends to comply with the requirements of Item 5.05 of Form 8-K with respect to any amendment to or waiver of the provisions of the Entegris, Inc. Code of Business Ethics applicable to the registrant’s Chief Executive Officer, Chief Financial Officer or Chief Accounting Officer by posting notice of any such amendment or waiver at the same location on our website.

Item 11. Executive Compensation.

The information required by this Item 11 has been omitted from this report, and is incorporated by reference to the sections entitled "Compensation of Executive Officers" and "Management Development & Compensation Committee Report" in our definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on May 9, 2018, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2017 fiscal year.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

Securities Authorized for Issuance Under Equity Compensation Plans:

As of December 31, 2017, our equity compensation plan information is as follows:

Equity Compensation Plan Information

	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options, warrants and rights (1)	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a)) (2)
Plan category	(a)	(b)	(c)
Equity compensation plans approved by security holders	4,129,624	$ 13.46	8,815,168
Equity compensation plans not approved by security holders	—	—	—
Total	4,129,624	$ 13.46	8,815,168

(1) The weighted average exercise price does not take into account the shares issuable upon outstanding restricted stock unit vesting, which have no exercise price.

(2) These shares are available under the 2010 Stock Plan for future issuance for stock options, restricted stock units, performance shares and stock awards in accordance with the terms of the 2010 Stock Plan.

The other information called for by this Item 12 has been omitted from this report, and is incorporated by reference to the section entitled “Ownership of Entegris Common Stock” in our definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on May 9, 2018, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2017 fiscal year.

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Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by this Item 13 has been omitted from this report, and is incorporated by reference to the section entitled "Corporate Governance" in our definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on May 9, 2018, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2017 fiscal year.

Item 14. Principal Accountant Fees and Services.

The information required by this Item 14 has been omitted from this report, and is incorporated by reference to the section entitled "Proposal 2 - Ratification of Selection of Independent Registered Public Accounting Firm for 2018" in our definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on May 9, 2018, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2017 fiscal year.

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PART IV

Item 15. Exhibits and Financial Statement Schedules.

(a) The following documents are filed as a part of this report:

1. Financial Statements. The Consolidated Financial Statements listed under Item 8 of this report and in the Index to Consolidated Financial Statements on page F-1 of this report are incorporated by reference herein.

2. Exhibits.

A. The following exhibits are incorporated by reference:

Reg. S-K Item 601(b) Reference	Document Incorporated	Referenced Document on file with the Commission
(2)	Agreement and Plan of Merger, dated as of February 4, 2014, among Entegris, Inc., Atomic Merger Corporation and ATMI, Inc.	Exhibit 2.1 to Entegris, Inc Current Report on Form 8-K filed on February 4, 2014
(3)	By-Laws of Entegris, Inc., as amended December 17, 2008	Exhibit 3 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2008
(3)	Amended and Restated Certificate of Incorporation of Entegris, Inc., as amended	Exhibit 3.1 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2011
(4)	Form of certificate representing shares of Common Stock, $.01 par value per share	Exhibit 4.1 to Form S-4 Registration Statement of Entegris, Inc. and Eagle DE, Inc. (No. 333-124719)
(4)	Indenture, dated as of November 10, 2017, by and among the Company, certain of subsidiaries of the Company and Wells Fargo Bank, National Association Bank, as trustee, including the form of note representing the 2026 Notes	Exhibit 4.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on November 13, 2017
(10)	ABL Credit and Guaranty Agreement, dated as of April 30, 2014, among the Company, certain subsidiaries of the Company as guarantors, the lenders party thereto and Goldman Sachs Bank USA as administrative agent and collateral agent	Exhibit 10.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on May 1, 2014
(10)	Term Loan Credit and Guaranty Agreement, dated as of April 30, 2014, among the Company, certain subsidiaries of the Company as guarantors, the lenders party thereto and Goldman Sachs Bank USA as administrative agent and collateral agent	Exhibit 10.2 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on May 1, 2014
(10)	Amendment No. 1 to Term Credit and Guaranty Agreement, dated as of March 14, 2017, among the Company, Goldman Sachs Bank USA, as administrative agent and collateral agent, and each participating lender party thereto	Exhibit 10.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on March 14, 2017
(10)	ABL Pledge and Security Agreement, dated as of April 30, 2014, among the Company, certain subsidiaries of the Company as guarantors, the lenders party thereto and Goldman Sachs Bank USA as collateral agent	Exhibit 10.3 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on May 1, 2014
(10)	Term Loan Pledge and Security Agreement, dated as of April 30, 2014, among the Company, certain subsidiaries of the Company as guarantors, the lenders party thereto and Goldman Sachs Bank USA as collateral agent	Exhibit 10.4 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on May 1, 2014
(10)	ABL Intercreditor Agreement, dated as of April 30, 2014, among Goldman Sachs Bank USA, as ABL Collateral Agent, Goldman	Exhibit 10.5 to Entegris, Inc. Current Report on Form 8-K filed with the

	Sachs Bank USA, as Term Collateral Agent, and acknowledged by the Company and its wholly owned domestic subsidiaries	Securities and Exchange Commission on May 1, 2014
(10)	Entegris, Inc. – 2010 Stock Plan, as amended*	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended July 3, 2010
(10)	Entegris, Inc. Outside Directors' Stock Option Plan*	Exhibit 10.2 to Entegris, Inc. Registration Statement on Form S-1 (No. 333-33668)

(10)	Entegris, Inc. Amended and Restated Employee Stock Purchase Plan*	Exhibit 4.1 to Entegris, Inc. Registration Statement on Form S-8 (No. 333-211444)
(10)	Second Amended and Restated Entegris Incentive Plan*	Exhibit 10.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on May 24, 2017
(10)	Trust Agreement between Entegris, Inc. Fidelity Management Trust Company and Entegris Inc. 401(k) Savings and Profit Sharing Plan Trust, dated December 29, 2007.	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2007
(10)	Entegris, Inc. - 401(k) Savings and Profit Sharing Plan (2017 Restatement)*	Exhibit 10.1 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 17, 2017
(10)	Entegris, Inc. 2007 Deferred Compensation Plan*	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form10-Q for the fiscal period ended June 30, 2007
(10)	Amended and Restated Supplemental Executive Retirement Plan for Key Salaried Employees*	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2008
(10)	Amendment to Amended and Restated SERP*	Exhibit 10.15 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2009.
(10)	Lease Agreement, dated April 1, 2002 between Nortel Networks HPOCS Inc. and Mykrolis Corporation, relating to Executive office, R&D and manufacturing facility located at 129 Concord Road Billerica, MA	Exhibit 10.1.3 to Mykrolis Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2002
(10)	Amendment of Lease between Entegris, Inc. and KBS Rivertech, LLC dated April 1, 2012	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended June 30, 2012
(10)	Second Amendment of Lease, dated March 8, 2016, between Entegris, Inc. and KBS Rivertech, LLC	Exhibit 10.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on March 11, 2016
(10)	Fluoropolymer Purchase and Sale Agreement, by and between E.I. Du Pont De Nemours and Company and the Registrant, dated January 1, 2011, as amended	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q for the quarter ended April 2, 2011
(10)	Form of Indemnification Agreement between Entegris, Inc. and each of its executive officers and Directors	Exhibit 10.30 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended August 27, 2005
(10)	Form of Executive Change of Control Termination Agreement between Entegris, Inc. and certain of its executive officers*	Exhibit 10.31 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended August 27, 2005
(10)	Form of Revised Executive Change of Control Termination Agreement between Entegris, Inc. and certain of its executive officers executed in 2015 (other than those executive officers who executed the form previously filed)*	Exhibit 10.1 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 29, 2016
(10)	Entegris, Inc. 2010 Stock Option Award Agreement*	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q for the fiscal period

		ended April 3, 2010
(10)	Entegris, Inc. 2011 Stock Option Award Agreement*	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2012
(10)	Entegris, Inc. 2012 Stock Option Grant Agreement*	Exhibit 10.3 to Entegris, Inc. Quarterly Report on Form 10-Q for the fiscal period ended March 31, 2012
(10)	Entegris, Inc. 2013 Stock Option Grant Agreement*	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 26, 2015

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(10)	Entegris, Inc. 2014 Performance Award Agreement*	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 26, 2015
(10)	Entegris, Inc. 2014 RSU Unit Award Agreement*	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 26, 2015
(10)	Entegris, Inc. 2014 Stock Option Grant Agreement*	Exhibit 10.4 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 26, 2015
(10)	Entegris, Inc. 2015 Performance Share Award Agreement*	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 29, 2016
(10)	Entegris, Inc. 2015 RSU Unit Award Agreement*	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 29, 2016
(10)	Entegris, Inc. 2015 Stock Option Grant Agreement*	Exhibit 10.4 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 29, 2016
(10)	Entegris, Inc. 2016 Performance Share Award Agreement*	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 17, 2017
(10)	Entegris, Inc. 2016 RSU Unit Award Agreement*	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 17, 2017
(10)	Entegris, Inc. 2016 Stock Option Grant Agreement*	Exhibit 10.4 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 17, 2017
(10)	Executive Employment Agreement, effective November 28, 2012, between the Registrant and Bertrand Loy*	Exhibit 10.1 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2012
(10)	Amendment No. 1, dated April 26, 2013, to Executive Change in Control Termination Agreement, between Entegris, Inc. and Bertrand Loy*	Exhibit 99.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on April 26, 2013
(10)	Severance Protection Agreement, dated May 13, 2011 between Entegris, Inc. and Gregory B. Graves*	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended July 2, 2011
(10)	Amendment No. 1, dated as of February 23, 2016, to the Severance Protection Agreement by and between Entegris, Inc, and Gregory B. Graves*	Exhibit 10.3 to Entegris, Inc. Quarterly Report on Form 10-Q filed with the Securities and Exchange Commission on April 28, 2016
(10)	Executive Separation Letter Agreement, dated as of June 13, 2016, by and between Entegris, Inc. and Christian F. Kramer*	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q filed with the Securities and Exchange Commission on July 28, 2016
(10)	Executive Separation Letter Agreement, dated as of February 3, 2016 by and between Entegris, Inc. and Peter W. Walcott*	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q filed with the Securities and Exchange Commission on April 28, 2016

* A “management contract or compensatory plan”

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B. The Company hereby files as exhibits to this Annual Report on Form 10-K the following documents:

Reg. S-K Item 601(b) Reference	Exhibit No.	Documents Filed Herewith
(10)	10.1	Entegris, Inc. 2017 Performance Share Award Agreement*
(10)	10.2	Entegris, Inc. 2017 RSU Unit Award Agreement*
(10)	10.3	Entegris, Inc. 2017 Stock Option Grant Agreement*
(21)	21	Subsidiaries of Entegris, Inc.
(23)	23	Consent of Independent Registered Public Accounting Firm
(24)	24	Power of Attorney by the Directors of Entegris, Inc.
(31)	31.1	Certification required by Rule 13a-14(a) in accordance with Section 302 of the Sarbanes—Oxley Act of 2002.
(31)	31.2	Certification required by Rule 13a-14(a) in accordance with Section 302 of the Sarbanes—Oxley Act of 2002.
(32)	32.1	Certification required by Rule 13a-14(b) and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
(32)	32.2	Certification required by Rule 13a-14(b) and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
(101)	101.INS	XBRL Instance Document
(101)	101.SCH	XBRL Taxonomy Extension Schema Document
(101)	101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
(101)	101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
(101)	101.LAB	XBRL Taxonomy Extension Label Linkbase Document
(101)	101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

* A “management contract or compensatory plan”

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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.

ENTEGRIS, INC.

Date: February 14, 2018 By /s/ BERTRAND LOY
Bertrand Loy
President & Chief Executive Officer

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.

SIGNATURE	TITLE	DATE
/s/ BERTRAND LOY Bertrand Loy	President, Chief Executive Officer and Director (Principal executive officer)	February 14, 2018
/s/ GREGORY B. GRAVES Gregory B. Graves	Executive Vice President, Chief Financial Officer & Treasurer (Principal financial officer)	February 14, 2018
/s/ MICHAEL D. SAUER Michael D. Sauer	Vice President, Controller & Chief Accounting Officer (Principal accounting officer)	February 14, 2018
PAUL L.H. OLSON* Paul L.H. Olson	Director, Chairman of the Board	February 14, 2018
MICHAEL A. BRADLEY* Michael A. Bradley	Director	February 14, 2018
R. NICHOLAS BURNS* R. Nicholas Burns	Director	February 14, 2018
DANIEL W. CHRISTMAN* Daniel W. Christman	Director	February 14, 2018
JAMES F. GENTILCORE* James F. Gentilcore	Director	February 14, 2018
JAMES P. LEDERER* James P. Lederer	Director	February 14, 2018
AZITA SALEKI-GERHARDT*	Director	February 14, 2018

Azita Saleki-Gerhardt

BRIAN F. SULLIVAN*	Director	February 14, 2018

Brian F. Sullivan
*By /s/ SUE LEE
Sue Lee,
Attorney-in-fact

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EXHIBIT INDEX

Reg. S-K Item 601(b) Reference	Exhibit No.	Documents Filed Herewith
(10)	10.1	Entegris, Inc. 2017 Performance Share Award Agreement*
(10)	10.2	Entegris, Inc. 2017 RSU Unit Award Agreement*
(10)	10.3	Entegris, Inc. 2017 Stock Option Grant Agreement*
(21)	21	Subsidiaries of Entegris, Inc.
(23)	23	Consent of Independent Registered Public Accounting Firm
(24)	24	Power of Attorney by the Directors of Entegris, Inc.
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(101)	101.LAB	XBRL Taxonomy Extension Label Linkbase Document
(101)	101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

* A “management contract or compensatory plan”

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ENTEGRIS, INC.
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Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders
Entegris, Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Entegris, Inc. and subsidiaries (the “Company”) as of December 31, 2017 and 2016, the related consolidated statements of operations, comprehensive income (loss), equity, and cash flows for each of the years in the three-year period ended December 31, 2017, and the related notes (collectively, the “consolidated financial statements”). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2017 and 2016, and the results of its operations and its cash flows for each of the years in the three-year 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 (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission, and our report dated February 14, 2018 expressed an unqualified opinion on the effectiveness of the Company’s internal control over financial reporting.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on these consolidated 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 consolidated 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 consolidated 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 consolidated 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 consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We or our predecessor firms have served as the Company's auditor since 1966.

Minneapolis, Minnesota
February 14, 2018

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ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED BALANCE SHEETS

(In thousands, except share and per share data)	December 31, 2017	December 31, 2016
ASSETS		
Current assets:		
Cash and cash equivalents	$625,408	$406,389
Trade accounts and notes receivable, net	183,434	165,675
Inventories, net	198,089	183,529
Deferred tax charges and refundable income taxes	18,012	20,140
Other current assets	32,665	24,398
Total current assets	1,057,608	800,131
Property, plant and equipment, net	359,523	321,562
Other assets:		
Goodwill	359,688	345,269
Intangible assets, net	182,430	217,548
Deferred tax assets and other noncurrent tax assets	9,103	8,022
Other	7,820	7,000
Total assets	$1,976,172	$1,699,532
LIABILITIES AND EQUITY		
Current liabilities:		
Long-term debt, current maturities	$100,000	$100,000
Accounts payable	68,762	61,617
Accrued payroll and related benefits	64,860	54,317
Other accrued liabilities	34,514	29,213
Income taxes payable	22,835	16,424
Total current liabilities	290,971	261,571
Long-term debt, excluding current maturities	574,380	484,677
Pension benefit obligations and other liabilities	32,130	27,220
Deferred tax liabilities and other noncurrent tax liabilities	85,673	26,846
Commitments and contingent liabilities	—	—
Equity:		
Preferred stock, par value $.01; 5,000,000 shares authorized; none issued and outstanding	—	—
Common stock, par value $.01; 400,000,000 shares authorized; issued and outstanding shares: 141,282,539 and 141,319,964	1,413	1,413
Additional paid-in capital	867,699	859,778
Retained earnings	147,418	92,303
Accumulated other comprehensive loss	(23,512)	(54,276)
Total equity	993,018	899,218
Total liabilities and equity	$1,976,172	$1,699,532

See the accompanying notes to consolidated financial statements.

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ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF OPERATIONS

(In thousands, except per share data)	Year ended December 31, 2017	Year ended December 31, 2016	Year ended December 31, 2015
Net sales	$1,342,532	$1,175,270	$1,081,121
Cost of sales	733,547	666,579	610,890
Gross profit	608,985	508,691	470,231
Selling, general and administrative expenses	216,194	201,901	198,914
Engineering, research and development expenses	106,951	106,991	105,900
Amortization of intangible assets	44,023	44,263	47,349
Operating income	241,817	155,536	118,068
Interest expense	32,343	36,846	38,667
Interest income	(715)	(318)	(429)
Other expense (income), net	25,458	(991)	(12,355)
Income before income tax expense and equity in net loss of affiliate	184,731	119,999	92,185
Income tax expense	99,665	22,852	10,202
Equity in net loss of affiliate	—	—	1,687
Net income	$85,066	$97,147	$80,296
Basic net income per common share	$0.60	$0.69	$0.57
Diluted net income per common share	$0.59	$0.68	$0.57
Weighted shares outstanding			
Basic	141,553	141,093	140,353
Diluted	143,518	142,050	141,121

See the accompanying notes to consolidated financial statements.

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ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME

(In thousands)	Year ended December 31, 2017	Year ended December 31, 2016	Year ended December 31, 2015
Net income	$ 85,066	$ 97,147	$ 80,296
Other comprehensive income (loss), net of tax			
Foreign currency translation adjustments	29,294	(7,352)	(44,569)
Unrealized gain on available-for-sale investment	—	—	611
Reclassification of cumulative translation adjustment associated with liquidated and planned sale of subsidiaries	1,702	—	—
Reclassification adjustment associated with sale of available-for-sale investments	—	(611)	—
Pension liability adjustments, net of income tax (benefit) expense of $(26), $82, and $(45) for year ended December 31, 2017, 2016, and 2015	(232)	462	(142)
Other comprehensive income (loss)	30,764	(7,501)	(44,100)
Comprehensive income	$ 115,830	$ 89,646	$ 36,196

See the accompanying notes to consolidated financial statements

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ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF EQUITY

(In thousands)	Common shares outstanding	Common stock	Additional paid-in capital	Retained earnings (deficit)	Foreign currency translation adjustments	Available-for-sale investments - Change in net unrealized gains	Defined benefit pension adjustments	Total
Balance at December 31, 2014	139,793	$ 1,398	$ 830,430	$ (80,712)	$ (1,668)	$ —	$ (1,007)	$ 748,441
Shares issued under stock plans	923	9	1,747	—	—	—	—	1,756
Share-based compensation expense	—	—	11,033	—	—	—	—	11,033
Tax benefit associated with stock plans	—	—	5,457	—	—	—	—	5,457
Pension liability adjustment	—	—	—	—	—	—	(142)	(142)
Available-for-sale investment, change in net unrealized gain, net of taxes	—	—	—	—	—	611	—	611
Foreign currency translation	—	—	—	—	(44,569)	—	—	(44,569)
Net income	—	—	—	80,296	—	—	—	80,296
Balance at December 31, 2015	140,716	1,407	848,667	(416)	(46,237)	611	(1,149)	802,883
Shares issued under stock plans	1,123	11	815	—	—	—	—	826
Share-based compensation expense	—	—	13,436	—	—	—	—	13,436
Repurchase and retirement of common stock	(519)	(5)	(3,140)	(4,428)	—	—	—	(7,573)
Pension liability adjustment	—	—	—	—	—	—	462	462
Available-for-sale investment, change in net unrealized gain, net of taxes	—	—	—	—	—	(611)	—	(611)
Foreign currency translation	—	—	—	—	(7,352)	—	—	(7,352)
Net income	—	—	—	97,147	—	—	—	97,147
Balance at December 31, 2016	141,320	1,413	859,778	92,303	(53,589)	—	(687)	899,218
Shares issued under stock plans	1,040	11	(332)	—	—	—	—	(321)
Share-based compensation expense	—	—	15,306	—	—	—	—	15,306
Repurchase and retirement of common stock	(1,077)	(11)	(6,565)	(21,424)				(28,000)
Dividends	—	—	—	(9,896)	—	—	—	(9,896)
Pension liability adjustment	—	—	—	—	—	—	(232)	(232)
Foreign currency translation	—	—	—	—	29,294	—	—	29,294
	—	—	—	—	1,702	—	—	1,702

Reclassification of cumulative translation adjustment associated with liquidated and planned sale of subsidiaries								
Cumulative effect of change in accounting principle	—	—	(488)	1,369	—	—	—	881
Net income	—	—	—	85,066	—	—	—	85,066
Balance at December 31, 2017	141,283	$ 1,413	$ 867,699	$ 147,418	$ (22,593)	$ —	$ (919)	$ 993,018

See the accompanying notes to consolidated financial statements.

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ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS

(In thousands)	Year ended December 31, 2017	Year ended December 31, 2016	Year ended December 31, 2015
Operating activities:			
Net income	$85,066	$97,147	$80,296
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation	58,208	55,623	54,305
Amortization	44,023	44,263	47,349
Share-based compensation expense	15,306	13,436	11,033
Provision for deferred income taxes	1,628	(16,284)	(13,313)
Charge for excess and obsolete inventory	9,405	9,302	8,311
Excess tax benefit from share-based compensation plans	—	—	(5,457)
Amortization of debt issuance costs	2,864	3,947	3,344
Loss on extinguishment of debt	20,687	—	—
Other	16,026	9,744	(20,299)
Changes in operating assets and liabilities, net of effects of acquisitions:			
Trade accounts receivable and notes receivable	(15,401)	(25,298)	5,212
Inventories	(20,214)	(19,871)	(26,670)
Accounts payable and other accrued liabilities	15,975	31,294	(28,686)
Other current assets	(3,330)	185	654
Income taxes payable, refundable income taxes and noncurrent taxes payable	64,516	3,408	4,955
Other	(1,386)	659	(116)
Net cash provided by operating activities	293,373	207,555	120,918
Investing activities:			
Acquisition of property and equipment	(93,597)	(65,260)	(71,977)
Acquisition of business, net of cash acquired	(20,000)	—	—
Proceeds from sale or maturities of short-term investments	—	1,726	7,692
Other	1,142	(3,152)	647
Net cash used in investing activities	(112,455)	(66,686)	(63,638)
Financing activities:			
Proceeds from long-term debt	550,000	—	—
Payments of long-term debt	(460,000)	(75,000)	(100,000)
Payments for debt issuance costs	(7,333)	—	—
Payments for debt extinguishment costs	(16,200)	—	—
Payments for dividends	(9,896)	—	—
Issuance of common stock from employee stock plans	5,566	4,844	4,264
Taxes paid related to net share settlement of equity awards	(5,887)	(4,018)	(2,508)
Repurchase and retirement of common stock	(28,000)	(7,573)	—
Other	(999)	—	5,457
Net cash provided by (used in) financing activities	27,251	(81,747)	(92,787)
Effect of exchange rate changes on cash and cash equivalents	10,850	(2,558)	(4,367)
Increase (decrease) in cash and cash equivalents	219,019	56,564	(39,874)
Cash and cash equivalents at beginning of year	406,389	349,825	389,699
Cash and cash equivalents at end of year	$625,408	$406,389	$349,825

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Supplemental Cash Flow Information

(In thousands)	Year ended December 31, 2017	Year ended December 31, 2016	Year ended December 31, 2015
Non-cash transactions:			
Equipment purchases in accounts payable	$ 8,608	$ 5,104	$ 3,757
Capital lease obligations incurred	$ 4,768	—	$ —
Schedule of interest and income taxes paid:			
Interest paid	$ 30,392	$ 32,085	$ 35,126
Income taxes, net of refunds received	$ 33,330	$ 35,722	$ 16,060

See accompanying notes to consolidated financial statements.

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ENTEGRIS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
DECEMBER 31, 2017

(1) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Nature of Operations Entegris, Inc. (Entegris or the Company) is a leading global developer, manufacturer and supplier of microcontamination control products, specialty chemicals and advanced materials handling solutions for manufacturing processes in the semiconductor and other high-technology industries.

Principles of Consolidation The consolidated financial statements include the accounts of the Company and its majority-owned subsidiaries. Intercompany profits, transactions and balances have been eliminated in consolidation.

Use of Estimates and Basis of Presentation The preparation of consolidated financial statements in conformity with accounting principles generally accepted in the United States requires management to make judgments, estimates and assumptions that affect the amounts reported in the consolidated financial statements and accompanying notes. On an ongoing basis, Entegris evaluates its estimates, including those related to receivables, inventories, property, plant and equipment, intangible assets, accrued liabilities, income taxes and share-based compensation, among others. Actual results could differ from those estimates.

Cash and Cash Equivalents Cash and cash equivalents include cash on hand and highly liquid debt securities with original maturities of three months or less, which are valued at cost and approximates fair value.

Allowance for Doubtful Accounts An allowance for uncollectible trade receivables is estimated based on a combination of write-off history, aging analysis and any specific, known troubled accounts. The Company maintains an allowance for doubtful accounts that management believes is adequate to cover expected losses on trade receivables.

Inventories Inventories are stated at the lower of cost and net realizable value. Cost is determined by the first-in, first-out (FIFO) method.

Property, Plant, and Equipment Property, plant and equipment are carried at cost and are depreciated on the straight-line method over the estimated useful lives of the assets. When assets are retired or disposed of, the cost and related accumulated depreciation are removed from the accounts, and gains or losses are recognized in the same period. Maintenance and repairs are expensed as incurred, while significant additions and improvements are capitalized. Long-lived assets, including property, plant and equipment, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset or group of assets may not be recoverable based on estimated future undiscounted cash flows. The amount of impairment, if any, is measured as the difference between the net book value and the estimated fair value of the asset(s).

Investments The Company’s nonmarketable investments are accounted for under either the cost or equity method of accounting, as appropriate. All nonmarketable investments are periodically reviewed to determine whether declines, if any, in fair value below cost basis are other-than-temporary. If the decline in fair value is determined to be other-than-temporary, an impairment loss is recorded and the investment is written down to a new cost basis.

Fair Value of Financial Instruments The carrying value of cash equivalents, accounts receivable, accounts payable, accrued payroll and related benefits, and other accrued liabilities approximates fair value due to the short maturity of those instruments.

The fair value of long-term debt, including current maturities, based upon models utilizing market observable (Level 2) inputs and credit risk, was $686 million at December 31, 2017 compared to the carrying amount of long-term debt, including current maturities, of $674 million.

Goodwill and Intangible Assets Goodwill represents the excess of acquisition costs over the fair value of the net assets of businesses acquired. Goodwill is not subject to amortization, but is tested for impairment annually at August 31, the Company's annual testing date, and whenever events or changes in circumstances indicate that impairment may have occurred. The Company compares the carrying value of its reporting units, including goodwill, to their fair value. For reporting units in which the assessment indicates that it is more likely than not that the fair value is more than its carrying value, goodwill is not considered impaired. If the carrying value of the reporting unit exceeds fair value, goodwill is considered impaired.

Based on its annual analysis, the Company determined there was no indication of impairment of goodwill and the estimated fair value of each reporting unit substantially exceeded its carrying value.
Amortizable intangible assets include, among other items, patented, unpatented and other developed technology and customer-based intangibles, and are amortized using the straight-line method over their respective estimated useful lives. The Company reviews intangible assets, along with other long-lived assets - primarily property, plant and equipment - for impairment if changes in circumstances or the occurrence of events suggest the remaining value may not be recoverable.

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Derivative Financial Instruments The Company records derivatives as assets or liabilities on the balance sheet and measures such instruments at fair value. Changes in fair value of derivatives are recorded each period in the Company's consolidated statements of operations.

The Company periodically enters into forward foreign currency contracts to reduce exposures relating to rate changes in certain foreign currencies. Certain exposures to credit losses related to counterparty nonperformance exist. However, the Company does not anticipate nonperformance by the counterparties since they are large, well-established financial institutions. None of these derivatives is accounted for as a hedge transaction. Accordingly, changes in the fair value of forward foreign currency contracts are recorded as other (income) expense, net, in the Company's consolidated statements of operations. The fair values of the Company's derivative financial instruments are based on prices quoted by financial institutions for these instruments.

Foreign Currency Translation Assets and liabilities of certain foreign subsidiaries are translated from foreign currencies into U.S. dollars at period-end exchange rates, and the resulting gains and losses arising from translation of net assets located outside the U.S. are recorded as a cumulative translation adjustment, a component of accumulated other comprehensive loss in the consolidated balance sheets. Income statement amounts are translated at the weighted average exchange rates for the year. Translation adjustments are not adjusted for income taxes, as substantially all translation adjustments relate to permanent investments in non-U.S. subsidiaries. Gains and losses resulting from foreign currency transactions are included in other (income) expense, net, in the Company's consolidated statements of operations.

Revenue Recognition Revenue and the related cost of sales are generally recognized upon shipment of the products. Revenue for product sales is recognized upon delivery, when persuasive evidence of an arrangement exists, when title and risk of loss have been transferred to the customer, collectability is reasonably assured, and pricing is fixed or determinable. Shipping and handling fees related to sales transactions are billed to customers and are recorded as revenue.

The Company sells its products throughout the world primarily to companies in the microelectronics industry. The Company performs continuing credit evaluations of its customers and generally does not require collateral. Letters of credit may be required from its customers in certain circumstances. The Company provides for estimated returns based on historical and current trends in both sales and product returns.

The Company collects various sales and value-added taxes on certain product and service sales that are accounted for on a net basis.

Shipping and Handling Costs Shipping and handling costs incurred are recorded in cost of sales in the Company's consolidated statements of operations.

Engineering, Research and Development Expenses Engineering, research and development costs are expensed as incurred.

Share-based Compensation The Company measures the cost of employee services received in exchange for the award of equity instruments based on the fair value of the award at the date of grant. Compensation expense is recognized using the straight-line attribution method to recognize share-based compensation over the service period of the award, with adjustments recorded for forfeitures as they occur.

Income Taxes The Company accounts for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements. Under this method, deferred tax assets and liabilities are determined on the basis of the differences between the financial statements and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in income tax expense in the period that includes the enactment date.

The Company recognizes deferred tax assets to the extent that it believes these assets are more likely than not to be realized. A valuation allowance is recorded to reduce deferred tax assets when it is more likely than not that the Company would not be able to realize all or part of its deferred tax assets. In making such a determination, the Company considers all available positive and negative evidence, including future reversals of existing temporary differences, projected future taxable income, tax-planning strategies, and results of recent operations. If the Company determines that it would be able to realize its deferred tax assets in the future in excess of their net recorded amount,

the Company would make an adjustment to the deferred tax asset valuation allowance, which would reduce the provision for income taxes.

The Company's policy for recording interest and penalties associated with audits and unrecognized tax benefits is to record such items as a component of income before taxes. Penalties and interest to be paid or received are recorded in other expense (income), net, in the statement of operations.

Comprehensive Income (Loss) Comprehensive income (loss) represents the change in equity resulting from items other than shareholder investments and distributions. The Company's foreign currency translation adjustments, unrealized gains and losses on available-for-sale investments, and minimum pension liability adjustments are included in accumulated other

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comprehensive loss. Comprehensive income (loss) and the components of accumulated other comprehensive loss are presented in the accompanying consolidated statements of comprehensive income (loss) and consolidated statements of equity.

Recent Accounting Pronouncements Adopted in 2017 In April 2016, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) No. 2016-09, Compensation - Stock Compensation (Topic 718), which simplifies several aspects of the accounting for employee share-based payment transactions, including the accounting for tax effects related to share-based payments, forfeitures, and statutory tax withholding requirements, as well as the classification of tax-related cash flows in the statement of cash flows. The update eliminates the accounting for excess tax benefits to be recognized in additional paid-in capital and tax deficiencies recognized either in the income tax provision or in additional paid-in capital. ASU No. 2016-09 became effective for the Company on January 1, 2017. The Company adopted ASU No. 2016-09 using the modified retrospective approach. In connection with the adoption of ASU No. 2016-09, the Company elected as an accounting policy to record forfeitures as they occur and recorded a cumulative-effect adjustment of $0.4 million to retained earnings as of January 1, 2017. The Company also recorded a cumulative-effect adjustment of $1.0 million to retained earnings as of January 1, 2017 with respect to previously unrecognized excess tax benefits. Under ASU No. 2016-09, excess tax benefits or deficiencies related to stock option exercises and restricted stock unit vesting are recognized in the consolidated statement of operations. Accordingly, for the twelve months ended December 31, 2017, the Company recorded a tax benefit of $3.6 million in the consolidated statement of operations. Also related to the adoption of ASU No. 2016-09, the Company elected to present the cash flow statement using the prospective transition method. No prior periods have been adjusted.

Recent Accounting Pronouncements Yet to be Adopted In May 2014, the FASB issued ASU No. 2014-09, Revenue from Contracts with Customers (Topic 606). ASU No. 2014-09 outlines a new, single comprehensive model for entities to use in accounting for revenue arising from contracts with customers and supersedes most current revenue recognition guidance. Under ASU No. 2014-09, revenue for the Company’s contracts will be recognized when control of the products or services transfers to the customer at an amount that reflects the consideration the Company expects to receive in exchange for those goods or services, which is generally consistent with the revenue recognition model currently used for the Company's contracts. ASU No. 2014-09 provides a five-step analysis for determining when and how revenue is recognized. The Company performed and completed a review of its revenue streams as compared to its current accounting policies for customer contracts in 2017. The Company designed and implemented specific controls over its evaluation of the impact of ASU No. 2014-09, including its calculation of the cumulative effect of adopting the standard. As a result of its evaluation, the Company also identified changes to and modified certain of its accounting policies and practices. Although there were no significant changes to its accounting systems or controls upon adoption, the Company modified certain of its existing controls to incorporate the revisions made to its accounting policies and practices. The Company adopted ASU No. 2014-09 on January 1, 2018 on a modified retrospective basis and has concluded that the adoption of this ASU did not have a material impact on the Company’s consolidated financial statements and its internal controls over financial reporting. The Company recorded a cumulative adjustment that decreased retained earnings by approximately $0.7 million reflecting the cumulative impact of changes to revenue recognition related to certain customer incentive arrangements and to product deliveries using certain shipping terms made upon adoption of ASU No. 2014-09. ASU No. 2014-09 also requires disclosures sufficient to enable users to understand the nature, amount, timing, and uncertainty of revenue and cash flows arising from contracts with customers, including qualitative and quantitative disclosures about contracts with customers.

In February 2016, the FASB issued ASU No. 2016-02, Leases (Topic 842). ASU No. 2016-02 requires the identification of arrangements that should be accounted for as leases by lessees. In general, for lease arrangements exceeding a twelve-month term, these arrangements must now be recognized as assets and liabilities on the balance sheet of the lessee. Under ASU No. 2016-02, a right-of-use asset and lease obligation will be recorded for all leases, whether operating or financing, while the income statement will reflect lease expense for operating leases, and amortization and interest expense for financing leases. The balance sheet amount recorded for existing leases at the date of adoption of ASU No. 2016-02 must be calculated using the applicable incremental borrowing rate at the date of adoption. ASU No. 2016-02 is effective beginning January 1, 2019. The Company is currently assessing the impact that adopting this new accounting standard will have on its consolidated financial statements and disclosures, and the

timing of adoption.

(2) ACQUISITION

On April 24, 2017, the Company acquired the microelectronic water and chemical filtration product line of W.L. Gore & Associates, Inc. (Gore). The acquired assets became part of the Company’s Microcontamination Control (MC) segment. The transaction was accounted for under the acquisition method of accounting and the results of operations of the product line are included in the Company's consolidated financial statements as of and since April 24, 2017. The acquisition of the product line’s assets and liabilities does not constitute a material business combination.

The purchase price for the product line was cash consideration of $20.0 million, funded from the Company's existing cash on hand. Costs associated with the acquisition of the product line were not significant and were expensed as incurred.

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The purchase price of the product line exceeds the net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed by $8.0 million. Cash flows used to determine the purchase price included strategic and synergistic benefits (investment value) specific to the Company, which resulted in a purchase price in excess of the fair value of identifiable net assets. This additional investment value resulted in goodwill, which is expected to be deductible for income tax purposes.

The following table summarizes the final allocation of the purchase price to the fair values assigned to the assets and liabilities assumed at the date of acquisition:

(In thousands)	Amount
Other current assets	$ 726
Property, plant and equipment	2,447
Identifiable intangible assets	8,820
Net assets acquired	11,993
Goodwill	$ 8,007
Total purchase price	20,000

Intangible assets, consisting mostly of technology-related intellectual property, generally will be amortized on a straight-line basis over an estimated useful life of approximately 7 years.

As part of the accounting for this transaction, the Company allocated the purchase price of the acquired product line based on the fair value of all the assets acquired. The valuation of the assets acquired was based on the information that was available as of the acquisition date and the expectations and assumptions that have been deemed reasonable by the Company's management.

In performing these valuations, the Company used independent appraisals, discounted cash flows and other factors, as the best evidence of fair value. The key underlying assumptions of the discounted cash flows were projected revenues, gross margin expectations and operating cost estimates. There are inherent uncertainties and management judgment required in these determinations. No assurance can be given that the underlying assumptions will occur as projected. The fair value measurement of the assets acquired and liabilities assumed was based on valuation involving significant unobservable inputs, or Level 3 in the fair value hierarchy.

(3) TRADE ACCOUNTS AND NOTES RECEIVABLE

Trade accounts and notes receivable from customers at December 31, 2017 and 2016 consist of the following:

(In thousands)	2017	2016
Accounts receivable	$179,194	$163,759
Notes receivable	5,100	4,390
	184,294	168,149
Less allowance for doubtful accounts	860	2,474
	$183,434	$165,675

(4) INVENTORIES

Inventories at December 31, 2017 and 2016 consist of the following:

(In thousands)	2017	2016
Raw materials	$58,226	$53,109
Work-in-process	16,193	15,976
Finished goods [(a)]	123,670	114,444
	$198,089	$183,529

[(a)] Includes consignment inventories held by customers for $15.6 million and $16.4 million at December 31, 2017 and 2016, respectively.

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(5) PROPERTY, PLANT AND EQUIPMENT

Property, plant, and equipment at December 31, 2017 and 2016 consists of the following:

(In thousands)	2017	2016	Estimated useful lives in years
Land	$16,795	$15,903	
Buildings and improvements	174,615	155,769	5-35
Manufacturing equipment	274,723	248,201	5-10
Canisters and cylinders	77,325	65,100	3-12
Molds	80,198	76,782	3-5
Office furniture and equipment	121,345	107,194	3-8
Construction in progress	42,288	40,136	
	787,289	709,085	
Less accumulated depreciation	427,766	387,523	
	$359,523	$321,562	

The table below sets forth the depreciation expense for the years ended December 31, 2017, 2016 and 2015:

(In thousands)	2017	2016	2015
Depreciation expense	$58,208	$55,623	$54,305

(6) GOODWILL AND INTANGIBLE ASSETS

Goodwill activity for each of the Company's reportable segments that carry goodwill, Specialty Chemicals and Engineered Materials (SCEM), Microcontamination Control (MC) and Advanced Materials Handling (AMH), for the years ended December 31, 2017 and 2016 is shown below:

(In thousands)	SCEM	MC	AMH	Total
December 31, 2015	$294,700	$—	$47,411	$342,111
Addition due to purchase accounting adjustments	4,434	—	—	4,434
Other, including foreign currency translation	(1,276)	—	—	(1,276)
December 31, 2016	297,858	—	47,411	345,269
Addition due to acquisition	—	8,007	—	8,007
Other, including foreign currency translation	6,412	—	—	6,412
December 31, 2017	$304,270	$8,007	$47,411	$359,688

As of December 31, 2017, goodwill amounted to approximately $359.7 million, an increase of $14.4 million from the balance at December 31, 2016. The increase in goodwill in 2017 reflects the acquisition of the microelectronic water and chemical filtration product line of Gore described in note 2. In addition, goodwill increased due to foreign currency translation.

Identifiable intangible assets at December 31, 2017 and 2016 consist of the following:

2017

(In thousands)	Gross carrying Amount	Accumulated amortization	Net carrying value	Weighted average life in years
Developed technology	206,224	149,215	57,009	6.6
Trademarks and trade names	16,807	13,712	3,095	9.9
Customer relationships	220,806	110,281	110,525	10.3
Other	20,032	8,231	11,801	6.7
	$463,869	$ 281,439	$182,430	8.5

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2016

(In thousands)	Gross carrying amount	Accumulated amortization	Net carrying value	Weighted average life in years
Developed technology	202,591	126,077	76,514	6.7
Trademarks and trade names	16,661	12,617	4,044	9.9
Customer relationships	216,918	90,581	126,337	10.3
Other	18,585	7,932	10,653	6.5
	$454,755	$ 237,207	$217,548	8.5

The table below sets forth the amortization expense for the years ended December 31, 2017, 2016, and 2015:

(In thousands)	2017	2016	2015
Amortization expense	$44,023	$44,263	$47,349

The amortization expense for each of the five succeeding years and thereafter relating to intangible assets currently recorded in the Company's consolidated balance sheets is estimated to be the following at December 31, 2017:

Fiscal year ending December 31	(In thousands)
2018	$ 43,670
2019	41,540
2020	26,767
2021	20,055
2022	19,907
Thereafter	30,491
	$ 182,430

(7) DEBT

Long-term debt at December 31, 2017 and 2016 consists of the following:

(In thousands)	December 31, 2017	December 31, 2016
Senior secured term loan facility due 2021	$ 133,850	$ 233,850
Senior unsecured notes due 2022	—	360,000
Senior unsecured notes due 2026	550,000	—
	683,850	593,850
Unamortized discount and debt issuance costs	9,470	9,173
Total long-term debt	674,380	584,677
Less current maturities of long-term debt	100,000	100,000
Long-term debt less current maturities	$ 574,380	$ 484,677

Annual maturities of long-term debt contractually due as of December 31, 2017 are as follows:

Fiscal year ending December 31	(In thousands)
2018	$ —
2019	—
2020	—
2021	133,850
2022	—
Thereafter	550,000
	$ 683,850

In November 2017, the Company issued $550 million aggregate principal amount of 4.625% senior unsecured notes due February 10, 2026 (the "2026 Notes"). The Company used the net proceeds of the issuance of the 2026 Senior Unsecured Notes to redeem all of the Company's 6.000% Senior Unsecured Notes due 2022 (the "2022 Notes"), to pay fees and expenses related to the issuance and the redemption, and for general corporate purposes. Debt issuance

costs of $7.1 million paid to third parties
are capitalized as debt issuance costs in connection with the 2026 Notes. These debt issuance costs are being amortized as interest expense in the Company's consolidated statements of operations over the term of the debt instrument using the straight-line method. The 2022 Notes were redeemed at the redemption price of 104.5% (expressed as percentage of principal amount), plus accrued and unpaid interest. The redemption of the 2022 Notes resulted in a loss of $20.7 million on extinguishment of debt, which is included in other expense in the Company's consolidated statement of operations.

2022 Senior Unsecured Notes

On April 1, 2014, the Company issued $360 million aggregate principal amount of 6.000% senior unsecured notes due April 1, 2022. The 2022 Notes were issued under an indenture dated as of April 1, 2014 by and among the Company and Wells Fargo Bank, National Association, as trustee. Interest on the 2022 Notes is payable semi-annually in arrears on April 1 and October 1, commencing October 1, 2014. As stated above, the 2022 Notes were redeemed in November 2017.

2026 Senior Unsecured Notes

On November 10, 2017, the Company issued $550 million aggregate principal amount of 4.625% senior unsecured notes due February 10, 2026. The 2026 Notes were issued under an indenture dated as of November 10, 2017 (the "2026 Notes Indenture") by and among the Company and Wells Fargo Bank, National Association, as trustee. Interest on the 2026 Notes is payable semi-annually in arrears on February 15 and August 15, commencing February 15, 2018. The 2026 Notes are guaranteed, jointly and severally, fully and unconditionally, on a senior unsecured basis, by, subject to certain exclusions, each of the Company’s domestic subsidiaries (the Guarantors) that guarantee indebtedness under the Company’s senior secured term loan facility and senior secured asset-based revolving credit facility (Senior Secured Credit Facilities).

As provided in the 2026 Notes Indenture, the Company may at its option on one or more occasions redeem all or a part of the 2026 Notes at a redemption price equal to (a) 100% of the principal amount of the 2026 Notes redeemed plus a make-whole premium if redeemed prior to November 10, 2020, or (b) 100% of the principal amount of the 2026 Notes redeemed plus a percentage of principal amount between 100% and 103.469% of the aggregate principal amount of notes to be redeemed depending on the period of redemption, if redeemed on or after November 10, 2020, plus, in each case, accrued and unpaid interest on the amount of 2026 Notes being redeemed.

Upon a change in control accompanied by certain rating events, the Company is required to offer to repurchase all of the 2026 Notes at a price in cash equal to 101% of the aggregate principal amount thereof, plus accrued and unpaid interest, if any, to, but not including, the date of repurchase.

The 2026 Notes Indenture contains covenants that, among other things and subject to certain exceptions, limit the Company's ability and the ability of the Company's restricted subsidiaries to create liens, enter into sale and leaseback transactions, engage in consolidations or mergers, or sell, transfer or otherwise dispose of all or substantially all of their assets. The 2026 Notes Indenture also, subject to certain exceptions, limits the ability of any non-Guarantor subsidiary of the Company to incur indebtedness. The Company is in compliance with all of the above covenants at December 31, 2017.

The 2026 Notes Indenture also provides for events of default which, if certain of them occur, would permit the trustee or the holders of at least 25% in aggregate principal amount of the then outstanding 2026 Notes to declare the principal, premium, if any, interest and any other monetary obligations on all the then-outstanding 2026 Notes to be due and payable immediately.

Senior Secured Term Loan Facility

On April 30, 2014, the Company entered into a term loan credit and guaranty agreement with Goldman Sachs Bank USA, as administrative agent, collateral agent, sole lead arranger, sole bookrunner and sole syndication agent (the Term Loan Facility), that provides senior secured financing of $460 million (which may be increased by up to $225 million in certain circumstances). During the first quarter of 2017, the Company and its lenders agreed to an amendment of the term loan agreement that decreases the applicable margins for the Company’s term loan. Borrowings under the Term Loan Facility bear interest at a rate per annum equal to, at the Company’s option, a base rate (such as prime rate or LIBOR) plus, an applicable margin. The Company's interest rate is 3.819% at December 31, 2017. In addition to paying interest on the outstanding principal under the Term Loan Facility, the Company is required to pay customary agency fees.

During the years ended December 31, 2017 and 2016, the Company made payments of $100.0 million and $75.0 million, respectively, on the Term Loan Facility. As of December 31, 2017, under the terms of the Term Loan Facility, the Company is not obligated to remit payments on the Term Loan Facility in 2018. However, based on management's plans and intent, the Company reflects $100 million as the current maturity of long-term debt in its consolidated balance sheet as of December 31, 2017.

The credit agreement governing the Term Loan Facility requires the Company to prepay outstanding term loans, subject to certain exceptions, with (a) up to 50% of the Company’s annual Excess Cash Flow (as defined in the credit agreement

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governing the Term Loan Facility) and (b) 100% of the net cash proceeds of (i) certain asset sales and casualty and condemnation events, subject to reinvestment rights and certain other exceptions; and (ii) any incurrence or issuance of certain debt, other than debt permitted under the Term Loan Facility.

The Company may voluntarily prepay outstanding loans under the Term Loan Facility at any time without premium or penalty other than customary “breakage” costs with respect to LIBOR loans.

All obligations under the Term Loan Facility are unconditionally guaranteed by certain of the Company’s existing wholly owned domestic subsidiaries, and are secured, subject to certain exceptions, by substantially all of the Company’s assets and the assets of the Company's subsidiary guarantors.

The Term Loan Facility contains a number of negative covenants that, subject to certain exceptions, restrict the Company’s ability and each of the Company’s subsidiaries' ability to incur additional indebtedness; pay dividends on its capital stock or redeem, repurchase or retire its capital stock or its other indebtedness; make investments, loans and acquisitions; create restrictions on the payment of dividends or other amounts to the Company from the Company’s restricted subsidiaries; engage in transactions with its affiliates; sell assets, including capital stock of its subsidiaries; materially alter the business it conducts; consolidate or merge; incur liens; and engage in sale-leaseback transactions. The credit agreement governing the Term Loan Facility additionally contains certain customary representations and warranties, affirmative covenants and provisions relating to events of default. The Company is in compliance with all of the above covenants at December 31, 2017.

Senior Secured Asset-Based Revolving Credit Facility

The Company has an asset-based credit agreement with Goldman Sachs Bank USA, as administrative agent, collateral agent, sole lead arranger, sole bookrunner and sole syndication agent (the ABL Facility), that provides senior secured financing of $75 million (which may be increased by up to $35 million in certain circumstances), subject to a borrowing base limitation. The borrowing base for the ABL Facility at any time equals the sum of certain percentages of various accounts and inventories and stood at $65.0 million at December 31, 2017. The ABL Facility includes borrowing capacity in the form of letters of credit up to $35 million of the facility, and up to $20 million in U.S. dollars for borrowings on same-day notice, referred to as swingline loans.

Borrowings under the ABL Facility bear interest at a rate per annum equal to, at the Company’s option, a base rate (prime rate or LIBOR), plus an applicable margin. Swingline loans shall bear interest at a rate per annum equal to the base rate plus the applicable margin.

In addition to paying interest on outstanding principal under the ABL Facility, the Company is required to pay a commitment fee of 0.33% per annum in respect of the unutilized commitments thereunder. The Company must also pay customary letter of credit fees and agency fees.

The Company may voluntarily reduce the unutilized portion of the commitment amount and repay outstanding loans at any time. Prepayments of the loans may be made without premium or penalty other than customary “breakage” costs with respect to LIBOR loans.

There is no scheduled amortization under the Company’s ABL Facility. The principal amount outstanding under the ABL Facility is due and payable in full on April 30, 2019. There is no outstanding balance under the ABL Facility at December 31, 2017.

All obligations under the ABL Facility are unconditionally guaranteed by certain of the Company’s existing wholly owned domestic subsidiaries and are secured, subject to certain exceptions, by substantially all of the Company’s assets and the assets of the Company's subsidiaries that have guaranteed the ABL Facility.

The ABL Facility contains a number of negative covenants that, among other things, subject to certain exceptions, restrict the Company’s ability and the ability of each of the Company’s subsidiaries to incur additional indebtedness; pay dividends on its capital stock or redeem, repurchase or retire its capital stock or its other indebtedness; make investments, loans and acquisitions; create restrictions on the payment of dividends or other amounts to the Company from the Company’s restricted subsidiaries; engage in transactions with its affiliates; sell assets, including capital stock of its subsidiaries; materially alter the business it conducts; consolidate or merge; incur liens; and engage in sale-leaseback transactions. The credit agreement governing the ABL Facility additionally contains certain customary representations and warranties, affirmative covenants and provisions relating to events of default. The Company is in compliance with all of the above covenants at December 31, 2017.

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(8) LEASE COMMITMENTS

As of December 31, 2017, the Company was obligated under noncancellable operating lease agreements for certain sales offices and manufacturing facilities, manufacturing equipment, vehicles, information technology equipment and warehouse space. Future minimum lease payments for noncancellable operating leases with initial or remaining terms in excess of one year are as follows:

Fiscal year ending December 31	(In thousands)
2018	$ 9,805
2019	7,663
2020	5,015
2021	4,911
2022	3,369
Thereafter	11,794
Total minimum lease payments	$ 42,557

Total rental expense for all equipment and building operating leases for the years ended December 31, 2017, 2016 and 2015, were $10.6 million, $13.3 million and $13.8 million, respectively.

(9) ASSET RETIREMENT OBLIGATIONS

The Company has asset retirement obligations (AROs) related to environmental disposal obligations associated with cylinders used to supply customers with gas products, and certain restoration obligations associated with its leased facilities.

Changes in the carrying amounts of the Company's AROs for the years ended December 31, 2017 and 2016 are shown below:

(In thousands)	2017	2016
Balance at beginning of year	$11,529	$11,334
Liabilities settled	(577)	(975)
Liabilities incurred	412	491
Accretion expense	215	188
Revision of estimate	588	491
Balance at end of year	$12,167	$11,529

ARO liabilities expected to be settled within twelve months are included in the consolidated balance sheets in other accrued liabilities, while all other ARO liabilities are included in pension benefit obligations and other liabilities in the consolidated balance sheets.

(10) INCOME TAXES

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act. The Tax Cuts and Jobs Act makes broad and complex changes to the U.S. tax code that will affect 2017, most notably a reduction of the U.S. corporate income tax rate from 35 percent to 21 percent for tax years beginning after December 31, 2017. The Tax Cuts and Jobs Act also provides for a one-time transition tax on the mandatory deemed repatriation of cumulative foreign earnings as of December 31, 2017 and the acceleration of depreciation for certain assets placed into service after September 27, 2017 as well as prospective changes beginning in 2018, including the repeal of the domestic manufacturing deduction, additional limitations on executive compensation and limitations on the deductibility of interest.

The Security and Exchange Commission (SEC) staff issued Staff Accounting Bulletin (SAB) 118, which provides guidance on accounting for the tax effects of the Tax Cuts and Jobs Act. SAB 118 provides a measurement period that should not extend beyond one year from the Tax Cuts and Jobs Act enactment date for entities to complete the accounting under ASC 740. In accordance with SAB 118, an entity must reflect the income tax effects of those aspects of the Tax Cuts and Jobs Act for which the accounting under Accounting Standards Codification (ASC) 740 is complete. To the extent that an entity's accounting for certain income tax effects of the Tax Cuts and Jobs Act is incomplete but it is able to determine a reasonable estimate, it must record a provisional estimate in the financial statements. If an entity cannot determine a provisional estimate to be included in the financial statements, it should

continue to apply ASC 740 on the basis of the provisions of the tax laws that were in effect immediately before the enactment of the Tax Cuts and Jobs Act.

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The Company has calculated its best estimate of the impact of the Tax Cuts and Jobs Act in its year end income tax provision in accordance with its understanding of the Tax Cuts and Jobs Act and guidance available as of the date of this filing. As a result, the Company recorded a discrete net tax expense of $66.7 million in the period ending December 31, 2017. This net expense primarily consists of a net benefit for the corporate rate reduction of $10.2 million and a net expense for the transition tax of $73.0 million and $4.0 million of additional tax related to no longer asserting that a significant portion of the Company's undistributed earnings are considered indefinitely reinvested overseas. For various reasons that are discussed more fully below, the Company has not completed its accounting for the income tax effects of certain elements of the Tax Cuts and Jobs Act. If the Company was able to make reasonable estimates of the effects of elements for which its analysis is not yet complete, the Company recorded provisional adjustments. If the Company was not yet able to make reasonable estimates of the impact of certain elements, it has not recorded any adjustments related to those elements and has continued accounting for them in accordance with ASC 740 on the basis of the tax laws in effect before the Tax Cuts and Jobs Act. The Company continues to analyze the implications of the global intangible low taxed income ("GILTI") provision of the Tax Cuts and Jobs Act and delays finalizing its GILTI policy election under SAB 118 until it has the necessary information available to analyze and make an informed policy decision. The changes to existing U.S. tax laws as a result of the Tax Cuts and Jobs Act, which the Company believes have the most significant impact on the Company’s federal income taxes are as follows:

Reduction of U.S. federal corporate tax rate
The Company measures deferred tax assets and liabilities using enacted tax rates that will apply in the years in which the temporary differences are expected to be recovered or paid. Accordingly, the Company’s deferred tax assets and liabilities were remeasured to reflect the reduction in the U.S. corporate income tax rate from 35 percent to 21 percent, resulting in a $10.2 million decrease in income tax expense for the year ended December 31, 2017 and a corresponding decrease in net deferred tax liabilities as of December 31, 2017. Included in this benefit are provisional amounts related to certain deferred tax assets and liabilities where the necessary information is not available, prepared or analyzed. Examples of this include fixed assets and compensation. The Company expects to complete its analysis of these provisional items when the necessary information becomes available to accurately analyze and compute in reasonable detail under ASC Topic 740. The Company estimates such analysis will be completed in the second half of 2018.

Transition Tax on Foreign Earnings
The Deemed Repatriation Transition Tax ("Transition Tax") is a tax on previously untaxed accumulated and current earnings and profits (E&P) of certain of our foreign subsidiaries. To determine the amount of the Transition Tax, the Company must determine, in addition to other factors, the amount of post-1986 E&P of the relevant subsidiaries, as well as the amount of non-U.S. income taxes paid on such earnings. The Company recognized a provisional income tax expense of $73.0 million for the year ended December 31, 2017 related to the one-time Transition Tax on certain foreign earnings. This resulted in a corresponding decrease in deferred tax assets due to the utilization of foreign tax credit carryforwards of $10.2 million and research and development credit carryforwards of $11.8 million. The determination of the Transition Tax requires further analysis regarding the amount and composition of the Company’s historical earnings, which is expected to be completed when the necessary information becomes available to accurately analyze and compute in reasonable detail under ASC Topic 740. The Company estimates such analysis will be completed in the second half of 2018.

Acceleration of Depreciation
The Company recorded a provisional benefit of $1.3 million attributable to the accelerated depreciation for certain assets placed into service after September 27, 2017. This resulted in a decrease of approximately $3.2 million to our current income tax payable and a corresponding increase in our deferred tax liabilities of approximately $1.9 million (after considering the effects of the reduction in income tax rates). The income tax effects for this position requires further analysis due to the volume of data required to complete the calculations. The Company expects to complete this analysis when the necessary information becomes available to accurately analyze and compute in reasonable

detail under ASC Topic 740. The Company estimates such analysis will be completed in the second half of 2018.

Excessive Compensation under Sec. 162(m)

The Tax Cuts and Jobs Act repeals the exceptions to the section 162(m) deduction limitation for commissions and performance-based compensation. The Tax Cuts and Jobs Act provides a transition rule which states that the expansion of section 162(m) does not apply to any remuneration paid under a written, binding contract in effect on November 2, 2017, which was not materially modified on or after this date. The Tax Cuts and Jobs Act does not specifically define the criteria for a binding contract and no further guidance was provided on this topic. The Company has determined this change would be immaterial and its analysis will be completed when the necessary information becomes available to accurately analyze and compute in reasonable detail under ASC Topic 740. The Company estimates such analysis will be completed in the second half of 2018.

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Undistributed Foreign Earnings

As of December 31, 2017, the Company has accumulated undistributed earnings generated by its foreign subsidiaries of approximately $943.7 million subject to the one-time Transition Tax on foreign earnings required by the Tax Cuts and Jobs Act or has otherwise been previously taxed. As of January 1, 2017, the Company removed its assertion on its Korean entities. Additionally, due to tax reform, the Company removed its prior year assertion on all but certain entities and recorded the associated withholding tax of $4.0 million. At December 31, 2017, there were approximately $30.7 million of accumulated undistributed earnings of subsidiaries outside of United States, all of which are considered to be indefinitely reinvested. Management estimates that no material withholding taxes would be incurred if these undistributed earnings were distributed.

Income (loss) before income taxes for the years ended December 31, 2017, 2016 and 2015 was derived from the following sources:

(In thousands)	2017	2016	2015
Domestic	$13,363	$(7,328)	$(16,751)
Foreign	171,368	127,327	108,936
Income before income tax expense and equity in net loss of affiliate	$184,731	$119,999	$92,185

Income tax expense for the years ended December 31, 2017, 2016 and 2015 is summarized as follows:

(In thousands)	2017	2016	2015
Current:			
Federal	$60,529	$7,759	$4,170
State	808	(10)	528
Foreign	36,700	31,387	18,817
	98,037	39,136	23,515
Deferred (net of valuation allowance):			
Federal	249	(8,183)	(11,374)
State	(891)	250	(738)
Foreign	2,270	(8,351)	(1,201)
	1,628	(16,284)	(13,313)
Income tax expense	$99,665	$22,852	$10,202

Income tax (benefit) expense differs from the expected amounts based upon the statutory federal tax rates for the years ended December 31, 2017, 2016 and 2015 as follows:

(In thousands)	2017	2016	2015
Expected federal income tax at statutory rate	$64,656	$42,000	$32,265
State income taxes before valuation allowance, net of federal tax effect	(1,376)	(769)	(576)
Effect of foreign source income	(27,581)	(22,242)	(23,374)
Tax contingencies	2,816	1,103	1,483
Valuation allowance	3,195	1,713	1,109
U.S. federal research credit	(4,881)	(1,676)	(3,905)
Equity compensation	(2,321)	815	739
Transition tax	72,993	—	—
Remeasurement of deferred taxes	(10,248)	—	—
Incremental taxes on unremitted foreign earnings release	3,968	—	—
Other items, net	(1,556)	1,908	2,461
Income tax expense	$99,665	$22,852	$10,202

As a result of commitments made by the Company related to investments in tangible property and equipment, the establishment of a research and development center in 2006 and certain employment commitments, income from certain manufacturing activities in Malaysia has been exempt from tax for years up through 2015. The income tax benefits attributable to the tax status of this subsidiary is $10.2 million ($0.07 per diluted share) for the year ended December 31, 2015. The 2017, 2016 and 2015 effective tax rates include additional benefits of $2.0 million, $4.3 million, and $4.4 million, respectively, because the corporate tax rate in Malaysia is lower than the U.S. rate.

In 2012, Entegris' Korean subsidiary made commitments to produce a certain line of products. In return for this commitment, the Company has a tax holiday on income earned on sales of these products for five years and a partial holiday for two additional years. The income tax benefits attributable to this tax holiday are $7.4 million ($0.05 per diluted share), $3.3 million ($0.02 per diluted share) and $1.5 million ($0.01 per diluted share) for the years ended December 31, 2017, 2016 and 2015, respectively. The 2017, 2016 and 2015 effective tax rates include additional benefits of $4.3 million, $1.9 million and $0.9 million, respectively, because the corporate tax rate in Korea is lower than the U.S. rate.

The Company also has made employment and spending commitments to Singapore. In return for those commitments, the Company has been granted a partial tax holiday for eight years starting in 2013. During 2017, this agreement was extended to 2027 in exchange for revised employment and spending commitments. The income tax benefits attributable to the tax status are $4.7 million ($0.03 cents per diluted share), $2.3 million ($0.02 cent per diluted share) and $1.7 million ($0.01 cent per diluted share) for the years ending December 31, 2017, 2016 and 2015, respectively. The 2017, 2016 and 2015 effective tax rates include additional benefits of $12.4 million, $6.5 million and $4.6 million, because the corporate tax rate in Singapore is lower than the U.S. rate.

The Company has remeasured its deferred tax assets and liabilities as a result of passage of the Tax Cuts and Jobs Act. The primary impact of this remeasurement was a reduction in deferred tax assets and liabilities in connection with the reduction of the U.S. corporate income tax rate as described above. The significant components of the Company's deferred tax assets and deferred tax liabilities at December 31, 2017 and 2016 are as follows:

(In thousands)	2017	2016
Deferred tax assets attributable to:		
Accounts receivable	$32	$470
Inventory	4,132	5,061
Accruals not currently deductible for tax purposes	8,641	3,729
Net operating loss and credit carryforwards	15,184	27,198
Capital loss carryforward	2,391	3,134
Depreciation	—	8,395
Equity compensation	3,658	5,134
Asset impairments	452	1,467
Other, net	2,549	4,356
Gross deferred tax assets	37,039	58,944
Valuation allowance	(17,494)	(14,661)
Total deferred tax assets	19,545	44,283
Deferred tax liabilities attributable to:		
Purchased intangible assets	(28,956)	(55,809)
Depreciation	(2,512)	—
Total deferred tax liabilities	(31,468)	(55,809)
Net deferred tax liabilities	$(11,923)	$(11,526)

Deferred tax assets are generally required to be reduced by a valuation allowance if, based on the weight of available positive and negative evidence, it is more likely than not that some portion or all of the deferred tax assets will not be realized.

As of December 31, 2017 and 2016, the Company had a net U.S. deferred tax liability of $5.1 million and $3.5 million, respectively, which are composed of temporary differences and various tax credit carryforwards. Management believes that it is more likely than not that the benefit from certain state net operating loss carryforwards, state credits, capital asset impairments, and a federal capital loss carryforward will not be realized. In recognition of this risk, management has provided a valuation allowance of $10.6 million and $9.6 million as of December 31, 2017 and 2016, respectively, on the related deferred tax assets. If the assumptions change and management determines the assets will be realized, the tax benefits relating to any reversal of the valuation allowance on deferred tax assets at December 31, 2017 will be recognized as a reduction of income tax expense.

As of December 31, 2017 and 2016, the Company had a net non-U.S. deferred tax asset of $10.7 million and $6.6 million, respectively, for which management determined based upon the available evidence a valuation allowance of $6.9 million and $5.0 million as of December 31, 2017 and 2016, respectively, was required against the non-U.S. gross deferred tax assets. For other non-U.S. jurisdictions, management is relying upon projections of future taxable income to utilize deferred tax assets.

At December 31, 2017, the Company had state operating loss and credit carryforwards of approximately $7.9 million, which begin to expire in 2019 and foreign operating loss carryforwards of $25.0 million, which begin to expire in 2018.

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Benefits from tax positions should be recognized in the financial statements only when it is more likely than not that the tax positions will be sustained upon examination by the appropriate taxing authority that would have full knowledge of all relevant information. A tax position that meets the more-likely-than-not recognition threshold is measured at the largest amount of benefit that is greater than fifty percent likely of being realized upon ultimate settlement. Tax positions that fail to meet the more-likely-than-not recognition threshold should be recognized in the first subsequent financial reporting period in which that threshold is met. Previously recognized tax positions that no longer meet the more-likely-than-not recognition threshold should be derecognized in the first subsequent financial reporting period in which that threshold is no longer met. The provisions also provide guidance on the accounting for and disclosure of unrecognized tax benefits, interest and penalties.

Reconciliations of the beginning and ending balances of the total amounts of gross unrecognized tax benefits for the years ended December 31, 2017 and 2016 are as follows:

(In thousands)	2017	2016
Gross unrecognized tax benefits at beginning of year	$8,293	$7,621
Increase in tax positions from prior years	298	14
Increases in tax positions for current year	4,724	1,944
Lapse in statute of limitations	(754)	(1,286)
Gross unrecognized tax benefits at end of year	$12,561	$8,293

The total amount of net unrecognized tax benefits that, if recognized, would affect the effective tax rate was $9.9 million at December 31, 2017.

Penalties and interest paid or received are recorded in other income, net, in the consolidated statements of operations. For the years ended December 31, 2017 and 2016, the Company has accrued interest and penalties related to unrecognized tax benefits of $1.0 million and $0.7 million, respectively. Expenses of $0.3 million, $0.1 million and $0.1 million were recognized as interest and penalties in the consolidated statements of operations for the years ended December 31, 2017, 2016 and 2015, respectively.

The Company files income tax returns in the U.S. and in various state, local and foreign jurisdictions. The statutes of limitations related to both the consolidated Federal income tax return and state returns are closed for all years up to and including 2013 and 2013, respectively. With respect to foreign jurisdictions, the statute of limitations varies from country to country, with the earliest open year for the Company’s major foreign subsidiaries being 2011.

Due to the expiration of various statutes of limitations and settlement of audits, it is reasonably possible that the Company’s gross unrecognized tax benefit balance may decrease within the next twelve months by approximately $1.8 million.

(11) EQUITY

Dividend

On October 18, 2017, the Company's Board of Directors declared its initial quarterly cash dividend of $0.07 per share, totaling $9.9 million, paid on November 22, 2017 to shareholders of record on the close of business on November 1, 2017. Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of the Company’s Board of Directors.

Share Repurchase Program

On February 15, 2017, the Company's Board of Directors authorized a repurchase program which expires February 15, 2018 covering up to an aggregate of $100.0 million of the Company's common stock in open market transactions and in accordance with one or more pre-arranged stock trading plans established in accordance with Rule 10b5-1 under the Securities and Exchange Act of 1934, as amended. The repurchase program represents a renewal and replacement of the repurchase program originally authorized on February 5, 2016, which expired February 15, 2017. The Company repurchased $28.0 million of shares and $7.6 million of shares for the years ended December 31, 2017 and December 31, 2016, respectively.

2010 Stock Plan

In 2009, the Company’s Board of Directors approved the 2010 Stock Plan, subject to the approval by the Company’s stockholders in 2010. The 2010 Stock Plan replaced the predecessor plans for future stock awards and stock option grants. Subsequent to the acquisition of ATMI, Inc. in 2014, the Company's Board of Directors approved the

absorption of 5.7 million additional shares of the ATMI, Inc. 2010 Stock Plan (ATMI Plan) into the Company's 2010 Stock Plan for the remaining term of the ATMI Plan.
The 2010 Stock Plan has a term of ten years and provides for the issuance of stock options and other share-based awards to selected employees, directors, and other individuals or entities that provide services to the Company or its affiliates. Under the
2010 Stock Plan, the Board of Directors or a committee selected by the Board of Directors will determine for each award, the term, price, number of shares, rate at which each award is exercisable and whether restrictions are imposed on the shares subject to the awards. The exercise price for option awards generally may not be less than the fair market value per share of the underlying common stock on the date granted. The 2010 Stock Plan allows that after December 31, 2009 any stock awards that were awarded from the expired plans mentioned above that are forfeited, expired or otherwise terminated without issuance of such stock award again be available for issuance under the 2010 Stock Plan.
Stock Options
Stock option activity for the 2010 Stock Plan and predecessor plans for the years ended December 31, 2017, 2016 and 2015 is summarized as follows:

(Shares in thousands)	2017 Number of shares	Weighted average exercise price	2016 Number of shares	Weighted average exercise price	2015 Number of shares	Weighted average exercise price
Options outstanding, beginning of year	1,907	$ 11.54	2,139	$ 10.57	2,034	$ 9.67
Granted	335	21.60	549	12.20	411	13.49
Exercised	(359)	10.89	(633)	8.66	(219)	7.62
Expired or forfeited	(14)	12.78	(148)	12.32	(87)	10.72
Options outstanding, end of year	1,869	$ 13.46	1,907	$ 11.54	2,139	$ 10.57
Options exercisable, end of year	872	$ 11.11	776	$ 10.65	961	$ 9.07

Options outstanding for the Company's stock plans at December 31, 2017 are summarized as follows:

(Shares in thousands)	Options outstanding			Options exercisable	
Range of exercise prices	Number outstanding	Weighted average remaining life in years	Weighted-average exercise price	Number exercisable	Weighted average exercise price
$9.27 to $9.88	396	1.9 years	$ 9.71	396	$ 9.71
$11.71 to $11.71	382	3.1 years	11.71	255	11.71
$12.20 to $12.20	467	5.1 years	12.20	95	12.20
$13.49 to $13.49	289	4.1 years	13.49	126	13.49
$21.60 to $21.60	335	6.1 years	21.60	—	—
	1,869	4.1 years	13.46	872	11.11

The weighted average remaining contractual term for options outstanding and exercisable for all plans at December 31, 2017 was 4.1 years and 2.9 years, respectively.
For all plans, the Company had shares available for future grants of 8.8 million shares, 9.4 million shares, and 10.4 million shares at December 31, 2017, 2016 and 2015, respectively.
For all plans, the total pre-tax intrinsic value of stock options exercised during the years ended December 31, 2017 and 2016 was $4.8 million and $5.1 million, respectively. The aggregate intrinsic value, which represents the total pre-tax intrinsic value based on the Company's closing stock price of $30.45 at December 31, 2017, which theoretically could have been received by the option holders had all option holders exercised their options as of that date, was $31.8 million and $16.9 million for options outstanding and options exercisable, respectively.
Share-based payment awards in the form of stock option awards for 0.3 million, 0.5 million and 0.4 million options were granted to employees during the years ended December 31, 2017, 2016 and 2015. Compensation expense is

based on the grant date fair value. The awards vest annually over a three-year or four-year period and have a contractual term of 7 years. The Company estimates the fair value of stock options using the Black-Scholes valuation model. Key inputs and assumptions used to estimate the fair value of stock options include the grant price of the award, the expected option term, volatility of the Company's stock, the risk-free rate and the Company's dividend yield. Estimates of fair value are not intended to predict actual future events or the value ultimately realized by employees who receive equity awards, and subsequent events are not indicative of reasonableness of the original estimates of fair value made by the Company.

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The fair value of each stock option grant was estimated at the date of grant using a Black-Scholes option pricing model. The following table presents the weighted-average assumptions used in the valuation and the resulting weighted-average fair value per option granted for the years ended December 31, 2017, 2016 and 2015:

Employee stock options:	2017		2016		2015	
Volatility	26.9	%	27.6	%	34.6	%
Risk-free interest rate	1.7	%	1.1	%	1.3	%
Dividend yield	—	%	—	%	—	%
Expected life (years)	4.1		4.0		3.9	
Weighted average fair value per option	$5.25		$2.85		$3.86	

A historical daily measurement of volatility is determined based on the expected life of the option granted. The risk-free interest rate is determined by reference to the yield on an outstanding U.S. Treasury note with a term equal to the expected life of the option granted. Expected life is determined by reference to the Company's historical experience. The Company determines the dividend yield by dividing the expected annual dividend on the Company's stock by the option exercise price.

Employee Stock Purchase Plan

The Company maintains the Entegris, Inc. Amended and Restated Employee Stock Purchase Plan (ESPP). The ESPP allows employees to elect, at six-month intervals, to contribute up to 10% of their compensation, subject to certain limitations, to purchase shares of common stock at a discount of 15% from the fair market value on the first day or last day of each six-month period. The Company treats the ESPP as a compensatory plan. At December 31, 2017, 2.1 million shares remained available for issuance under the ESPP. Employees purchased 0.2 million shares, 0.3 million shares, and 0.3 million shares, at a weighted-average price of $16.92, $11.56, and $11.21 during the years ended December 31, 2017, 2016 and 2015, respectively.

Restricted Stock Awards

Restricted stock awards are awards of common stock made under the 2010 Stock Plan that are subject to a risk of forfeiture if the awardee terminates employment with the Company prior to the lapse of the restrictions. The value of such stock is determined using the market price on the grant date. Compensation expense for restricted stock awards is generally recognized using the straight-line single-option method. A summary of the Company's restricted stock activity for the years ended December 31, 2017, 2016 and 2015 is presented in the following table:

	2017		2016		2015	
(Shares in thousands)	Number of shares	Weighted average grant date fair value	Number of shares	Weighted average grant date fair value	Number of shares	Weighted average grant date fair value
Unvested, beginning of year	2,164	$ 12.49	1,882	$ 12.25	1,613	$ 10.53
Granted	659	22.14	1,249	12.42	1,043	13.47
Vested	(801)	12.22	(711)	11.74	(638)	10.13
Forfeited	(165)	14.48	(256)	12.44	(136)	11.26
Unvested, end of year	1,857	15.86	2,164	12.49	1,882	12.25

The weighted average remaining contractual term for unvested restricted shares at December 31, 2017 and 2016 was 2.1 years and 2.4 years, respectively.

During the years ended December 31, 2017, 2016 and 2015, the Company awarded performance stock for up to 0.1 million shares, 0.2 million shares and 0.2 million shares, respectively, to be issued upon the achievement of performance conditions (Performance shares) under the Company's 2010 Stock Plan to certain officers and other key employees. Compensation expense is based on the grant date fair value. The awards vest on the third anniversary of the award date. The Company estimates the fair value of the Performance shares using a Monte Carlo simulation process.

As of December 31, 2017, the total compensation cost related to unvested stock options and restricted stock awards not yet recognized was $2.6 million and $21.1 million, respectively, and is expected to be recognized over the next 2.5 years on a weighted-average basis.

Valuation and Expense Information

The Company recognizes compensation expense for all share-based payment awards made to employees and directors based on their estimated fair values on the date of grant. Compensation expense is recognized using the straight-line attribution method

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to recognize share-based compensation over the service period of the award, with adjustments recorded for forfeitures as they occur. The following table summarizes the allocation of share-based compensation expense related to employee stock options, restricted stock awards and grants under the employee stock purchase plan for the years ended December 31, 2017, 2016 and 2015:

(In thousands)	2017	2016	2015
Cost of sales	$1,031	$1,579	$1,317
Engineering, research and development expenses	1,457	1,124	1,000
Selling, general and administrative expenses	12,818	10,733	8,716
Share-based compensation expense	15,306	13,436	11,033
Tax benefit	4,978	4,153	3,362
Share-based compensation expense, net of tax	$10,328	$9,283	$7,671

(12) BENEFIT PLANS

401(k) Plan

The Company maintains the Entegris, Inc. 401(k) Savings and Profit Sharing Plan (the 401(k) Plan) that qualifies as a deferred salary arrangement under Section 401(k) of the Internal Revenue Code. Under the Plan, eligible employees may defer a portion of their pre-tax wages, up to the Internal Revenue Service annual contribution limit. Entegris matches employees' contributions to a maximum match of 4% of the employee's eligible wages. The employer matching contribution expense under the Plan was $5.1 million, $4.9 million and $5.0 million in the fiscal years ended December 31, 2017, 2016 and 2015, respectively.

Defined Benefit Plans

The employees of the Company's subsidiaries in Japan, Taiwan and Germany are covered in defined benefit pension plans. The Company uses a December 31 measurement date for its pension plans.

The tables below set forth the Company's estimated funded status as of December 31, 2017 and 2016:

(In thousands)	2017	2016
Change in benefit obligation:		
Benefit obligation at beginning of year	$7,073	$8,194
Service cost	38	66
Interest cost	46	91
Actuarial (gain) loss	302	(481)
Benefits paid	(222)	(1,000)
Other	7	—
Foreign exchange impact	438	203
Benefit obligation at end of year	7,682	7,073
Change in plan assets:		
Fair value of plan assets at beginning of year	743	718
Return on plan assets	5	7
Employer contributions	88	6
Foreign exchange impact	72	12
Fair value of plan assets at end of year	908	743
Funded status:		
Plan assets less than benefit obligation - Net amount recognized	$(6,774)	$(6,330)

Amounts recognized in the consolidated balance sheets consist of:

(In thousands)	2017	2016
Noncurrent liability	$(6,774)	$(6,330)
Accumulated other comprehensive loss, net of taxes	919	681

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Amounts recognized in accumulated other comprehensive loss, net of tax consist of:

(In thousands)	2017	2016
Net actuarial loss	$490	$170
Prior service cost	705	712
Gross amount recognized	1,195	882
Deferred income taxes	(276)	(195)
Net amount recognized	$919	$687

Information for pension plans with an accumulated benefit obligation in excess of plan assets:

(In thousands)	2017	2016
Projected benefit obligation	$6,774	$7,073
Accumulated benefit obligation	6,497	6,145
Fair value of plan assets	908	743

The components of the net periodic benefit cost for the years ended December 31, 2017, 2016 and 2015 were as follows:

(In thousands)	2017	2016	2015
Pension benefits:			
Service cost	$38	$66	$65
Interest cost	46	91	119
Expected return on plan assets	(11)	(10)	(17)
Amortization of prior service cost	69	65	76
Amortization of net transition obligation	22	—	(1)
Amortization of plan loss	—	—	28
Recognized actuarial net loss	—	17	14
Curtailments	—	—	160
Net periodic pension benefit cost	$164	$229	$444

The estimated amount that will be amortized from accumulated other comprehensive income into net periodic benefit cost in 2018 is as follows:

(In thousands)	
Prior service cost	$70
Net actuarial loss	21
	$91

Assumptions used in determining the benefit obligation and net periodic benefit cost for the Company's pension plans for the years ended December 31, 2017, 2016 and 2015 are presented in the following table as weighted-averages:

	2017	2016	2015
Benefit obligations:			
Discount rate	0.82%	0.63%	1.10%
Rate of compensation increase	3.05%	2.90%	3.70%
Net periodic benefit cost:			
Discount rate	1.45%	1.70%	1.94%
Rate of compensation increase	3.00%	3.43%	4.41%
Expected return on plan assets	1.80%	1.43%	1.76%

The plans' expected return on assets as shown above is based on management's expectations of long-term average rates of return to be achieved by the underlying investment portfolios. In establishing this assumption, management considers historical and expected returns for the asset classes in which the plans are invested, as well as current economic and capital market conditions. The discount rate primarily used by the Company is based on market yields at the valuation date on government bonds as well as the estimated maturity of benefit payments.

Plan Assets

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At December 31, 2017, the majority of the Company's pension plan assets are deposited in Bank of Taiwan in the form of money market funds, where the Bank of Taiwan is the assigned funding vehicle for the statutory retirement benefit. The remaining portion of the Company's plan assets is deposited in a German insurance company's investment fund. The fair value measurements of the Company's pension plan assets at December 31, 2017, by asset category are as follows:

(In thousands) Asset category	Total	Quoted prices in active markets for identical assets (Level 1)	Significant observable inputs (Level 2)	Significant unobservable inputs (Level 3)
Taiwan plan assets (a)	$830	$ 830	—	—
Germany plan assets (b)	$78	$ 78	—	—
	$908	$ 908	—	—

(a) This category includes investments in the government of Taiwan's pension fund. The government of Taiwan is responsible for the strategy and allocation of the investment contributions.

(b) This category includes investments in an insurer's balanced asset fund. The insurer is responsible for the strategy and allocation of the investment contributions. The Company selects a pre-packaged portfolio pooled investment fund that is conservative. The majority of the funs are invested broadly in German mortgage bonds, construction loans and government bonds with good credit rating.

At December 31, 2016, the Company's pension plan assets are deposited in Bank of Taiwan in the form of money market funds, where the Bank of Taiwan is the assigned funding vehicle for the statutory retirement benefit. The fair value measurements of the Company's pension plan assets at December 31, 2016, by asset category are as follows:

(In thousands) Asset category	Total	Quoted prices in active markets for identical assets (Level 1)	Significant observable inputs (Level 2)	Significant unobservable inputs (Level 3)
Taiwan plan assets (a)	$743	$ 743	—	—

(a) This category includes investments in the government of Taiwan's pension fund. The government of Taiwan is responsible for the strategy and allocation of the investment contributions.

Cash Flows

The Company expects to make the following contributions and benefit payments:

(In thousands)	Contributions	Payments
2018	$ 112	$ 102
2019	—	103
2020	—	205
2021	—	186
2022	—	437
Years 2023-2027	—	2,021

(13) FAIR VALUE MEASUREMENTS

Generally accepted accounting principles establish a fair value hierarchy that prioritizes the inputs used to measure fair value. The three levels of the fair value hierarchy are as follows:

Level 1—Quoted prices in active markets accessible at the reporting date for identical assets and liabilities.

Level 2—Quoted prices for similar assets or liabilities in active markets. Quoted prices for identical or similar assets and liabilities in markets that are not considered active or financial instruments for which all significant inputs are observable, either directly or indirectly.

Level 3—Prices or valuations that require inputs that are significant to the valuation and are unobservable.

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A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement.

Financial Assets Measured at Fair Value on a Recurring Basis

The following table presents the Company's financial assets and liabilities that are measured at fair value on a recurring basis at December 31, 2017 and 2016.

(In thousands)	December 31, 2017				December 31, 2016			
	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Other current assets:								
Foreign exchange forward contracts asset	$—	$ 36	$ —	$ 36	$—	$4,784	$ —	$4,784
Total assets measured and recorded at fair value	$—	$ 36	$ —	$ 36	$—	$4,784	$ —	$4,784

The following table provides information about derivative positions held by the Company as of December 31, 2017 and 2016:

(In thousands)	December 31, 2017			December 31, 2016		
	Gross amounts of recognized assets	Gross amounts offset in the consolidated balance sheet	Net amount of assets in the consolidated balance sheet	Gross amounts of recognized assets	Gross amounts offset in the consolidated balance sheet	Net amount of assets in the consolidated balance sheet
Foreign exchange forward contracts	$36	$0	$36	$4,784	$0	$4,784

Gains and losses associated with derivatives are recorded in other expense (income), net, in the consolidated statements of operations. Losses associated with derivative instruments not designated as hedging instruments for the years ended December 31, 2017, 2016 and 2015 were as follows:

(In thousands)	2017	2016	2015
Losses on foreign currency forward contracts	$(2,209)	$(1,647)	$(10,787)

(14) EARNINGS PER SHARE (EPS)

Basic EPS is computed by dividing net income by the weighted average number of shares of common stock outstanding during each period. The following table presents a reconciliation of the share amounts used in the computation of basic and diluted earnings per share:

(In thousands)	2017	2016	2015
Basic earnings per share—Weighted common shares outstanding	141,553	141,093	140,353
Weighted common shares assumed upon exercise of options and vesting of restricted stock units	1,965	957	768
Diluted earnings per share—Weighted common shares outstanding	143,518	142,050	141,121

The Company excluded the following shares underlying stock-based awards from the calculations of diluted EPS because their inclusion would have been anti-dilutive for the years ended December 31, 2017, 2016 and 2015:

(In thousands)	2017	2016	2015
Shares excluded from calculations of diluted EPS	303	434	998

(15) SEGMENT INFORMATION

The Company's financial segment reporting reflects an organizational alignment intended to leverage the Company's unique portfolio of capabilities to create value for its customers by developing mission-critical solutions to maximize manufacturing yields and enable higher performance of devices. While these segments have separate products and technical know-how, they share a global generalist sales force, common business systems and processes, technology centers, and strategic and technology roadmaps. The Company leverages its expertise from these three segments to create new and increasingly integrated solutions for its customers. The Company's business is reported in the following segments:

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- Specialty Chemicals and Engineered Materials (SCEM): SCEM provides high-performance and high-purity process chemistries, gases, and materials and safe and efficient delivery systems to support semiconductor and other advanced manufacturing processes.
- Microcontamination Control (MC): MC solutions purify critical liquid chemistries and gases used in semiconductor manufacturing processes and other high-technology industries.
- Advanced Materials Handling (AMH): AMH develops solutions to monitor, protect, transport, and deliver critical liquid chemistries and substrates for a broad set of applications in the semiconductor industry and other high-technology industries.

Inter-segment sales are not significant. Segment profit is defined as net sales less direct segment operating expenses, excluding certain unallocated expenses, consisting mainly of general and administrative costs for the Company’s human resources, finance and information technology functions as well as interest expense, amortization of intangible assets, income taxes and equity in net loss of affiliate.

Corporate assets consist primarily of cash and cash equivalents, deferred tax assets and deferred tax charges.

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Summarized financial information for the Company’s reportable segments is shown in the following tables.

(In thousands)	2017	2016	2015
Net sales:			
SCEM	$485,470	$428,328	$418,878
MC	436,225	362,658	315,817
AMH	420,837	384,284	346,426
Total net sales	$1,342,532	$1,175,270	$1,081,121

(In thousands)	2017	2016	2015
Segment profit:			
SCEM	$132,859	$96,060	$100,370
MC	160,715	110,042	83,076
AMH	77,971	73,452	66,419
Total segment profit	$371,545	$279,554	$249,865

(In thousands)	2017	2016	2015
Total assets:			
SCEM	$749,379	$766,126	$801,250
MC	251,216	200,399	183,518
AMH	278,079	267,085	259,377
Corporate	697,498	465,922	402,552
Total assets	$1,976,172	$1,699,532	$1,646,697

(In thousands)	2017	2016	2015
Depreciation and amortization:			
SCEM	$65,559	$64,062	$65,352
MC	12,881	9,222	8,733
AMH	20,167	22,874	23,604
Corporate	3,624	3,728	3,965
Total depreciation and amortization	$102,231	$99,886	$101,654

(In thousands)	2017	2016	2015
Capital expenditures:			
SCEM	$41,216	$27,348	$29,333
MC	24,909	6,281	11,408
AMH	16,078	19,029	23,617
Corporate	11,394	12,602	7,619
Total capital expenditures	$93,597	$65,260	$71,977

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The following table reconciles total segment profit to income before income taxes and equity in net loss of affiliate:

(In thousands)	2017	2016	2015
Total segment profit	$371,545	$279,554	$249,865
Less:			
Amortization of intangibles	44,023	44,263	47,349
Unallocated general and administrative expenses	85,705	79,755	84,448
Operating income	241,817	155,536	118,068
Interest expense	32,343	36,846	38,667
Interest income	(715)	(318)	(429)
Other expense (income), net	25,458	(991)	(12,355)
Income before income tax expense and equity in net loss of affiliate	$184,731	$119,999	$92,185

The following table presents amortization of intangibles for each of the Company’s segments for the years ended December 31, 2017, 2016 and 2015:

(In thousands)	2017	2016	2015
Amortization of intangibles:			
SCEM	$38,836	$40,034	$42,909
MC	881	—	—
AMH	4,306	4,229	4,440
Total amortization of intangibles	$44,023	$44,263	$47,349

The following table summarizes total net sales, based upon the country or region to which sales to external customers were made for the years ended December 31, 2017, 2016 and 2015:

(In thousands)	2017	2016	2015
Net sales:			
Taiwan	$289,714	$291,309	$248,842
United States	286,339	253,868	253,141
South Korea	216,868	145,661	148,016
Japan	169,480	156,021	131,336
China	148,890	118,435	97,148
Europe	120,481	105,779	106,036
Southeast Asia	110,760	104,197	96,602
	$1,342,532	$1,175,270	$1,081,121

The following table summarizes property, plant and equipment, net, attributed to significant countries for the years ended December 31, 2017, 2016 and 2015:

(In thousands)	2017	2016	2015
Property, plant and equipment:			
United States	$257,584	$226,394	$229,558
South Korea	39,562	33,441	32,400
Japan	23,648	25,248	23,619
Malaysia	19,212	19,180	19,878
Taiwan	16,073	14,151	11,333
Other	3,444	3,148	4,513
	$359,523	$321,562	$321,301

In the years ended December 31, 2017, 2016 and 2015, Taiwan Semiconductor Manufacturing Company Limited, accounted for $167.9 million, $161.9 million and $134.1 million of net sales, respectively, all of which include sales from all of the Company's segments. In addition, in the year ended December 31, 2017, Samsung Electronics Co. accounted for $140.6 million of net sales which include sales from all of the Company's segments.

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(16) COMMITMENTS AND CONTINGENT LIABILITIES

The Company is subject to various claims, legal actions, and complaints arising in the ordinary course of business. The Company believes the final outcome of these matters will not have a material adverse effect on its consolidated financial statements. The Company expenses legal costs as incurred.

(17) QUARTERLY INFORMATION-UNAUDITED

(In thousands, except per share data)	Fiscal quarter ended April 1, 2017	July 1, 2017	September 30, 2017	December 31, 2017
Net sales	$317,377	$329,002	$ 345,591	$ 350,562
Gross profit	139,596	150,303	155,407	163,679
Net income (loss)	32,514	39,991	40,902	(28,341)
Basic net income (loss) per common share	0.23	0.28	0.29	(0.20)
Diluted net income (loss) per common share	0.23	0.28	0.28	(0.20)

(In thousands, except per share data)	Fiscal quarter ended April 2, 2016	July 2, 2016	October 1, 2016	December 31, 2016
Net sales	$267,024	$303,052	$296,692	$ 308,502
Gross profit	114,706	139,205	122,980	131,800
Net income	16,212	32,890	21,947	26,098
Basic net income per common share	0.12	0.23	0.16	0.18
Diluted net income per common share	0.11	0.23	0.15	0.18

(18) SUBSEQUENT EVENTS

On January 22, 2018, the Company acquired Particle Sizing Systems, LLC (PSS), a company focused on particle sizing instrumentation for liquid applications in both the semiconductor and life science industries. The total purchase price of the acquisition was approximately $37 million in cash, subject to customary working capital adjustments. The acquisition of PSS does not constitute a material business combination.

On February 13, 2018, the Company’s Board of Directors authorized a repurchase program covering up to an aggregate of $100 million of the Company’s common stock, during a period of twenty-four months, in open market transactions and in accordance with one or more pre-arranged stock trading plans to be established in accordance with Rule 10b5-1 under the Securities Exchange Act of 1934, as amended. This repurchase program represents a further renewal of the repurchase program originally authorized by the Board of Directors on February 5, 2016 and first renewed on February 15, 2017.