CTS CORP
Form 10-K
February 22, 2019
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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, 2018

OR

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

Commission File Number: 1-4639
CTS CORPORATION
(Exact name of registrant as specified in its charter)

Indiana	35-0225010
(State or other jurisdiction of incorporation or organization)	(IRS Employer Identification Number)

4925 Indiana Avenue, Lisle, IL	60532
(Address of principal executive offices)	(Zip Code)

Registrant's telephone number, including area code: 630-577-8800
Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	Name of Each Exchange on Which Registered
Common stock, without par value	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: None
Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ¨ No x
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Exchange Act. Yes ¨ No x
Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes x No ¨
Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for

such shorter period that the registrant was required to submit such files). x Yes ¨ No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ¨

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

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

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

The aggregate market value of the voting and non-voting stock held by non-affiliates of CTS Corporation, based upon the closing sales price of CTS common stock on June 30, 2018, was approximately $1,176,000,000. There were 32,734,227 shares of common stock, without par value, outstanding on February 19, 2019.

DOCUMENTS INCORPORATED BY REFERENCE

(1) Portions of the Proxy Statement to be filed for the annual meeting of shareholders to be held on or about May 16, 2019 are incorporated by reference in Part III.

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Safe Harbor

Forward-Looking Statements

This document contains statements that are, or may be deemed to be, forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. These forward-looking statements include, but are not limited to, any financial or other guidance, statements that reflect our current expectations concerning future results and events, and any other statements that are not based solely on historical fact. Forward-looking statements are based on management's expectations, certain assumptions and currently available information. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date hereof and are based on various assumptions as to future events, the occurrence of which necessarily are subject to uncertainties. These forward-looking statements are made subject to certain risks, uncertainties and other factors, which could cause our actual results, performance or achievements to differ materially from those presented in the forward-looking statements. Examples of factors that may affect future operating results and financial condition include, but are not limited to: changes in the economy generally and in respect to the business in which CTS operates; unanticipated issues in integrating acquisitions; the results of actions to reposition our business; rapid technological change; general market conditions in the transportation, telecommunications, and information technology industries, as well as conditions in the industrial, aerospace and defense, and medical markets; reliance on key customers; unanticipated natural disasters or other events; environmental compliance and remediation expenses; the ability to protect our intellectual property; pricing pressures and demand for our products; and risks associated with our international operations, including trade and tariff barriers, exchange rates and political and geopolitical risks. Many of these, and other risks and uncertainties, are discussed in further detail in Item 1A. of this Annual Report on Form 10-K. We undertake no obligation to publicly update our forward-looking statements to reflect new information or events or circumstances that arise after the date hereof, including market or industry changes.

PART I

Item 1. Business

CTS Corporation ("CTS", "we", "our", "us" or the "Company") is a global manufacturer of sensors, electronic components, and actuators. CTS was established in 1896 as a provider of high-quality telephone products and was incorporated as an Indiana corporation in February 1929. Our principal executive offices are located in Lisle, Illinois. We design, manufacture, and sell a broad line of sensors, electronic components, and actuators primarily to original equipment manufacturers ("OEMs") for the aerospace and defense, industrial, information technology, medical, telecommunications, and transportation markets. Our vision is to be a leading provider of sensing and motion devices as well as connectivity components, enabling an intelligent and seamless world. These devices are categorized by their ability to Sense, Connect or Move. Sense products provide vital inputs to electronic systems. Connect products allow systems to function in synchronization with other systems. Move products ensure required movements are effectively and accurately executed. We are committed to achieving our vision by continuing to invest in the development of products and technologies within these categories.

We operate manufacturing facilities in North America, Asia, and Europe. Sales and marketing are accomplished through our sales engineers, independent manufacturers' representatives, and distributors.

See the Consolidated Financial Statements and Notes included in Part II, Item 8 of this Annual Report on Form 10-K for financial information regarding the Company.

PRODUCTS BY MAJOR MARKETS

Our products perform specific electronic functions for a given product family and are intended for use in customer assemblies. Our major products consist principally of sensors and actuators used in passenger or commercial vehicles, electronic components used in telecommunications infrastructure, information technology and other high-speed applications, switches, and potentiometers supplied to multiple markets, and fabricated piezoelectric materials and substrates used primarily in medical, industrial, aerospace and defense, and information technology markets.

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The following table provides a breakdown of net sales by industry as a percent of consolidated net sales:

	2018	2017	2016
Industry			
Transportation	64%	65%	66%
Industrial	18%	18%	17%
Medical	9%	8%	7%
Aerospace and Defense	5%	4%	4%
Telecommunications and IT	4%	5%	6%
% of consolidated net sales	100%	100%	100%

The following table identifies major products by industry. Products are sold to several industry OEMs and through distributors.

Product Description	Transportation	Industrial	Medical	Aerospace and Defense	Telecom and IT
SENSE (Controls, Pedals, Piezo Sensing Products, Sensors, Switches, Transducers)	l	l	l	l	
CONNECT (EMI/RFI Filters, Capacitors, Frequency Control, Resistors, RF filters)		l	l	l	l
MOVE (Piezo Microactuators, Rotary Actuators)	l	l			l

MARKETING AND DISTRIBUTION

Sales and marketing to OEMs is accomplished through our sales engineers, independent manufacturers' representatives, and distributors. We maintain sales offices in China, Czech Republic, Denmark, Germany, India, Japan, Scotland, Singapore, Taiwan, and the United States. Approximately 89% of 2018 net sales were attributable to our sales engineers.

Our sales engineers generally service our largest customers with application-specific products. The sales engineers work closely with major customers in designing and developing products to meet specific customer requirements.

We utilize the services of independent manufacturers' representatives for customers not serviced directly by our sales engineers. Independent manufacturers' representatives receive commissions from us. During 2018, approximately 5% of net sales were attributable to independent manufacturers' representatives. We also use independent distributors. Independent distributors purchase products from us for resale to customers. In 2018, independent distributors accounted for approximately 6% of net sales.

RAW MATERIALS

We utilize a wide variety of raw materials and purchased parts in our manufacturing processes. The following are the most significant raw materials and purchased components:

Conductive inks and contactors, passive electronic components, integrated circuits and semiconductors, certain rare earth elements ("REEs"), ceramic powders, plastic components, molding compounds, printed circuit boards and assemblies, quartz blanks and crystals, wire harness assemblies, copper, brass, silver, gold, platinum, lead, aluminum, and steel-based raw materials and components.

These raw materials and parts are purchased from a number of suppliers, and we generally do not believe we are dependent upon one or a limited number of suppliers. Although we purchase all of our semiconductors, REEs, conductive inks, and silver pastes from a limited number of suppliers, alternative sources are available.

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We do not currently anticipate any significant raw material shortages that would limit production. However, the lead times between the placement of orders for certain raw materials and purchased parts and actual delivery to us may vary. Occasionally, we may need to order raw materials in greater quantities and at higher prices to compensate for the variability of lead times for delivery.

PATENTS, TRADEMARKS, AND LICENSES

We maintain a program of obtaining and protecting U.S. and non-U.S. patents relating to products that we have designed and manufactured, as well as processes and equipment used in our manufacturing technology. We were issued 10 new U.S. patents and 19 non-U.S. patents in 2018 and currently hold 147 U.S. patents and 159 non-U.S. patents. We have 9 registered U.S. trademarks, 20 registered foreign trademarks and 4 international trademark registrations. We have licensed the right to use several of our patents. In 2018, license and royalty income was less than 1% of net sales.

MAJOR CUSTOMERS

Sales to our 15 largest customers as a percentage of total net sales were as follows:

	Years Ended December 31,		
	2018	2017	2016
Total of 15 largest customers / net sales	63.7%	64.4%	63.1%

Our net sales to significant customers as a percentage of total net sales were as follows:

	Years Ended December 31,		
	2018	2017	2016
Cummins Inc.	15.2%	13.4%	9.9%
Honda Motor Co.	10.5%	11.2%	10.7%
Toyota Motor Corporation	10.5%	10.2%	10.4%

We sell automotive parts to these three customers for certain vehicle platforms under purchase agreements that have no volume commitments and are subject to purchase orders issued from time to time.

No other customer accounted for 10% or more of total net sales during these periods.

We continue to broaden our customer base. Changes in the level of our customers' orders have, in the past, had a significant impact on our operating results. If a major customer reduces the amount of business it does with us, or substantially changes the terms of that business, there could be an adverse impact on our operating results.

We expect to continue to depend on sales to our major customers. Because our customers are under no obligation to continue to do business with us on a long-term basis, it is possible that one or more customers may choose to work with a competitor and reduce its business with us. Customers may also reduce or delay their business with us because of economic or other conditions or decisions that reduce their need for our products or services. Since it is difficult to replace lost business on a timely basis, it is likely that our operating results would be adversely affected if one or more of our major customers were to cancel, delay, or reduce a large amount of business with us in the future. If one or more of our customers were to become insolvent or otherwise unable to pay for our products and/or services, our operating results, financial condition, and cash flows could be adversely affected.

ORDER BACKLOG

Order backlog is comprised of firm open purchase orders we have received from our customers and generally represents 1 to 2 months of sales for certain products. Our business is a mix of purchase order based business, shorter-term contracts, and multi-year awards, such as with customers who serve the automotive end market. As such, order backlog does not provide a meaningful indication of future sales.

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COMPETITION

We compete with many domestic and foreign manufacturers principally on the basis of product features, technology, price, quality, reliability, delivery, and service. Most of our product lines encounter significant global competition. The number of competitors varies from product line to product line. No one competitor competes with us in every product line, but many competitors are larger and more diversified than we are.

Some customers have reduced or plan to reduce their number of suppliers, while increasing their volume of purchases. Customers demand lower cost and higher quality, reliability, and delivery standards from us as well as from our competitors. These trends create opportunities for us, but also increase the risk of loss of business to competitors. We are subject to competitive risks that are typical within the electronics industry, including in some cases short product life cycles and technical obsolescence.

We believe we compete most successfully in custom engineered products manufactured to meet specific applications of major OEMs.

NON-U.S. REVENUES AND ASSETS

Our net sales to customers originating from our non-U.S. operations as a percentage of total net sales were as follows:

	Years Ended December 31,		
	2018	2017	2016
Net sales from non-U.S. operations	33%	32%	30%

Our percentages of total assets at non-U.S. locations were as follows:

	Years Ended December 31,		
	2018	2017	2016
Total assets at non-U.S. operations	46%	49%	48%

A substantial portion of these assets, other than cash and cash equivalents, cannot readily be liquidated. We believe the business risks to our non-U.S. operations, though substantial, are normal risks for global businesses. These risks include currency controls and changes in currency exchange rates, longer collection cycles, political and transportation risks, economic downturns and inflation, government regulations, and expropriation. Our non-U.S. manufacturing facilities are located in China, Czech Republic, Denmark, India, Mexico, and Taiwan.

EMPLOYEES

We employed 3,230 people at December 31, 2018, with 81% of these employees located outside the U.S. We employed 3,222 people at December 31, 2017. Approximately 11 employees at one location in the United States were covered by two collective bargaining agreements as of December 31, 2018. Both agreements are scheduled to expire upon completion of our 2016 Restructuring Plan activities.

ADDITIONAL INFORMATION

We are incorporated in the State of Indiana. Our principal corporate office is located at 4925 Indiana Avenue Lisle, IL 60532.

Our internet address is www.ctscorp.com. We make available free of charge through our website our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) of the Securities Exchange Act of 1934 as soon as reasonably practicable after we electronically file such material with, or furnish it to, the Securities and Exchange Commission ("SEC"). Other than the documents that we file with the SEC that are incorporated by reference herein, the information contained on or accessible through our website is not part of this or any other report we file or furnish to the SEC.

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The SEC maintains an internet site that contains reports, proxy and information statements and other information regarding our filings at www.sec.gov.

EXECUTIVE OFFICERS OF THE COMPANY

Executive Officers. The following serve as executive officers of CTS as of February 22, 2019. The executive officers are expected to serve until the next annual shareholders meeting, scheduled to be held on or about May 16, 2019, at which time the election of officers will be considered again by the Board of Directors.

Name	Age	Positions and Offices
Kieran O'Sullivan	56	President, Chief Executive Officer and Chairman of the Board
Ashish Agrawal	48	Vice President and Chief Financial Officer
Luis Francisco Machado	56	Vice President, General Counsel and Secretary

Kieran O'Sullivan - 56 - President, Chief Executive Officer and Chairman of the Board. Mr. O'Sullivan joined CTS on January 7, 2013. Before joining CTS, Mr. O'Sullivan served as Executive Vice President of Continental AG's Global Infotainment and Connectivity Business and led the NAFTA Interior Division, having joined Continental AG, a global automotive supplier, in 2006. Mr. O'Sullivan is a member of the board of directors, is chairman of the compensation committee, and is a member of the audit committee of LCI Industries, a supplier of components for manufacturers of recreational vehicles, manufactured homes, marine applications, and for the related aftermarkets of those industries.

Ashish Agrawal - 48 - Vice President and Chief Financial Officer. On November 11, 2013, Mr. Agrawal was elected Vice President and Chief Financial Officer for CTS. Mr. Agrawal joined CTS in June 2011 as Vice President, Treasury and Corporate Development, and was elected as Treasurer on September 1, 2011. Before joining CTS, Mr. Agrawal was with Dometic Corporation, a manufacturer of refrigerators, awnings and air conditioners, as Senior Vice President and Chief Financial Officer since 2007. Prior to that, Mr. Agrawal was with General Electric Co. in various positions since December 1994.

Luis Francisco Machado - 56 - Vice President, General Counsel and Secretary. Mr. Machado joined CTS in August 2015. Before joining CTS, Mr. Machado was at L Brands, Inc., a retailer of intimate apparel, home fragrance and beauty products under the Victoria's Secret, Pink, and Bath and Body Works Brands, as Senior Vice President, Legal and Assistant Secretary since August 2010, and Associate General Counsel, Corporate and Assistant Secretary of Wm. Wrigley Jr. Company since February 2006.

Information with respect to Directors and Corporate Governance may be found in our definitive proxy statement to be delivered to shareholders in connection with our 2019 Annual Meeting of Shareholders. Such information is incorporated herein by reference.

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Item 1A. Risk Factors

The following are certain risk factors that could affect our business, financial condition and operating results. These risk factors should be considered in connection with evaluating forward-looking statements contained in this Annual Report on Form 10-K or in any other reports filed or furnished by us, because these factors could cause our actual results and financial condition to differ materially from those projected in any such forward-looking statements. Before you invest in us, you should know that making such an investment involves risks, including the risks described below. The risks that are highlighted below are not the only ones that we face. If any of the following risks occur, our business, financial condition or operating results could be negatively affected.

Because we currently derive a significant portion of our revenues from a small number of customers, any decrease in orders from these customers could have an adverse effect on our business, financial condition and operating results.

We depend on a small number of customers for a large portion of our business, and changes in the level of our customers' orders have, in the past, had a significant impact on our results of operations. If a major customer significantly delays, reduces, or cancels the level of business it does with us, there could be an adverse effect on our business, financial condition and operating results. Significant pricing and margin pressures exerted by a major customer could also materially adversely affect our operating results. In addition, we generate significant accounts receivable from sales to our major customers. If one or more of our major customers were to become insolvent or otherwise unable to pay or were to delay payment for our products, our business, financial condition and operating results could be materially adversely affected.

Negative or unexpected tax consequences could adversely affect our results of operations.

We operate globally and changes in tax laws could adversely affect our results. The international tax environment continues to change as a result of both coordinated actions by governments and unilateral measures enacted by individual countries, such as the comprehensive tax reform enacted in the U.S. in 2017, which could significantly impact our effective tax rate, tax liabilities, and ability to utilize deferred tax assets.

Adverse changes in the underlying profitability and financial outlook of our operations in several jurisdictions could lead to changes in our valuation allowances against deferred tax assets and other tax accruals that could materially and adversely affect our results of operations. In addition, acquisitions or divestitures may cause our effective tax rate to change.

We base our tax accounting positions upon the anticipated nature and conduct of our business and upon our understanding of the tax laws of the various countries in which we have assets or conduct activities. However, our tax accounting positions are subject to review and possible challenge by taxing authorities and to possible changes in law, which may have a retroactive effect.

We may be unable to compete effectively against competitors.

The industries in which we operate are highly competitive and characterized by price erosion and rapid technological change. 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. If any customer becomes dissatisfied with our prices, quality, or timeliness of delivery, among other things, it could award business to our competitors. Moreover, some of our customers could choose to manufacture and develop particular products themselves rather than purchase them from us. Increased competition could result in price reductions, reduced profit margins and loss of market share, each of which could materially adversely affect our business, financial condition and operating results. These developments also may materially adversely affect our ability to compete successfully going forward. We cannot assure you that our products will continue to compete successfully with our competitors' products, including OEMs.

We may be unable to keep pace with rapid technological changes that could make some of our products or processes obsolete before we realize a return on our investment.

The technologies relating to some of our products have undergone, and are continuing to undergo, rapid and significant changes. End markets for our products are characterized by technological change, frequent new product introductions and enhancements, changes in customer requirements, and emerging industry standards. The introduction of products embodying new technologies and the emergence of new industry standards could render our existing products obsolete and unmarketable before we can recover any or all of our research, development and commercialization expenses, or our capital investments. Furthermore, the life cycles of our products and the products we manufacture for others vary, may change, and are difficult to estimate.

We may experience difficulties that could delay or prevent the successful development, introduction and marketing of new products or product enhancements and our new products or product enhancements may not adequately meet the requirements of the

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marketplace or achieve market acceptance. If we are unable, for technological or other reasons, to develop and market new products or product enhancements in a timely and cost-effective manner, our business, financial condition and operating results could be materially adversely affected.

Our customers may cancel their orders, change production quantities or locations or delay production.

We generally do not obtain firm, long-term purchase commitments from our customers, and regularly experience reduced or extended lead times in customer orders. Customers cancel orders, change production quantities and delay production for a number of reasons. Uncertain economic and geopolitical conditions may result in some of our customers delaying the delivery of some of the products we manufacture for them and placing purchase orders for lower volumes of products than previously anticipated. Cancellations, reductions or delays by a significant customer or by a number of customers may harm our results of operations by reducing the volumes of products we manufacture and sell, as well as by causing a delay in the recovery of our expenditures for inventory in preparation for customer orders, or by reducing our asset utilization, resulting in lower profitability.

In addition, customers may require that manufacturing of their products be transitioned from one of our facilities to another to achieve cost reductions and other objectives. Such transfers may result in inefficiencies and costs due to resulting excess capacity and overhead at one facility and capacity constraints and the inability to fulfill all orders at another. In addition, we make key decisions based on our estimates of customer requirements, including determining the levels of orders that we will seek and accept, production schedules, component procurement commitments, personnel needs and other resource requirements. The short-term nature of our customers' commitments and the changes in demand for their products may reduce our ability to estimate future customer requirements accurately. This may make it difficult to schedule production and maximize utilization of our manufacturing capacity. Anticipated orders may not materialize and delivery schedules may be deferred as a result of changes in demand for our products or our customers' products. We often increase staffing and capacity, and incur other expenses to meet the anticipated demand of our customers, which causes reductions in our gross margins if customer orders are delayed or canceled. On occasion, customers require rapid increases in production, which may stress our resources and reduce margins. We may not have sufficient capacity at any given time to meet our customers' demands. In addition, because many of our costs and operating expenses are relatively fixed over the short-term, a reduction in customer demand could harm our gross margin and operating income until such time as adjustments can be made to activity and operating levels or to structural costs.

We sell products to customers in cyclical industries that are subject to significant downturns that could materially adversely affect our business, financial condition and operating results.

We sell products to customers in cyclical industries that have experienced economic and industry downturns. The markets for our products have softened in the past and may again soften in the future. We may face reduced end-customer demand, underutilization of our manufacturing capacity, changes in our revenue mix and other factors that could adversely affect our results of operations in the near-term. We cannot predict whether we will achieve profitability in future periods.

We derive a substantial portion of our revenues from customers in the transportation, information technology and telecommunications industries and are susceptible to trends and factors affecting those industries.

Sales to the transportation, information technology and telecommunications industries represent a substantial portion of our revenues. Factors negatively affecting these industries and the demand for their products also negatively affect our business, financial condition and operating results. Any adverse occurrence, including among others, industry slowdown, recession, political instability, costly or constraining regulations, increased tariffs, reduced government budgets and spending, armed hostilities, terrorism, excessive inflation, prolonged disruptions in one or more of our customers' production schedules or labor disturbances, that results in a decline in the volume of sales in these industries, or in an overall downturn in the business and operations of our customers in these industries, could materially adversely affect our business, financial condition and operating results. These industries are generally unionized and some of our customers have experienced labor disruptions in the past. Furthermore, these industries are highly cyclical in nature and sensitive to changes in general economic conditions, consumer preferences and interest rates. The failure of manufacturers that we serve may result in the failure to receive payment in full for products sold in the past and an abrupt cancellation in demand for certain products. Weakness in demand, the insolvency of manufacturers that we serve or their suppliers, and constriction of credit markets may negatively and materially affect our facility utilization, cost structure, financial condition, and operating results.

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Products we manufacture may contain design or manufacturing defects that could result in reduced demand for our products or services and liability claims against us.

Despite our quality control and quality assurance efforts, defects may occur in the products we manufacture due to design or manufacturing errors or component failure. Product defects could result in delayed shipments and reduced demand for our products. We may be subject to increased costs due to warranty claims on defective products. Product defects could result in product liability claims against us where defects cause, or are alleged to cause, property damage, bodily injury or death. As we grow our business in the transportation and medical device markets, the risk of exposure to product liability litigation increases. We may be required to participate in a recall involving products which are, or are alleged to be, defective. We carry insurance for certain legal matters involving product liability; however, we do not have coverage for all costs related to product defects and the costs of such claims, including costs of defense and settlement, may exceed our available coverage. Accordingly, our results of operations, cash flow and financial position could be adversely affected.

We are exposed to fluctuations in foreign currency exchange rates that may adversely affect our business, financial condition and operating results.

We transact business in various foreign countries. We present our consolidated financial statements in U.S. dollars, but a portion of our revenues and expenditures are transacted in other currencies. As a result, we are exposed to fluctuations in foreign currencies. Additionally, we have currency exposure arising from funds held in local currencies in foreign countries. Volatility in the exchange rates between the foreign currencies and the U.S. dollar could harm our business, financial condition and operating results. Furthermore, to the extent we sell our products in foreign markets, currency fluctuations may result in our products becoming too expensive for foreign customers.

Our operating results vary significantly from period to period.

We experience fluctuations in our operating results. Some of the principal factors that contribute to these fluctuations are: changes in demand for our products; our effectiveness in managing manufacturing processes, costs and timing of our component purchases so that components are available when needed for production, while mitigating the risks of purchasing inventory in excess of immediate production needs; the degree to which we are able to utilize our available manufacturing capacity; changes in the cost and availability of components, which often occur in the electronics manufacturing industry and which affect our margins and our ability to meet delivery schedules; general economic and served industry conditions; and local conditions and events that may affect our production volumes, such as labor conditions or political instability.

We face risks relating to our international operations.

Because we have significant international operations, our operating results and financial condition could be materially adversely affected by economic, political, health, regulatory and other factors existing in foreign countries in which we operate. Our international operations are subject to inherent risks, which may materially adversely affect us, including: political and economic instability in countries in which our products are manufactured; expropriation or the imposition of government controls; changes in government regulations; export license requirements; trade restrictions; earnings repatriation and expatriation restrictions; exposure to different legal standards, including related to intellectual property; health conditions and standards; currency controls; fluctuations in exchange rates; increases in the duties and taxes we pay; inflation or deflation; greater difficulty in collecting accounts receivable and longer payment cycles; changes in labor conditions and difficulties in staffing and managing our international operations; limitations on insurance coverage against geopolitical risks, natural disasters, and business operations; and communication among and management of international operations. In addition, these same factors may also place us at a competitive disadvantage compared to some of our foreign competitors.

We may face risks associated with violations of the Foreign Corrupt Practices Act ("FCPA") and similar anti-bribery laws. The FCPA and similar anti-bribery laws in other jurisdictions generally prohibit companies and their intermediaries from making improper payments to government officials for the purpose of obtaining or retaining business. Our Code of Ethics mandates compliance with these anti-bribery laws. We operate in many parts of the world where strict compliance with anti-bribery laws may conflict with local customs and practices. We cannot assure you that our internal controls and procedures always will protect us from the detrimental actions by our employees or agents. If we are found to be liable for FCPA violations (either due to our own acts or inadvertence or due to the acts or inadvertence of others), we could suffer from criminal or civil penalties or other sanctions, which could have a material adverse effect on our business.

Public health or safety concerns, conditions, or restrictions that impact the availability of labor or the movement of goods in some of the countries in which we operate could have a material adverse effect on our business, financial condition and operating results.

We may restructure our operations or fail to execute capital projects as planned, which may materially adversely affect our business, financial condition and operating results.

We have announced and initiated restructuring plans or capital projects at various times in the recent past designed to revise and consolidate certain aspects of our operations for the purpose of improving our cost structure or manufacturing efficiency. We may incur restructuring and impairment charges in the future if circumstances warrant. Additionally, if we are unsuccessful in implementing restructuring plans or in executing capital projects, we may experience disruptions in our operations and higher ongoing costs, which may materially adversely affect our business, financial condition and operating results.

Losses in the stock market could negatively impact pension asset returns and cash flow due to possible required contributions in the future.

We make a number of assumptions relating to our pension plans in order to measure the financial position of the plans and the net periodic benefit cost. The most significant assumptions relate to the discount rate and the expected long-term return on plan assets. If these assumptions prove to be significantly different from actual rates, then we may need to record additional expense relating to the pension plans, which could require cash contributions to fund future pension obligation payments and could have a material adverse effect on our financial condition and results of operations.

We may pursue acquisition opportunities that complement or expand our business as well as divestitures that could impact our business operations. We may not be able to complete these transactions, and these transactions, if executed, may pose significant risks that could materially adversely affect our business, financial condition and operating results.

On an ongoing basis we explore opportunities to buy other businesses or technologies that could complement, enhance or expand our current business or product lines or that might otherwise offer us growth opportunities. We may have difficulty finding suitable opportunities or, if we do identify these opportunities, we may not be able to complete the transactions for any number of reasons including a failure to secure financing. In addition, we may not be able to successfully or profitably integrate, operate, maintain and manage our newly acquired operations or employees. Any transactions that we are able to identify and complete may involve a number of risks, including: the diversion of management's attention from our existing business to integrate the operations and personnel of the acquired or combined business; possible adverse effects on our operating results during the integration process; difficulties managing and integrating operations in geographically dispersed locations; increases in our expenses and working capital requirements, which could reduce our return on invested capital; exposure to unanticipated liabilities of acquired companies; and our possible inability to achieve the intended objectives of the transaction. Even if we are initially successful in integrating a new operation, we may not be able to maintain uniform standards, controls, procedures and policies, and this may lead to operational inefficiencies. In addition, future acquisitions may result in dilutive issuances of equity securities or the incurrence of additional debt. These and other factors could harm our ability to achieve anticipated levels of profitability from acquired operations or realize other anticipated benefits of an acquisition, and could adversely affect our business and operating results.

We have in the past, and may in the future, consider divesting certain business operations. Divestitures may involve a number of risks, including the diversion of management's attention, significant costs and expenses, the loss of customer relationships and cash flow, and the disruption of operations in the affected business. Failure to timely complete or consummate a divestiture may negatively affect valuation of the affected business or result in restructuring charges.

If we are unable to protect our intellectual property or we infringe, or are alleged to infringe, on others' intellectual property rights, our business, financial condition and operating results could be materially adversely affected.

The success of our business depends, in part, upon our ability to protect trade secrets, trademarks, copyrights and patents, obtain or license patents and operate without infringing on the intellectual property rights of others. We rely on a combination of trade secrets, copyrights, patents, nondisclosure agreements and technical measures to protect our proprietary rights in our products and technology. The steps we have taken to prevent misappropriation of our technology may be inadequate. In addition, the laws of some foreign countries in which we operate do not protect our proprietary rights to the same extent as do the laws of the United States. Although we continue to evaluate and implement protective measures, there can be no assurance that these efforts will be successful. Our inability to protect our intellectual property rights could diminish or eliminate the competitive advantages that we derive from our technology, cause us to lose sales or otherwise harm our business.

We believe that patents will continue to play an important role in our business. However, there can be no assurance that we will be successful in securing patents for claims in any pending patent application or that any issued patent will provide us with any

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competitive advantage. We also cannot provide assurance that the patents will not be challenged by third parties or that the patents of others will not materially adversely affect our ability to do business.

We may become involved in litigation in the future to protect our intellectual property or because others may allege that we infringed on their intellectual property. These claims and any resulting lawsuit could subject us to liability for damages and invalidate our intellectual property rights. If an infringement claim is successfully asserted by a holder of intellectual property rights, we may be required to cease marketing or selling certain products, pay penalties and spend significant time and money to develop a non-infringing product or process or to obtain licenses for the technology, process or information from the holder. We may not be successful in the development of a non-infringing alternative, or licenses may not be available on commercially acceptable terms, if at all, in which case we may lose sales and profits. In addition, any litigation could be lengthy and costly and could materially adversely affect us even if we are successful in the litigation.

We may experience shortages and increased costs of raw material and required electronic components.

Unanticipated raw material or electronic component shortages may prevent us from making scheduled shipments to customers. Our inability to make scheduled shipments could cause us to experience a shortfall in revenue, increase our costs and adversely affect our relationship with affected customers and our reputation as a reliable supplier. We may be required to pay higher prices for raw materials or electronic components in short supply and order these raw materials or electronic components in greater quantities to compensate for variable delivery times. We may also be required to pay higher prices for raw materials or electronic components due to inflationary trends regardless of supply. We are also dependent on our suppliers' ability to supply and deliver raw materials on a timely basis at negotiated prices. Any delay or inability to deliver raw materials by our suppliers may require that we attempt to mitigate such failure or fail to make deliveries to our customers on a timely basis. As a result, raw material or electronic component shortages, price increases, or failure to perform by our suppliers could adversely affect our operating results for a particular period due to the resulting revenue shortfall and/or increased costs.

Loss of our key management and other personnel, or an inability to attract key management and other personnel, could materially affect our business.

We depend on our senior executive officers and other key personnel to run our business. We do not have long-term employment contracts with our key personnel. The loss of any of these officers or other key personnel could adversely affect our operations. Competition for qualified employees among companies that rely heavily on engineering and technology is at times intense, and the loss of qualified employees or an inability to attract, retain and motivate additional highly skilled employees required for the operation and expansion of our business could hinder our ability to conduct research activities and develop marketable products successfully.

We are subject to a variety of environmental, health, and safety laws and regulations that expose us to potential financial liability.

Our operations are regulated by a number of federal, state, local and foreign environmental, health, and safety (“EHS”) laws and regulations that govern, among other things, air and water emissions, worker protection, and the handling, storage and disposal of hazardous materials. Compliance with EHS laws and regulations is a major consideration for us because we use hazardous materials in our manufacturing processes. If we violate EHS laws and regulations, we could be liable for substantial fines, penalties, and costs of mandated remedial actions. Our environmental permits could also be revoked or modified, which could require us to cease or limit production at one or more of our facilities, thereby materially adversely affecting our business, financial condition and operating results. EHS laws and regulations have generally become more stringent over time and could continue to do so, imposing greater compliance costs and increasing risks and penalties associated with any violation, which also could materially affect our business, financial condition and operating results.

We have been notified by the U.S. Environmental Protection Agency, state environmental agencies and, in some cases, groups of potentially responsible parties, that we are potentially liable for environmental contamination at several sites currently and formerly owned or operated by us, including sites designated as National Priorities List sites under the U.S. Environmental Protection Agency’s Superfund program. Superfund liability is joint and several and we may be held responsible for more than our share of contamination at a site. Although we estimate our potential environmental liability and reserve for such matters, we cannot assure you that our reserves will be sufficient to cover the actual costs that we incur as a result of these matters.

Future events, such as the notification of potential liability at new sites, the discovery of additional contamination or changes to an approved remedy at existing sites, changes to existing EHS environmental laws and regulations or their interpretation, and more

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rigorous regulatory action by government authorities, may require additional expenditures by us, which could have a negative impact on our operations.

In addition, we could be affected by future laws or regulations imposed in response to climate change concerns. Such laws or regulations could have a material adverse effect on our business, financial condition, and results of operations.

Our indebtedness may adversely affect our financial health.

Our debt consists of borrowings under our revolving credit facility. Our indebtedness could, among other things: increase our vulnerability to general economic and industry conditions, including recessions; require us to use cash flow from operations to service our indebtedness, thereby reducing our ability to fund working capital, capital expenditures, research and development efforts and other expenses; limit our flexibility in planning for, or reacting to, changes in our business and the industries in which we operate; place us at a competitive disadvantage compared to competitors that have less indebtedness; or limit our ability to borrow additional funds that may be needed to operate and expand our business. Moreover, an increase in interest rates could increase our interest expense.

Our credit facility contains provisions that could materially restrict our business.

Our revolving credit facility contains restrictions limiting our ability to: dispose of assets; incur certain additional debt; repay other debt or amend subordinated debt instruments; create liens on assets; make investments, loans or advances; make acquisitions or engage in mergers or consolidations; engage in certain transactions with our subsidiaries and affiliates; repurchase stock; or make dividend payments above a certain amount.

The restrictions contained in our credit facility could limit our ability to plan for or react to changes in market conditions or meet capital needs or could otherwise restrict our activities or business plans. These restrictions could adversely affect our ability to finance our operations, make strategic acquisitions, fund investments or other capital needs or engage in other business activities that could be in our interest.

Further, our ability to comply with our loan covenants may be affected by events beyond our control that could result in an event of default under our credit facility, or documents governing any other existing or future indebtedness. A default, if not cured or waived, may permit acceleration of our indebtedness. In addition, our lenders could terminate their commitments to make further extensions of credit under our credit facility. If our indebtedness is accelerated, we cannot be certain that we will have sufficient funds to pay the accelerated indebtedness or that we will have the ability to refinance accelerated indebtedness on terms favorable to us, or at all.

Regulations related to conflict minerals could adversely impact our business.

The Dodd-Frank Wall Street Reform and Consumer Protection Act contains provisions to improve transparency and accountability concerning the supply of certain minerals, known as conflict minerals, originating from the Democratic Republic of Congo ("DRC") and adjoining countries. As a result, the SEC adopted annual disclosure and reporting requirements for those companies who may use conflict minerals mined from the DRC and adjoining countries in their products. There have been and will continue to be costs associated with complying with these disclosure requirements, including diligence costs to determine the sources of minerals used in our products and other potential changes to products, processes or sources of supply to the extent necessary as a consequence of such verification activities. These rules could adversely affect the sourcing, supply and pricing of materials used in our products. As there may be only a limited number of suppliers offering conflict-free minerals, we cannot be sure that we will be able to obtain necessary conflict-free minerals from such suppliers in sufficient quantities or at competitive prices. Also, we may face reputational challenges if we determine that certain of our products contain conflict minerals or if we are unable to sufficiently verify the origins for all minerals used in our products through the procedures we may implement.

Ineffective internal control over our financial reporting may harm our business.

We are subject to the ongoing internal control provisions of Section 404 of the Sarbanes-Oxley Act of 2002 ("Sarbanes-Oxley"). Our controls necessary for continued compliance with Sarbanes-Oxley may not operate effectively or at all times and may result in a material weakness. The identification of material weaknesses in internal control over financial reporting could indicate a lack of proper controls to generate accurate financial statements. Further, the effectiveness of our internal controls may be impacted if we are unable to retain sufficient skilled finance and accounting personnel, especially in light of the increased demand for such personnel among publicly traded companies.

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Natural disasters may adversely impact our capability to supply product to our customers.

Natural disasters, such as storms, flooding and associated power outages, occurring at any of our locations or supplier locations may lead to disruption of our manufacturing operations and supply chain, adversely impacting our capability to supply product to our customers. In the event of a natural disaster, it may not be possible for us to find an alternate manufacturing location for certain product lines, further impacting our capability to recover from such a disruption.

We could face risks to our systems, networks and production including increased IT security threats and more sophisticated and targeted computer crime.

Increased global information technology security threats and more sophisticated and targeted computer crime pose a risk to the security of our systems and networks and the confidentiality, availability and integrity of our data and communications. While we attempt to mitigate these risks by employing a number of measures - including employee training, comprehensive monitoring of our networks and systems, and maintenance of backup and protective systems - our systems, networks and products remain potentially vulnerable to advanced persistent threats. Depending on their nature and scope, such threats could potentially lead to the compromising of confidential information and communications, improper use of our systems and networks, manipulation and destruction of data, defective products, production downtimes and operational disruptions, which in turn could adversely affect our reputation, competitiveness and results of operations. Additionally, any updates to or implementation of systems, including the selection and implementation of an ERP system, may cause delays or disruptions in our processes or production which could adversely affect our results.

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Item 1B. Unresolved Staff Comments
Not applicable.
Item 2. Properties
As of February 22, 2019, we had manufacturing facilities, administrative, research and development and sales offices in the following locations:

Manufacturing Facilities	Square Footage	Owned/Leased	
Albuquerque, New Mexico	114,525	Leased	
Bolingbrook, Illinois	30,600	Leased	
Elkhart, Indiana	319,000	Owned	
Haryana, India	19,400	Leased	
Hopkinton, Massachusetts	32,000	Owned	
Hradec Kralove, Czech Republic	30,680	Leased	
Juarez, Mexico	114,600	Leased	
Kaohsiung, Taiwan	75,900	Owned	(1)
Kvistgaard, Denmark	30,680	Leased	
Lisle, Illinois	31,000	Leased	
Matamoros, Mexico	51,000	Owned	
Nogales, Mexico	64,000	Leased	
Ostrava, Czech Republic	67,600	Leased	
Prague, Czech Republic	13,660	Leased	
Tianjin, China	225,000	Owned	(2)
Zhongshan, China	112,600	Leased	
Total manufacturing	1,332,245		

(1) Ground lease through 2026; restrictions on use and transfer apply.
(2) Land Use Rights Agreement through 2050 includes transfer, lease and mortgage rights.

Non-Manufacturing Facilities	Square Footage	Owned/Leased	Description
Brownsville, Texas	N/A	Owned	Land
Brownsville, Texas	10,000	Leased	Warehouse
El Paso, Texas	22,400	Leased	Office and warehouse
Matamoros, Mexico	20,000	Leased	Warehouse
Elkhart, Indiana	93,000	Owned	Idle facility
Farmington Hills, Michigan	1,800	Leased	Sales office
Glasgow, Scotland	18,600	Leased	Administrative offices and research
Lisle, Illinois	74,925	Leased	Administrative offices and research
Malden, Massachusetts	3,600	Leased	Administrative offices and research
Nagoya, Japan	800	Leased	Sales office
Singapore	5,600	Leased	Sales office
Yokohama, Japan	1,400	Leased	Sales office
Total non-manufacturing	252,125		

We regularly assess the adequacy of our manufacturing facilities for manufacturing capacity, available labor, and proximity to our markets and major customers. Management believes our manufacturing facilities are suitable and adequate, and have sufficient capacity to meet our current needs. The extent of utilization varies from plant to plant and with general economic conditions. We

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also review the operating costs of our facilities and may from time-to-time relocate a portion of our manufacturing activities in order to reduce operating costs and improve asset utilization and cash flow.

Item 3. Legal Proceedings

From time to time we are involved in litigation with respect to matters arising from the ordinary conduct of our business, and currently certain claims are pending against us. In the opinion of management, based upon presently available information, either adequate provision for anticipated costs have been accrued or the ultimate anticipated costs will not materially affect our consolidated financial position, results of operations, or cash flows.

See Note 10 "Contingencies" in the Notes to the Consolidated Financial Statements in this Annual Report on Form 10-K.

Item 4. Mine Safety Disclosures

Not applicable.

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PART II

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

Our common stock is listed on the New York Stock Exchange under the symbol "CTS." On February 19, 2019, there were approximately 962 shareholders of record.

As shown in the following table, we repurchased stock totaling $9,440 during the twelve months ended December 31, 2018:

(in thousands, except share data)	(a) Total Number of Shares Purchased	(b) Average Price Paid per Share	(c) Total Value of Shares Purchased as Part of Plans or Program	(d) Maximum Value of Shares That May Yet Be Purchased Under the Plans or Programs(1)
Balance at December 31, 2017				$ 17,554
January 1, 2018 - September 30, 2018	—	$ —	$ —	$ 17,554
October 1, 2018 – December 31, 2018	342,100	$ 27.60	$ 9,440	$ 8,114

(1) In April 2015, the Board of Directors authorized a program to repurchase up to $25 million of our common stock in the open market. The authorization has no expiration.

On February 7, 2019, the Board of Directors of CTS authorized a new stock repurchase program with a maximum dollar limit of $25 million and no set expiration date. This new program replaces the program shown in the table above.

Shareholder Performance Graph

The following graph shows a five-year comparison of the cumulative total shareholder return on CTS common stock with the cumulative total returns of a general market index and a peer group index (S&P 500 and Dow Jones Electrical Components & Equipment Industry Group). The graph tracks the performance of a $100 investment in the Company's common stock and in each of the indexes (with the reinvestment of all dividends) on December 31, 2013.

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Item 6. Selected Financial Data
Five-Year Summary
(Amounts in thousands, except percentages and per share amounts)

	2018	% of Sales	2017	% of Sales	2016	% of Sales	2015	% of Sales	2014	% of Sales
Summary of Operations										
Net sales	$470,483	100.0	$422,993	100.0	$396,679	100.0	$382,310	100.0	$404,021	100.0
Cost of goods sold	305,510	64.9	282,562	66.8	256,251	64.6	255,201	66.8	274,058	67.8
Gross Margin	164,973	35.1	140,431	33.2	140,428	35.4	127,109	33.2	129,963	32.2
Selling, general and administrative expenses	73,569	15.6	71,943	17.0	61,624	15.5	59,586	15.6	61,051	15.1
Research and development expenses	25,304	5.4	25,146	5.9	24,040	6.1	22,461	5.9	22,563	5.6
Non-recurring environmental expense	—	—	—	—	—	—	14,541	3.8	—	—
Restructuring and impairment charges	5,062	1.1	4,139	1.0	3,048	0.8	14,564	3.8	5,941	1.5
Loss (gain) on sale of assets	—	—	708	(2.9)	(11,450)	(2.9)	(2,156)	(0.6)	(1,915)	(0.5)
Operating earnings	61,038	13.0	38,495	9.1	63,166	15.9	18,113	4.7	42,323	10.5
Other (expense) income	(2,935)	(0.6)	1,758	0.4	(5,921)	(1.5)	(5,852)	(1.5)	(2,975)	(0.7)
Earnings before income taxes	58,103	12.3	40,253	9.5	57,245	14.4	12,261	3.2	39,348	9.8
Income tax expense	11,571	2.5	25,805	6.1	22,865	5.8	5,307	1.4	12,826	3.2
Net earnings	$46,532	9.9	$14,448	3.4	$34,380	8.7	$6,954	1.8	$26,522	6.6
Retained earnings - beginning of year	420,160		410,979		381,840		380,145		358,997	
Dividends declared	(5,278)		(5,267)		(5,241)		(5,259)		(5,374)	
Implementation of new accounting standard	17,433		$—		$—		$—		$—	
Retained earnings - end of year	$478,847		$420,160		$410,979		$381,840		$380,145	
Net earnings per share:										
Basic	$1.41		$0.44		$1.05		$0.21		$0.79	
Diluted	$1.39		$0.43		$1.03		$0.21		$0.78	
Average basic shares outstanding (000s)	33,024		32,892		32,728		32,959		33,618	
Average diluted shares outstanding (000s)	33,569		33,420		33,251		33,484		34,130	
Cash dividends per share (annualized)	$0.160		$0.160		$0.160		$0.160		$0.160	
Capital expenditures	$28,488		$18,094		$20,500		$9,723		$12,949	
Depreciation and amortization	$22,514		$20,674		$18,992		$16,254		$16,971	
Financial Position at Year End										

Current assets	$ 239,359	$ 233,609	$ 215,707	$ 245,954	$ 240,401
Current liabilities	103,993	102,412	98,129	94,620	79,982
Current ratio	2.3 to 1	2.3 to 1	2.2 to 1	2.5 to 1	3.0 to 1
Working capital	135,366	131,197	117,578	151,334	160,419
Inventories	43,486	36,596	28,652	24,600	27,887
Net property, plant and equipment	99,401	88,247	82,111	69,872	71,414
Total assets	548,341	539,696	517,697	483,373	456,926
Long-term debt	50,000	76,300	89,100	90,700	75,000
Long-term obligations, including long-term debt	66,419	93,479	101,686	107,099	87,155
Shareholders' equity	377,929	343,805	317,882	281,654	289,789
Common shares outstanding (000s)	32,751	32,938	32,762	32,548	33,392
Equity (book value) per share	$ 11.54	$ 10.44	$ 9.70	$ 8.65	$ 8.68
Stock price range	24.07-39.20	19.30-28.35	12.87-24.80	15.30-20.25	15.58-21.65

Certain acquisitions, divestitures, closures of operations or product lines, and certain accounting reclassifications affect the comparability of information contained in the "Five-Year Summary."

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

Overview

CTS Corporation ("CTS", "we", "our" or "us") is a leading designer and manufacturer of products that Sense, Connect and Move. Our vision is to be a leading provider of sensing and motion devices as well as connectivity components, enabling an intelligent and seamless world. These devices are categorized by their ability to Sense, Connect or Move. Sense products provide vital inputs to electronic systems. Connect products allow systems to function in synchronization with other systems. Move products ensure required movements are effectively and accurately executed. We are committed to achieving our vision by continuing to invest in the development of products and technologies within these categories.

We manufacture sensors, actuators, and electronic components in North America, Europe, and Asia. CTS provides engineered products to OEMs in the aerospace and defense, industrial, information technology, medical, telecommunications, and transportation markets.

There is an increasing proliferation of sensing and motion applications within various markets we serve. In addition, the increasing connectivity of various devices to the internet results in greater demand for communication bandwidth and data storage, increasing the need for our connectivity products. Our success is dependent on the ability to execute our strategy to support these trends. We are subject to challenges including periodic market softness, competition from other suppliers, changes in technology, and the ability to add new customers, launch new products or penetrate new markets.

Results of Operations: Fourth Quarter 2018 versus Fourth Quarter 2017

(Amounts in thousands, except percentages and per share amounts):

The following table highlights changes in significant components of the Consolidated Statements of Earnings (Loss) for the quarters ended December 31, 2018, and December 31, 2017:

	Three Months Ended December 31,			Percent of Net Sales	
	2018	2017	Percent Change	2018	2017
Net sales	$120,073	$110,910	8.3	100.0	100.0
Cost of goods sold	77,428	78,035	(0.8)	64.5	70.4
Gross margin	42,645	32,875	29.7	35.5	29.6
Selling, general and administrative expenses	18,128	24,973	(27.4)	15.1	22.5
Research and development expenses	5,804	6,714	(13.6)	4.8	6.1
Restructuring and impairment charges	1,698	1,197	41.9	1.4	1.1
(Gain) loss on sale of assets	(2)	10	(120.0)	—	—
Total operating expenses	25,628	32,894	(22.1)	21.3	29.7
Operating earnings (loss)	17,017	(19)	89,663.2	14.2	—
Other (expense) income, net	(144)	164	(187.8)	(0.1)	0.1
Earnings before income tax	16,873	145	11,536.6	14.1	0.1
Income tax (benefit) expense	(691)	13,766	(105.0)	(0.6)	12.4
Net earnings (loss)	$17,564	$(13,621)	228.9	14.6	(12.3)
Diluted earnings per share:					
Diluted net earnings (loss) per share	$0.52	$(0.41)			

Sales of $120,073 in the fourth quarter of 2018 increased $9,163 or 8.3% from the fourth quarter of 2017. Sales to transportation markets increased $5,163 or 7.2%. Sales to other end markets increased $4,000 or 10.2%. Changes in foreign exchange rates decreased sales by $880 year-over-year due to the U.S. Dollar appreciating compared to the Chinese Renminbi and Euro.

In the fourth quarter of 2017, we recorded a $13,415 one-time, non-cash pension settlement charge. During 2017, CTS offered its pension participants the opportunity to receive a lump sum payment to settle their future pension benefits. A number of participants elected the lump sum option, and the total lump sum payments distributed to these participants when the offer window closed in the fourth quarter was large enough to trigger a pension settlement charge under U.S. GAAP. This charge was recorded in the amount of $4,796 to cost of goods sold, $6,557 to selling, general and administrative expenses and $2,062 to research and development expenses.

Gross margin as a percent of sales was 35.5% in the fourth quarter of 2018 compared to 29.6% in the fourth quarter of 2017. The pension settlement charge recorded in the fourth quarter of 2017 impacted gross margin unfavorably by $4,796 or 4.3%. The

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increase in gross margin was primarily driven by savings related to product line transfers associated with the June 2016 Restructuring Plan described in Note 8.

Selling, general and administrative expenses were $18,128 or 15.1% of sales in the fourth quarter of 2018 versus $24,973 or 22.5% of sales in the comparable quarter of 2017. The pension settlement charge recorded in the fourth quarter of 2017 impacted selling, general and administrative expenses unfavorably by $6,557 or 5.9%.

Research and development expenses were $5,804 or 4.8% of sales in the fourth quarter of 2018 compared to $6,714, or 6.1% of sales, in the comparable quarter of 2017. The pension settlement charge recorded in the fourth quarter of 2017 impacted research and development expenses unfavorably by $2,062, or 1.9%. Research and development expenses are focused on expanded applications of existing products, new product development, and enhancements for current products and processes.

Restructuring and impairment charges were $1,698 in the fourth quarter of 2018. These charges were mainly for building and equipment relocation, severance, and travel costs related to the restructuring of certain operations as part of the June 2016 Restructuring Plan. In the fourth quarter 2017, restructuring and impairment charges consisting of severance and other costs totaled $1,197, which were also in connection with our June 2016 Restructuring Plan.

Operating earnings were $17,017, or 14.2% of sales in the fourth quarter of 2018, compared to an operating loss of $19, or 0.0% of sales, in the comparable quarter of 2017 as a result of the items discussed above.

Other income and expense items are summarized in the following table:

	Three Months Ended December 31, 2018	2017
Interest expense	$(484)	$(1,134)
Interest income	459	370
Other (expense) income	(119)	928
Total other (expense) income, net	$(144)	$164

Interest expense decreased in the fourth quarter of 2018 versus 2017 due to lower debt balances and a reduction in interest related to interest rate swaps. Interest income increased due to higher interest rates. Other income in the fourth quarter of 2017 was driven mainly by foreign currency translation gains due to the appreciation of the Chinese Renminbi compared to the U.S. Dollar.

	Three Months Ended December 31, 2018	2017
Effective tax rate	(4.1)%	9,493.8%

The effective income tax rate for the fourth quarter of 2018 was (4.1)% compared to 9,493.8% in the fourth quarter of 2017. The tax rate in 2018 was impacted primarily by a discrete one-time rate change benefit related to the Tax Cuts and Jobs Act (“Tax Act”) resulting from the election of tax accounting method changes. The effective income tax rate in the fourth quarter of 2017 was primarily related to the initial application of the Tax Act including the remeasurement of the net deferred tax assets from 35% to 21% and the one-time mandatory transition tax on the historical earnings of foreign affiliates, which resulted in a net non-cash charge of $18,001.

Net earnings was $17,564, or $0.52 per diluted share, in the fourth quarter of 2018, compared to a net loss of $13,621, or $0.41 per share, in the comparable quarter of 2017.

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Results of Operations: Year Ended December 31, 2018, versus Year Ended December 31, 2017
(Amounts in thousands, except percentages and per share amounts):
The following table highlights changes in significant components of the Consolidated Statements of Earnings for the years ended December 31, 2018, and December 31, 2017:

	Years Ended December 31,			Percent of Net Sales	
	2018	2017	Percent Change	2018	2017
Net sales	$470,483	$422,993	11.2	100.0	100.0
Cost of goods sold	305,510	282,562	8.1	64.9	66.8
Gross margin	164,973	140,431	17.5	35.1	33.2
Selling, general and administrative expenses	73,569	71,943	2.3	15.6	17.0
Research and development expenses	25,304	25,146	0.6	5.4	5.9
Restructuring and impairment charges	5,062	4,139	22.3	1.1	1.0
Loss on sale of assets	—	708	(100.0)	—	0.2
Total operating expenses	103,935	101,936	2.0	22.1	24.1
Operating earnings	61,038	38,495	58.6	13.0	9.1
Other (expense) income, net	(2,935)	1,758	(267.0)	(0.6)	0.4
Earnings before income tax	58,103	40,253	44.3	12.4	9.5
Income tax expense	11,571	25,805	(55.2)	2.5	6.1
Net earnings	46,532	14,448	222.1	9.9	3.4
Diluted earnings per share:					
Diluted net earnings per share	$1.39	$0.43			

Sales were $470,483 for the year ended December 31, 2018, an increase of $47,490, or 11.2% from 2017. Sales to transportation markets increased $24,873 or 9.0%. Sales to other end markets increased $22,617 or 15.3%. The Noliac acquisition added $9,463 in sales in 2018 and $7,084 in sales in 2017. Changes in foreign exchange rates increased sales by $3,238 year-over-year due to the U.S. Dollar depreciating compared to the Chinese Renminbi and Euro.
Gross margin as a percent of sales was 35.1% in 2018 versus 33.2% in 2017. The pension settlement charge recorded in the fourth quarter of 2017 impacted gross margin unfavorably by $4,796, or 1.1% of sales. The increase in gross margin was primarily driven by savings related to product line transfers and a favorable impact of foreign exchange rate movements which were partially offset by material cost increases.
Selling, general and administrative expenses were $73,569, or 15.6% of sales for the year ended December 31, 2018, versus $71,943 or 17.0% of sales in the comparable period of 2017. The pension settlement charge recorded in the fourth quarter of 2017 impacted selling, general and administrative expenses unfavorably by $6,557 or 1.6% of sales. The increase includes higher stock-based compensation and ERP implementation costs as well as incremental costs resulting from the Noliac acquisition in 2017, including amortization of intangibles.
Research and development expenses were $25,304 or 5.4% of sales in 2018 compared to $25,146 or 5.9% of sales in 2017. The pension settlement charge recorded in the fourth quarter of 2017 impacted research and development expenses unfavorably by $2,062, or 0.5% of sales. Research and development expenses are focused on expanded applications of existing products, new product development, and enhancements for current products and processes.
Restructuring and impairment charges were $5,062 for year ended December 31, 2018. The charges were mainly for building and equipment relocation, severance, and travel costs related to the restructuring of certain operations as part of the 2016 Restructuring Plan. Restructuring charges were $4,139 in 2017.
The loss on sale of assets in 2017 was driven by a loss on the sale of vacant land at our Hopkinton, Massachusetts facility in September 2017.

Operating earnings were $61,038, or 13.0% of sales in 2018, compared to $38,495, or 9.1% of sales in 2017 as a result of the items discussed above.

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Other income and expense items are summarized in the following table:

	Years Ended December 31,	
	2018	2017
Interest expense	$(2,085)	$(3,343)
Interest income	1,826	1,284
Other (expense) income	(2,676)	3,817
Total other (expense) income, net	$(2,935)	$1,758

Interest expense decreased in the year ended December 31, 2018, versus the same period in 2017 primarily due to lower debt balances, a reduction in interest related to interest rate swaps, and a one-time charge related to a liability that was settled in 2017. Interest income increased due to higher interest rates. Other expense in the year ended December 31, 2018, was driven by foreign currency translation losses mainly due to the appreciation of the U.S. Dollar compared to the Chinese Renminbi and the Euro. Other income in the year ended December 31, 2017 was driven mainly by foreign currency translation gains due to the depreciation of the U.S. Dollar compared to the Chinese Renminbi and the Euro.

	Years Ended December 31,	
	2018	2017
Effective tax rate	19.9%	64.1%

The effective income tax rate in 2018 was 19.9% compared to 64.1% in the prior year. The tax rate in 2018 was favorably impacted by a discrete one-time rate change benefit related to the Tax Act resulting from the election of tax accounting method changes, partially offset by a one-time withholding tax on repatriation of earnings from one of our foreign subsidiaries that was completed during the year to enable the use of tax credits due to expire in 2018. The tax rate in 2017 was unfavorably impacted by the application of the Tax Act, driven by the remeasurement of the net deferred tax assets from 35% to 21% and the one-time mandatory transition tax on the historical earnings of foreign affiliates, which resulted in a net non-cash charge of $18,001.

Net earnings were $46,532 or $1.39 per diluted share for the year ended December 31, 2018, compared to earnings of $14,448 or $0.43 per diluted share in the comparable period of 2017.

Results of Operations: Years Ended December 31, 2017, versus Year Ended December 31, 2016

(Amounts in thousands, except percentages and per share amounts):

The following table highlights changes in significant components of the Consolidated Statements of Earnings for the years ended December 31, 2017, and December 31, 2016:

	Years Ended December 31,			Percent of Net Sales	
	2017	2016	Percent Change	2017	2016
Net sales	$422,993	$396,679	6.6	100.0	100.0
Cost of goods sold	282,562	256,251	10.3	66.8	64.6
Gross margin	140,431	140,428	—	33.2	35.4
Selling, general and administrative expenses	71,943	61,624	16.7	17.0	15.5
Research and development expenses	25,146	24,040	4.6	5.9	6.1
Restructuring and impairment charges	4,139	3,048	35.8	1.0	0.8
Loss (gain) on sale of assets	708	(11,450)	(106.2)	0.2	(2.9)
Total operating expenses	101,936	77,262	31.9	24.1	19.5
Operating earnings	38,495	63,166	(39.1)	9.1	15.9
Other income (expense), net	1,758	(5,921)	(129.7)	0.4	(1.5)

Earnings before income tax	40,253	57,245	(29.7	)9.5	14.4
Income tax expense	25,805	22,865	12.9	6.1	5.8
Net earnings	14,448	34,380	(58.0	)3.4	8.7
Diluted earnings per share:					
Diluted net earnings per share	$0.43	$1.03			

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Sales were $422,993 for the year ended December 31, 2017, an increase of $26,314, or 6.6% from 2016. Sales to transportation markets increased $12,586 or 4.8%. Other sales increased $13,728 or 10.2%. The Noliac acquisition added $7,084 in sales in 2017.

Gross margin as a percent of sales was 33.2% in 2017 versus 35.4% in 2016. The pension settlement charge recorded in the fourth quarter of 2017 impacted gross margin unfavorably by $4,796, or 1.1% of sales. The remaining decrease in gross margin resulted from costs relating to certain production rework issues that were resolved in 2017 and an unfavorable impact of foreign exchange rate movements.

Selling, general and administrative expenses were $71,943, or 17.0% of sales for the year ended December 31, 2017, versus $61,624 or 15.5% of sales in the comparable period of 2016. The pension settlement charge recorded in the fourth quarter of 2017 impacted selling, general and administrative expenses unfavorably by $6,557 or 1.6% of sales. The remaining increase was primarily attributable to an increase in stock-based compensation as well as incremental costs resulting from the Noliac acquisition in 2017 and the single crystal acquisition in 2016, including amortization of intangibles.

Research and development expenses were $25,146 or 5.9% of sales in 2017 compared to $24,040 or 6.1% of sales in 2016. The pension settlement charge recorded in the fourth quarter of 2017 impacted research and development expenses unfavorably by $2,062, or 0.5% of sales. The remaining decrease is related to higher reimbursements from customers for research and development costs in 2017 and timing of certain expenses. Research and development expenses are focused on expanded applications of existing products, new product development, and enhancements for current products and processes.

Restructuring and impairment charges were $4,139 for year ended December 31, 2017. The charges were mainly for building and equipment relocation, severance and travel costs related to the restructuring of certain operations as part of the 2016 Restructuring Plan. Restructuring charges were $3,048 in 2016.

The loss on sale of assets in 2017 was driven by a loss on the sale of vacant land at our Hopkinton, Massachusetts facility in September 2017. The 2016 gain on sale of assets of $11,450 is driven principally by a gain on the sale of our former manufacturing facility in Canada in June 2016.

Operating earnings were $38,495, or 9.1% of sales in 2017, compared to $63,166, or 15.9% of sales in 2016 as a result of the items discussed above.

Other income and expense items are summarized in the following table:

	Years Ended December 31,	
	2017	2016
Interest expense	$(3,343)	$(3,702)
Interest income	1,284	1,305
Other expense (income)	3,817	(3,524)
Total other expense (income), net	$1,758	$(5,921)

Interest expense decreased in the year ended December 31, 2017, versus the same period in 2016 primarily as a result of a reduction in interest related to interest rate swaps. Interest income was down slightly in 2017 versus 2016. Other income in the year ended December 31, 2017, was driven mainly by foreign currency translation gains due to the depreciation of the U.S. Dollar compared to the Chinese Renminbi and the Euro. Other expense in the year ended December 31, 2016, was driven by foreign currency translation losses, mainly due to the appreciation of the U.S. Dollar compared to the Chinese Renminbi and the Euro.

	Years Ended December 31,	
	2017	2016

Effective tax rate 64.1 % 39.9 %

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The effective income tax rate in 2017 was 64.1%, which was primarily due to a provisional one-time tax expense of $18,001 resulting from the Tax Cuts and Jobs Act, which was enacted on December 22, 2017. The rate also reflects a decrease in the valuation allowance on certain non-U.S. losses as a result of changes in the expectation of our ability to utilize those losses and changes in the mix of earnings by jurisdiction. The effective income tax rate in 2016 was 39.9%, which includes restructuring charges, one-time items, an increase in valuation allowances recorded against certain state net operating losses and tax credits, and the revaluation of U.S. deferred taxes as a result of the June 2016 restructuring activities discussed in Note 8, "Costs Associated with Exit and Restructuring Activities". The rate also reflects an increase in the valuation allowance on certain non-U.S. losses as a result of changes in the expectation of our ability to utilize those losses, changes in the mix of earnings by jurisdiction, our decision to no longer permanently reinvest the earnings of our Canadian and U.K. subsidiaries, tax expense for withholding taxes on earnings in China that are not anticipated to be maintained in China, and various other discrete items.

Net earnings were $14,448 or $0.43 per diluted share for the year ended December 31, 2017, compared to earnings of $34,380 or $1.03 per diluted share in the comparable period of 2016.

Liquidity and Capital Resources

(Amounts in thousands, except percentages and per share amounts):

Cash and cash equivalents were $100,933 at December 31, 2018, and $113,572 at December 31, 2017, of which $96,762 and $112,531, respectively, were held outside the United States. The decrease in cash and cash equivalents of $12,639 was driven principally by cash generated from operating activities of $58,152, which was offset by capital expenditures of $28,488, net debt payments of $26,300, purchase of treasury stock of $9,440, and dividends paid of 5,285. Total debt as of December 31, 2018, and December 31, 2017, was $50,000 and $76,300, respectively. Total debt as a percentage of total capitalization, defined as long-term debt as a percentage of total debt and shareholders' equity, was 11.7% at December 31, 2018, compared to 18.2% at December 31, 2017.

Working capital increased by $4,169 from December 31, 2017, to December 31, 2018, primarily due to increases in accounts receivable and inventory, which were partially offset by the decrease in cash.

Cash Flows from Operating Activities

Net cash provided by operating activities was $58,152 during the year ended December 31, 2018. Components of net cash provided by operating activities included net earnings of $46,532, depreciation and amortization expense of $22,514, stock-based compensation of $5,256, and other net non-cash items totaling $340, which were offset by net changes in assets and liabilities of $15,482 and deferred income taxes of 1,008.

Cash Flows from Investing Activities

Net cash used in investing activities for the year ended December 31, 2018, was $28,485, driven by the net capital expenditures of $28,488.

Cash Flows from Financing Activities

Net cash used in financing activities for the year ended December 31, 2018, was $42,493. This cash outflow was the result of net debt payments of $26,300, the purchase of treasury stock of $9,440, dividend payments of $5,285, and taxes paid on behalf of equity award participants of $1,468.

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Capital Resources

Long-term debt was comprised of the following:

	As of December 31,	
	2018	2017
Total credit facility	$300,000	$300,000
Balance Outstanding	$50,000	$76,300
Standby letters of credit	$1,940	$2,065
Amount available	$248,060	$221,635
Weighted-average interest rate	3.10 %	2.30 %
Commitment fee percentage per annum	0.20 %	0.25 %

On August 10, 2015, we entered into an unsecured five-year revolving credit agreement (“Revolving Credit Facility”) with a group of banks in order to support our financing needs. The Revolving Credit Facility originally provided for a credit line of $200,000. On May 23, 2016, we requested and received a $100,000 increase in the aggregate revolving credit commitments under our existing credit agreement, which increased the credit line from $200,000 to $300,000. The Revolving Credit Facility requires, among other things, that we comply with a maximum total leverage ratio and a minimum fixed charge coverage ratio. Failure to comply with these covenants could reduce the borrowing availability under the Revolving Credit Facility. We were in compliance with all debt covenants at December 31, 2018.

On February 12, 2019, CTS entered into a new amended and restated five-year credit agreement with a group of banks that expires on February 12, 2024. This credit agreement provides for a revolving credit facility of $300 million, which may be increased by $150 million at the request of the Company, subject to the administrative agent’s approval. This new unsecured credit facility replaces the prior $300 million unsecured credit facility, which would have expired August 10, 2020. Borrowings of $50 million under the prior credit agreement were refinanced and the prior agreement was terminated as of February 12, 2019.

We use interest rate swaps to convert the Revolving Credit Facility’s variable rate of interest into a fixed rate on a portion of our debt balance. In the second quarter of 2012, we entered into four separate one-year interest rate swap agreements to fix interest rates on $50,000 of long-term debt for the periods January 2013 to January 2017. In the third quarter of 2012, we entered into four additional one-year interest rate swap agreements to fix interest rates on $25,000 of long-term debt for the periods January 2013 to January 2017. In the third quarter of 2016, we entered into three additional one-year interest rate swap agreements to fix interest rates on $50,000 of long-term debt for the periods August 2017 to August 2020. The difference to be paid or received under the terms of the swap agreements will be recognized as an adjustment to interest expense when settled.

We have historically funded our capital and operating needs primarily through cash flows from operating activities, supported by available credit under our Revolving Credit Facility. We believe that cash flows from operating activities and available borrowings under our Revolving Credit Facility will be adequate to fund our working capital needs, capital expenditures, and debt service requirements for at least the next twelve months. However, we may choose to pursue additional equity and debt financing to provide additional liquidity or to fund acquisitions.

Critical Accounting Policies and Estimates

Management prepared the consolidated financial statements under accounting principles generally accepted in the United States of America. These principles require the use of estimates, judgments, and assumptions. We believe that the estimates, judgments, and assumptions we used are reasonable, based upon the information available.

Our estimates and assumptions affect the reported amounts in our financial statements. The following accounting policies comprise those that we believe are the most critical in understanding and evaluating our reported financial results.

Revenue Recognition

Beginning in January 2018, CTS adopted the provisions of Accounting Standards Update ("ASU") No. 2014-09, "Revenue from Contracts with Customers (Topic 606)". Product revenue is recognized when the transfer of promised goods to a customer occurs in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods. We follow the five step model to determine when this transfer has occurred: 1) identify the contract(s) with the customer; 2) identify the performance obligations in the contract; 3) determine the transaction price; 4) allocate the transaction price to the performance obligations in the contract; 5) recognize revenue when (or as) the entity satisfies a performance obligation.

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Prior to January 1, 2018, product revenue was recognized once four criteria were met: 1) we have persuasive evidence that an arrangement exists; 2) delivery has occurred and title has passed to the customer, which generally happens at the point of shipment provided that no significant obligations remain; 3) the price is fixed and determinable; and 4) collectability is reasonably assured.

Product Warranties

Provisions for estimated warranty expenses primarily related to our automotive products are made at the time products are sold. These estimates are established using a quoted industry rate. We adjust our warranty reserve for any known or anticipated warranty claims as new information becomes available. We evaluate our warranty obligations at least quarterly and adjust our accruals if it is probable that future costs will be different than our current reserve. Over the last three years, product warranty reserves have ranged from 0.5% to 2.4% of total sales. We believe our reserve level is appropriate considering all facts and circumstances surrounding any outstanding quality claims and our historical experience selling our products to our customers.

Accounts Receivable

We have standardized credit granting and review policies and procedures for all customer accounts, including:

- Credit reviews of all new significant customer accounts,
- Ongoing credit evaluations of current customers,
- Credit limits and payment terms based on available credit information,
- Adjustments to credit limits based upon payment history and the customer's current creditworthiness,
- An active collection effort by regional credit functions, reporting directly to the corporate financial officers, and
- Limited credit insurance on the majority of our international receivables.

We reserve for estimated credit losses based upon historical experience and specific customer collection issues. Over the last three years, accounts receivable reserves have ranged from 0.3% to 0.7% of total accounts receivable. We believe our reserve level is appropriate considering the quality of the portfolio. While credit losses have historically been within expectations of the reserves established, we cannot guarantee that our credit loss experience will continue to be consistent with historical experience.

Inventories

We value our inventories at the lower of the actual cost to purchase or manufacture using the first-in, first-out ("FIFO") method, or net realizable value. We review inventory quantities on hand and record a provision for excess and obsolete inventory based on forecasts of product demand and production requirements.

Over the last three years, our reserves for excess and obsolete inventories have ranged from 11.2% to 19.5% of gross inventory. We believe our reserve level is appropriate considering the quantities and quality of the inventories.

Retirement Plans

Actuarial assumptions are used in determining pension income and expense and our defined benefit obligations. We utilize actuaries from consulting companies in each applicable country to develop our discount rates, matching high-quality bonds currently available and expected to be available during the period to maturity of the pension benefit in order to provide the necessary future cash flows to pay the accumulated benefits when due. After considering the recommendations of our actuaries, we have assumed a discount rate, expected rate of return on plan assets, and a rate of compensation increase in determining our annual pension income and expense and the projected benefit obligation. During the fourth quarter of each year, we review our actuarial assumptions in light of current economic factors to determine if the assumptions need to be adjusted. Changes in the actuarial assumptions could have a material effect on our results of operations.

Impairment of Goodwill

Goodwill of a reporting unit is tested for impairment annually, or more frequently if an event occurs or circumstances change that would more-likely-than-not reduce the fair value of a reporting unit below its carrying amount. Examples of such events or circumstances include, but are not limited to, the following:

- Significant decline in market capitalization relative to net book value,
- Significant adverse change in legal factors or in the business climate,

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- Adverse action or assessment by a regulator,
- Unanticipated competition,
- More-likely-than-not expectation that a reporting unit or a significant portion of a reporting unit will be sold or otherwise disposed of,
- Testing for recoverability of a significant asset group within a reporting unit, and
- Allocation of a portion of goodwill to a business to be disposed.

If we believe that one or more of the above indicators of impairment have occurred, we perform an impairment test. We have the option to perform a qualitative assessment (commonly referred to as "step zero" test) to determine whether further quantitative analysis for impairment of goodwill and indefinite-lived intangible assets is necessary. The qualitative assessment includes a review of macroeconomic conditions, industry and market considerations, internal cost factors, and our own overall financial and share price performance, among other factors. If, after assessing the totality of events or circumstances we determine that it is not more-likely-than-not that the fair value of a reporting unit is less than its carrying amount, we do not need to perform a quantitative analysis.

If a quantitative assessment is required, we estimate the fair value of each reporting unit using a combination of discounted cash flow analysis and market-based valuation methodologies. Determining fair value using a quantitative approach requires significant judgment, including judgments about projected revenues, operating expenses, working capital investment, capital expenditures, and cash flows over a multi-year period. The discount rate applied to our forecasts of future cash flows is based on our estimated weighted average cost of capital. In assessing the reasonableness of our determined fair values, we evaluate our results against our market capitalization. Changes in these estimates and assumptions could materially affect the determination of fair value and impact the goodwill impairment assessment.

Our latest assessment was performed using a qualitative approach as of October 1, 2018, and we determined that it was likely that the fair values of our reporting units were more than their carrying amounts, and therefore no impairment charges were recorded. We will monitor future results and will perform a test if indicators trigger an impairment review.

Impairment of Other Intangible and Long-Lived Assets

We evaluate the impairment of identifiable intangibles and other long-lived assets whenever events or changes in circumstances indicate that the carrying value may not be recoverable. Factors considered that may trigger an impairment review consist of, but are not limited to, the following:

- Significant decline in market capitalization relative to net book value,
- Significant underperformance relative to expected historical or projected future operating results,
- Significant changes in the manner of use of the acquired assets or the strategy for the overall business,
- Significant negative industry or economic trends.

If we believe that one or more indicators of impairment have occurred, we perform a recoverability test by comparing the carrying amount of an asset or asset group to the sum of the undiscounted cash flows expected to result from the use and the eventual disposition of the asset or asset group. If such assets are considered to be impaired, the impairment to be recognized is measured by the amount by which the carrying amount of the assets exceeds the fair value. No indicators of impairment were identified during the year ended December 31, 2018.

Environmental and Legal Contingencies

U.S. GAAP requires a liability to be recorded for contingencies when it is probable that a liability has been incurred and the amount of the liability can be reasonably estimated. Significant judgment is required to determine the existence and amounts of our environmental, legal and other contingent liabilities. We regularly consult with attorneys and consultants to determine the relevant facts and circumstances before we record a liability. Changes in laws, regulatory orders, cost estimates, participation of other parties, timing of payments, input of attorneys and consultants, or other circumstances may have a material impact on the recorded liability.

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Income Taxes

Our income tax expense, deferred tax assets and liabilities, and liabilities for unrecognized tax benefits reflect management’s best estimate of current and future taxes to be paid. We are subject to income taxes in the United States and numerous foreign jurisdictions. Significant judgments and estimates are required in the determination of 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 financial statements, which will result in taxable or deductible amounts in the future. In evaluating our ability to recover our deferred tax assets in the jurisdiction from which they arise, we consider 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. The assumptions about future taxable income require the use of significant judgment and are consistent with the plans and estimates we are using to manage our underlying businesses.

The calculation of our tax liabilities involves dealing with uncertainties in the application of complex tax laws and regulations in a multitude of jurisdictions across our global operations. Accounting Standards Codification (ASC) No. 740 states that 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 resolution of any related appeals or litigation processes, on the basis of its technical merits. We record unrecognized tax benefits as liabilities in accordance with ASC 740 and adjust these liabilities when our judgment changes as a result of the evaluation of new information not previously available. Because of the complexity of some of these uncertainties, the ultimate resolution may result in a payment that is materially different from our current estimate of the unrecognized tax benefit liabilities. These differences will be reflected as increases or decreases to income tax expense in the period in which new information is available.

Our practice is to recognize interest and penalties related to income tax matters as part of income tax expense.

Generally, outside of Canada and the United Kingdom, it has been our historical practice to permanently reinvest the earnings of our non-U.S. subsidiaries in those operations. As previously noted, the Tax Act made significant changes to the taxation of undistributed foreign earnings, requiring that all previously untaxed earnings and profits of our controlled foreign corporation be subjected to a one-time mandatory deemed repatriation tax. The transition tax substantially eliminated the basis difference that existed prior to the Tax Act. However, there are limited other taxes that could continue to apply such as foreign withholding and certain state taxes. We completed the evaluation of our indefinite reinvestment assertion as a result of the Tax Act during the fourth quarter of 2018 and decided not to reinvest the current year earnings of our primary operations, except for in the Czech Republic, Denmark, India, Mexico and Taiwan. We intend to continue to indefinitely reinvest the earnings in these non-U.S. subsidiaries.

Contractual Obligations

Our contractual obligations as of December 31, 2018, were:

	Payments due by period				
	Total	2019	2020-2021	2022-2023	2024-beyond
Long-term debt, including interest	$51,680	$1,045	$ 50,635	$ —	$ —
Operating lease payments	31,029	3,859	6,209	4,875	16,086
Retirement obligations	6,663	779	1,476	1,370	3,038
Total	$89,372	$5,683	$ 58,320	$ 6,245	$ 19,124

We have no off-balance sheet arrangements, except for operating leases, that have a material current effect or are reasonably likely to have a material future effect on our financial condition or changes in our financial condition. Management believes that existing capital resources and funds generated from operations are sufficient to finance anticipated capital requirements.

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Item 7A. Quantitative and Qualitative Disclosures About Market Risk

(in thousands)

Our cash flows and earnings are subject to fluctuations resulting from changes in foreign currency exchange rates and interest rates. We manage our exposure to these market risks through internally established policies and procedures and, when deemed appropriate, through the use of derivative financial instruments. Our policies do not allow speculation in derivative instruments for profit or execution of derivative instrument contracts for which there are no underlying exposures. We do not use financial instruments for trading purposes and we are not a party to any leveraged derivatives. We monitor our underlying market risk exposures on an ongoing basis and believe that we can modify or adapt our hedging strategies as needed.

Interest Rate Risk

We are exposed to risk of changes in interest rates on our revolving credit facility. There was $50,000 and $76,300 outstanding under our revolving credit facility at December 31, 2018, and 2017, respectively. As of December 31, 2018, we had interest rate swaps that fix interest costs on $50,000 of our long-term debt through August 2020.

Foreign Currency Risk

We are exposed to foreign currency exchange rate risks. Our significant foreign subsidiaries are located in China, Czech Republic, Mexico, and Taiwan. As of December 31, 2018, we had $15,700 outstanding foreign currency forward exchange contracts to hedge our exposure against the Mexican Peso.

Commodity Price Risk

Many of our products require the use of raw materials that are produced in only a limited number of regions around the world or are available from only a limited number of suppliers. Our results of operations may be materially and adversely affected if we have difficulty obtaining these raw materials, the quality of available raw materials deteriorates, or there are significant price increases for these raw materials. For periods in which the prices of these raw materials are rising, we may be unable to pass on the increased cost to our customers, which would result in decreased margins for the products in which they are used. For periods in which the prices are declining, we may be required to write down our inventory carrying cost of these raw materials, since we record our inventory at the lower of cost or net realizable value.

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Item 8. Financial Statements and Supplementary Data

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Shareholders
CTS Corporation

Opinion on the financial statements

We have audited the accompanying consolidated balance sheets of CTS Corporation (an Indiana corporation) and subsidiaries (the “Company”) as of December 31, 2018 and 2017, the related consolidated statements of earnings, comprehensive earnings, changes in shareholders’ equity, and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and financial statement schedule included under Item 15(a) (collectively referred to as the “financial statements”). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.

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, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”), and our report dated February 22, 2019 expressed an unqualified opinion.

Basis for opinion

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

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

We have served as the Company’s auditor since 2005.

/s/ GRANT THORNTON LLP
Chicago, Illinois
February 22, 2019

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Shareholders
CTS Corporation

We have audited the internal control over financial reporting of CTS Corporation (an Indiana corporation) and subsidiaries (the "Company") as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by COSO.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated financial statements of the Company as of and for the year ended December 31, 2018, and our report dated February 22, 2019 expressed an unqualified opinion on those 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. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and limitations of internal control over financial reporting

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

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

/s/ GRANT THORNTON LLP
Chicago, Illinois
February 22, 2019

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CTS CORPORATION AND SUBSIDIARIES
Consolidated Statements of Earnings
(in thousands)

	Years Ended December 31,		
	2018	2017	2016
Net sales	$470,483	$422,993	$396,679
Cost of goods sold	305,510	282,562	256,251
Gross Margin	164,973	140,431	140,428
Selling, general and administrative expenses	73,569	71,943	61,624
Research and development expenses	25,304	25,146	24,040
Restructuring and impairment charges	5,062	4,139	3,048
Loss (gain) on sale of assets	—	708	(11,450)
Operating earnings	61,038	38,495	63,166
Other (expense) income:			
Interest expense	(2,085)	(3,343)	(3,702)
Interest income	1,826	1,284	1,305
Other (expense) income	(2,676)	3,817	(3,524)
Total other (expense) income, net	(2,935)	1,758	(5,921)
Earnings before taxes	58,103	40,253	57,245
Income tax expense	11,571	25,805	22,865
Net earnings	$46,532	$14,448	$34,380
Net earnings per share:			
Basic	1.41	0.44	1.05
Diluted	1.39	0.43	1.03
Basic weighted-average common shares outstanding	33,024	32,892	32,728
Effect of dilutive securities	545	528	523
Diluted weighted-average common shares outstanding	33,569	33,420	33,251
Cash dividends declared per share	$0.16	$0.16	$0.16

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

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CTS CORPORATION AND SUBSIDIARIES
Consolidated Statements of Comprehensive Earnings
(in thousands)

	Years Ended December 31,		
	2018	2017	2016
Net earnings	$46,532	$14,448	$34,380
Other comprehensive earnings (loss):			
Changes in fair market value of hedges, net of tax	795	110	553
Changes in unrealized pension cost, net of tax	(1,830)	13,687	6,412
Cumulative translation adjustment, net of tax	(311)	437	(1,154)
Other comprehensive (loss) earnings	$(1,346)	$14,234	$5,811
Comprehensive earnings	$45,186	$28,682	$40,191

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

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CTS CORPORATION AND SUBSIDIARIES
Consolidated Balance Sheets
(in thousands)

	December 31, 2018	December 31, 2017
ASSETS		
Current Assets		
Cash and cash equivalents	$100,933	$113,572
Accounts receivable, net	79,518	70,584
Inventories, net	43,486	36,596
Other current assets	15,422	12,857
Total current assets	239,359	233,609
Property, plant and equipment, net	99,401	88,247
Other Assets		
Prepaid pension asset	54,100	57,050
Goodwill	71,057	71,057
Other intangible assets, net	60,180	66,943
Deferred income taxes	22,201	20,694
Other assets	2,043	2,096
Total other assets	209,581	217,840
Total Assets	$548,341	$539,696
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current Liabilities		
Accounts payable	$51,975	$49,201
Accrued payroll and benefits	14,671	11,867
Accrued expenses and other liabilities	37,347	41,344
Total current liabilities	103,993	102,412
Long-term debt	50,000	76,300
Long-term pension obligations	6,510	7,201
Deferred income taxes	3,990	3,802
Other long-term obligations	5,919	6,176
Total Liabilities	170,412	195,891
Commitments and Contingencies (Note 10)		
Shareholders' Equity		
Common stock	306,697	304,777
Additional contributed capital	42,820	41,084
Retained earnings	478,847	420,160
Accumulated other comprehensive loss	(97,739)	(78,960)
Total shareholders' equity before treasury stock	730,625	687,061
Treasury stock	(352,696)	(343,256)
Total shareholders' equity	377,929	343,805
Total Liabilities and Shareholders' Equity	$548,341	$539,696

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

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CTS CORPORATION AND SUBSIDIARIES
Consolidated Statements of Cash Flows
(in thousands)

	Years Ended December 31,		
	2018	2017	2016
Cash flows from operating activities:			
Net earnings	$46,532	$14,448	$34,380
Adjustments to reconcile net earnings to net cash provided by operating activities:			
Depreciation and amortization	22,514	20,674	18,992
Stock-based compensation	5,256	4,184	2,738
Pension and other post-retirement plan expense (income)	422	11,570	(1,599)
Deferred income taxes	(1,008)	16,710	10,297
Loss (gain) on sale of assets	—	708	(11,450)
(Gain) loss on foreign currency hedges, net of cash received	(82)	94	(36)
Changes in assets and liabilities, net of acquisitions and divestitures:			
Accounts receivable	(9,877)	(5,198)	(7,120)
Inventories	(7,521)	(5,404)	(2,290)
Other assets	(2,675)	(1,531)	(289)
Accounts payable	5,113	5,387	537
Accrued payroll and benefits	2,349	(1,666)	1,876
Accrued expenses	(3,795)	28	451
Income taxes payable	1,564	(4,555)	966
Other liabilities	(258)	2,918	52
Pension and other post-retirement plans	(382)	(319)	(303)
Total adjustments	11,620	43,600	12,822
Net cash provided by operating activities	58,152	58,048	47,202
Cash flows from investing activities:			
Capital expenditures	(28,488)	(18,094)	(20,500)
Proceeds from sale of assets	3	541	12,296
Payment for acquisitions, net of cash acquired	—	(19,121)	(73,063)
Net cash used in investing activities	(28,485)	(36,674)	(81,267)
Cash flows from financing activities:			
Payments of long-term debt	(1,060,100)	(1,518,200)	(2,458,400)
Proceeds from borrowings of long-term debt	1,033,800	1,505,400	2,456,800
Payments of short-term notes payable	—	(1,150)	—
Purchase of treasury stock	(9,440)	—	—
Dividends paid	(5,285)	(5,260)	(5,234)
Taxes paid on behalf of equity award participants	(1,468)	(1,604)	(1,809)
Net cash used in financing activities	(42,493)	(20,814)	(8,643)
Effect of exchange rate on cash and cash equivalents	187	(793)	(415)
Net decrease in cash and cash equivalents	(12,639)	(233)	(43,123)
Cash and cash equivalents at beginning of year	113,572	113,805	156,928
Cash and cash equivalents at end of year	$100,933	$113,572	$113,805
Supplemental cash flow information:			
Cash paid for interest	$1,582	$2,130	$2,939
Cash paid for income taxes, net	$9,916	$10,884	$10,471
Non-cash investing and financing activities:			
Purchase of assets with short-term notes payable	$—	$—	$1,006
Capital expenditures incurred not paid	$4,312	$5,914	$3,214

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

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CTS CORPORATION AND SUBSIDIARIES
Consolidated Statements of Shareholders' Equity
(in thousands)

	Common Stock	Additional Contributed Capital	Retained Earnings	Accumulated Other Comprehensive Earnings/(Loss)	Treasury Stock	Total
Balances at January 1, 2016	$300,909	$41,166	$381,840	$(99,005)	$(343,256)	$281,654
Net earnings	—	—	34,380	—	—	34,380
Changes in fair market value of hedges, net of tax	—	—	—	553	—	553
Changes in unrealized pension cost, net of tax	—	—	—	6,412	—	6,412
Cumulative translation adjustment, net of tax	—	—	—	(1,154)	—	(1,154)
Cash dividends of $0.16 per share	—	—	(5,241)	—	—	(5,241)
Issued shares on vesting of restricted stock units	1,923	(3,307)	—	—	—	(1,384)
Stock compensation	—	2,662	—	—	—	2,662
Balances at December 31, 2016	$302,832	$40,521	$410,979	$(93,194)	$(343,256)	$317,882
Net earnings	—	—	14,448	—	—	14,448
Changes in fair market value of hedges, net of tax	—	—	—	110	—	110
Changes in unrealized pension cost, net of tax	—	—	—	13,687	—	13,687
Cumulative translation adjustment, net of tax	—	—	—	437	—	437
Cash dividends of $0.16 per share	—	—	(5,267)	—	—	(5,267)
Issued shares on vesting of restricted stock units	1,945	(3,549)	—	—	—	(1,604)
Stock compensation	—	4,112	—	—	—	4,112
Balances at December 31, 2017	$304,777	$41,084	$420,160	$(78,960)	$(343,256)	$343,805
Net earnings	—	—	46,532	—	—	46,532
Changes in fair market value of hedges, net of tax	—	—	—	795	—	795
Changes in unrealized pension cost, net of tax	—	—	—	(1,830)	—	(1,830)
Cumulative translation adjustment, net of tax	—	—	—	(311)	—	(311)
Cash dividends of $0.16 per share	—	—	(5,278)	—	—	(5,278)
Acquired 342,100 shares for treasury stock	—	—	—	—	(9,440)	(9,440)
Issued shares on vesting of restricted stock units	1,920	(3,389)	—	—	—	(1,469)
Implementation of ASU No. 2018-02 (see Note 1)	—	—	17,433	(17,433)	—	—
Stock compensation	—	5,125	—	—	—	5,125
Balances at December 31, 2018	$306,697	$42,820	$478,847	$(97,739)	$(352,696)	$377,929

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

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except for share and per share data)
NOTE 1 — Summary of Significant Accounting Policies
Description of Business: CTS Corporation ("CTS", "we", "our", "us" or the "Company") is a global manufacturer of sensors, electronic components, and actuators. We operate manufacturing facilities located throughout North America, Asia and Europe and service major markets globally.
CTS consists of one reportable business segment.
Principles of Consolidation: The consolidated financial statements include the accounts of CTS and its wholly-owned subsidiaries. All significant intercompany accounts and transactions have been eliminated.
Fiscal Calendar: We began using a calendar period end in 2016. Prior to that, we operated on a 4 week/ 4 week/ 5 week fiscal quarter, and each fiscal quarter ended on a Sunday that always began on January 1 and ended on December 31.
Use of Estimates: The preparation of financial statements in conformity with the accounting principles generally accepted in the United States of America ("U.S. GAAP") requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. Actual results could differ materially from those estimates.
Cash and Cash Equivalents: All highly liquid investments with maturities of three months or less at the date of purchase are considered to be cash equivalents.
Accounts Receivable and Allowance for Doubtful Accounts: Accounts receivable consists primarily of amounts due from normal business activities. We maintain an allowance for doubtful accounts for estimated uncollectible accounts receivable. Our reserves for estimated credit losses are based upon historical experience and specific customer collection issues. Accounts are written off against the allowance account when they are determined to no longer be collectible.
Concentration of Credit Risk: Financial instruments that potentially subject us to concentrations of credit risk consist of cash and cash equivalents and trade receivables. Our cash and cash equivalents, at times, may exceed federally insured limits. Cash and cash equivalents are deposited primarily in banking institutions with global operations. We have not experienced any losses in such accounts. We believe we are not exposed to any significant credit risk on cash and cash equivalents.
Trade receivables subject us to the potential for credit risk with major customers. We sell our products to customers principally in the aerospace and defense, industrial, information technology, medical, telecommunications, and transportation markets, primarily in North America, Europe, and Asia. We perform ongoing credit evaluations of our customers to minimize credit risk. We do not require collateral. The allowance for doubtful accounts is based on management's estimates of the collectability of its accounts receivable after analyzing historical bad debts, customer concentrations, customer creditworthiness, and current economic trends. Uncollectible trade receivables are charged against the allowance for doubtful accounts when all reasonable efforts to collect the amounts due have been exhausted.
Our net sales to significant customers as a percentage of total net sales were as follows:

	Years Ended December 31,		
	2018	2017	2016
Cummins Inc.	15.2%	13.4%	9.9%
Honda Motor Co.	10.5%	11.2%	10.7%
Toyota Motor Corporation	10.5%	10.2%	10.4%

We sell automotive parts to these three customers for certain vehicle platforms under purchase agreements that have no volume commitments and are subject to purchase orders issued from time to time.
No other customer accounted for 10% or more of total net sales during these periods.
Inventories: We value our inventories at the lower of the actual cost to purchase or manufacture or the net realizable value using the first-in, first-out ("FIFO") method. We review inventory quantities on hand and record a provision for

excess and obsolete inventory based on forecasts of product demand and production requirements.

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Retirement Plans: We have various defined benefit and defined contribution retirement plans. Our policy is to annually fund the defined benefit pension plans at or above the minimum required by law. We: 1) recognize the funded status of a benefit plan (measured as the difference between plan assets at fair value and the benefit obligation) in our Consolidated Balance Sheets; 2) recognize the gains or losses and prior service costs or credits that arise during the period but are not recognized as components of net periodic benefit/cost as a component of other comprehensive earnings; and 3) measure defined benefit plan assets and obligations as of the date of our fiscal year-end. See Note 6, "Retirement Plans" for further information.

Property, Plant and Equipment: Property, plant and equipment is stated at cost. Depreciation and amortization is computed primarily over the estimated useful lives of the various classes of assets using the straight-line method. Useful lives for buildings and improvements range from 10 to 45 years. Machinery and equipment useful lives range from 3 to 15 years. Depreciation on leasehold improvements is computed over the lesser of the lease term or estimated useful lives of the assets. Amounts expended for maintenance and repairs are charged to expense as incurred. Upon disposition, any related gains or losses are included in operating earnings.

Income Taxes: We account 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, we determine deferred tax assets and liabilities on the basis of the differences between the financial statement and tax bases of assets and liabilities by 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 in the period that includes the enactment date.

We recognize deferred tax assets to the extent that we believe that these assets are more-likely-than-not to be realized. In making such a determination, we consider all available positive and negative evidence, including future reversals of existing taxable temporary differences, projected future taxable income, tax-planning strategies, and results of recent operations. If we determine that we would be able to realize our deferred tax assets in the future in excess of their net recorded amount, we would make an adjustment to the deferred tax asset valuation allowance, which would reduce the provision for income taxes. In 2016, we elected to early adopt Accounting Standards Update ("ASU") No. 2015-17 "Income Taxes (Topic 740): Balance Sheet Classification of Deferred Taxes", on a retrospective basis allowing for all deferred tax items to be classified as non-current. Certain non-current deferred tax assets and non-current deferred tax liabilities were not netted since these items relate to different tax jurisdictions.

We record uncertain tax positions in accordance with Accounting Standards Codification ("ASC") Topic 740 on the basis of a two-step process in which (1) we determine whether it is more-likely-than-not that the tax positions will be sustained on the basis of the technical merits of the position and (2) for those tax positions that meet the more-likely-than-not recognition threshold, we recognize the largest amount of tax benefit that is more than 50 percent likely to be realized upon ultimate settlement with the related tax authority.

We recognize interest and penalties related to unrecognized tax benefits on the income tax expense line in the accompanying Consolidated Statements of Operations. Accrued interest and penalties are included on the related tax liability line in the Consolidated Balance Sheets.

See Note 18, "Income Taxes" for further information.

Goodwill and Indefinite-lived Intangible Assets: Goodwill represents the excess of the purchase price over the fair values of the net assets acquired in a business combination. We test the impairment of goodwill at least annually as of the first day of our fourth quarter, or more frequently if events or changes in circumstances indicate that the carrying value may not be recoverable.

In addition to goodwill, we also have acquired in-process research and development ("IPR&D") intangible assets that are treated as indefinite-lived intangible assets and therefore not subject to amortization until the completion or abandonment of the associated research and development efforts. If these efforts are abandoned in the future, the carrying value of the IPR&D asset will be expensed. If the research and development efforts are successfully completed, the IPR&D will be reclassified as a finite-lived asset and amortized over its useful life.

We have the option to perform a qualitative assessment (commonly referred to as "step zero" test) to determine whether further quantitative analysis for impairment of goodwill and indefinite-lived intangible assets is necessary. The qualitative assessment includes a review of macroeconomic conditions, industry and market considerations, internal cost factors, and our own overall financial and share price performance, among other factors. If, after assessing the totality of events or circumstances, we determine that it is not more-likely-than-not that the fair value of a reporting unit is less than its carrying amount, we do not need to perform a quantitative analysis.

We completed our annual impairment test during 2018 by performing a qualitative assessment and determined that our goodwill was not impaired as of the measurement date. We have not recorded any impairment of goodwill or other indefinite-lived intangible assets in the years ended December 31, 2018, 2017 and 2016.

Other Intangible Assets and Long-lived Assets: We account for long-lived assets (excluding indefinite-lived intangible assets) in accordance with the provisions of ASC 360. This statement requires that long-lived assets, which includes fixed assets and finite-lived intangible assets, be reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. If an impairment test is warranted, recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset to the sum of the undiscounted cash flows expected to result from the use and the eventual disposition of the asset. If such assets are considered to be impaired, the impairment to be recognized is measured by the amount in which the carrying amount of the assets exceeds the fair value of the assets. Assets to be disposed of are reported at the lower of the carrying amount or fair value less costs to sell.

Intangible assets (excluding indefinite-lived intangible assets) consist primarily of technology, customer lists and relationships, patents, and trade names. These assets are recorded at cost and usually amortized on a straight-line basis over their estimated lives. We assess useful lives based on the period over which the asset is expected to contribute to cash flows.

Revenue Recognition: Beginning in January 2018, CTS adopted the provisions ASU No. 2014-09, "Revenue from Contracts with Customers (Topic 606)". Product revenue is recognized upon the transfer of promised goods to a customer in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods. We follow the five step model to determine when this transfer has occurred: 1) identify the contract(s) with the customer; 2) identify the performance obligations in the contract; 3) determine the transaction price; 4) allocate the transaction price to the performance obligations in the contract; 5) recognize revenue when (or as) the entity satisfies a performance obligation.

Prior to January 1, 2018, product revenue was recognized once four criteria were met: 1) we have persuasive evidence that an arrangement exists; 2) delivery has occurred and title has passed to the customer, which generally happens at the point of shipment provided that no significant obligations remain; 3) the price is fixed and determinable; and 4) collectability is reasonably assured.

Research and Development: Research and development ("R&D") costs include expenditures for search and investigation aimed at discovery of new knowledge to be used to develop new products or processes or to significantly enhance existing products or production processes. R&D costs also include the implementation of new knowledge through design, testing of product alternatives, or construction of prototypes. We expense all R&D costs as incurred, net of customer reimbursements for sales of prototypes and non-recurring engineering charges.

We create prototypes and tools related to R&D projects. A prototype is defined as a constructed product not intended for production resulting in a commercial sale. We also incur engineering costs related to R&D activities. Such costs are incurred to support such activities to improve the reliability, performance and cost-effectiveness of our existing products and to design and develop innovative products that meet customer requirements for new applications. Furthermore, we may engage in activities that develop tooling machinery and equipment for our customers.

We occasionally enter into agreements with our customers whereby we receive a contractual guarantee to be reimbursed the costs we incur to construct molds, dies, and other tools that are used to make many of the products we sell. The costs we incur are included in other current assets on the Consolidated Balance Sheets until reimbursement is received from the customer. Reimbursements received from customers are netted against such costs and included in our Consolidated Statements of Earnings if the amount received is in excess of the costs that we incur. The following is a summary of amounts to be received from customers as of December 31, 2018 and 2017:

	December 31,	
	2018	2017
Cost of molds, dies and other tools included in other current assets	$5,388	$3,382

The following is a summary of amounts received from customers for molds, dies, and other tools during the years ended December 31, 2018 and 2017:

	Years Ended December 31,	
	2018	2017
Reimbursements received from customers	$4,483	$4,299

Financial Instruments: We use forward contracts to mitigate currency risk related to forecasted foreign currency revenue and costs. These forward contracts are designed as cash flow hedges. At least quarterly, we assess the effectiveness of these hedging relationships based on the total change in their fair value using regression analysis. In addition, we use interest rate swaps to convert a portion of our revolving credit facility's variable rate of interest into a fixed rate. As a result of the use of these derivative instruments, the Company is exposed to the risk that counterparties to derivative contracts will fail to meet their contractual obligations. To mitigate the counterparty credit risk, the Company has a policy of only entering into contracts with carefully selected major financial institutions based upon their credit ratings and other factors and by using netting agreements. Our

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established policies and procedures for mitigating credit risk on principal transactions include reviewing and establishing limits for credit exposure and continually assessing the creditworthiness of counterparties.

We estimate the fair value of our financial instruments as follows:

Instrument	Method for determining fair value
Cash, cash equivalents, accounts receivable and accounts payable	Cost, approximates fair value due to the short-term nature of these instruments.
Revolving credit facility	The fair value of long-term debt approximates carrying value and was determined by valuing a similar hypothetical coupon bond and attributing that value to our credit facility.
Interest rate swaps and forward contracts	The fair value of our interest rate swaps and forward contracts are measured using a market approach which uses current industry information.

Debt Issuance Costs: We have debt issuance costs related to our long-term debt that are being amortized using the straight-line method over the life of the debt.

Stock-Based Compensation: We recognize expense related to the fair value of stock-based compensation awards, consisting of restricted stock units ("RSUs"), cash-settled restricted stock units, and stock options, in the Consolidated Statements of Earnings.

We estimate the fair value of stock option awards on the date of grant using the Black-Scholes option pricing model. A number of assumptions are used by the Black-Scholes option pricing model to compute the grant date fair value of an award, including expected price volatility, option term, risk-free interest rate, and dividend yield. These assumptions are established at each grant date based upon current information at that time. Expected volatilities are based on historical volatilities of CTS' common stock. The expected option term is derived from historical data of exercise behavior. Actual option terms can differ from the expected option terms as a result of different groups of employees exhibiting different exercise behavior. The dividend yield is based on historical dividend payments. The risk-free rate for periods within the contractual life of the option is based on the U.S. Treasury yield curve at the time of grant. The fair value of awards that are ultimately expected to vest is recognized as expense over the requisite service periods of the awards in the Consolidated Statements of Earnings.

The grant date fair values of our service-based and performance-based RSUs are the closing price of our common stock on the date of grant. The grant date fair value of our market-based RSUs is determined by using a simulation, or Monte Carlo, approach. Under this approach, stock returns from a comparative group of companies are simulated over the performance period, considering both stock price volatility and the correlation of returns. The simulated results are then used to estimate the future payout based on the performance and payout relationship established by the conditions of the award. The future payout is discounted to the measurement date using the risk-free interest rate.

Both our stock option and RSU awards primarily have a graded vesting schedule. We recognize expense on a straight-line basis over the requisite service period for each separately vesting portion of the award as if the award was, in substance, multiple awards. See Note 16, "Stock-Based Compensation" for further information.

In 2016, we elected to early adopt the provisions of ASU No. 2016-09 "Compensation-Stock Compensation (Topic 718): Improvement to Employee Share based Payment Accounting". Pursuant to this adoption, we recorded excess tax benefits within income tax expense for the year ended December 31, 2016, where previously these were recorded as increases or decreases to additional contributed capital. In addition, we have elected to account for forfeitures of awards as they occur. Both of these changes have been applied prospectively, and therefore no adjustments were made to prior periods. In accordance with the guidance, we retrospectively reported cash paid on behalf of employees for withholding shares for tax-withholding purposes as a financing activity in the Consolidated Statements of Cash Flows. Additionally, excess tax benefits were classified as an operating activity, applied prospectively. Adoption of this ASU did not result in a material change in our earnings, cash flows, or financial position.

Earnings Per Share: Basic earnings per share excludes any dilution and is computed by dividing net earnings available to common shareholders by the weighted-average number of common shares outstanding for the period.

Diluted earnings per share reflects the potential dilution that could occur if dilutive securities, such as stock options and unvested restricted stock units, were exercised or resulted in the issuance of common stock. Diluted earnings per share is calculated by adding all potentially dilutive shares to the weighted average number of common shares outstanding for the denominator. If the common stock equivalents have an anti-dilutive effect, they are excluded from the computation of diluted earnings per share.

Our antidilutive stock options and RSUs consist of the following:

	Years Ended December 31,		
(units)	2018	2017	2016
Antidilutive stock options and RSUs	18,138	22,110	35,189

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Foreign Currencies: The financial statements of our non-U.S. subsidiaries, except the United Kingdom ("U.K.") subsidiary, are remeasured into U.S. dollars using the U.S. dollar as the functional currency with all remeasurement adjustments included in the determination of net earnings.

Foreign currency gains (losses) recorded in the Consolidated Statement of Earnings includes the following:

	Years Ended December 31,		
	2018	2017	2016
Foreign currency (losses) gains	$(2,619)	$3,052	$(3,714)

The assets and liabilities of our U.K. subsidiary are translated into U.S. dollars at the current exchange rate at period end, with the resulting translation adjustments made directly to the "accumulated other comprehensive loss" component of shareholders' equity. Our Consolidated Statement of Earnings accounts are translated at the average rates during the period.

Shipping and Handling: All fees billed to the customer for shipping and handling are classified as a component of net sales. All costs associated with shipping and handling are classified as a component of cost of goods sold or operating expenses, depending on the nature of the underlying purchase.

Sales Taxes: When applicable, we classify sales taxes on a net basis in our consolidated financial statements.

Subsequent Events: We have evaluated subsequent events and transactions for potential recognition or disclosure in the financial statements through the date the financial statements are issued.

On February 7, 2019, the Board of Directors authorized a new stock repurchase program with a maximum dollar limit of $25 million and no set expiration date. This new program replaces the previous program that was approved in April 2015.

On February 12, 2019, CTS entered into an amended and restated five-year Credit Agreement with a group of banks (the “Credit Agreement”). The Credit Agreement provides for a revolving credit facility of $300 million, which may be increased by $150 million at the request of the Company, subject to the administrative agent’s approval. This new unsecured credit facility replaces the prior $300 million unsecured credit facility, which would have expired August 10, 2020. Borrowings of $50 million under the prior credit agreement were refinanced into the Credit Agreement and the prior agreement was terminated as of February 12, 2019.

Changes in Accounting Principles: Beginning in January 2018, CTS adopted the provisions of ASU No. 2014-09, "Revenue from Contracts with Customers (Topic 606)" under the modified retrospective method, which requires a cumulative effect adjustment to the opening balance of retained earnings on the date of adoption. This approach was applied to contracts not completed as of December 31, 2017. At date of adoption, there was no significant change to our past revenue recognition practices and therefore no adjustment to the opening balance of retained earnings was required.

Beginning in April 2018, CTS elected to adopt the provisions of ASU No. 2017-12 "Derivatives and Hedging (Topic 815): Target Improvements to Accounting for Hedging Activities" under the modified retrospective method, which may require a cumulative effect adjustment to the opening balance of retained earnings. Prior to adoption, the company measured hedge effectiveness for all cash flow hedges quarterly and recognized any ineffectiveness in earnings in the current period. Upon adoption the company elected to review hedge effectiveness qualitatively as described further in Note 13 - Derivatives. At the date of adoption there was no significant hedge ineffectiveness recorded in earnings for hedged assets existing as of January 1, 2018, and therefore no adjustment to the opening balance of retained earnings was required.

In 2018, CTS adopted the provision of ASU No. 2018-02 "Income Statement - Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income". This ASU allows for the reclassification from Accumulated Other Comprehensive Income ("AOCI") to retained earnings for the stranded tax effects resulting from the Tax Cuts and Jobs Act that was enacted in December 2017. The total impact due to adoption of this standard was an increase in retained earnings of $17,433.

Change in Estimate: Beginning in January 2017, we changed the method we use to calculate the service and interest cost components of net periodic benefit cost for our U.S. pension and other post-retirement benefit plans. Previously, we calculated the service and interest cost components using a single weighted-average discount rate derived from the yield curve to measure the benefit obligation at the beginning of the period. In 2017, we began using a full yield curve approach in the estimation of these components of benefit cost by applying the specific spot-rates along the yield curve to the relevant projected cash flows. This approach better aligns each of the projected benefit cash flows to the corresponding spot rates on the yield curve, resulting in a more precise measurement of service and interest costs. The change in method resulted in a decrease in the service and interest components of pension costs in 2017. Any decrease to these components as a result of adoption of this approach is equally offset

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by a decrease in the actuarial losses included in our accumulated other comprehensive loss, with no impact on the measurement of the benefit obligation. This change is accounted for prospectively as a change in accounting estimate.

Reclassifications: Certain reclassifications have been made to prior year amounts to conform to the current year presentation. The reclassifications had no impact on previously reported net earnings.

Recently Issued Accounting Pronouncements

ASU No. 2018-14 "Compensation - Retirement Benefits - Defined Benefit Plans - General"

In August 2018, the Financial Accounting Standards Board ("FASB") issued ASU No. 2018-14, "Compensation - Retirement Benefits - Defined Benefit Plans - General." This ASU modifies the disclosure requirements for defined benefit and other postretirement plans. This ASU eliminates certain disclosures associated with accumulated other comprehensive income, plan assets, related parties, and the effects of interest rate basis point changes on assumed health care costs; while other disclosures have been added to address significant gains and losses related to changes in benefit obligations. This ASU also clarifies disclosure requirements for projected benefit and accumulated benefit obligations. The amendments in this ASU are effective for fiscal years ending after December 15, 2020 and for interim periods therein with early adoption permitted. Adoption on a retrospective basis for all periods presented is required. This ASU will impact our financial statement disclosures but will not have an impact on our consolidated financial position, results of operations, or cash flows.

ASU No. 2018-13 "Fair Value Measurement (Topic 820): Disclosure Framework-Changes to the Disclosure Requirements for Fair Value Measurement"

In August 2018, the FASB issued ASU No. 2018-13 "Fair Value Measurement (Topic 820): Disclosure Framework-Changes to the Disclosure Requirements for Fair Value Measurement". This ASU modified the disclosures related to recurring and nonrecurring fair value measurements. Disclosures related to the transfer of assets between Level 1 and Level 2 hierarchies have been eliminated and various additional disclosures related to Level 3 fair value measurements have been added, modified or removed. This ASU is effective for annual periods beginning after December 15, 2019, and interim periods within those fiscal years. Early adoption is permitted upon issuance of the standard for modified or removed disclosures, with a delay in adoption for the additional required disclosures until their effective date. This ASU is not expected to have a significant impact on our financial statement disclosures.

ASU No. 2016-16 "Income Taxes (Topic 740) Intra-Entity Transfers of Assets Other Than Inventory"

In October 2016, the FASB issued ASU No. 2016-16, "Intra-Entity Transfers of Assets Other Than Inventory". This ASU is meant to improve the accounting for the income tax effect of intra-entity transfers of assets other than inventory. Currently, U.S. GAAP prohibits the recognition of current and deferred income taxes for intra-entity asset transfers until the asset is sold to a third party. This ASU will now require companies to recognize the income tax effect of an intra-entity asset transfer (other than inventory) when the transaction occurs. This ASU is effective for public companies in fiscal years beginning after December 15, 2019 and interim periods within those annual reporting periods. Early adoption is permitted and is to be applied on a modified retrospective bases through a cumulative-effect adjustment to retained earnings as of the beginning of the period of adoption. This guidance is not expected to have a material impact on our consolidated financial statements.

ASU No. 2016-02 "Leases (Topic 842)"

In February 2016, the FASB issued ASU 2016-02, "Leases (Topic 842)", which requires companies to record almost all leases on the balance sheet as a lease liability with a corresponding right of use asset. The lease liability is based on the present value of minimum lease payments discounted using our secured incremental borrowing rate at the date of adoption. Existing deferred rent liability balances, resulting from historical straight-lining of operating leases, will be reclassified upon adoption to reduce the measurement of the lease assets, causing a difference between the lease liability and asset.

The majority of our leases are operating leases where expense will be recognized in the consolidated statement of income in a manner similar to current accounting guidance. Accounting for finance leases requires amortization of the right-of-use asset and an interest expense component, similar to the prior account for capital leases. Lessor accounting under the new standard is substantially unchanged.

We will adopt the new standard effective January 1, 2019, and intend to elect the optional transition method that allows us to recognize a cumulative effect adjustment to the opening balance of retained earnings on the date of adoption, if necessary, without adjusting the comparative periods presented. We have elected the package of practical expedients permitted under the transition guidance, which among other things, allows us to carry forward the historical accounting relating to lease identification and classification for existing leases upon adoption. We have also elected the practical expedient to not separate lease and non-lease

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components for the majority of our leases and the election to keep leases with an initial term of 12 months or less off of the consolidated balance sheet.
We have assessed the impact of the new standard and have concluded it will not have a material effect on our results from operations or cash flows. However it will materially impact our financial position by increasing lease assets and liabilities. We have estimated our lease liability to be in the range of $24-$28 million and expect our lease asset to be lower than the lease liability by approximately $3 million as a result of our existing deferred rent liability balances. We do not expect any adjustment to the opening balance of retained earnings. We will include the impact of the new standard and the additional required disclosures beginning with our Form 10-Q for the first quarter of 2019.
NOTE 2 – Revenue Recognition

The core principle of ASC 606 is that an entity should recognize revenue to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. The guidance provides a five-step process to achieve that core principle:

- Identify the contract(s) with a customer
- Identify the performance obligations
- Determine the transaction price
- Allocate the transaction price
- Recognize revenue when the performance obligations are met

We recognize revenue when the performance obligations specified in our contracts have been satisfied, after considering the impact of variable consideration and other factors that may affect the transaction price. Our contracts normally contain a single performance obligation that is fulfilled on the date of delivery based on shipping terms stipulated in the contract. We usually expect payment within 30 to 90 days from the shipping date, depending on our terms with the customer. None of our contracts as of December 31, 2018, contained a significant financing component. Differences between the amount of revenue recognized and the amount invoiced, collected from, or paid to our customers are recognized as contract assets or liabilities. Contract assets will be reviewed for impairment when events or circumstances indicate that they may not be recoverable.

To the extent the transaction price includes variable consideration, we estimate the amount of variable consideration that should be included in the transaction price utilizing the most likely amount method based on an analysis of historical experience and current facts and circumstances, which requires significant judgment. Variable consideration is included in the transaction price if, in our judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur.

Contract Assets and Liabilities

Contract assets and liabilities included in our Condensed Consolidated Balance Sheets are as follows:

	As of December 31, 2018	December 31, 2017
Contract Assets		
Prepaid rebates included in Other current assets	$65	$ 52
Prepaid rebates included in Other assets	999	465
Total Contract Assets	$1,064	$ 517
Contract Liabilities		
Customer discounts and price concessions included in Accrued liabilities	$(1,656)	$(1,133)

Customer rights of return included in Accrued liabilities	(325)	(462)
Total Contract Liabilities	$ (1,981)	$ (1,595)

During the three and twelve months ended December 31, 2018, we recognized a decrease of revenues of $46 and an increase of $22, respectively, that were included in contract liabilities at the beginning of the period.

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The increase in contract liabilities as of December 31, 2018 is primarily due to net increases in estimated future discounts and price concessions, offset by net settlements of products sold with rights of return.

Disaggregated Revenue

The following table presents revenues disaggregated by the major markets we serve:

	Three Months Ended		Twelve Months Ended	
	December 31, 2018	December 31, 2017	December 31, 2018	December 31, 2017
Transportation	$76,729	$ 71,566	$300,124	$ 275,251
Industrial	21,164	19,537	86,968	74,605
Medical	11,370	10,474	40,663	35,264
Aerospace & Defense	6,504	4,978	23,323	18,813
Telecom & IT	4,306	4,355	19,405	19,060
Total	$120,073	$ 110,910	$470,483	$ 422,993

NOTE 3 — Accounts Receivable

The components of accounts receivable are as follows:

	As of December 31,	
	2018	2017
Accounts receivable, gross	$79,902	$70,941
Less: Allowance for doubtful accounts	(384)	(357)
Accounts receivable, net	$79,518	$70,584

NOTE 4 — Inventories

Inventories consist of the following:

	As of December 31,	
	2018	2017
Finished goods	$10,995	$9,203
Work-in-process	12,129	12,065
Raw materials	25,746	21,150
Less: Inventory reserves	(5,384)	(5,822)
Inventories, net	$43,486	$36,596

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NOTE 5 — Property, Plant and Equipment

Property, plant and equipment is comprised of the following:

	As of December 31,	
	2018	2017
Land	$1,136	$1,130
Buildings and improvements	70,522	64,201
Machinery and equipment	231,619	223,650
Less: Accumulated depreciation	(203,876)	(200,734)
Property, plant and equipment, net	$99,401	$88,247

Depreciation expense recorded in the Consolidated Statements of Earnings includes the following:

	For the Years Ended		
	2018	2017	2016
Depreciation expense	$15,697	$14,071	$13,177

NOTE 6 — Retirement Plans

We have a number of noncontributory defined benefit pension plans ("pension plans") covering approximately 1% of our active employees. Pension plans covering salaried employees provide pension benefits that are based on the employees´ years of service and compensation prior to retirement. Pension plans covering hourly employees generally provide benefits of stated amounts for each year of service.

We also provide post-retirement life insurance benefits for certain retired employees. Domestic employees who were hired prior to 1982 and certain domestic union employees are eligible for life insurance benefits upon retirement. We fund life insurance benefits through term life insurance policies and intend to continue funding all of the premiums on a pay-as-you-go basis.

We recognize the funded status of a benefit plan in our consolidated balance sheets. The funded status is measured as the difference between plan assets at fair value and the projected benefit obligation. We also recognize, as a component of other comprehensive income, net of tax, the gains or losses and prior service costs or credits that arise during the period but are not recognized as components of net periodic benefit/cost.

The measurement dates for the pension plans for our U.S. and non-U.S. locations were December 31, 2018, and 2017. During 2017, we offered certain former vested employees in our U.S. pension plan a one-time option to receive a lump sum distribution of their benefits from pension plan assets. The pension plan made approximately $23,912 in lump sum payments to settle its obligation to these participants. These settlement payments decreased the projected benefit obligation and plan assets by $23,912, and resulted in a non-cash settlement charge of $13,476 related to unrecognized net actuarial losses that were previously included in accumulated other comprehensive loss. The measurement date of this settlement was December 31, 2017.

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The following table provides a reconciliation of benefit obligation, plan assets, and the funded status of the pension plans for U.S. and non-U.S. locations at the measurement dates.

	U.S. Pension Plans		Non-U.S. Pension Plans	
	2018	2017	2018	2017
Accumulated benefit obligation	$205,319	$228,934	$1,936	$2,535
Change in projected benefit obligation:				
Projected benefit obligation at January 1	$228,934	$247,276	$3,140	$2,866
Service cost	—	—	43	48
Interest cost	7,123	8,273	42	34
Benefits paid	(14,781)	(39,177)	(669)	(210)
Actuarial (gain) loss	(15,957)	12,562	287	164
Foreign exchange impact	—	—	(87)	238
Projected benefit obligation at December 31	$205,319	$228,934	$2,756	$3,140
Change in plan assets:				
Assets at fair value at January 1	$284,762	$292,044	$1,777	$1,523
Actual return on assets	(11,757)	31,559	67	17
Company contributions	103	336	300	319
Benefits paid	(14,781)	(39,177)	(669)	(210)
Foreign exchange impact	—	—	(50)	128
Assets at fair value at December 31	$258,327	$284,762	$1,425	$1,777
Funded status (plan assets less projected benefit obligations)	$53,008	$55,828	$(1,331)	$(1,363)

The measurement dates for the post-retirement life insurance plan were December 31, 2018, and 2017. The following table provides a reconciliation of benefit obligation, plan assets, and the funded status of the post-retirement life insurance plan at those measurement dates.

	Post-Retirement Life Insurance Plan	
	2018	2017
Accumulated benefit obligation	$4,595	$5,134
Change in projected benefit obligation:		
Projected benefit obligation at January 1	$5,134	$4,952
Service cost	2	2
Interest cost	156	161
Benefits paid	(157)	(165)
Actuarial loss	(540)	184
Projected benefit obligation at December 31	$4,595	$5,134
Change in plan assets:		
Assets at fair value at January 1	$—	$—
Actual return on assets	—	—
Company contributions	157	165
Benefits paid	(157)	(165)
Other	—	—
Assets at fair value at December 31	$—	$—
Funded status (plan assets less projected benefit obligations)	$(4,595)	$(5,134)

The components of the prepaid (accrued) cost of the domestic and foreign pension plans are classified in the following lines in the Consolidated Balance Sheets at December 31:

	U.S.Pension Plans	Non-U.S. Pension Plans

	2018	2017	2018	2017
Prepaid pension asset	$54,100	$57,050	$—	$—
Accrued expenses and other liabilities	(100)	(100)	—	—
Long-term pension obligations	(992)	(1,122)	(1,331)	(1,363)
Net prepaid (accrued) cost	$53,008	$55,828	$(1,331)	$(1,363)

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The components of the accrued cost of the post-retirement life insurance plan are classified in the following lines in the Consolidated Balance Sheets at December 31:

	Post-Retirement Life Insurance Plan	
	2018	2017
Accrued expenses and other liabilities	$(407)	$(418)
Long-term pension obligations	(4,188)	(4,716)
Total accrued cost	$(4,595)	$(5,134)

We have also recorded the following amounts to accumulated other comprehensive loss for the U.S. and non-U.S. pension plans, net of tax:

	U.S.Pension Plans Unrecognized Loss	Non-U.S. Pension Plans Unrecognized Loss
Balance at January 1, 2017	$ 89,763	$ 1,743
Amortization of retirement benefits, net of tax	(3,685)	10
Settlements	(8,585)	—
Net actuarial (loss) gain	(1,753)	2
Foreign exchange impact	—	143
Balance at January 1, 2018	$ 75,740	$ 1,898
Amortization of retirement benefits, net of tax	(4,538)	(126)
Settlements	19,083	—
Net actuarial (loss) gain	(12,351)	196
Foreign exchange impact	—	(52)
Tax impact due to implementation of ASU 2018-02	17,560	—
Balance at December 31, 2018	$ 95,494	$ 1,916

We have recorded the following amounts to accumulated other comprehensive loss for the post-retirement life insurance plan, net of tax:

	Unrecognized Gain
Balance at January 1, 2017	$ (560)
Amortization of retirement benefits, net of tax	64
Net actuarial gain	117
Balance at January 1, 2018	$ (379)
Amortization of retirement benefits, net of tax	36
Net actuarial loss	(418)
Tax impact due to implementation of ASU No. 2018-02	(88)
Balance at December 31, 2018	$ (849)

The accumulated actuarial gains and losses and prior service costs and credits included in other comprehensive income are amortized in the following manner:

The component of unamortized net gains or losses related to our qualified pension plans is amortized based on the expected future life expectancy of the plan participants (estimated to be approximately 17 years at December 31, 2018), because substantially all of the participants in those plans are inactive. The component of unamortized net gains or losses related to our post-retirement life insurance plan is amortized based on the estimated remaining future service period of the plan participants (estimated to be approximately 4 years at December 31, 2018). The Company uses a market-related approach to value plan assets, reflecting changes in the fair value of plan assets over a five-year

period. The variance resulting from the difference between the expected and actual return on plan assets is included in the amortization calculation upon reflection in the market-related value of plan assets.
In 2019, we expect to recognize approximately $5,270 and $0 of pre-tax losses included in accumulated other comprehensive loss related to our pension plans and post-retirement life insurance plan, respectively.

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The projected benefit obligation, accumulated benefit obligation and fair value of plan assets for those Pension Plans with accumulated benefit obligation in excess of fair value of plan assets is shown below:

	As of December 31,	
	2018	2017
Projected benefit obligation	$3,848	$4,361
Accumulated benefit obligation	$3,028	$3,757
Fair value of plan assets	$1,426	$1,776

Net pension expense (income) includes the following components:

	Years Ended December 31, U.S. Pension Plans			Years Ended December 31, Non-U.S. Pension Plans		
	2018	2017	2016	2018	2017	2016
Service cost	$—	$—	$87	$43	$48	$51
Interest cost	7,123	8,273	11,024	42	34	46
Expected return on plan assets[1]	(12,898)	(16,243)	(18,976)	(25)	(20)	(26)
Amortization of unrecognized loss	5,863	5,785	5,994	162	155	140
Settlement loss	—	13,476	—	—	—	—
Net expense (income)	$88	$11,291	$(1,871)	$222	$217	$211
Weighted-average actuarial assumptions[2]						
Benefit obligation assumptions:						
Discount rate	4.30%	3.63%	4.16%	1.13%	1.38%	1.13%
Rate of compensation increase	0.00%	0.00%	0.00%	3.00%	2.00%	2.00%
Pension income/expense assumptions:						
Discount rate	3.63%	4.16%	4.43%	1.38%	1.13%	1.63%
Expected return on plan assets[1]	4.72%	5.61%	6.63%	1.38%	1.13%	1.63%
Rate of compensation increase	0.00%	0.00%	0.00%	2.00%	2.00%	2.00%

(1) Expected return on plan assets is net of expected investment expenses and certain administrative expenses.

(2) During the fourth quarter of each year, we review our actuarial assumptions in light of current economic factors to determine if the assumptions need to be adjusted.

Net post-retirement expense includes the following components:

	Post-Retirement Life Insurance Plan Years Ended December 31,		
	2018	2017	2016
Service cost	$2	$2	$3
Interest cost	156	161	207
Amortization of unrecognized gain	(46)	(101)	(149)
Net expense	$112	$62	$61
Weighted-average actuarial assumptions [1]			
Benefit obligation assumptions:			
Discount rate	4.26%	3.59%	4.10%
Rate of compensation increase	0%	0%	0%
Pension income/post-retirement expense assumptions:			
Discount rate	3.59%	4.10%	4.43%
Rate of compensation increase	0%	0%	0%

(1)

During the fourth quarter of each year, we review our actuarial assumptions in light of current economic factors to determine if the assumptions need to be adjusted.

The discount rate utilized to estimate our pension and post-retirement obligations is based on market conditions at December 31, 2018, and is determined using a model consisting of high quality bond portfolios that match cash flows of the plans' projected benefit payments based on the plan participants' service to date and their expected future compensation. Use of the rate produced

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by this model generates a projected benefit obligation that equals the current market value of a portfolio of high quality bonds whose maturity dates match the timing and amount of expected future benefit payments.

The discount rate used to determine 2018 pension and post-retirement expense is based on market conditions at December 31, 2017, and is the interest rate used to estimate interest incurred on the outstanding projected benefit obligations during the period.

We utilize a building block approach in determining the long-term rate of return for plan assets. Historical markets are reviewed and long-term relationships between equities and fixed-income are preserved consistent with the generally accepted capital market principle that assets with higher volatility generate a greater return over the long term. Current market factors such as inflation and interest rates are evaluated before long-term capital market assumptions are determined. The long-term portfolio return is established via a building block approach with proper consideration of diversification and rebalancing. Peer data and historical returns are reviewed to ensure for reasonableness and appropriateness.

Our pension plan asset allocation at December 31, 2018, and 2017, and target allocation for 2019 by asset category are as follows:

	Target Allocations	Percentage of Plan Assets at December 31,	
Asset Category	2019	2018	2017
Equity securities	13%	12%	11%
Debt securities	83%	84%	82%
Other	4%	4%	7%
Total	100%	100%	100%

We employ a liability-driven investment strategy whereby a mix of equity and fixed-income investments are used to pursue a de-risking strategy which over time seeks to reduce interest rate mismatch risk and other risks while achieving a return that matches or exceeds the growth in projected pension plan liabilities. Risk tolerance is established through careful consideration of plan liabilities and funded status. The investment portfolio primarily contains a diversified mix of equity and fixed-income investments. Other assets such as private equity are used modestly to enhance long-term returns while improving portfolio diversification. Investment risk is measured and monitored on an ongoing basis through quarterly investment portfolio reviews, annual liability measurements, and asset/liability studies at regular intervals.

The following table summarizes the fair values of our pension plan assets:

	As of December 31,	
	2018	2017
Equity securities - U.S. holdings(1)	$20,469	$19,487
Equity securities - non-U.S. holdings(1)	—	1,131
Equity funds - U.S. holdings(1) (8)	54	1,314
Bond funds - government(5) (8)	19,146	3,126
Bond funds - other(6) (8)	202,393	231,710
Real estate(7) (8)	2,652	1,235
Cash and cash equivalents(2)	5,866	11,145
Partnerships(4)	9,172	10,787
International hedge funds(3)	—	6,604
Total fair value of plan assets	$259,752	$286,539

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The fair values at December 31, 2018, are classified within the following categories in the fair value hierarchy:

	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Leveled	Total
Equity securities - U.S. holdings(1)	$ 20,469	$ —	$ —	$—	$ 20,469
Equity funds - U.S. holdings(1) (8)	—	—	—	54	54
Bond funds - government(5)	—	—	—	19,146	19,146
Bond funds - other(6) (8)	—	—	—	202,393	202,393
Real estate(7) (8)	—	—	—	2,652	2,652
Cash and cash equivalents(2)	5,866	—	—	—	5,866
Partnerships(4)	—	—	9,172	—	9,172
Total	$ 26,335	$ —	$ 9,172	$ 224,245	$ 259,752

The fair values at December 31, 2017, are classified within the following categories in the fair value hierarchy:

	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Leveled	Total
Equity securities - U.S. holdings(1)	$ 19,487	$ —	$ —	$—	$ 19,487
Equity securities - non-U.S. holdings(1)	1,131	—	—	—	1,131
Equity funds - U.S.holdings(1) (8)	—	—	—	1,314	1,314
Bond funds - government(5) (8)	—	—	—	3,126	3,126
Bond funds - other(6) (8)	—	—	—	231,710	231,710
Real estate(7) (8)	—	—	—	1,235	1,235
Cash and cash equivalents(2)	11,145	—	—	—	11,145
Partnerships(4)	—	—	10,787	—	10,787
International hedge funds(3) (8)	—	—	—	6,604	6,604
Total	$ 31,763	$ —	$ 10,787	$ 243,989	$ 286,539

(1) Comprised of common stocks of companies in various industries. The Pension Plan fund manager may shift investments from value to growth strategies or vice-versa, from small cap to large cap stocks or vice-versa, in order to meet the Pension Plan's investment objectives, which are to provide for a reasonable amount of long-term growth of capital without undue exposure to volatility, and protect the assets from erosion of purchasing power.

(2) Comprised of investment grade short-term investment and money-market funds.

(3) This fund allocates its capital across several direct hedge fund organizations. This fund invests with hedge funds that employ "non-directional" strategies. These strategies do not require the direction of the markets to generate returns. The majority of these hedge funds generate returns by the occurrence of key events such as bankruptcies, mergers, spin-offs, etc. Investments can be redeemed at the share Net Asset Value ("NAV") as of the last business day of each calendar quarter with at least a sixty-five day prior written notice to the administrator.

(4) Comprised of partnerships that invest in various U.S. and international industries.

(5) Comprised of long-term government bonds with a minimum maturity of 10 years and zero-coupon Treasury securities ("Treasury Strips") with maturities greater than 20 years.

(6) Comprised predominately of investment grade U.S. corporate bonds with maturities greater than 10 years and U.S. high-yield corporate bonds; emerging market debt (local currency sovereign bonds, U.S. dollar-denominated sovereign bonds and U.S. dollar-denominated corporate bonds); and U.S. bank loans.

(7) Comprised of investments in securities of U.S. and non-U.S. real estate investment trusts (REITs), real estate operating companies and other companies that are principally engaged in the real estate industry and of investments in global private direct commercial real estate. Investments can be redeemed immediately following

the valuation date with a notice of at least fifteen business days before valuation.

(8) Comprised of investments that are measured at fair value using the NAV per share practical expedient. In accordance with the provisions of ASC 820-10, these investments have not been classified in the fair value hierarchy. The fair value amount not leveled is presented to allow reconciliation of the fair value hierarchy to total fund pension plan assets.

The pension plan assets recorded at fair value are measured and classified in a hierarchy for disclosure purposes consisting of three levels based on the observability of inputs available in the marketplace used to measure fair value as discussed below:

- Level 1: Fair value measurements that are based on quoted prices (unadjusted) in active markets that the pension plan trustees have the ability to access for identical assets or liabilities. Market price data generally is obtained from exchange or dealer markets.
- Level 2: Fair value measurements based on inputs other than quoted prices included in Level 1 that are observable for the asset, either directly or indirectly. Level 2 inputs include quoted prices for similar assets in active or inactive markets, and inputs other than quoted prices that are observable for the asset, such as interest rates and yield curves that are observable at commonly quoted intervals.
- Level 3: Fair value measurements based on valuation techniques that use significant inputs that are unobservable.

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The table below reconciles the Level 3 partnership assets within the fair value hierarchy:

	Amount
Fair value of Level 3 partnership assets at January 1, 2017	$12,862
Capital contributions	343
Realized and unrealized gain	2,107
Capital distributions	(4,525)
Fair value of Level 3 partnership assets at December 31, 2017	10,787
Capital contributions	78
Realized and unrealized gain	1,154
Capital distributions	(2,847)
Fair value of Level 3 partnership assets at December 31, 2018	$9,172

The partnership fund manager uses a market approach in estimating the fair value of the plan's Level 3 asset. The market approach estimates fair value by first determining the entity's earnings before interest, taxes, depreciation and amortization and then multiplying that value by an estimated multiple. When establishing an appropriate multiple, the fund manager considers recent comparable private company transactions and multiples paid. The entity's net debt is then subtracted from the calculated amount to arrive at an estimated fair value for the entity.

We expect to make $100 of contributions to the U.S. plans and $271 of contributions to the non-U.S. plans during 2019.

The following benefit payments, which reflect expected future service, as appropriate, are expected to be paid:

	U.S. Pension Plans	Non-U.S. Pension Plans	Post-Retirement Life Insurance Plan
2019	$15,537	$ 52	$ 407
2020	15,519	57	393
2021	15,409	66	379
2022	15,226	91	365
2023	14,988	82	351
2024-2027	70,462	658	1,551
Total	$147,141	$ 1,006	$ 3,446

Defined Contribution Plans

We sponsor a 401(k) plan that covers substantially all of our U.S. employees. Contributions and costs are generally determined as a percentage of the covered employee's annual salary.

Expenses related to defined contribution plans include the following:

	Years Ended December 31,		
	2018	2017	2016
401(k) and other plan expense	$3,256	$3,141	$2,841

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NOTE 7 — Goodwill and Other Intangible Assets

We evaluate finite-lived intangible assets for impairment if indicators of impairment exist. No indicators were identified for the years ended December 31, 2018, or December 31, 2017.

Other intangible assets consist of the following:

	As of December 31, 2018			
	Gross Carrying Amount	Accumulated Amortization	Net Amount	Weighted Average Remaining Amortization Period (in years)
Other intangible assets:				
Customer lists / relationships	$64,323	$ (37,088)	$27,235	9.6
Technology and other intangibles	44,460	(13,715)	30,745	10.1
In process research and development	2,200	—	2,200	—
Other intangible assets, net	$110,983	$ (50,803)	$60,180	9.8
Amortization expense for the year ended December 31, 2018		$ 6,817		

Amortization expense remaining for other intangible assets is as follows:

	Amortization expense
2019	$ 6,754
2020	6,624
2021	6,467
2022	6,230
2023	4,225
Thereafter	29,880
Total future amortization expense	$ 60,180

	As of December 31, 2017		
	Gross Carrying Amount	Accumulated Amortization	Net Amount
Other intangible assets:			
Customer lists / relationships	$64,323	$ (33,685)	$30,638
Patents	10,319	(10,319)	—
Technology and other intangibles	44,460	(10,355)	34,105
In process research and development	2,200	—	2,200
Other intangible assets, net	$121,302	$ (54,359)	$66,943
Amortization expense for the year ended December 31, 2017		$ 6,603	
Amortization expense for the year ended December 31, 2016		$ 5,815	

In 2018, a goodwill impairment test was performed by management with the assistance of a third-party valuation firm. As of December 31, 2018, it was concluded that the fair value of each of our reporting units exceeded their carrying values, and accordingly, no goodwill impairment was required.

Changes in the net carrying value amount of goodwill were as follows:

	Total
Goodwill as of December 31, 2016	$61,744
Increase from acquisitions	9,313
Goodwill as of December 31, 2017	71,057

Increase from acquisition	—
Goodwill as of December 31, 2018	$71,057

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NOTE 8 — Costs Associated with Exit and Restructuring Activities

Restructuring and impairment charges are reported as a separate line within operating earnings in the Consolidated Statements of Earnings. Total restructuring and impairment charges were:

	Years Ended December 31,		
	2018	2017	2016
Restructuring and impairment charges	5,062	4,139	3,048

In June 2016, we announced plans to restructure operations by phasing out production at our Elkhart, IN facility and transitioning it into a research and development center supporting our global operations ("June 2016 Plan"). Additional organizational changes will also occur in various other locations. In 2017, we amended this plan to include costs related to the relocation of our corporate headquarters and Bolingbrook, Illinois manufacturing operations. The cost of the plan, which is expected to be completed in mid 2019, is estimated to be approximately $13,400 and impacts approximately 230 employees. Additional costs related to line movements, equipment charges, and other costs will be expensed as incurred. The total restructuring liability related to the June 2016 Plan was $668 at December 31, 2018.

The following table displays the planned restructuring and impairment charges associated with the June 2016 Plan as well as a summary of the actual costs incurred through December 31, 2018:

June 2016 Plan	Planned Costs	Actual costs incurred through December 31, 2018
Workforce reduction	$3,075	$ 2,975
Building and equipment relocation	9,025	7,807
Other charges	1,300	964
Restructuring and impairment charges	$13,400	$ 11,746

During the years ended December 31, 2018 and 2017, total restructuring and impairment charges for the June 2016 Plan were as follows:

	Years Ended December 31,		
	2018	2017	2016
Restructuring and impairment charges	$4,559	$4,139	$3,048

During April 2014, we announced plans to restructure our operations and consolidate our Canadian operations into other existing facilities as part of our overall plan to simplify our business model and rationalize our global footprint ("April 2014 Plan"). These restructuring actions, which were substantially completed during 2015, resulted in the elimination of approximately 120 positions.

The following table displays the planned restructuring and restructuring-related charges associated with the April 2014 Plan, as well as a summary of the actual costs incurred through December 31, 2018:

April 2014 Plan	Planned Costs	Actual costs incurred through December 31, 2018
Inventory write-down	$ 850	$ —
Equipment relocation	1,800	444
Other charges	1,400	113
Restructuring-related charges, included in cost of goods sold	4,050	557

Workforce reduction	4,200	4,423
Other charges, including pension termination costs	1,700	3,916
Restructuring and impairment charges	5,900	8,339
Total restructuring, impairment and restructuring-related charges	$ 9,950	$ 8,896

Restructuring charges under the April 2014 Plan were $503, $0, and $4,923 during the years ended December 31, 2018, 2017, and 2016, respectively. The total restructuring liability related to the April 2014 Plan was $918 at December 31, 2018.

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The following table displays the restructuring liability activity for the year ended December 31, 2018:

April 2014 Plan and June 2016 Plan	Restructuring Liability
Restructuring liability at January 1, 2018	$ 1,913
Restructuring charges	5,062
Cost paid	(5,465)
Other activities (1)	76
Restructuring liability at December 31, 2018	$ 1,586

(1) Other activities includes currency translation adjustments not recorded through restructuring expense.
The total liability of $1,586 is included in Accrued expenses and other liabilities at December 31, 2018.

NOTE 9 — Accrued Expenses and Other Liabilities

The components of accrued expenses and other liabilities are as follows:

	As of December 31,	
	2018	2017
Accrued product-related costs	$4,377	$5,297
Accrued income taxes	6,914	5,475
Accrued property and other taxes	1,976	997
Accrued professional fees	3,350	2,228
Contract liabilities	1,981	1,595
Dividends payable	1,310	1,318
Remediation reserves	11,274	17,067
Other accrued liabilities	6,165	7,367
Total accrued expenses and other liabilities	$37,347	$41,344

NOTE 10 — Contingencies

Certain processes in the manufacture of our current and past products create by-products classified as hazardous waste. We have been notified by the U.S. Environmental Protection Agency, state environmental agencies, and in some cases, groups of potentially responsible parties, that we are potentially liable for environmental contamination at several sites currently and formerly owned or operated by CTS. Some sites, such as Asheville, North Carolina and Mountain View, California, are designated National Priorities List Superfund sites under the U.S. Environmental Protection Agency's Superfund program. We reserve for probable remediation activities at these sites and for claims and proceedings against CTS with respect to other environmental matters. We record reserves on an undiscounted basis. In the opinion of management, based upon presently available information relating to such matters, adequate provision for probable and estimable costs have been recorded. We do not have any known environmental obligations where a loss is probable or reasonably possible of occurring for which we do not have a reserve, nor do we have any amounts for which we have not reserved because the amount of the loss cannot be reasonably estimated. Due to the inherent nature of environmental obligations, we cannot provide assurance that our ultimate environmental liability will not materially exceed the amount of our current reserve. Our reserve and disclosures will be adjusted accordingly if additional information becomes available in the future.

A roll-forward of remediation reserves on the balance sheet is comprised of the following:

	Years Ended December 31,		
	2018	2017	2016
Balance at beginning of period	$17,067	$18,176	$20,603
Remediation expense	1,182	307	556
Remediation payments	(6,967)	(1,416)	(2,983)
Other activity (1)	(8)	—	—
Balance at end of the period	$11,274	$17,067	$18,176

(1) Other activity includes currency translation adjustments not recorded through remediation expense

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Unrelated to the environmental claims described above, certain other legal claims are pending against us with respect to matters arising out of the ordinary conduct of our business. Although the ultimate outcome of any potential litigation resulting from these claims cannot be predicted with certainty, and some may be disposed of unfavorably to CTS, management believes that adequate provision for anticipated costs have been established based upon all presently available information. Except as noted herein, we do not believe we have any pending loss contingencies that are probable or reasonably possible of having a material impact on our consolidated financial position, results of operations or cash flows.

NOTE 11 — Leases

Minimum future obligations under all non-cancelable operating leases as of December 31, 2018, are as follows:

	Operating Leases
2019	$ 3,859
2020	3,622
2021	2,587
2022	2,411
2023	2,464
Thereafter	16,086
Total minimum lease obligations	$ 31,029

Rent expense for operating leases charged to operations was as follows:

	Years Ended December 31,		
	2018	2017	2016
Rent expense	$5,726	$4,762	$5,694

Operating leases include a variety of properties around the world. These properties are used as manufacturing facilities, distribution centers and sales and administrative offices. Lease expirations range from 2018 to 2033 with breaking periods specified in the lease agreements. Sublease income was $455 in 2018. Future sublease income is $444 in 2019, $423 in 2020, and $846 thereafter. Some of our operating leases include renewal options and escalation clauses.

NOTE 12 — Debt

Long-term debt was comprised of the following:

	As of December 31	
	2018	2017
Total credit facility	$300,000	$300,000
Balance outstanding	$50,000	$76,300
Standby letters of credit	$1,940	$2,065
Amount available	$248,060	$221,635
Weighted-average interest rate	3.10 %	2.30 %
Commitment fee percentage per annum	0.20 %	0.25 %

Our revolving credit facility requires, among other things, that we comply with a maximum total leverage ratio and a minimum fixed charge coverage ratio. Failure to comply with these covenants could reduce the borrowing availability under the revolving credit facility. We were in compliance with all debt covenants as of December 31, 2018. The revolving credit facility requires us to deliver quarterly financial statements, annual financial statements, auditors certifications and compliance certificates within a specified number of days after the end of a quarter and year. Additionally, the revolving credit facility contains restrictions limiting our ability to dispose of assets; incur certain additional debt; repay other debt or amend subordinated debt instruments; create liens on assets; make investments, loans or advances; make acquisitions or engage in mergers or consolidations; engage in certain transactions with our subsidiaries and affiliates; and make stock repurchases and dividend payments. Interest rates on the revolving credit facility fluctuate based upon the London Interbank Offered Rate and the Company's quarterly total leverage ratio. We pay a commitment fee on the undrawn portion of the revolving credit facility. The commitment fee varies based on the quarterly leverage ratio.

We have debt issuance costs related to our long-term debt that are being amortized using the straight-line method over the life of the debt. Amortization expense was approximately $185 in 2018 and 2017, and $163 in 2016, and was recognized as interest expense.

We use interest rate swaps to convert the revolving credit facility's variable rate of interest into a fixed rate on a portion of the debt as described more fully in Note 13 "Derivatives". These swaps are treated as cash flow hedges and consequently, the changes in fair value were recorded in other comprehensive earnings.

Interest rate swaps activity recorded in other comprehensive earnings before tax included the following:

	Years Ended December 31,		
	2018	2017	2016
Unrealized (loss) gain	$(394)	$(255)	$593
Realized gain reclassified to interest expense	$421	$37	$928

NOTE 13 — Derivatives

Our earnings and cash flows are subject to fluctuations due to changes in foreign currency exchange rates and interest rates. We selectively use derivative financial instruments including foreign currency forward contracts and interest rate swaps to manage our exposure to these risks.

The use of derivative financial instruments exposes the Company to credit risk, which relates to the risk of nonperformance by a counterparty to the derivative contracts. We manage our credit risk by entering into derivative contracts with only highly rated financial institutions and by using netting agreements.

The effective portion of derivative gains and losses are recorded in accumulated other comprehensive (loss) income until the hedged transaction affects earnings upon settlement, at which time they are reclassified to interest expense, cost of goods sold, or net sales. If it is probable that an anticipated hedged transaction will not occur by the end of the originally specified time period, we reclassify the gains or losses related to that hedge from accumulated other comprehensive (loss) income to other income (expense).

On April 1, 2018, the company adopted the provisions of ASU No. 2017-12 "Derivatives and Hedging (Topic 815): Target Improvements to Accounting for Hedging Activities". As a result, hedge effectiveness was reviewed qualitatively by verifying that the critical terms of the hedging instrument and the forecasted transaction continue to match, and that there have been no adverse developments that have increased the risk that the counterparty will default. No recognition of ineffectiveness was recorded in our Consolidated Statement of Earnings as a result of this qualitative analysis for the year ended December 31, 2018.

Foreign Currency Hedges

In January of 2016, we began using forward contracts to mitigate currency risk related to a portion of our forecasted foreign Euro denominated revenues and Mexican Peso denominated expenses. The currency forward contracts are designed as cash flow hedges and are recorded in the Consolidated Balance Sheets at fair value.

As of December 31, 2018, we were hedging a portion of our forecasted Peso expenses for the following twelve months. We continue to monitor the Company’s overall currency exposure and may elect to add cash flow hedges in the future. At December 31, 2018, we had a net unrealized loss of $371 in accumulated other comprehensive loss, of which $318 is expected to be reclassified to income within the next 12 months. The notional amount of foreign currency forward contracts outstanding was $15,700 at December 31, 2018.

Interest Rate Swaps

We use interest rate swaps to convert the revolving credit facility’s variable rate of interest into a fixed rate on a portion of our debt balance. In the second quarter of 2012, we entered into four separate one-year interest rate swap agreements to fix interest rates on $50,000 of long-term debt for the periods January 2013 to January 2017. In the third quarter of 2012, we entered into four additional one-year interest rate swap agreements to fix interest rates on $25,000 of long-term debt for the periods January 2013 to January 2017. In the third quarter of 2016, we entered into three additional one-year interest rate swap agreements to fix interest rates on $50,000 of long-term debt for the periods August 2017 to August 2020. The difference to be paid or received under the terms of the swap agreements will be recognized as an adjustment to interest expense when settled.

These swaps are treated as cash flow hedges and consequently, the changes in fair value were recorded in other comprehensive income (loss). The estimated net amount of the existing gains or losses that are reported in accumulated other comprehensive income (loss) that is expected to be reclassified into earnings within the next twelve months is approximately $576.

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The location and fair values of derivative instruments designated as hedging instruments in the Consolidated Balance Sheets as of December 31, 2018, are shown in the following table:

	As of December 31,	
	2018	2017
Foreign currency hedges reported in Accrued expenses and other liabilities	$—	$742
Foreign currency hedges reported in Other current assets	$393	$—
Interest rate swaps reported in Other current assets	$576	$278
Interest rate swaps reported in Other assets	$369	$693

The Company has elected to net its foreign currency derivative assets and liabilities in the balance sheet in accordance with ASC 210-20 (Balance Sheet, Offsetting). On a gross basis, there were $423 foreign currency derivative assets and foreign currency derivative liabilities were $30.

The effect of derivative instruments on the Consolidated Statements of Earnings is as follows:

	Years Ended December 31,		
	2018	2017	2016
Foreign Exchange Contracts:			
Amounts reclassified from AOCI to earnings:			
Net sales	$383	$(488)	$(124)
Cost of goods sold	(6)	497	111
Selling, general and administrative	107	45	1
Total amounts reclassified from AOCI to earnings	484	54	(12)
Loss recognized in other expense for hedge ineffectiveness	—	(1)	(1)
Loss recognized in other expense for derivatives not designated as cash flow hedges	—	(15)	(5)
Total derivative gain (loss) on foreign exchange contracts recognized in earnings	$484	$38	$(18)
Interest Rate Swaps:			
Interest Expense	$(421)	$(37)	$(928)
Total income (loss) on derivatives recognized in earnings	$63	$1	$(946)

NOTE 14 — Accumulated Other Comprehensive Loss

Shareholders' equity includes certain items classified as accumulated other comprehensive loss ("AOCI") in the Consolidated Balance Sheets, including:

- Unrealized gains (losses) on hedges relate to interest rate swaps to convert the revolving credit facility's variable rate of interest into a fixed rate and foreign currency forward contracts used to hedge our exposure to changes in exchange rates affecting certain revenues and costs denominated in foreign currencies. These hedges are designated as cash flow hedges, and we have deferred income statement recognition of gains and losses until the hedged transaction is settled. Amounts reclassified to income from AOCI for hedges are included in interest expense, cost of sales, or net sales. Further information related to our interest rate swaps and foreign currency hedges is included in Note 13, "Derivatives".
- Unrealized gains (losses) on pension obligations are deferred from income statement recognition until the gains or losses are realized. Amounts reclassified to income from AOCI are included in net periodic pension expense. Further information related to our pension obligations is included in Note 6, "Retirement Plans".
- Cumulative translation adjustment relates to our non-U.S. subsidiaries that have designated a functional currency other than the U.S. dollar. We are required to translate the subsidiary functional currency financial statements to dollars using a combination of historical, period-end, and average foreign exchange rates. This combination of rates creates the foreign currency translation adjustment component of other comprehensive

income. Transfer of foreign currency translation gains and losses from AOCI to income are included in other income (expense) in our Consolidated Statements of Earnings.

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In 2018, CTS adopted the provision of ASU No. 2018-02 "Income Statement - Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income". This ASU allows for the reclassification from AOCI to retained earnings for the stranded tax effects resulting from the Tax Cuts and Jobs Act that was enacted in December 2017. The total impact due to adoption of this standard was an increase in retained earnings of $17,433.

The components of AOCI for 2018 are as follows:

	As of December 31, 2017	Gain (Loss) Recognized in OCI	Gain (Loss) reclassified from AOCI to income	Impact of ASU No. 2018-02	As of December 31, 2018
Changes in fair market value of hedges:					
Gross	$ 289	$ 1,932	$ (905)	$ —	$ 1,316
Income tax (expense) benefit	(105)	(437)	205	39	(298)
Net	184	1,495	(700)	39	1,018
Changes in unrealized pension cost:					
Gross	(130,096)	—	(2,358)	—	(132,454)
Income tax benefit (expense)	52,837	—	528	(17,472)	35,893
Net	(77,259)	—	(1,830)	(17,472)	(96,561)
Cumulative translation adjustment:					
Gross	(1,985)	(306)	—	—	(2,291)
Income tax benefit (expense)	100	(5)	—	—	95
Net	(1,885)	(311)	—	—	(2,196)
Total accumulated other comprehensive (loss) income	$ (78,960)	$ 1,184	$ (2,530)	$ (17,433)	$ (97,739)

The components of AOCI for 2017 are as follows:

	As of December 31, 2016	(Loss) Gain recognized in OCI	Gain (Loss) reclassified from AOCI to income	As of December 31, 2017
Changes in fair market value of hedges:				
Gross	$ 116	$ 264	$ (91)	$ 289
Income tax (expense) benefit	(42)	(96)	33	(105)
Net	74	168	(58)	184
Changes in unrealized pension cost:				
Gross	(151,618)	—	21,522	(130,096)
Income tax benefit (expense)	60,672	—	(7,835)	52,837
Net	(90,946)	—	13,687	(77,259)
Cumulative translation adjustment:				
Gross	(2,414)	429	—	(1,985)
Income tax benefit	92	8	—	100
Net	(2,322)	437	—	(1,885)
Total accumulated other comprehensive (loss) income	$ (93,194)	$ 605	$ 13,629	$ (78,960)

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NOTE 15 — Shareholders' Equity

Share count and par value data related to shareholders' equity are as follows:

	As of December 31,	
	2018	2017
Preferred Stock		
Par value per share	No par value	No par value
Shares authorized	25,000,000	25,000,000
Shares outstanding	—	—
Common Stock		
Par value per share	No par value	No par value
Shares authorized	75,000,000	75,000,000
Shares issued	56,786,849	56,632,488
Shares outstanding	32,750,727	32,938,466
Treasury stock		
Shares held	24,036,122	23,694,022

We use the cost method to account for our common stock purchases. During the year ended December 31, 2018 we purchased 342,100 shares for $9,440. During the year ended December 31, 2017, we did not purchase any shares of common stock under our board-authorized share repurchase program. Approximately $8,114 was available for future purchases under the previously authorized stock repurchase program that was approved by our Board of Directors in April 2015. As discussed in Note 1, the Board or Directors authorized a new stock repurchase program with a maximum dollar limit of $25 million that replaced the previous program.

A roll forward of common shares outstanding is as follows:

	As of December 31,	
	2018	2017
Balance at beginning of the year	32,938,466	32,762,494
Repurchases	(342,100)	—
Restricted stock unit issuances	154,361	175,972
Balance at end of period	32,750,727	32,938,466

NOTE 16 — Stock-Based Compensation

At December 31, 2018, we had five stock-based compensation plans: the Non-Employee Directors' Stock Retirement Plan ("Directors' Plan"), the 2004 Omnibus Long-Term Incentive Plan ("2004 Plan"), the 2009 Omnibus Equity and Performance Incentive Plan ("2009 Plan"), the 2014 Performance & Incentive Plan ("2014 Plan"), and the 2018 Equity and Incentive Compensation Plan ("2018 Plan"). Future grants can only be made under the 2018 Plan.

These plans allow for grants of stock options, stock appreciation rights, restricted stock, restricted stock units ("RSUs"), performance shares, performance units, and other stock awards subject to the terms of the specific plans under which the awards are granted.

The following table summarizes the compensation expense included in selling, general and administrative expenses in the Consolidated Statements of Earnings related to stock-based compensation plans:

	Years Ended December 31,		
	2018	2017	2016
Service-Based RSUs	$2,036	$1,762	$1,997
Performance-Based RSUs	3,089	2,350	665
Cash-settled awards	131	72	76
Total	$5,256	$4,184	$2,738
Income tax benefit	1,188	1,573	1,029
Net	$4,068	$2,611	$1,709

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The fair value of all equity awards that vested during the periods ended December 31, 2018, 2017, and 2016 were $5,805, $5,471, and $4,959, respectively. We recorded a tax deduction related to equity awards that vested during the year ended December 31, 2018, in the amount of $1,312.

The following table summarizes the unrecognized compensation expense related to non-vested RSUs by type and the weighted-average period in which the expense is to be recognized:

	Unrecognized compensation expense at December 31, 2018	Weighted-average period
Service-Based RSUs	$ 1,598	1.21
Performance-Based RSUs	2,539	1.56
Total	$ 4,137	1.43

We recognize expense on a straight-line basis over the requisite service period for each separately vesting portion of the award as if the award was, in substance, multiple awards.

The following table summarizes the status of these plans as of December 31, 2018:

	2018 Plan	2014 Plan	2009 Plan	2004 Plan	Directors' Plan
Awards originally available to be granted	2,500,000	1,500,000	3,400,000	6,500,000	N/A
Performance stock options outstanding	—	275,000	—	—	—
Maximum potential RSU and cash settled awards outstanding	25,200	722,035	92,600	35,952	5,522
Maximum potential awards outstanding	25,200	997,035	92,600	35,952	5,522
RSUs and cash settled awards vested and released	—	—	—	—	—
Awards available to be granted	2,474,800	—	—	—	—

Stock Options

Stock options are exercisable in cumulative annual installments over a maximum 10-year period, commencing at least one year from the date of grant. Stock options are generally granted with an exercise price equal to the market price of our stock on the date of grant. The stock options generally vest over four years and have a 10-year contractual life. The awards generally contain provisions to either accelerate vesting or allow vesting to continue on schedule upon retirement if certain service and age requirements are met. The awards also provide for accelerated vesting if there is a change in control event.

We estimate the fair value of the stock option on the grant date using the Black-Scholes option-pricing model and assumptions for expected price volatility, option term, risk-free interest rate, and dividend yield. Expected price volatilities are based on historical volatilities of our common stock. The expected option term was derived from historical data of exercise behavior. The dividend yield was based on historical dividend payments. The risk-free rate for periods within the contractual life of the option was based on the U.S. Treasury yield curve in effect at the time of grant.

There were no outstanding stock options at December 31, 2018, or 2017 other than the performance-based stock options described below.

Performance-Based Stock Options

During 2015 and 2016, the Compensation committee of the Board of Directors (the "Committee") granted a total of 350,000 performance-based stock options, of which 275,000 remain outstanding after forfeitures. The Performance-Based Option Awards have an exercise price of $18.37, a term of five years and generally will become exercisable (provided the optionee remains employed by the Company or an affiliate) upon our attainment of at least $600,000 in revenues during any of our four-fiscal-quarter trailing periods (as determined by the Committee) during the term. We have not recognized any expense on these Performance-Based Option Awards for the years ended December 31, 2018 and 2017, since the revenue target is not deemed likely to be attained based on our current forecast.

Service-Based Restricted Stock Units

Service-based RSUs entitle the holder to receive one share of common stock for each unit when the unit vests. RSUs are issued to officers, key employees and non-employee directors as compensation. Generally, the RSUs vest over a three-year period. RSUs granted to non-employee directors vest one year after being granted. Upon vesting, the non-employee directors elect to either receive the stock associated with the RSU immediately, or defer receipt of the stock to a future date. The fair value of the RSUs is equivalent to the trading value of our common stock on the grant date.

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A summary of RSUs for all Plans is presented below:

	Units	Weighted Average Grant Date Fair Value	Weighted Average Remaining Contractual Term	Aggregate Intrinsic Value
Outstanding at January 1, 2018	399,347	$ 14.60		
Granted	99,422	26.95		
Released	(137,500)	14.68		
Forfeited	(5,679)	22.07		
Outstanding at December 31, 2018	355,590	$ 17.91	22.46	$ 9,206
Releasable at December 31, 2018	209,474	$ 13.76	33.63	$ 5,423

	Years Ended December 31,		
	2018	2017	2016
Weighted-average grant date fair value	$26.95	$24.32	$15.07
Intrinsic value of RSUs released	$4,015	$4,485	$1,520

A summary of nonvested RSUs is presented below:

	RSUs	Weighted Average Grant Date Fair Value
Nonvested at January 1, 2018	139,536	$ 18.56
Granted	99,422	26.95
Vested	(87,163)	19.05
Forfeited	(5,679)	22.07
Nonvested at December 31, 2018	146,116	$ 23.84

Performance-Based Restricted Stock Units

We grant performance-based restricted stock unit awards ("PSUs") to certain executives and key employees. Units are usually awarded in the range from zero percent to 200% of a targeted number of shares. The award rate for the 2016-2018, 2017-2019, and 2018-2020 PSUs is dependent upon our achievement of sales growth targets, cash flow targets, and relative total shareholder return ("RTSR") using a matrix based on the percentile ranking of our stock price performance compared to a peer group over a three-year period. These awards are weighted 35% for achievement of the sales growth metric, 30% for achievement of the cash flow metric, and 35% for achievement of the RTSR metric. Other PSUs are granted from time to time based on other performance criteria.

A summary of PSUs for all Plans is presented below:

	Units	Weighted Average Grant Date Fair Value	Weighted Average Remaining Contractual Term	Aggregate Intrinsic Value

Outstanding at January 1, 2018	271,305	$ 18.77		
Granted	72,043	28.75		
Released	(72,456)	18.66		
Forfeited	(21,700)	17.66		
Added by performance factor	18,600	17.66		
Outstanding at December 31, 2018	267,792	$ 21.44	1.14	$ 6,933
Releasable at December 31, 2018	—	$ —	—	$ —

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The following table summarizes each grant of performance awards outstanding at December 31, 2018:

Description	Grant Date	Vesting Year	Vesting Dependency	Target Units Outstanding	Maximum Number of Units to be Granted
2016-2018 Performance RSUs	February 16, 2016	2018	35% RTSR, 35% sales growth, 30% cash flow	92,840	185,680
Single Crystal Performance RSUs	March 31, 2016	2018	Various	4,000	8,000
2017-2019 Performance RSUs	February 9, 2017	2019	35% RTSR, 35% sales growth, 30% cash flow	71,796	143,592
2017-2019 Performance RSUs	February 9, 2017	2020	Operating Income	27,113	27,113
2018-2020 Performance RSUs	February 8, 2018	2021	35% RTSR, 35% sales growth, 30% cash flow	40,223	80,446
2018- 2020 Performance RSUs	February 16, 2018	2021	35% RTSR, 35% sales growth, 30% cash flow	31,820	63,640
Total				267,792	508,471

Cash-Settled Restricted Stock Units

Cash-Settled RSUs entitle the holder to receive the cash equivalent of one share of common stock for each unit when the unit vests. These RSUs are issued to key employees residing in foreign locations as direct compensation. Generally, these RSUs vest over a three-year period. Cash-settled RSUs are classified as liabilities and are remeasured at each reporting date until settled. At December 31, 2018, and 2017, we had 17,248 and 14,082 cash-settled RSUs outstanding, respectively. At December 31, 2018, and 2017, liabilities of $300 and $241, respectively were included in Accrued expenses and other liabilities on our Consolidated Balance Sheets.

NOTE 17 — Fair Value Measurements

The table below summarizes the financial assets and liabilities that were measured at fair value on a recurring basis as of December 31, 2018 and the (gain) loss recorded during the year ended December 31, 2018:

	Asset Carrying Value at December 31, 2018	Quoted Prices in Active Markets for Identical (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Loss (gain) for Year Ended December 31, 2018
Interest rate swap	$ 945	$ —	$ 945	$ —	$ 421
Foreign currency hedges	$ 393	$ —	$ 393	$ —	$ (484)

The table below summarizes the financial assets and liabilities that were measured at fair value on a recurring basis as of December 31, 2017 and the (gain) loss recorded during the year ended December 31, 2017:

	Asset (Liability) Carrying Value at December 31, 2017	Quoted Prices in Active Markets for Identical (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Loss (gain) for Year Ended December 31, 2017

Interest rate swap	$	971	$	—	$ 971	$	—	$ 37
Foreign currency hedges	$	(742)	$	—	$ (742)	$	—	$ (38)

The fair value of our interest rate swaps and foreign currency hedges were measured using standard valuation models using market-based observable inputs over the contractual terms, including forward yield curves, among others. There is a readily determinable market for these derivative instruments, but the market is not active and therefore they are classified within level 2 of the fair value hierarchy.

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The table below provides a reconciliation of the recurring financial assets and liabilities related to interest rate swaps and foreign currency hedges:

	Interest Rate Swaps	Foreign Currency Hedges
Balance at January 1, 2017	$ 753	$ (601)
Cash settlements paid (received)	37	(132)
Total gains (losses) for the period:		
Included in earnings	(37)	38
Included in other comprehensive earnings	218	(47)
Balance at January 1, 2018	$ 971	$ (742)
Cash settlements paid (received)	421	(402)
Total gains (losses) for the period:		
Included in earnings	(421)	484
Included in other comprehensive earnings	(26)	1,053
Balance at December 31, 2018	$ 945	$ 393

Our long-term debt consists of a revolving credit facility which is recorded at its carrying value. There is a readily determinable market for our revolving credit debt and it is classified within Level 2 of the fair value hierarchy as the market is not deemed to be active. The fair value of long-term debt approximates carrying value and was determined by valuing a similar hypothetical coupon bond and attributing that value to our credit facility.

NOTE 18 — Income Taxes

Earnings before income taxes consist of the following:

	Years Ended December 31,		
	2018	2017	2016
U.S.	$ 30,815	$ 9,315	$ 25,746
Non-U.S.	27,288	30,938	31,499
Total	$ 58,103	$ 40,253	$ 57,245

Significant components of income tax provision/(benefit) are as follows:

	Years Ended December 31,		
	2018	2017	2016
Current:			
U.S.	$ (397)	$ 1,635	$ (1,312)
Non-U.S.	12,538	7,150	13,729
Total Current	12,141	8,785	12,417
Deferred:			
U.S.	(330)	17,597	13,245
Non-U.S.	(240)	(577)	(2,797)
Total Deferred	(570)	17,020	10,448
Total provision for income taxes	$ 11,571	$ 25,805	$ 22,865

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Significant components of our deferred tax assets and liabilities are as follows:

	As of December 31,	
	2018	2017
Post-retirement benefits	$1,061	$1,160
Inventory reserves	1,236	1,128
Loss carry-forwards	4,647	5,401
Credit carry-forwards	16,909	10,793
Nondeductible accruals	5,685	7,062
Research expenditures	16,847	20,002
Stock compensation	2,142	1,803
Foreign exchange loss	2,245	1,373
Other	207	220
Gross deferred tax assets	50,979	48,942
Depreciation and amortization	11,500	9,819
Pensions	11,736	12,387
Subsidiaries' unremitted earnings	1,258	1,662
Gross deferred tax liabilities	24,494	23,868
Net deferred tax assets	26,485	25,074
Deferred tax asset valuation allowance	(8,274)	(8,182)
Total net deferred tax assets	$18,211	$16,892

The long-term deferred tax assets and long-term deferred tax liabilities are as follows below:

	As of December 31,	
	2018	2017
Non-current deferred tax assets	$22,201	$20,694
Non-current deferred tax liabilities	$(3,990)	$(3,802)
Total net deferred tax assets	$18,211	$16,892

At each reporting date, we weigh all available positive and negative evidence to assess whether it is more-likely-than-not that the Company's deferred tax assets, including deferred tax assets associated with accumulated loss carryforwards and tax credits in the various jurisdictions in which it operates, will be realized. As of December 31, 2018, and 2017, we recorded deferred tax assets related to certain U.S. state and non-U.S. income tax loss carryforwards of $4,647 and $5,401, respectively, and U.S. and non-U.S. tax credits of $16,909 and $10,793, respectively. The deferred tax assets expire in various years primarily between 2021 and 2038.

Generally, we assess if it is more-likely-than-not that our net deferred tax assets will be realized during the available carry-forward periods. As a result, we have determined that valuation allowances of $8,274 and $8,182 should be provided for certain deferred tax assets at December 31, 2018, and 2017, respectively. As of December 31, 2018, the valuation allowances relate to certain U.S. state and non-U.S. loss carry-forwards and certain U.S. state tax credits that management does not anticipate will be utilized.

No valuation allowance was recorded in 2018 against the U.S. federal foreign tax credit carryforwards of $7,316, which expire in varying amounts between 2023 and 2025 as well as the research and development tax credits of $6,516, which expire in varying amounts between 2021 and 2038. We assessed the anticipated realization of those tax credits utilizing future taxable income projections. Based on those projections, management believes it is more-likely-than-not that we will realize the benefits of these credit carryforwards.

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The following table reconciles taxes at the U.S. federal statutory rate to the effective income tax rate:

	Years Ended December 31,		
	2018	2017	2016
Taxes at the U.S. statutory rate	21.0 %	35.0 %	35.0 %
State income taxes, net of federal income tax benefit	1.2 %	1.1 %	1.4 %
Non-U.S. income taxed at rates different than the U.S. statutory rate	0.8 %	(9.0)%	(7.5)%
Foreign source income, net of associated foreign tax credits	4.1 %	0.1 %	5.3 %
Benefit of tax credits	(0.9)%	(1.4)%	(1.0)%
Non-deductible expenses	1.3 %	1.5 %	0.7 %
Stock compensation - excess tax benefits	(0.9)%	(1.5)%	(0.8)%
Adjustment to valuation allowances	(0.6)%	(4.4)%	3.8 %
Other changes in tax laws and rates	(6.1)%	— %	— %
Change in unrecognized tax benefits	(1.7)%	2.0 %	3.3 %
Impacts of unremitted foreign earnings	1.1 %	0.9 %	0.6 %
Impacts related to the 2017 Tax Cuts and Jobs Act	(0.6)%	44.7 %	— %
Other	1.2 %	(4.9)%	(0.9)%
Effective income tax rate	19.9 %	64.1 %	39.9 %

On December 22, 2017, the Tax Cuts and Jobs Act of 2017 (the "Tax 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% to 21% 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. We recognized a provisional amount of $18,001 as an additional income tax expense in the fourth quarter of 2017. This amount included $11,734 related to the mandatory deemed one-time transition tax and $6,267 related to the remeasurement of certain deferred tax assets and liabilities.
On December 22, 2017, Staff Accounting Bulletin No. 118 ("SAB 118") was issued to address the application of U.S. GAAP in situations when a registrant does not have the necessary information available, prepared, or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the Tax Act. The remeasurement period for SAB 118 ended on December 22, 2018, and upon completion of our analysis we determined the final impact of the Tax Act resulted in an additional tax benefit of $348 during the fourth quarter of 2018. This amount included a $589 tax benefit related to the one-time transition tax and $241 tax expense related to the remeasurement of certain deferred tax assets and liabilities.
Generally, outside of Canada and the United Kingdom, it has been our historical practice to permanently reinvest the earnings of our non-U.S. subsidiaries in those operations. As previously noted, the Tax Act made significant changes to the taxation of undistributed foreign earnings, requiring that all previously untaxed earnings and profits of our controlled foreign corporation be subjected to a one-time mandatory deemed repatriation tax. The transition tax substantially eliminated the basis differences that existed prior to the Tax Act. However, there are limited other taxes that could continue to apply such as foreign withholding and certain state taxes. We completed the evaluation of our indefinite reinvestment assertion as a result of the Tax Act during the fourth quarter of 2018 and decided not to reinvest the current year earnings of our primary operations, except for in the Czech Republic, Denmark, India, Mexico and Taiwan. We intend to continue to indefinitely reinvest the earnings in these non-U.S. subsidiaries.
The Tax Act also includes provisions for Global Intangible Low-Taxed Income ("GILTI") wherein taxes on foreign income are imposed in excess of a deemed return on tangible assets of foreign corporations. We elected to recognize the tax on GILTI as an expense in the period the tax is incurred. We have not provided deferred taxes related to temporary differences that upon their reversal will impact the amount of income subject to GILTI in the period.
We recognize the financial statement benefit of a tax position when it is more-likely-than-not, based on its technical merits, that the position will be sustained upon examination. A tax position that meets the more-likely-than-not threshold is then measured to determine the amount of benefit to be recognized in the financial statements. As of December 31, 2018, we have approximately $6,203 of unrecognized tax benefits, which if recognized, would impact

the effective tax rate. We do not anticipate any significant changes in our unrecognized tax benefits within the next 12 months.

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A reconciliation of the beginning and ending unrecognized tax benefits is provided below:

	2018	2017
Balance at January 1	$7,306	$12,347
Increase related to current year tax positions	55	—
(Decrease) increase related to prior year tax positions	(36)	1,290
Decrease related to lapse in statute of limitation	(1,076)	—
Decrease related to settlements with taxing authorities	(46)	(6,331)
Balance at December 31	$6,203	$7,306

Our continuing practice is to recognize interest and/or penalties related to unrecognized tax benefits as income tax expense. As of December 31, 2018, and 2017, $2,515 and $2,596, respectively, of interest and penalties were accrued. We are subject to taxation in the U.S., various states, and in non-U.S. jurisdictions. Our U.S. income tax returns are primarily subject to examination from 2015 through 2017; however, U.S. tax authorities also have the ability to review prior tax years to the extent loss carryforwards and tax credit carryforwards are utilized. The open years for the non-U.S. tax returns range from 2010 through 2017 based on local statutes.

NOTE 19 - Business Acquisitions

On May 15, 2017, we acquired 100% of the equity interests in Noliac A/S, a privately-held company, for $19.3 million in cash. Noliac A/S is a designer and manufacturer of tape cast and bulk piezoelectric material as well as transducers for use in the telecommunications, industrial, medical, and defense industries. This acquisition will enable us to increase our product base within our ceramics product lines as well as expand our presence in the European market.

The purchase price of $19,121, net of cash acquired of $199, has been allocated to the assets acquired and liabilities assumed on the acquisition date based on their fair values.

The following table summarizes the fair values of the assets acquired and the liabilities assumed at the date of acquisition:

	Fair Values at May 15, 2017
Current assets	$2,836
Property, plant and equipment	580
Other assets	395
Goodwill	9,313
Intangible assets	9,142
Fair value of assets acquired	22,266
Less fair value of liabilities acquired	(3,145)
Net cash paid	$19,121

Goodwill recorded in connection with this acquisition represents the value we expect to be created by combining the operations of the acquired business with our existing operations, including the expansion into markets within our existing business, access to new customers, and potential cost savings and synergies. Goodwill related to this acquisition is expected to be deductible for tax purposes.

The following table summarizes the carrying amounts and weighted average lives of the acquired intangible assets:

	Carrying Value	Weighted Average Amortization Period (in years)
Developed technology	$ 7,581	15.0
Customer relationships	937	10.0
Other	624	3.0

Total	$ 9,142	13.7

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We incurred $291 in transaction related costs during the year ended December 31, 2017. These costs are included in selling, general, and administrative costs in our Consolidated Statements of Earnings.

On March 11, 2016, we acquired all of the outstanding membership interests in CTG Advanced Materials, LLC ("CTG-AM"), a privately-held company, for $73 million in cash plus a working capital adjustment. CTG-AM, formerly operated as H.C. Materials, is the market leading designer and manufacturer of single crystal piezoelectric materials, serving major original equipment manufacturers throughout the medical marketplace. These materials enable high definition ultrasound imaging (3D and 4D), as well as intravascular ultrasound applications. Other applications for these materials include wireless pacemakers, implantable hearing aids, and defense technologies.

With the CTG-AM acquisition, we gained technology and proprietary manufacturing methods that expand our offering of piezoelectric materials. This allows us to become the leading large-scale commercial producer of both single crystal materials and traditional piezoelectric ceramics.

The purchase price of $73,063, net of cash acquired of $4, has been allocated to the fair values of assets and liabilities acquired as of March 11, 2016.

The following table summarizes the fair values of the assets acquired and the liabilities assumed at the date of acquisition:

	Fair Values at March 11, 2016
Current assets	$4,215
Property, plant and equipment	6,173
Other assets	37
Goodwill	27,879
Intangible assets	35,427
Fair value of assets acquired	73,731
Less fair value of liabilities acquired	(668)
Net cash paid	$73,063

Goodwill recorded in connection with this acquisition represents the value we expect to be created by combining the operations of the acquired business with our existing operations, including the expansion into markets within our existing business, access to new customers, and potential cost savings and synergies. Goodwill related to this acquisition is expected to be deductible for tax purposes.

The following table summarizes the carrying amounts and weighted average lives of the acquired intangible assets:

	Carrying Value	Weighted Average Amortization Period (in years)
Developed technology	$23,730	15.0
Customer relationships and contracts	11,502	14.6
Other	195	0.8
Total	$35,427	14.8

We incurred $804 in transaction related costs during the year ended December 31, 2016. These costs are included in selling, general, and administrative costs in our Consolidated Statements of Earnings.

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NOTE 20 — Geographic Data

Financial information relating to our operations by geographic area were as follows:

Net Sales	Years Ended December 31,		
	2018	2017	2016
United States	$313,489	$287,092	$276,033
Singapore	6,724	5,596	6,668
Taiwan	20,802	18,586	17,121
China	79,380	66,510	59,506
Czech Republic	36,528	34,476	34,767
Other non-U.S.	13,560	10,733	2,584
Consolidated net sales	$470,483	$422,993	$396,679

Sales are attributed to countries based upon the origin of the sale.

Long-Lived Assets	Years Ended December 31,	
	2018	2017
United States	$53,950	$44,010
China	32,973	32,464
Taiwan	3,752	3,540
Czech Republic	5,976	5,518
Other non-U.S	2,750	2,715
Consolidated long-lived assets	$99,401	$88,247

NOTE 21 — Quarterly Financial Data

Quarterly Results of Operations (Unaudited)

	First	Second	Third	Fourth
2018				
Net sales	$113,530	$118,021	$118,859	$120,073
Gross margin	$38,433	$41,813	$42,082	$42,645
Operating earnings	$13,359	$14,544	$16,118	$17,017
Net earnings	$11,548	$7,209	$10,211	$17,564
Basic earnings per share	$0.35	$0.22	$0.31	$0.53
Diluted earnings per share	$0.34	$0.21	$0.30	$0.52
2017				
Net sales	$100,154	$105,686	$106,243	$110,910
Gross margin	$34,224	$35,794	$37,538	$32,875
Operating earnings (loss)	$12,196	$13,208	$13,111	$(19)
Net earnings (loss)	$8,484	$9,966	$9,619	$(13,621)
Basic earnings (loss) per share	$0.26	$0.30	$0.29	$(0.41)
Diluted earnings (loss) per share	$0.25	$0.30	$0.29	$(0.41)

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CTS CORPORATION
SCHEDULE II — VALUATION AND QUALIFYING ACCOUNTS

(in thousands)	Balance at Beginning of Period	Charged to Expense	Charged to Other Accounts	(Write-offs) / Recoveries	Balance at End of Period
Year ended December 31, 2018 Allowance for doubtful accounts	$ 357	$ 56	$ (8)	$ (21)	$ 384
Year ended December 31, 2017 Allowance for doubtful accounts	$ 170	$ 248	$ 9	$ (70)	$ 357
Year ended December 31, 2016 Allowance for doubtful accounts	$ 133	$ 44	$ —	$ (7)	$ 170

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Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure
Not applicable.
Item 9A. Controls and Procedures
Pursuant to Rule 13a-15(e) of the Securities Exchange Act of 1934, management, under the direction of our Chief Executive Officer and Chief Financial Officer, evaluated our disclosure controls and procedures as of the end of the period covered by this annual report. Based on such evaluation, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective as of December 31, 2018.
The report from Grant Thornton LLP on its audit of the effectiveness of our internal control over financial reporting as of December 31, 2018, is included in Part II, Item 8 of this Annual Report on Form 10-K under the heading "Report of Independent Registered Public Accounting Firm" and is incorporated herein by reference. The Report of Management on Internal Control over Financial Reporting, which can be found following the signature page of this Annual Report on Form 10-K, is incorporated herein by reference.
Changes in Internal Control over Financial Reporting
Beginning January 1, 2018, we adopted ASC 606 "Revenue from Contracts with Customers". It did not have a material impact on our ongoing net income; however, we implemented changes to our processes related to revenue recognition and related internal controls. These changes included the development of new policies related to the five-step model, training, ongoing contract review requirements, and gathering of information to comply with disclosure requirements.
The Company is implementing an enterprise resource planning (“ERP”) system on a worldwide basis, which is expected to improve the efficiency of certain operational, financial, and related transactional processes. The implementation began in 2018 and is expected to continue in phases over the next year. The implementation of a worldwide ERP system has and will continue to affect the processes that constitute our internal control over financial reporting and will require annual testing for effectiveness.

The Company completed implementation in certain subsidiaries/locations during 2018, including aspects relative to the United States, and will continue to roll out the ERP system into 2019. As with any new information technology application we implement, this application, along with the internal controls over financial reporting included in the related processes, was appropriately considered within the testing for effectiveness with respect to the implementation in these instances. We concluded, as part of our evaluation described in the above paragraphs, that the implementation of the ERP system in these circumstances has not materially affected our internal control over financial reporting.
There were no additional changes in our internal control over financial reporting for the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.
Item 9B. Other Information
Not applicable.

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PART III

Item 10. Directors, Executive Officers and Corporate Governance

Please see Part I, Item 1 of this Annual Report on Form 10-K for information about our executive officers, which is incorporated by reference herein. Information with respect to Directors and Corporate Governance may be found in our definitive proxy statement to be delivered to shareholders in connection with our 2019 Annual Meeting of Shareholders. Such information is incorporated herein by reference.

Item 11. Executive Compensation

Information with respect to this item may be found in our definitive proxy statement to be delivered to shareholders in connection with our 2019 Annual Meeting of Shareholders. Such information is incorporated herein by reference.

EQUITY COMPENSATION PLAN INFORMATION

The following table provides information about shares of CTS common stock that could be issued under all of our equity compensation plans as of December 31, 2018:

Plan Category	(a) Number of Securities to be Issued Upon Exercise of Outstanding Options, RSUs, Warrants and Rights (2)	(b) Weighted-Average Grant Date Fair Value of Outstanding Options, RSUs, Warrants and Rights	(c) Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column(a))
Equity compensation plans approved by security holders	1,133,539	$ 13.48	2,474,800
Equity compensation plans not approved by security holders(1)	5,522	—	—
Total	1,139,061		2,474,800

(1) In 1990, we adopted the Stock Retirement Plan for Non-Employee Directors. Prior to December 1, 2004, we annually credited an account for each non-employee director with 800 CTS common stock units. We also annually credited each deferred stock account with an additional number of CTS common stock units representing the amount of dividends which would have been paid on an equivalent number of shares of CTS common stock for each quarter during the preceding calendar year. As of December 1, 2004, this plan was amended to preclude crediting any additional CTS common stock units under the plan. Upon retirement, a participating non-employee director is entitled to receive one share of CTS common stock for each CTS common stock unit in his deferred stock account. On December 31, 2018, the deferred stock accounts contained a total of 5,522 CTS common stock units.

(2) Based on achievement of the maximum targets for performance-based equity grants.

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

Information with respect to this item may be found in our definitive proxy statement to be delivered to shareholders in connection with our 2019 Annual Meeting of Shareholders. Such information is incorporated herein by reference.

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

Information with respect to this item may be found in our definitive proxy statement to be delivered to shareholders in connection with our 2019 Annual Meeting of Shareholders. Such information is incorporated herein by reference.

Item 14. Principal Accountant Fees and Services

Information with respect to this item may be found in our definitive proxy statement to be delivered to shareholders in connection with our 2019 Annual Meeting of Shareholders. Such information is incorporated herein by reference.

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PART IV

Item 15. Exhibits and Financial Statements Schedules

(a) (1) Financial Statements

The following Consolidated Financial Statements of CTS Corporation and Subsidiaries are included herein:

Report of Independent Registered Public Accounting Firm

Report of Independent Registered Public Accounting Firm on Internal Control over Financial Reporting

Consolidated Statements of Earnings: Years ended December 31, 2018, December 31, 2017, and December 31, 2016

Consolidated Statements of Comprehensive Earnings: Years ended December 31, 2018, December 31, 2017, and December 31, 2016

Consolidated Balance Sheets: December 31, 2018, and December 31, 2017

Consolidated Statements of Cash Flows: Years ended December 31, 2018, December 31, 2017, and December 31, 2016

Consolidated Statements of Shareholders' Equity: Years Ended December 31, 2018, December 31, 2017, and December 31, 2016

Notes to Consolidated Financial Statements

(a) (2) Financial Statement Schedule:

Schedule II: Valuation and Qualifying Accounts and Reserves

Other schedules have been omitted because they are not applicable or the required information is shown in the Consolidated Financial Statements or Notes thereto.

(a) (3) Exhibits

All references to documents filed pursuant to the Securities Exchange Act of 1934, including Forms 10-K, 10-Q and 8-K, were filed by CTS, File No. 1-4639.

(3)(i)	Amended and Restated Articles of Incorporation (incorporated by reference to Exhibit 5 to the Current Report on Form 8-K, filed with the SEC on September 1, 1998).
(3)(ii)	Amended Bylaws (incorporated herein by reference to Exhibit 3 to the Form 8-K, filed with the SEC on December 28, 2018).
(10)(a)	CTS Corporation Stock Retirement Plan for Non-Employee Directors, effective April 30, 1990, as amended (incorporated by reference to Exhibit (10)(a) to the Quarterly Report on Form 10-Q for the quarter ended March 30, 2003, filed with the SEC on April 23, 2003).*
(10)(b)	Amendment to the CTS Corporation Stock Retirement Plan for Non-Employee Directors, dated as of December 1, 2004 (incorporated by reference to Exhibit (10)(j) to the Annual Report on Form 10-K for the year ended December 31, 2004, filed with the SEC on March 4, 2005).
(10)(c)	CTS Corporation 2004 Omnibus Long-term Incentive Plan and Incentive Stock Option Agreement (incorporated by reference to the Exhibit 10(a) to the Quarterly Report on Form 10-Q for the quarter ended September 26, 2004, filed with the SEC on October 19, 2004).*
(10)(d)	Credit Agreement Between CTS Corporation and BMO Harris Bank N.A. dated August 10, 2015 (incorporated by reference to Exhibit 10.1 to the Form 8-K filed with the SEC on August 12, 2015).
(10)(e)	Amendment to Credit Agreement between CTS Corporation and BMO Harris Bank N.A. (incorporated by reference to Exhibit 10.1 to the Form 8-K filed with the SEC on May 25, 2016).
(10)(f)	Amendment No. 1 to the CTS Corporation 2004 Omnibus Long-term Incentive Plan (incorporated by reference to Exhibit 10(aa) to the Annual Report on Form 10-K filed with the SEC on May 15, 2007.

(10)(g)	Prototype Individual Excess Benefit Retirement Plan (incorporated by reference to Exhibit 10(d) to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2007, filed with the SEC on October 24, 2007).*
(10)(h)	CTS Corporation 2009 Omnibus Equity and Performance Incentive Plan (incorporated by reference to Exhibit 10.1 to the Current Report on Form 8-K, filed with the SEC on May 28, 2009).*

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(10)(i)	Form Restricted Stock Unit Agreement (Shares) (incorporated by reference to Exhibit 10.2 to the Current Report on Form 8-K, filed with the SEC on May 28, 2009).*
(10)(j)	Form Restricted Stock Unit Agreement (Cash) (incorporated by reference to Exhibit 10.3 to the Current Report on Form 8-K, filed with the SEC on May 28, 2009).*
(10)(k)	CTS Corporation Executive Severance Policy, effective as of September 10, 2009 (incorporated by reference to Exhibit 10 to the Quarterly Report on Form 10-Q for the quarter ended September 27, 2009, filed with the SEC on October 28, 2009).*
(10)(l)	Letter Agreement dated February 19, 2010 by and among CTS Corporation, Toyota Motor Sales, U.S.A. Inc., Toyota Canada Inc. and Toyota Motor Engineering & Manufacturing North America, Inc. (incorporated by reference to Exhibit 10(a) to the Quarterly Report on form 10-Q for the quarter ended October 3, 2010, filed with the SEC October 27, 2010).
(10)(m)	Prototype Change in Control Agreement (incorporated by reference to Exhibit 10(x) to the Annual Report on Form 10-K for the year ended December 31, 2011, filed with the SEC on February 24, 2012).*
(10)(n)	CTS Corporation Management Incentive Plan, approved by the shareholders on May 23, 2012 (incorporated by reference to Appendix A to the Proxy Statement for the 2012 Annual Meeting of Shareholders, filed with the SEC on April 17, 2012).*
(10)(o)	CTS Corporation 2013-2015 CEO Performance Restricted Stock Unit Plan dated February 8, 2013 (incorporated by reference to Exhibit 10(cc) to the Annual Report on Form 10-K for the year ended December 31, 2012, filed with the SEC on February 25, 2013).*
(10)(p)	First Amendment to the CTS Corporation Executive Severance Policy (incorporated by reference to Exhibit 10(b) to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2013, filed with the SEC on April 25, 2013).*
(10)(q)	CTS Corporation 2014 Performance and Incentive Compensation Plan (incorporated by reference to Exhibit 10.1 to the Form 8-K, filed with the SEC on May 22, 2014).*
(10)(r)	Credit Agreement Between CTS Corporation and CTS International B.V. and BMO Harris Bank N.A. dated February 12, 2019 (incorporated by reference to Exhibit 10.1 to the Form 8-K filed with the SEC on February 15, 2019).
(10)(s)	CTS Corporation Pension Plan Exhibit (Amended and Restated Effective As of July 1, 2015) (incorporated by reference to Exhibit 10(s) to the Form 10-K filed with the SEC on February 23, 2018).
(10)(t)	Amendment to the CTS Corporation Pension Plan (Amended and Restated Effective as of July 1, 2015) as of October 6, 2016, (incorporated by reference to Exhibit 10(t) to the Form 10-K filed with the SEC on February 23, 2018).
(10)(u)	Amendment to the CTS Corporation Pension Plan (Amended and Restated Effective as of July 1, 2015) as of June 26, 2017, (incorporated by reference to Exhibit 10(u) to the Form 10-K filed with the SEC on February 23, 2018).
(10)(v)	

	Amendment to the CTS Corporation Pension Plan (Amended and Restated Effective as of July 1, 2015) as of September 22, 2017, (incorporated by reference to Exhibit 10(v) to the Form 10-K filed with the SEC on February 23, 2018).
(10)(w)	CTS Corporation Director and Officer Indemnification Agreement (incorporated by reference to Exhibit 10.1 to the Form 8-K, filed with the SEC on February 18, 2015)
(10)(x)	CTS Corporation 2018 Equity and Incentive Compensation Plan (incorporated by reference to Exhibit 10.1 to the Form 8-K, filed with the SEC on May 22, 2018).
(21)	Subsidiaries.
(23)	Consent of Grant Thornton LLP.
(31)(a)	Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
(31)(b)	Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
(32)(a)	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.

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(32)(b)	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	XBRL Instance Document
101.SCH	XBRL Taxonomy Extension Schema Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	XBRL Taxonomy Extension Label Linkbase Document
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

* Management contract or compensatory plan or arrangement.

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.

	CTS Corporation	
Date: February 22, 2019	By:	/s/ Ashish Agrawal Ashish Agrawal Vice President and Chief Financial Officer (Principal Financial Officer)
Date: February 22, 2019	By:	/s/ William Cahill William Cahill Chief Accounting Officer (Principal Accounting 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.

Date: February 22, 2019	By:	/s/ Kieran O'Sullivan Kieran O'Sullivan Chairman, President, and Chief Executive Officer (Principal Executive Officer)
Date: February 22, 2019	By:	/s/ Robert A. Profusek Robert A. Profusek Lead Director
Date: February 22, 2019	By:	/s/ Patricia K. Collawn Patricia K. Collawn Director
Date: February 22, 2019	By:	/s/ Gordon Hunter Gordon Hunter Director
Date: February 22, 2019	By:	/s/ William S. Johnson William S. Johnson Director
Date: February 22, 2019	By:	/s/ Diana M. Murphy Diana M. Murphy Director
Date: February 22, 2019	By:	/s/ Alfonso G. Zulueta Alfonso G. Zulueta Director

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Management's Report on Internal Control Over Financial Reporting

CTS' management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rule 13a-15(f). Under the supervision and with the participation of management, including CTS' Chief Executive Officer and Chief Financial Officer, CTS conducted an evaluation of the effectiveness of internal control over financial reporting based on the framework in Internal Control—Integrated Framework (2013 framework) issued by the Committee of Sponsoring Organizations of the Treadway Commission. In its assessment of the effectiveness of internal control over financial reporting as of December 31, 2018, management determined that its internal control over financial reporting was effective as of December 31, 2018. Grant Thornton LLP, an independent registered public accounting firm, has audited CTS' internal control over financial reporting as of December 31, 2018, as stated in their report which is included herein.

CTS Corporation
Lisle, IL
February 22, 2019

/s/ Kieran O'Sullivan
Kieran O'Sullivan
Chairman, President and Chief Executive Officer
(Principal Executive Officer)

/s/ Ashish Agrawal
Ashish Agrawal
Vice President and Chief Financial Officer
(Principal Financial Officer)