FERRO CORP
Form 10-K
February 27, 2019
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UNITED STATES SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 10-K

(Mark One)

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

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from _________ to __________

Commission file number 1-584

FERRO CORPORATION

(Exact name of registrant as specified in its charter)

Ohio	34-0217820
(State or Other Jurisdiction of Incorporation or Organization)	(IRS Employer Identification No.)
6060 Parkland Blvd.	
Suite 250	
Mayfield Heights, OH	44124
(Address of Principal Executive Offices)	(Zip Code)

Registrant’s telephone number, including area code: 216-875-5600

Securities Registered Pursuant to section 12(b) of the Act:

Title of Each Class	Name of Each Exchange on Which Registered
Common Stock, par value $1.00	New York Stock Exchange

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. YES NO

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. YES NO

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. YES NO

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

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

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

Large accelerated filer	Accelerated filer	Non-accelerated filer	Smaller reporting company	Emerging growth company

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

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

The aggregate market value of Ferro Corporation Common Stock, par value $1.00, held by non-affiliates and based on the closing sale price as of June 30, 2018, was approximately $1,728,453,000.

On January 31, 2019, there were 82,705,878 shares of Ferro Corporation Common Stock, par value $1.00 outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Proxy Statement for Ferro Corporation's 2019 Annual Meeting of Shareholders are incorporated into Part III of this Annual Report on Form 10-K.

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PART I

Item 1 — Business

History, Organization and Products

Ferro Corporation was incorporated in Ohio in 1919 as an enameling company and today is a leading producer of specialty materials that are sold to a broad range of manufacturers who, in turn, make products for many end-use markets. When we use the terms “Ferro,” “we,” “us” or “the Company,” we are referring to Ferro Corporation and its subsidiaries unless indicated otherwise.

Ferro’s products fall into two general categories: functional coatings, which perform specific functions in the manufacturing processes and end products of our customers; and color solutions, which provide aesthetic and performance characteristics to our customers’ products. Our products are manufactured in approximately 52 facilities around the world. They include frits, porcelain and other glass enamels, glazes, stains, decorating colors, pigments, inks, polishing materials, dielectrics, electronic glasses, and other specialty coatings.

Ferro develops and delivers innovative products to our customers based on our strengths in the following technologies:

- Particle Engineering — Our ability to design and produce very small particles made of a broad variety of materials, with precisely controlled characteristics of shape, size and particle distribution. We understand how to disperse these particles within liquid, paste and gel formulations.
- Color and Glass Science — Our understanding of the chemistry required to develop and produce pigments that provide color characteristics ideally suited to customers’ applications. We have a demonstrated ability to manufacture glass-based and certain other coatings with properties that precisely meet customers’ needs in a broad variety of applications.
- Surface Chemistry and Surface Application Technology — Our understanding of chemicals and materials used to develop products and processes that involve the interface between layers and the surface properties of materials.
- Formulation — Our ability to develop and manufacture combinations of materials that deliver specific performance characteristics designed to work within customers’ particular products and manufacturing processes.

We differentiate ourselves in our industry by innovation and new products and services and the consistent high quality of our products, combined with delivery of localized technical service and customized application technology support. Our value-added technology services assist customers in their material specification and evaluation, product design, and manufacturing process characterization in order to help them optimize the application of our products.

Ferro’s operations are divided into the four business units, which comprise three reportable segments, listed below:

Tile Coating Systems(1)
Porcelain Enamel(1)
Performance Colors and Glass
Color Solutions

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(1) Tile Coating Systems and Porcelain Enamel are combined into one reportable segment, Performance Coatings, for financial reporting purposes.

Financial information about our segments is included herein in Note 21 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K.

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Markets and Customers

Ferro's products are used in a variety of product applications, within the following markets:

Appliances	Household furnishings
Automotive	Industrial products
Building and renovation	Packaging
Electronics	Sanitary

Many of our products are used as functional or aesthetic coatings for a variety of different substrates on our customers' products, such as metals, ceramics, glass, plastic, wood and concrete. Other products are used to manufacture electronic components and other products. Still other products are added during our customers' manufacturing processes to provide desired properties to their end product. Often, Ferro materials are a small portion of the total cost of our customers' products, but they can be critical to the functionality or appearance of those products.

Our customers include manufacturers of ceramic tile, major appliances, construction materials, automobile parts, automobiles, architectural and container glass, and electronic components and devices. Many of our customers, including makers of major appliances and automobile parts, purchase materials from more than one of our business units. Our customer base is well diversified both geographically and by end market.

We generally sell our products directly to our customers. However, a portion of our business uses indirect sales channels, such as agents and distributors, to deliver products to market. In 2018, no single customer or related group of customers represented more than 10% of net sales. In addition, none of our reportable segments is dependent on any single customer or related group of customers.

Backlog of Orders and Seasonality

Generally, there is no significant lead time between customer orders and delivery in any of our business segments. As a result, we do not consider that the dollar amount of backlogged orders believed to be firm is material information for an understanding of our business. Although not seasonal, in certain of our technology-driven markets, our customers' business is often characterized by product campaigns with specific life cycles, which can result in uneven demand as product ramp-up periods are followed by down-cycle periods. As our innovation activity increases in line with our value creation strategy, we expect this type of business to also increase. This type of market operates on a different cycle from the majority of our business. We also do not regard any material part of our business to be seasonal. However, customer demand has historically been higher in the second quarter when building and renovation markets are particularly active, and the second quarter is also normally the strongest for sales and operating profit.

Competition

In most of our markets, we have a substantial number of competitors, none of which is dominant. Due to the diverse nature of our product lines, no single competitor directly matches all of our product offerings. Our competition varies by product and by region, and is based primarily on product quality, performance and functionality, as well as on pricing, customer service, technical support, and the ability to develop custom products to meet specific customer applications.

We are a worldwide leader in the production of specialty coatings and enamels for glass enamels, porcelain enamel, and ceramic tile coatings. There is strong competition in our markets, ranging from large multinational corporations to local producers. While many of our customers purchase customized products and formulations from us, our customers could generally buy from other sources, if necessary.

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Raw Materials and Supplier Relations

Raw materials widely used in our operations include:

Metal Oxides:	Other Inorganic Materials:
Aluminum oxide(1)	Boron(2)
Chrome Oxide(1) (2)	Clay(2)
Cobalt oxide(1)(2)	Feldspar(2)
Iron Oxide(1)	Lithium(2)
Lead Oxide(1)	Silica(2)
Nickel oxide(1)(2)	Soda Ash(1)
Titanium dioxide(1)(2)	Zircon(2)
Zinc oxide(2)	
Zirconium dioxide(2)	

Precious and Non-precious Metals:	Energy:
Bismuth(1)	Electricity
Chrome(1)(2)	Natural gas
Copper(1)	
Gold(1)	
Molybdenum(1)	
Silver(1)	
Vandaium(1)	

(1) Primarily used by the Performance Colors and Glass and the Color Solutions segments.
(2) Primarily used by the Performance Coatings segment.

These raw materials make up a large portion of our product costs in certain of our product lines, and fluctuations in the cost of raw materials can have a significant impact on the financial performance of the related businesses. We attempt to pass through to our customers raw material cost increases.

We have a broad supplier base and, in many instances, multiple sources of essential raw materials are available worldwide if problems arise with a particular supplier. We maintain many comprehensive supplier agreements for strategic and critical raw materials. We did not encounter raw material shortages in 2018 that significantly affected our manufacturing operations, but we are subject to volatile raw material costs that can affect our results of operations.

Environmental Matters

We handle, process, use and store hazardous materials as part of the production of some of our products. As a result, we operate production facilities that are subject to a broad array of environmental laws and regulations in the countries in which we operate, particularly for wastes, wastewater discharges and air emissions. In addition, some of our products are subject to restrictions under laws or regulations such as California's Proposition 65, the Toxic Substances and Control Act and the European Union's ("EU") chemical substances directive. The costs to comply with the complex environmental laws and regulations applicable to our operations are significant and will continue for the industry and us for the foreseeable future. These routine costs are expensed as they are incurred. While these costs may increase in the future, they are not expected to have a material impact on our financial position, liquidity or results of operations. We believe that we are in substantial compliance with the environmental laws and regulations applicable to our operations.

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We also believe that, to the extent that we may not be in compliance with such regulations, such non-compliance will not have a materially adverse effect on our financial position, liquidity or results of operations.

Our policy is to operate our plants and facilities in a manner that protects the environment and the health and safety of our employees and the public. We intend to continue to make expenditures for environmental and health and safety protection and improvements in a timely manner consistent with available technology. Although we cannot precisely predict future environmental, health and safety spending, we do not expect the costs to have a material impact on our financial position, liquidity or results of operations. Capital expenditures for environmental, health and safety protection were $6.1 million in 2018, $6.2 million in 2017, and $1.4 million in 2016. We also accrue for environmental remediation costs when it is probable that a liability has been incurred and we can reasonably estimate the amount. We determine the timing and amount of any liability based upon assumptions regarding future events, and inherent uncertainties exist in such evaluations primarily due to unknown conditions or circumstances, changing governmental regulations and legal standards regarding liability, and evolving technologies. We adjust these liabilities periodically as remediation-related efforts progress, the nature and extent of contamination becomes more certain, or as additional technical or legal information becomes available.

Research and Development

We are involved worldwide in research and development activities relating to new and existing products, services and technologies required by our customers' continually changing markets. Our research and development resources are organized into centers of excellence that support our regional and worldwide major business units. These centers are augmented by local laboratories that provide technical service and support to meet customer and market needs in various geographic areas.

Total expenditures for product and application technology, including research and development, customer technical support and other related activities, were $40.2 million in 2018, $36.4 million in 2017, and $27.3 million in 2016.

Patents, Trademarks and Licenses

We own a substantial number of patents and patent applications relating to our various products and their uses. While these patents are of importance to us and we exercise diligence to ensure that they are valid, we do not believe that the invalidity or expiration of any single patent or group of patents would have a material adverse effect on our businesses. Our patents will expire at various dates through the year 2037. We also use a number of trademarks that are important to our businesses as a whole or to particular segments of our business. We believe that these trademarks are adequately protected.

Employees

At December 31, 2018, we employed 6,059 full-time employees, including 5,292 employees in our foreign consolidated subsidiaries and 767 in the United States ("U.S."). Total employment increased by 391 in our foreign subsidiaries and decreased by 14 in the U.S. from the prior year end due to the additions related to acquisitions and new business opportunities, net of cost reduction initiatives.

Collective bargaining agreements cover 11.6% of our U.S. workforce. Approximately 2.2% of all U.S. employees are affected by a labor agreement that expires in 2019, and we expect to complete the renewal of the agreement with no significant disruption to the related business. We consider our relations with our employees, including those covered by collective bargaining agreements, to be good.

Our employees in Europe have protections afforded them by local laws and regulations through unions and works councils. Some of these laws and regulations may affect the timing, amount and nature of restructuring and cost reduction programs in that region.

Domestic and Foreign Operations

We began international operations in 1927. Our products are manufactured and/or distributed through our consolidated subsidiaries and unconsolidated affiliates in the following countries:

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Consolidated Subsidiaries:

Argentina	Egypt	Japan	Russia
Australia	France	Luxembourg	Spain
Belgium	Germany	Malaysia	Taiwan
Brazil	India	Mexico	Thailand
Bulgaria	Indonesia	Netherlands	Turkey
Canada	Ireland	Poland	United Kingdom
China	Israel	Portugal	United States
Colombia	Italy	Romania	Vietnam

Unconsolidated Affiliates:

China	Egypt	South Korea
Ecuador	Spain	

Financial information for geographic areas is included in Note 21 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K. More than 76% of our net sales are outside of the U.S. We sell products into approximately 109 countries.

Our U.S. parent company receives technical service fees and/or royalties from many of its foreign subsidiaries. As a matter of corporate policy, the foreign subsidiaries have historically been expected to remit a portion of their annual earnings to the U.S. parent company as dividends. To the extent earnings of foreign subsidiaries are not remitted to the U.S. parent company, those earnings are indefinitely re-invested in those subsidiaries.

Available Information

Our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, and Current Reports on Form 8-K, including any amendments, will be made available free of charge on our website, www.ferro.com, as soon as reasonably practical, following the filing of the reports with the U.S. Securities and Exchange Commission (“SEC”). Our Corporate Governance Principles, Code of Business Conduct, Guidelines for Determining Director Independence, and charters for our Audit Committee, Compensation Committee and Governance and Nomination Committee are available free of charge either on our website or to any shareholder who requests them from the Ferro Corporation Investor Relations Department located at 6060 Parkland Blvd., Suite 250, Mayfield Heights, Ohio, 44124.

Forward-looking Statements

Certain statements contained here and in future filings with the SEC reflect our expectations with respect to future performance and constitute “forward-looking statements” within the meaning of Section 27A of the Securities Act of

1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. These statements are subject to a variety of uncertainties, unknown risks and other factors concerning our operations and the business environment, which are difficult to predict and are beyond our control.

Item 1A — Risk Factors

Many factors could cause our actual results to differ materially from those suggested by statements contained in this filing and could adversely affect our future financial performance. Such factors include the following:

We sell our products into industries where demand has been unpredictable, cyclical or heavily influenced by consumer spending, and such demand and our results of operations may be further impacted by macro-economic circumstances.

We sell our products to a wide variety of customers who supply many different market segments. Many of these market segments, including building and renovation, major appliances, transportation, and electronics, are cyclical or closely tied to consumer demand. Consumer demand may change and is difficult to accurately forecast. Change in demand and incorrect forecasts of demand or unforeseen reductions in demand can adversely affect costs and profitability due to factors such as underused manufacturing capacity, excess inventory, or working capital needs. Our forecasting systems and modeling tools may not accurately predict changes in demand for our products or other market conditions.

Our results of operations are materially affected by conditions in capital markets and economies in the U.S. and elsewhere around the world. Concerns over fluctuating prices, energy costs, geopolitical issues, government deficits and debt loads, and the availability and cost of credit have contributed to economic uncertainty around the world. Our customers may be impacted by these conditions and may modify, delay, or cancel plans to purchase our products. Additionally, if customers are not successful in generating sufficient revenue or are precluded from securing financing, they may not be able to pay, or may delay payment of, accounts receivable that are owed to us. A reduction in demand or inability of customers to pay us for our products may adversely affect our earnings and cash flow.

We strive to improve operating margins through sales growth, price increases, new products, productivity gains, optimization initiatives, and improved purchasing techniques, but we may not achieve the desired improvements.

We work to improve operating profit margins through activities such as growing sales to achieve increased economies of scale, increasing prices, introducing new products, improving manufacturing processes, product reformulation and adopting purchasing techniques that lower costs or provide increased cost predictability to realize cost savings. However, these activities depend on a combination of improved product design and engineering, effective manufacturing process control initiatives, cost-effective redistribution of production, and other efforts that may not be as successful as anticipated. The success of sales growth and price increases depends not only on our actions but also on the strength of customer demand and competitors' pricing responses, which are not fully predictable. Failure to successfully implement actions to improve operating margins could adversely affect our financial performance.

The global scope of our operations exposes us to risks related to currency conversion rates, new and different regulatory schemes and changing economic, regulatory, social and political conditions around the world.

More than 76% of our net sales during 2018 were outside of the U.S. In order to support our customers, access regional markets and compete effectively, our operations are located around the world. Our operations are subject to economic, regulatory, social and political conditions in multiple locations and we are subject to risks relating to currency conversion rates. We also may encounter difficulties expanding into additional growth markets around the world. Other risks inherent in our operations include the following:

- New, different and unpredictable legal and regulatory requirements and enforcement mechanisms in the U.S. and other countries;
- Export licenses may be difficult to obtain, and we may be subject to import or export duties or import quotas, export controls and restrictions administered by, for example, the Office of Foreign Assets Controls or other trade restrictions or barriers;
- Increased costs, and decreased availability, of transportation or shipping;
- Credit risk and financial conditions of local customers and distributors;
- Risk of nationalization of private enterprises by governments, or restrictions on investments;
- Potentially adverse tax consequences, including imposition or increase of withholding and other taxes on remittances and other payments by subsidiaries; and
- Political, economic and social conditions, including the possibility of hyperinflationary conditions, deflation, organized crime and political instability in certain countries.

We have subsidiaries in Egypt, Israel and Turkey that are located near politically volatile regions. Such conditions could potentially impact our ability to recover both the cost of our investments and earnings from those investments. While we attempt to anticipate these changes and manage our business appropriately in each location where we do business, these changes are often beyond our control and difficult to forecast.

The consequences of these risks may have significant adverse effects on our results of operations or financial position, and if we fail to comply with applicable laws and regulations, we could be exposed to civil and criminal penalties, reputational harm, and restrictions on our operations.

Changes in U.S. and other governments' trade policies and other factors beyond our control may adversely impact our business, financial condition and results of operations.

Tariffs, retaliatory tariffs or other trade restrictions on products and materials that we or our customers export or import could affect demand for our products. Direct or unforeseen consequences of tariffs, retaliatory tariffs or other trade restrictions may also alter the competitive landscape of our products in one or more regions of the world. Trade tensions or other governmental action related to tariffs or international trade agreements or policies has the potential to negatively impact our business, financial condition and results of operations.

We depend on reliable sources of energy and raw materials, minerals and other supplies, at a reasonable cost, but the availability of these materials and supplies could be interrupted and/or their prices could change and adversely affect our sales and profitability.

We purchase energy and many raw materials to manufacture our products. Changes in their availability or price could affect our ability to manufacture enough products to meet customers' demands or to manufacture products profitably. We try to maintain multiple sources of raw materials and supplies where practical, but this may not prevent unanticipated changes in their availability or cost and, for certain raw materials, there may not be alternative sources. We may not be able to pass cost increases through to our customers. Significant disruptions in availability or cost increases could adversely affect our manufacturing volume or costs, which could negatively affect product sales or profitability of our operations.

We operate in regions of the world where it can be difficult for a multi-national company such as Ferro to compete lawfully with local competitors, which may cause us to lose business opportunities.

We pursue business opportunities around the world and many of our most promising growth opportunities are in developing markets, including the People's Republic of China, Latin America, the Asia Pacific region, India and the Middle East. Although we have been able to compete successfully in those markets to date, local laws and customs can make it difficult for a multi-national company such as Ferro to compete on a "level playing field" with local competitors without engaging in conduct that would be illegal under U.S. or other countries' anti-bribery laws. Our strict policy of observing the highest standards of legal and ethical conduct may cause us to lose some otherwise attractive business opportunities to competitors in these regions.

We have undertaken and continue to undertake optimization initiatives, to rationalize our operations and improve our operating performance, but we may not be able to implement and/or administer these initiatives in the manner contemplated and these initiatives may not produce the desired results.

We have undertaken, and intend to continue undertaking, optimization initiatives to rationalize our operations to improve our operational performance. These initiatives may involve, among other things, changes to the operations of recently acquired business, the transfer of manufacturing to new or existing facilities, and restructuring programs that involve plant closures and staff reductions, which could be material in their nature with respect to the investments, costs and potential benefits. These initiatives also may involve changes in the management and delivery of functional services. Although we expect these initiatives to help us achieve operational efficiencies and cost savings, we may not be able to implement and/or administer these initiatives in the manner contemplated, which could cause the initiatives to fail to achieve the desired results. In addition, transfer and consolidation of manufacturing operations may involve substantial capital expenses and the transfer of manufacturing processes and personnel from one site to another, with resultant inefficiencies and other issues at the receiving site as it starts up, the need for requalification of our products and for ISO or other certifications of our products. We may experience shortages of affected products, delays and higher than expected expenses. Changes in functional services may prove ineffective, inefficient and disruptive. Accordingly, the initiatives that we have implemented and those that we may implement in the future may not improve our operating performance and may not help us achieve cost savings. Failure to successfully implement and/or administer these initiatives could have an adverse effect on our financial performance.

Our businesses depend on a continuous stream of new products and services, and failure to introduce new products and services could affect our sales, profitability and liquidity.

We strive to remain competitive through innovation, including by developing and introducing new and improved products and services on an ongoing basis. Customers continually evaluate our products and services in comparison to those offered by our competitors. A failure to introduce new products and services at the right time that are price competitive and that meet the needs of our

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customers could adversely affect our sales, or could require us to compensate by lowering prices. In addition, when we invest in new product development, we face risks related to production delays, cost over-runs and unanticipated technical difficulties, which could impact sales, profitability and/or liquidity.

Our strategy includes seeking opportunities in new growth markets, and failure to identify or successfully enter such markets could affect our ability to grow our revenues and earnings.

Certain of our products are sold into mature markets and part of our strategy is to identify and enter into markets growing more rapidly. These growth opportunities may involve new geographies, new product lines, new technologies, or new customers. We may not successfully exploit such opportunities and our ability to increase our revenue and earnings could be impacted as a result.

We may not be able to complete or successfully integrate future acquisitions into our business, which could adversely affect our business or results of operations.

We have pursued and we intend to continue to pursue acquisitions. Our success in accomplishing growth through acquisitions may be limited by the availability and suitability of acquisition candidates and by our financial resources, including available cash and borrowing capacity. Acquisitions involve numerous risks, including difficulty determining appropriate valuation, integrating operations, information systems, technologies, services and products of the acquired product lines or business, personnel turnover, and the diversion of management's attention from other business matters. In addition, we may be unable to achieve anticipated benefits from these acquisitions in the timeframe that we anticipate, or at all, which could adversely affect our business or result of operations.

Certain of the markets for our products and services are highly competitive and subject to intense price competition, which could adversely affect our sales and earnings performance.

Our customers typically have multiple suppliers from which to choose. If we are unwilling or unable to provide products and services at competitive prices, and if other factors, such as product performance and value-added services do not provide an offsetting competitive advantage, customers may reduce, discontinue, or decide not to purchase our products. If we could not secure alternate customers for lost business, our sales and earnings performance could be adversely affected.

We rely on information systems to conduct our business and interruption, or damage to, or failure or compromise of, these systems may adversely affect our business and results of operations.

We rely on information systems to obtain, process, analyze and manage data to forecast and facilitate the purchase of raw materials and the distribution of our products; to receive, process, and ship orders on a timely basis; to run and operate our facilities; to account for our product and service transactions with customers; to manage the accurate billing and collections for thousands of customers; to process payments to suppliers; and to manage data and records relating to our employees, contractors, and other individuals. Our business and results of operations may be adversely affected if these systems are interrupted, damaged, or compromised or if they fail for any extended period, due to events including but not limited to programming errors, aging information systems infrastructure and required maintenance or replacement, computer viruses and security breaches. Information privacy and cyber security risks have generally increased in recent years because of the proliferation of new technologies and the increased sophistication and activities of perpetrators of cyber-attacks. We may incur significant costs to implement the security measures that we feel are necessary to protect our information systems. However, our information systems may remain vulnerable to damage despite our implementation of security measures that we deem to be appropriate.

In addition, third-party service providers are responsible for managing a significant portion of our information systems, and we are subject to risk because of possible information privacy and security breaches of those third parties. Any system failure, accident or security breach involving our or a third-party's information system could result in disruptions to our operations. A breach in the security of our information systems could include the theft of our intellectual property or trade secrets, negatively impact our manufacturing operations, or result in the compromise of personal information of our employees, customers or suppliers. While we have, from time to time, experienced system failures, accidents and security breaches involving our information systems, these incidents have not had a material impact on our operations. To the extent that any system failure, accident or security breach results in material disruptions to our operations or the theft, loss or disclosure of, or damage to, material data or confidential information, our reputation, business, results of operations and financial condition could be materially adversely affected.

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Our implementation and operation of business information systems and processes could adversely affect our results of operations and cash flow.

We implement and operate information systems and related business processes for our business operations. Implementation and operation of information systems and related processes involves risk, including risks related to programming and data transfer. Costs of implementation also could be greater than anticipated. In addition, we may be unable or decide not to implement such systems and processes in certain locations. Inherent risks, decisions and constraints related to implementation and operation of information systems could result in operating inefficiencies and could impact our ability to perform business transactions. These risks could adversely impact our results of operations, financial condition, and cash flows.

Our business is subject to a variety of domestic and international laws, rules, policies and other obligations regarding data protection.

The processing and storage of certain information is increasingly subject to privacy and data security regulations and many such regulations are country-specific. The interpretation and application of data protection laws in the U.S, Europe and elsewhere, including but not limited to the California Consumer Privacy Act and the General Data Protection Regulation (the "GDPR"), are uncertain, evolving and may be inconsistent among jurisdictions. Complying with these various laws is difficult and could cause us to incur substantial costs or require us to change our business practices in a manner adverse to our business. We may be required to expend additional resources to continue to enhance our information privacy and security measures, investigate and remediate any information security vulnerabilities and/or comply with regulatory requirements.

We are subject to a number of restrictive covenants under our revolving credit facility, which could affect our flexibility to fund ongoing operations and strategic initiatives, and, if we are unable to maintain compliance with such covenants, could lead to significant challenges in meeting our liquidity requirements.

Our Amended Credit Facility, entered into on April 25, 2018, contains a number of restrictive covenants, including those described in more detail in Note 9 to the consolidated financial statements under Item 8 of this Annual Report on Form 10 K. These covenants include limitations on use of loan proceeds, limitations on the Company's ability to pay dividends and repurchase stock, limitations on acquisitions and dispositions and limitations on certain types of investments. The Amended Credit Facility also contains standard provisions relating to conditions of borrowing and customary events of default, including the non-payment of obligations by the Company and the bankruptcy of the Company. Specific to the 2018 Revolving Facility, the Company is subject to a financial covenant regarding the Company's maximum leverage ratio. If an event of default occurs, all amounts outstanding under the Amended Credit Facility may be accelerated and become immediately due and payable. The Amended Credit Facility is described in more detail in "Capital Resources and Liquidity" under Item 7 and in Note 9 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K.

We depend on external financial resources, and the economic environment and credit market uncertainty could interrupt our access to capital markets, borrowings, or financial transactions to hedge certain risks, which could adversely affect our financial condition.

At December 31, 2018, we had approximately \$821.4 million of short-term and long-term debt with varying maturities and approximately \$61.9 million of off balance sheet arrangements, including consignment arrangements for precious metals, bank guarantees, and standby letters of credit. These arrangements have allowed us to make investments in growth opportunities and fund working capital requirements. In addition, we may enter into financial transactions to hedge certain risks, including foreign exchange, commodity pricing, and sourcing of certain raw materials. Our continued access to capital markets and, the stability of our lenders, customers and financial partners, and their willingness to support our needs, are essential to our liquidity and our ability to meet our current obligations and to fund operations and our strategic initiatives. An interruption in our access to external financing or financial transactions to hedge risk could adversely affect our business prospects and financial condition. See further information regarding our liquidity in "Capital Resources and Liquidity" under Item 7 and in Note 9 to the consolidated financial statements under Item 8 of this Annual Report on Form 10 K.

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Regulatory authorities in the U.S., European Union and elsewhere are taking a more aggressive approach to regulating hazardous materials and other substances, and those regulations could affect sales of our products.

Legislation and regulations concerning hazardous materials and other substances can restrict the sale of products and/or increase the cost of producing them. Some of our products are subject to restrictions under laws or regulations such as California's Proposition 65 and the EU's chemical substances directive. The EU "REACH" registration system requires us to perform studies of some of our products or components of our products and to register the information in a central database, increasing the cost of these products. As a result of such regulations, our ability to sell certain products may be curtailed and customers may avoid purchasing some products in favor of less regulated, less hazardous or less costly alternatives. It may be impractical for us to continue manufacturing heavily regulated products, and we may incur costs to shut down or transition such operations to alternative products. These circumstances could adversely affect our business, including our sales and operating profits.

Our operations are subject to operating hazards and to stringent environmental, health and safety regulations, and compliance with those regulations could require us to make significant investments.

Our production facilities are subject to hazards associated with the manufacture, handling, storage, and transportation of chemical materials and products. These hazards can cause personal injury and loss of life, severe damage to, or destruction of, property and equipment and environmental contamination and other environmental damage and could have an adverse effect on our business, financial condition or results of operations.

We strive to maintain our production facilities and conduct our manufacturing operations in a manner that is safe and in compliance with all applicable environmental, health and safety regulations. Compliance with changing regulations, or other circumstances, may require us to make significant capital investments, incur training costs, make changes in manufacturing processes or product formulations, or incur costs that could adversely affect our profitability, and violations of these laws could lead to substantial fines and penalties. These costs may not affect competitors in the same way due to differences in product formulations, manufacturing locations or other factors, and we could be at a competitive disadvantage, which might adversely affect financial performance.

Our business could be adversely affected by safety, environmental and product stewardship issues.

We may be impacted by and may not be able to adequately address safety, human health, product liability and environmental risks associated with our current and historical products, product life cycles, and production processes and the obligations that follow from them. This could adversely impact employees, communities, stakeholders, the environment, our reputation and our business, financial condition, and the results of our operations. Public perception of the risks associated with our products, their respective life cycles, and production processes could impact product acceptance and influence the regulatory environment in which we operate.

We are exposed to lawsuits, governmental investigations and proceeding relating to current and historical operations and products, which could harm our business.

We are from time to time exposed to certain lawsuits, governmental investigations and proceedings relating to current and historical operations and products, which may include claims involving product liability, infringement of intellectual property rights of third parties, environmental compliance, hazardous materials, work place safety, employment contract and other claims. Due to the uncertainties of litigation, we can give no assurance that we will prevail on claims made against us in the lawsuits that we currently face or that additional claims will not be made against us in the future. We do not believe that lawsuits we currently face are likely to have a material adverse effect on our business, operating results or financial condition. Lawsuits or claims, if they were to result in a ruling adverse to us or otherwise result in an obligation on the part of the Company, could give rise to substantial liability, which could have a material adverse effect on our business, operating results or financial condition.

Sales of our products to certain customers or into certain industries may expose us to different and complex regulatory regimes.

We seek to expand our customer base and the industries into which we sell. Selling products to certain customers or into certain industries, such as governments or the defense industry, requires compliance with regulatory regimes that can be complex and difficult to navigate. Our failure to comply with these regulations could result in liabilities or damage to our reputation, which could negatively impact our business, financial condition, or results of operations.

If we are unable to protect our intellectual property rights, including trade secrets, or to successfully resolve claims of infringement brought against us, our product sales and financial performance could be adversely affected.

Our performance may depend in part on our ability to establish, protect and enforce intellectual property rights with respect to our products, technologies and proprietary rights and to defend against any claims of infringement, which involves complex legal, scientific and factual questions and uncertainties. We may have to rely on litigation to enforce our intellectual property rights. The intellectual property laws and practice of some countries may not protect our interests to the same extent as the laws and practices of the U.S. In addition, we may face claims of infringement that could interfere with our ability to use technology or other intellectual property rights that are material to our business operations. If litigation that we initiate is unsuccessful, we may not be able to protect the value of some of our intellectual property. In the event a claim of infringement against us is successful, we may be required to pay royalties or license fees to continue to use technology or other intellectual property rights that we have been using or we may be unable to obtain necessary licenses from third parties at a reasonable cost or within a reasonable time.

We have limited or no redundancy for certain of our manufacturing operations, and damage to our facilities or interference with our operations could interrupt our business, increase our costs of doing business and impair our ability to deliver our products on a timely basis.

If certain of our existing production facilities become incapable of manufacturing products for any reason, including through interruption of our supply chain, we may be unable to meet production requirements, we may lose revenue and we may not be able to maintain our relationships with our customers. Without operation of certain existing production facilities, we may be unable or limited in our ability to deliver products until we restore the manufacturing capability at the particular facility, find an alternative manufacturing facility or arrange an alternative source of supply. Although we carry business interruption insurance to cover lost revenue and profits in an amount we consider adequate, this insurance does not cover all possible situations or expenses. We may not be able to recover from or be compensated for the loss of opportunity and potential adverse impact on relations with our existing customers resulting from our inability to produce and deliver products for them.

Our multi-jurisdictional tax structure may not provide favorable tax efficiencies.

We conduct our business operations in a number of countries and are subject to taxation in those jurisdictions. While we seek to minimize our worldwide effective tax rate, our corporate structure may not optimize tax efficiency opportunities. We develop our tax position based upon the anticipated nature and structure of our business and the tax laws, administrative practices and judicial decisions now in effect in the countries in which we have assets or conduct business, which are subject to change or differing interpretations. In addition, our effective tax rate could be adversely affected by several other factors, including: increases in expenses that are not deductible for tax purposes, the tax effects of restructuring charges or purchase accounting for acquisitions, changes related to our ability to ultimately realize future benefits attributed to our deferred tax assets, including those related to other-than-temporary impairment, and a change in our decision to indefinitely reinvest foreign earnings. Further, we are subject to review and audit by both domestic and foreign tax authorities, which may result in adverse decisions. Increased tax expense could have a negative effect on our operating results and financial condition.

We have significant deferred tax assets, and if we are unable to utilize these assets, our results of operations may be adversely affected.

To fully realize the carrying value of our net deferred tax assets, we will have to generate adequate taxable profits in various tax jurisdictions. At December 31, 2018, we had $81.2 million of net deferred tax assets, after valuation allowances. If we do not generate adequate profits within the time periods required by applicable tax statutes, the carrying value of the tax assets will not be realized. If it becomes unlikely that the carrying value of our net deferred tax assets will be realized, the valuation allowances may need to be increased in our consolidated financial statements, adversely affecting results of operations. Further information on our deferred tax assets is presented in Note 11 to the consolidated financial statements under Item 8 of this Annual Report on Form 10 K.

U.S. federal income tax reform could adversely affect us.

On December 22, 2017, U.S. federal tax legislation, commonly referred to as the Tax Cuts and Jobs Act (the "Tax Act"), was signed into law, significantly reforming the U.S. Internal Revenue Code. The Tax Act, among other things, includes changes to U.S. federal tax rates, imposes significant additional limitations on the deductibility of interest, allows for the expensing of capital expenditures, creates a new minimum tax on certain foreign-sourced earnings and modifies or repeals many business deductions and credits. The Act contains many provisions which continue to be clarified through new regulations and we continue to examine the impact the Tax Act may have on our business.

Interest rates on some of our borrowings are variable, and our borrowing costs could be adversely affected by interest rate increases.

Portions of our debt obligations have variable interest rates. Generally, when interest rates rise, our cost of borrowings increases. We estimate, based on the debt obligations outstanding at December 31, 2018, that a one percent increase in interest rates would cause interest expense to increase by $2.7 million annually. Although interest rates have remained relatively stable over the past few years, future increases could raise our cost of borrowings and adversely affect our financial performance. See further information regarding our interest rates on our debt obligations in "Quantitative and Qualitative Disclosures about Market Risk" under Item 7A and in Note 9 to the consolidated financial statements under Item 8 of this Form 10-K.

If we are unable to manage our general and administrative expenses, our business, financial condition or results of operations could be negatively impacted.

We may not be able to effectively manage our administrative expense in all circumstances. While we attempt to effectively manage such expenses, including through projects designed to create administrative efficiencies, increases in staff-related and other administrative expenses may occur from time to time. We have made significant efforts to achieve general and administrative cost savings and improve our operational performance. As a part of these initiatives, we have and will continue to consolidate business and management operations and enter into arrangements with third parties offering cost savings. It cannot be assured that our strategies to reduce our general and administrative costs and improve our operating performance will be successful or achieve the anticipated savings.

We are subject to stringent labor and employment laws in certain jurisdictions in which we operate, we are party to various collective bargaining arrangements, and our relationship with our employees could deteriorate, which could adversely impact our operations.

A majority of our full-time employees are employed outside the U.S. In certain jurisdictions where we operate, labor and employment laws are relatively stringent and, in many cases, grant significant job protection to certain employees, including rights on termination of employment. In addition, in certain countries where we operate, our employees are members of unions or are represented by works councils. We are often required to consult with and seek the consent or advice of these unions and/or works councils. These regulations and laws, coupled with the requirement to seek consent or consult with the relevant unions or works councils, could have a significant impact on our flexibility in managing costs and responding to market changes.

Furthermore, approximately 11.6% of our U.S. employees as of December 31, 2018, are subject to collective bargaining arrangements or similar arrangements. Approximately 2.2% of all U.S. employees are affected by a labor agreement that expires in 2019. While we expect to be able to renew these agreements without significant disruption to our business when they are scheduled to expire, there can be no assurance that we will be able to negotiate labor agreements on satisfactory terms or that actions by our employees will not be disruptive to our business. If these workers were to engage in a strike, work stoppage or other slowdown or if other employees were to become unionized, we could experience a significant disruption of our operations and/or higher ongoing labor costs, which could adversely affect our business, financial condition and results of operations.

Employee benefit costs, especially postretirement costs, constitute a significant element of our annual expenses, and funding these costs could adversely affect our financial condition.

Employee benefit costs are a significant element of our cost structure. Certain expenses, particularly postretirement costs under defined benefit pension plans and healthcare costs for employees and retirees, may increase significantly at a rate that is difficult to forecast and may adversely affect our financial results, financial condition or cash flows. Changes in the applicable discount rate can affect our postretirement obligations. Declines in global capital markets may cause reductions in the value of our pension plan assets. Such circumstances could have an adverse effect on future pension expense and funding requirements. Further information regarding our retirement benefits is presented in Note 13 to the consolidated financial statements under Item 8 of this Annual Report on Form 10 K.

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We are subject to risks associated with outsourcing functions to third parties.

We have entered into outsourcing agreements with third parties, and rely on such parties, to provide certain services in support of our business. One such vendor provides a number of business services related to our information systems and finance and accounting activity. Arrangements with third-party service providers may make our operations vulnerable if vendors fail to provide the expected service or there are changes in their own operations, financial condition, or other matters outside of our control. If these service providers are unable to perform to our requirements or to provide the level of service expected, our operating results and financial condition may suffer and we may be forced to pursue alternatives to provide these services, which could result in delays, business disruptions and additional expenses.

There are risks associated with the manufacture and sale of our materials into industries that make products for sensitive applications.

We manufacture and sell materials to parties that make products for sensitive applications, such as medical devices. The supply of materials that enter the human body involves the risk of illness or injury to consumers, as well as commercial risks. Injury to consumers could result from, among other things, improper use, tampering by unauthorized third parties, or the introduction into the material of foreign objects, substances, chemicals and other agents during the manufacturing, packaging, storage, handling or transportation phases. Shipment of adulterated materials may be a violation of law and may lead to an increased risk of exposure to product liability or other claims, product recalls and increased scrutiny by federal and state regulatory agencies. Such claims or liabilities may not be covered by our insurance or by any rights of indemnity or contribution that we may have against third parties. In addition, the negative publicity surrounding any assertion that our materials caused illness or injury could have a material adverse effect on our reputation with existing and potential customers, which could negatively impact our business, operating results or financial condition.

If we are unable to attract and retain key personnel our business could be materially adversely affected.

Our business substantially depends on the continued service of key members of our management. The loss of the services of a key members of our management could have a material adverse effect on our business. Our future success will also depend on our ability to attract and retain highly skilled personnel, such as engineering, marketing and senior management professionals. Competition for these employees is intense, and we could experience difficulty from time to time in hiring and retaining the personnel necessary to support our business. If we do not succeed in retaining our current employees and attracting new skilled employees, our business could be materially adversely affected.

We are exposed to intangible asset risk, and a write down of our intangible assets could have an adverse impact to our operating results and financial position.

We have recorded intangible assets, including goodwill, in connection with business acquisitions. We are required to perform goodwill impairment tests on at least an annual basis and whenever events or circumstances indicate that the carrying value may not be recoverable from estimated future cash flows. As a result of our annual and other periodic evaluations, we may determine that the intangible asset values need to be written down to their fair values, which could result in material charges that could be adverse to our operating results and financial position. See further information regarding our goodwill and other intangible assets in “Critical Accounting Policies” under Item 7 and in Note 8 to the consolidated financial statements under Item 8 of this Form 10-K.

We may not be successful in implementing our strategies to increase our return on invested capital, internal rate of return, or other return metrics.

We are taking steps to generate a higher return our investments. There are risks associated with the implementation of these steps, which may be complicated and may involve substantial capital investment. To the extent we fail to achieve these strategies, our results of operations may be adversely affected.

Many of our assets are encumbered by liens that have been granted to lenders, and those liens affect our flexibility to dispose of property and businesses.

Certain of our debt obligations are secured by substantially all of our assets. These liens could reduce our ability and/or extend the time to dispose of property and businesses, as these liens must be cleared or waived by the lenders prior to any disposition. These security interests are described in more detail in Note 9 to the consolidated financial statements under Item 8 of this Annual Report on Form 10 K.

We are exposed to risks associated with acts of God, terrorists and others, as well as fires, explosions, wars, riots, accidents, embargoes, natural disasters, strikes and other work stoppages, quarantines and other governmental actions, and other events or circumstances that are beyond our control.

Ferro is exposed to risks from various events that are beyond our control, which may have significant effects on our results of operations. While we attempt to mitigate these risks through appropriate loss prevention measures, insurance, contingency planning and other means, we may not be able to anticipate all risks or to reasonably or cost-effectively manage those risks that we do anticipate. As a result, our operations could be adversely affected by circumstances or events in ways that are significant and/or long lasting.

The risks and uncertainties identified above are not the only risks that we face. Additional risks and uncertainties not presently known to us or that we currently believe to be immaterial also may adversely affect us. If any known or unknown risks and uncertainties develop into actual events, these developments could have material adverse effects on our financial position, results of operations, and cash flows.

Item 1B — Unresolved Staff Comments

None.

Item 2 — Properties

We lease our corporate headquarters offices, which are located at 6060 Parkland Blvd., Mayfield Heights, Ohio. The Company owns other corporate facilities worldwide. We own principal manufacturing plants that range in size from 21,000 sq. ft. to over 700,000 sq. ft. Plants we own with more than 250,000 sq. ft. are located in Spain; Germany; Belgium; Colombia; Mexico; Cleveland, Ohio; and Penn Yan, New York. The locations of these principal manufacturing plants by reportable segment are as follows:

Color Solutions-U.S.: Penn Yan, New York and Norcross, Georgia. Outside the U.S.: Colombia, China, India, Belgium, France, Romania and Spain.

Performance Colors and Glass-U.S.: Washington, Pennsylvania; King of Prussia, Pennsylvania and Orrville, Ohio. Outside the U.S.: Brazil, China, France, Germany, Mexico, Spain, and the United Kingdom.

Performance Coatings-U.S.: Cleveland, Ohio. Outside the U.S.: Argentina, Brazil, China, Egypt, France, Indonesia, Italy, Mexico, Spain, Poland, Portugal, Thailand and the United Kingdom.

In addition, we lease manufacturing facilities for the Performance Colors and Glass segment in the United Kingdom; Germany; Japan; Israel; Turkey; North Adams, Massachusetts, and Vista, California. We also lease manufacturing facilities for the Performance Coatings segment in Italy and Poland. We also lease manufacturing facilities in Taiwan for Color Solutions. In some instances, the manufacturing facilities are used for two or more segments. Leased facilities range in size from 12,000 sq. ft. to over 100,000 sq. ft.

Item 3 — Legal Proceedings

In November 2017, Suffolk County Water Authority filed a complaint, Suffolk County Water Authority v. The Dow Chemical Company et al., against the Company and a number of other companies in the U.S. Federal Court for the Eastern District of New York with regard to the product 1,4 dioxane. The plaintiff alleges, among other things, that the Suffolk County water supply is contaminated with 1,4 dioxane and that the defendants are liable for unspecified costs of cleanup and remediation of the water supply, among other damages. The Company has not manufactured 1,4 dioxane since 2008, denies the allegations related to liability for the plaintiff’s claims, and is vigorously defending this proceeding. In December 2018, additional complaints were filed in the same court by 10 other New York municipal water authorities against the company and others making substantially similar allegations regarding the contamination of their respective water supplies with 1,4 dioxane. The Company is likewise vigorously defending these additional actions. The Company currently does not expect the outcome of these proceedings to have a material adverse impact on its consolidated financial

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condition, results of operations, or cash flows, net of any insurance coverage. However, it is not possible to predict the ultimate outcome of these proceedings due to the unpredictable nature of litigation.

In addition to the proceedings described above, the Company and its consolidated subsidiaries are subject from time to time to various claims, lawsuits, investigations, and proceedings related to products, services, contracts, environmental, health and safety, employment, intellectual property, and other matters, including with respect to divested businesses. The outcome of such matters is unpredictable, our assessment of them may change, and resolution of them could have a material adverse effect on the Company’s consolidated financial position, results of operations, or cash flows. We do not currently expect the resolution of such matters to materially affect the consolidated financial position, results of operations, or cash flows of the Company.

Item 4 — Mine Safety Disclosures

Not applicable.

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Executive Officers of the Registrant

The executive officers of the Company as of February 27, 2019, are listed below, along with their ages and business experience during the past five years. The year indicates when the individual was named to the indicated position with Ferro, unless otherwise indicated.

Peter T. Thomas — 63

Chairman of the Board of Directors, 2014

President and Chief Executive Officer, 2013

Mark H. Duesenberg — 57

Vice President, General Counsel and Secretary, 2008

Benjamin J. Schlater — 43

Group Vice President and Chief Financial Officer, 2019

Vice President and Chief Financial Officer, 2016

Vice President, Corporate Development and Strategy, 2015

Treasurer and head of corporate development, strategic and financial planning and risk management, Veyance Technologies, a global manufacturing company, 2007

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PART II

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

Our common stock is listed on the New York Stock Exchange under the ticker symbol FOE. On January 31, 2019, we had 824 shareholders of record for our common stock, and the closing price of the common stock was $16.67 per share.

The chart below compares Ferro's cumulative total shareholder return for the five years ended December 31, 2018, to that of the Standard & Poor's 500 Index and the Standard & Poor's MidCap Specialty Chemicals Index. In all cases, the information is presented on a dividend-reinvested basis and assumes investment of $100.00 on December 31, 2013. At December 31, 2018, the closing price of our common stock was $15.68 per share.

COMPARISON OF FIVE-YEAR

CUMULATIVE TOTAL RETURNS

Our Board of Directors has not declared any dividends on common stock during 2018 or 2017. The Company's Amended Credit Facility restricts the amount of dividends we can pay on our common stock. Any future dividends declared would be at the discretion of our Board of Directors and would depend on our financial condition, results of operations, cash flows, contractual obligations, the terms our financing agreements at the time a dividend is considered, and other relevant factors. For further discussion, see Management's Discussion and Analysis of Financial Condition and Results of Operations under Item 7 of this Annual Report on Form 10-K.

In October 2018, the Company's Board of Directors approved a new share repurchase program under which the Company is authorized to repurchase up to an additional $50 million of the Company's outstanding common stock on the open market, including through Rule 10b5-1 plans, in privately negotiated transactions, or otherwise. This new program is in addition to the $100 million of authorization previously approved and announced.

The Company repurchased 1,470,791 shares of common stock at an average price of $19.59 per share for a total cost of $28.8 million during 2018. No repurchases were made during 2017. As of December 31, 2018, $71.2 million was available to purchase common stock under the programs.

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The following table summarizes purchases of our common stock by the Company and affiliated purchasers during the three months ended December 31, 2018:

	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Maximum Dollar Amount that May Yet Be Purchased Under the Plans or Programs
	(Dollars in thousands, except for per share amounts)			
October 1, 2018 to October 31, 2018	394,279	$ 17.75	6,998,284	$ 76,002,240
November 1, 2018 to November 30, 2018	268,696	$ 17.90	4,809,720	$ 71,192,520
December 1, 2018 to December 31, 2018	—	$ —	—	$ 71,192,520
Total	662,975		11,808,004	

Item 6 — Selected Financial Data

The following table presents selected financial data for the last five years ended December 31st:

	2018	2017	2016	2015	2014
	(Dollars in thousands, except for per share data)				
Net sales	$ 1,612,408	$ 1,396,742	$ 1,145,292	$ 1,075,341	$ 1,111,626
Income from continuing operations	80,946	57,768	44,577	99,883	(8,609)
Basic earnings (loss) per share from continuing operations attributable to Ferro Corporation common shareholders	0.95	0.68	0.52	1.16	(0.10)
Diluted earnings (loss) per share from continuing operations attributable to Ferro Corporation common shareholders	0.94	0.67	0.51	1.14	(0.10)
Cash dividends declared per common shares	-	-	-	-	-
Total assets	1,812,460	1,682,202	1,283,769	1,225,351	1,091,554
Long-term debt, including current portion	821,347	735,267	563,033	470,805	302,383

In 2015, we adopted the provisions of ASU 2015-03. The ASU requires debt issuance costs for term loans to be presented in the balance sheet as a reduction of the related debt liability rather than an asset. The adoption resulted in the reclassification of $5.3 million of unamortized debt issuance costs related to the term loan from Total assets to a reduction in Long-term debt, including current portion within the financial data above as of December 31, 2014.

In 2014, we commenced a process to market for sale all of the assets in our Polymer Additives reportable segment. During 2014, we sold substantially all of the assets related to our North America-based Polymer Additives business, which is presented as discontinued operations in 2014. In 2016, we completed the disposition of the Europe-based Polymer Additives business, which is presented as discontinued operations in 2016 through 2014.

In 2014, we sold substantially all of the assets in our Specialty Plastics business, which is presented as discontinued operations in 2014.

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

Overview

During the year ended December 31, 2018, net sales increased $215.7 million, or 15.4%, compared with 2017. The increase was driven by higher sales in Performance Coatings, Performance Colors and Glass and Color Solutions of $139.9 million, $42.8 million and $33.0 million, respectively. Gross profit increased $39.7 million compared with 2017. The increase in gross profit was attributable to increases across all of our segments, with increases in Performance Coatings, Color Solutions and Performance Colors and Glass and of $19.9 million, $11.2 million and $9.9 million, respectively. As a percentage of net sales, gross profit rate decreased approximately 150 basis points to 28.3%, from 29.8% in the prior year.

For the year ended December 31, 2018, selling, general and administrative ("SG&A") expenses increased $13.1 million, or 5.0%, compared with 2017. As a percentage of net sales, SG&A expenses decreased 170 basis points from 19.0% in 2017 to 17.3% in 2018.

For the year ended December 31, 2018, net income was $80.9 million, compared with net income of $57.8 million in 2017, and net income attributable to common shareholders was $80.1 million, compared with net income attributable to common shareholders of $57.1 million in 2017.

As previously disclosed on January 17, 2019, the Company is in the process of expanding its production facility in Villagran, Mexico, which will become the Company's Manufacturing Center of Excellence for the Americas. The expansion of the Villagran facility is expected to significantly increase the revenue generated from products manufactured at that facility. With the expanded capacity in Villagran, the Company (i) will discontinue the production of glass enamels, other industrial specialty products, such as architectural glass coatings, and pigments at its Washington, Pennsylvania facility over the course of 2019 and into 2020, (ii) plans to discontinue production of porcelain enamel products at its Cleveland, Ohio facility and (iii) will close additional facilities in Latin America. As part of this optimization initiative, the Company is expanding its King of Prussia, Pennsylvania facility. Conductive glass coatings production will be discontinued at the Washington, Pennsylvania facility and will be produced at the King of Prussia, Pennsylvania facility, and the Company's operations at its Vista, California facility will be transferred to the King of Prussia, Pennsylvania facility. In addition, the Company will be moving its Americas research and development center for glass products to its technology center in Independence, Ohio, where the Company is investing in expanded laboratory facilities. The Washington, Pennsylvania facility is expected to remain in operation until sometime in 2020. Production of specialty glasses for electronics applications will continue at the Cleveland, Ohio facility, and the Company will invest in the facility to equip it to serve as a logistics center. The Cleveland, Ohio facility also will serve as the Americas research and development center for the porcelain enamel business.

2018 Transactional Activity

Transactions undertaken in 2018 included the following business acquisitions:

Acquisition of Quimicer, S.A. ("Quimicer"): As discussed in Note 5, in the fourth quarter of 2018, the Company acquired 100% of the equity interests of Quimicer, for €27.0 million (approximately $31.3 million), including the assumption of debt of €5.2 million (approximately $6.1 million).

Acquisition of UWiZ Technology Co., Ltd. (“UWiZ”): As discussed in Note 5, in the third quarter of 2018, the Company acquired 100% of the equity interest of UWiZ for TWD823.4 million (approximately $26.9 million).

Acquisition of Ernst Diegel GmbH (“Diegel”): As discussed in Note 5, in the third quarter of 2018, the Company acquired 100% of the equity interests of Diegel, including the real property of a related party, for €12.1 million (approximately $14.0 million).

Acquisition of MRA Laboratories, Inc. (“MRA”): As discussed in Note 5, in the second quarter of 2018, the Company acquired 100% of the equity interests of MRA, for $16.0 million.

Acquisition of PT Ferro Materials Utama. (“FMU”): As discussed in Note 5, in the second quarter of 2018, the Company acquired 66% of the equity interests of FMU, for $2.7 million in cash, in addition to the forgiveness of debt of $9.2 million, bringing our total ownership to 100%.

2017 Transactional Activity

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Transactions undertaken in 2017 included the following business acquisitions:

Acquisition of Endeka Group ("Endeka"): As discussed in Note 5, in the fourth quarter of 2017, the Company acquired 100% of the equity interests of Endeka, a global producer of high-value coatings and key raw materials for the ceramic tile market, for €72.8 million (approximately $84.8 million).

Acquisition of Gardenia Quimica S.A. ("Gardenia"): As discussed in Note 5, in the third quarter of 2017, the Company acquired a majority interest in Gardenia for $3.0 million. On March 1, 2018, the Company acquired the remaining equity interest in Gardenia for $1.4 million.

Acquisition of Dip Tech Ltd. ("Dip-Tech"): As discussed in Note 5, in the third quarter of 2017, the Company acquired 100% of the equity interests of Dip-Tech, a leading provider of digital printing solutions for glass, for $77.0 million.

Acquisition of S.P.C. Group s.r.l. and Smalti per Ceramiche, s.r.l (together "SPC"): As discussed in Note 5, in the second quarter of 2017, the Company acquired 100% of the equity interests of SPC, for €18.7 million (approximately $20.3 million).

Outlook

The Company delivered strong performance throughout 2018 with sales and gross profit improvements driven by increases in organic growth, contributions from businesses acquired and optimization initiatives. We continue to execute the dynamic innovation and optimization phase of our value creation strategy, which includes organic and inorganic growth and optimization. We expect organic growth through new products and positioning our portfolio to continue to transition to the higher end of our target markets. We also intend to advance the business through acquisitions, and investments in technology, facilities and equipment. We are implementing optimization initiatives throughout the Company to further improve efficiency, productivity and profitability. We will deploy capital for strategic acquisitions, share repurchases or debt repayment depending on what we deem appropriate based on market conditions, shareholder value creation and long term business objectives.

Raw materials costs continued to increase through the majority of 2018, putting pressure on gross margin. Over the long term, we are confident in our ability to offset such increases with reformulated compounds, new product innovations, pricing initiatives and optimization efforts. We believe that, when taken as a whole, raw material prices have now peaked and are decreasing.

We perceive a degree of macro-economic uncertainty and the potential for slower growth in the outlook for 2019 across several industries. We expect demand will continue for our technology-driven functional coatings and color solutions in the niche markets we focus on, and that we will continue to develop innovative new products. We have identified a number of optimization opportunities in our manufacturing and logistics operations and will continue to implement strategic optimization initiatives.

Foreign currency rates may continue to be volatile through 2019 and changes in interest rates could adversely impact reported results. We expect cash flow from operating activities to continue to be positive for 2019, providing additional liquidity.

Factors that could adversely affect our future performance include those described under the heading "Risk Factors" in Item 1A of Part I of this Annual Report on Form 10-K for the year ended December 31, 2018.

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Results of Operations - Consolidated

Comparison of the years ended December 31, 2018 and 2017

For the year ended December 31, 2018, net income was $80.9 million, compared with net income of $57.8 million in 2017. For the year ended December 31, 2018, net income attributable to common shareholders was $80.1 million, or $0.95 earnings per share, compared with net income attributable to common shareholders of $57.1 million, or $0.68 earnings per share in 2017.

Net Sales

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Net sales	$ 1,612,408	$ 1,396,742	$ 215,666	15.4 %
Cost of sales	1,156,475	980,521	175,954	17.9 %
Gross profit	$ 455,933	$ 416,221	$ 39,712	9.5 %
Gross profit as a % of net sales	28.3 %	29.8 %		

Net sales increased by $215.7 million, or 15.4%, in the year ended December 31, 2018, compared with the prior year, with increased sales in Performance Coatings, Performance Colors and Glass and Color Solutions of $139.9 million, $42.8 million and $33.0 million, respectively. The increase in net sales was driven by both acquisitions and organic growth. Organic sales increased in Performance Coatings by $28.2 million, Color Solutions by $28.1 million, and Performance Colors and Glass by $22.6 million.

Gross Profit

Gross profit increased $39.7 million, or 9.5%, in 2018 to $455.9 million, compared with $416.2 million in 2017 and, as a percentage of net sales, it decreased 150 basis points to 28.3%. The increase in gross profit was attributable to increases across all of our segments, with increases in Performance Coatings, Color Solutions and Performance Colors and Glass of $19.9 million, $11.2 million and $9.9 million, respectively. The increase in gross profit was primarily attributable to favorable product pricing of $43.1 million, gross profit from acquisitions of $34.1 million, higher sales volumes and mix of $7.5 million, favorable foreign currency impacts of $5.3 million and lower manufacturing and product costs of $2.8 million, partially offset by higher raw material costs of $51.8 million.

Geographic Revenues

The following table presents our sales on the basis of where sales originated.

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Geographic Revenues on a sales origination basis				
EMEA	$ 852,775	$ 683,601	$ 169,174	24.7 %
United States	379,914	356,482	23,432	6.6 %
Asia Pacific	221,389	195,918	25,471	13.0 %
Latin America	158,330	160,741	(2,411)	(1.5) %
Net sales	$ 1,612,408	$ 1,396,742	$ 215,666	15.4 %

The increase in net sales of $215.7 million, compared with 2017, was driven by higher sales from EMEA, Asia Pacific and the United States, partially offset by a decrease in sales in Latin America. The increase in sales from EMEA was attributable to higher sales in Performance Coatings, Performance Colors and Glass and Color Solutions of $129.2 million, $32.0 million and $8.0 million, respectively. The increase in sales from Asia Pacific was attributable to higher sales in Performance Coatings, Performance Colors and Glass and Color Solutions of $13.9 million, $6.3 million and $5.3 million, respectively. The increase in sales from the United States was attributable to higher sales in Color Solutions, Performance Colors and Glass and Performance Coatings of $18.2 million, $2.7 million and $2.6 million, respectively. The decrease in sales from Latin America was attributable to lower sales in Performance Coatings of $5.8 million, partially mitigated by higher sales in Performance Colors and Glass and Color Solutions of $1.9 million and $1.5 million, respectively.

The following table presents our sales on the basis of where sold products were shipped.

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Geographic Revenues on a shipped-to basis				
EMEA	$ 803,282	$ 649,423	$ 153,859	23.7 %
Asia Pacific	352,433	300,594	51,839	17.2 %
United States	273,226	263,236	9,990	3.8 %
Latin America	183,467	183,489	(22)	(0.0) %
Net sales	$ 1,612,408	$ 1,396,742	$ 215,666	15.4 %

Selling, General and Administrative Expense

The following table includes SG&A components with significant changes between 2018 and 2017.

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Personnel expenses (excluding R&D personnel expenses)	$ 127,359	$ 116,570	$ 10,789	9.3 %
Research and development expenses	40,221	36,359	3,862	10.6 %
Business development	11,627	16,481	(4,854)	(29.5) %
Incentive compensation	8,476	12,581	(4,105)	(32.6) %
Stock-based compensation	8,441	11,770	(3,329)	(28.3) %
Intangible asset amortization	8,314	10,289	(1,975)	(19.2) %
Pension and other postretirement benefits	1,289	1,190	99	8.3 %
Bad debt	681	44	637	1,447.7 %
All other expenses	72,158	60,134	12,024	20.0 %
Selling, general and administrative expenses	$ 278,566	$ 265,418	$ 13,148	5.0 %

SG&A expenses were $13.1 million higher in 2018 compared with the prior year. As a percentage of net sales, SG&A expenses decreased 170 basis points from 19.0% in 2017 to 17.3% in 2018. The higher SG&A expenses compared with the prior year were primarily driven by businesses acquired within the last year. The acquisitions were the primary driver of the increase in personnel expenses. The decrease in incentive compensation is the result of the Company's performance relative to targets for certain awards compared to the prior year and the decrease in stock-based compensation expense of $3.3 million is the result of the Company's performance relative to targets for certain awards compared with the prior year, as well as decreases in the Company's stock price.

The following table presents SG&A expenses attributable to sales, research and development, and operations costs as strategic services and presents other SG&A costs as functional services.

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Strategic services	$ 157,020	$ 138,551	$ 18,469	13.3 %
Functional services	104,629	102,516	2,113	2.1 %
Incentive compensation	8,476	12,581	(4,105)	(32.6)%
Stock-based compensation	8,441	11,770	(3,329)	(28.3)%
Selling, general and administrative expenses	$ 278,566	$ 265,418	$ 13,148	5.0 %

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Restructuring and Impairment Charges

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Employee severance	$ 5,794	$ 5,167	$ 627	12.1 %
Equity method investment impairment	—	1,566	(1,566)	(100.0) %
Asset impairment	—	1,176	(1,176)	(100.0) %
Other restructuring costs	7,501	3,500	4,001	114.3 %
Restructuring and impairment charges	$ 13,295	$ 11,409	$ 1,886	16.5 %

Restructuring and impairment charges increased $1.9 million in 2018, compared with 2017. The increase was primarily related to costs associated with integration of recent acquisitions and optimization programs. The increase was partially offset by an “other than temporary impairment” charge on an equity method investment of $1.6 million and costs associated with a restructuring plan in Italy, which includes $1.2 million of asset impairment associated with assets that were taken out of service in 2017, which didn’t occur in 2018.

Interest Expense

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Interest expense	$ 32,252	$ 24,337	$ 7,915	32.5 %
Amortization of bank fees	3,577	3,496	81	2.3 %
Interest swap amortization	(762)	—	(762)	— %
Interest capitalization	(1,696)	(79)	(1,617)	NM %
Interest expense	$ 33,371	$ 27,754	$ 5,617	20.2 %

Interest expense in 2018 increased $5.6 million compared with 2017. The increase in interest expense was primarily due to an increase in the average long-term debt balance during 2018, compared with 2017, partially offset by increased interest capitalization during 2018.

Income Tax Expense

In 2018, we recorded an income tax expense of $23.0 million, or 22.2 % of income before income taxes, compared to an income tax expense of $52.8 million, or 47.7% of income before income taxes in 2017. The 2018 effective tax rate is greater than the statutory income tax rate of 21% primarily as a result of a net effect of a $7.9 million net expense related to foreign tax rate differences, $3.5 million net expense resulting from foreign income tax audit settlements, $5.7 million net benefit related to tax credits and $4.1 million net benefit related to the release of valuation allowances related to deferred tax assets that were utilized in the current year or which are deemed no longer necessary based upon changes in the current and expected future years of operating profits. The 2017 effective tax rate is greater than the statutory income tax rate of 35% primarily as a result of a net effect of a $21.5 million expense related to re-measuring the U.S. deferred tax assets as a result of the Tax Act, $5.6 million net expense related to uncertain tax positions and $8.0 million benefit related to foreign tax rate differences.

On December 22, 2017, U.S. federal tax legislation, commonly referred to as the Tax Cut and Jobs Act (the "Tax Act"), was signed into law, significantly changing the U.S. corporate income tax system. These changes include a federal statutory rate reduction from 35% to 21% effective January 1, 2018. Changes in tax rates and tax law are accounted for in the period of enactment. Accordingly, the Company's U.S. net deferred tax assets were re-measured to reflect the reduction in the federal statutory rate, resulting in a $21.5 million increase in income tax expense for the year ended December 31, 2017. The Tax Act also changed the U.S. taxation of worldwide income. The Tax Act contains many provisions which continue to be clarified through new regulations. Consistent with the guidance of SEC Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act ("SAB 118"), we completed our analysis within 2018 consistent with the guidance of SAB 118 and our initial determination of no tax due on the one-time mandatory deemed repatriation tax on accumulated foreign subsidiaries' previously untaxed foreign earnings and profits was unchanged from our position at December 31, 2017.

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Comparison of the years ended December 31, 2017 and 2016

For the year ended December 31, 2017, income from continuing operations was $57.8 million, compared with income from continuing operations of $44.6 million in 2016. For the year ended December 31, 2017, net income was $57.8 million, compared with net loss of $19.9 million in 2016. For the year ended December 31, 2017, net income attributable to common shareholders was $57.1 million, or $0.68 earnings per share, compared with net loss attributable to common shareholders of $20.8 million, or $0.25 loss per share in 2016.

Net Sales

	2017	2016	$ Change	% Change
	(Dollars in thousands)			
Net sales	$ 1,396,742	$ 1,145,292	$ 251,450	22.0 %
Cost of sales	980,521	788,914	191,607	24.3 %
Gross profit	$ 416,221	$ 356,378	$ 59,843	16.8 %
Gross profit as a % of net sales	29.8 %	31.1 %		

Net sales increased by $251.5 million, or 22.0%, in the year ended December 31, 2017, compared with the prior year, with increased sales in Color Solutions, Performance Colors and Glass and Performance Coatings of $111.2 million, $73.2 million and $67.0 million, respectively. The increase in net sales was driven by both acquisitions and organic growth. Organic sales increased in Color Solutions by $39.6 million, Performance Coatings by $24.1 million and Performance Colors and Glass by $11.8 million.

Gross Profit

Gross profit increased $59.8 million, or 16.8%, in 2017 to $416.2 million, compared with $356.4 million in 2016 and, as a percentage of net sales, it decreased 130 basis points to 29.8%. The increase in gross profit was attributable to increases across all of our segments, with increases in Color Solutions, Performance Colors and Glass and Performance Coatings of $29.2 million, $23.6 million and $6.3 million, respectively. The increase in gross profit was primarily attributable to acquisitions of $46.9 million, lower manufacturing and product costs of $28.8 million, driven by higher volume and mix, as well as strategic purchasing actions, favorable product pricing of $12.9 million, higher sales volumes and mix of $9.5 million, favorable foreign currency impacts of $0.3 million, partially offset by higher raw material costs of $39.3 million.

Geographic Revenues

The following table presents our sales on the basis of where sales originated.

	2017	2016	$ Change

				% Change
	(Dollars in thousands)			
Geographic Revenues on a sales origination basis				
EMEA	$ 683,601	$ 515,055	$ 168,546	32.7 %
United States	356,482	300,187	56,295	18.8 %
Asia Pacific	195,918	179,464	16,454	9.2 %
Latin America	160,741	150,586	10,155	6.7 %
Net sales	$ 1,396,742	$ 1,145,292	$ 251,450	22.0 %

The increase in net sales of $251.5 million, compared with 2016, was driven by higher sales from all regions. The increase in sales from EMEA was attributable to higher sales in Color Solutions, Performance Coatings and Performance Colors and Glass of $69.3 million, $56.4 million and $42.8 million, respectively. The increase in sales from the United States was primarily attributable to higher sales in Color Solutions and Performance Colors and Glass of $33.0 million and $22.9 million, respectively. The increase in sales from Latin America and Asia Pacific was attributable to higher sales across all segments.

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The following table presents our sales on the basis of where sold products were shipped.

	2017	2016	$ Change	% Change
	(Dollars in thousands)			
Geographic Revenues on a shipped-to basis				
EMEA	$ 649,423	$ 501,231	$ 148,192	29.6 %
Asia Pacific	300,594	244,057	56,537	23.2 %
United States	263,236	239,771	23,465	9.8 %
Latin America	183,489	160,233	23,256	14.5 %
Net sales	$ 1,396,742	$ 1,145,292	$ 251,450	22.0 %

Selling, General and Administrative Expense

The following table includes SG&A components with significant changes between 2017 and 2016.

	2017	2016	$ Change	% Change
	(Dollars in thousands)			
Personnel expenses (excluding R&D personnel expenses)	$ 116,570	$ 100,039	$ 16,531	16.5 %
Research and development expenses	36,359	27,327	9,032	33.1 %
Business development	16,481	12,890	3,591	27.9 %
Incentive compensation	12,581	10,852	1,729	15.9 %
Stock-based compensation	11,770	7,245	4,525	62.5 %
Intangible asset amortization	10,289	6,199	4,090	66.0 %
Pension and other postretirement benefits	1,190	939	251	26.7 %
Bad debt	44	1,383	(1,339)	(96.8)%
All other expenses	60,134	60,412	(278)	(0.5) %
Selling, general and administrative expenses	$ 265,418	$ 227,286	$ 38,132	16.8 %

SG&A expenses were $38.1 million higher in 2017 compared with the prior year. As a percentage of net sales, SG&A expenses decreased 80 basis points from 19.8% in 2016 to 19.0% in 2017. The higher SG&A expenses compared with the prior year are primarily driven by businesses acquired within the last year. The acquisitions were the primary driver of the increase in personnel expenses, business development expenses and accounted for the entire increase in intangible asset amortization. The increase in stock-based compensation expense of $4.5 million is the result of the Company's performance relative to targets for certain awards compared with the prior year, as well as increases in the Company's stock price.

The following table presents SG&A expenses attributable to sales, research and development, and operations costs as strategic services and presents other SG&A costs as functional services.

	2017	2016	$ Change	% Change
	(Dollars in thousands)			
Strategic services	$ 138,551	$ 116,807	$ 21,744	18.6 %
Functional services	102,516	92,382	10,134	11.0 %
Incentive compensation	12,581	10,852	1,729	15.9 %
Stock-based compensation	11,770	7,245	4,525	62.5 %
Selling, general and administrative expenses	$ 265,418	$ 227,286	$ 38,132	16.8 %

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Restructuring and Impairment Charges

	2017	2016	$ Change	% Change
	(Dollars in thousands)			
Employee severance	$ 5,167	$ 1,353	$ 3,814	281.9 %
Equity method investment impairment	1,566	—	1,566	NM %
Asset impairment	1,176	—	1,176	NM %
Goodwill impairment	—	13,198	(13,198)	(100.0)%
Other restructuring costs	3,500	1,356	2,144	158.1 %
Restructuring and impairment charges	$ 11,409	$ 15,907	$ (4,498)	(28.3) %

Restructuring and impairment charges decreased by $4.5 million in 2017, compared with 2016. The decrease was primarily attributable to an impairment charge in 2016 within our Tile Coating Systems reporting unit, a component of the Performance Coatings operating segment of $13.2 million. The decrease was partially offset by an increase due to an “other than temporary impairment” charge on an equity method investment of $1.6 million and costs associated with a restructuring plan in Italy, which includes $1.2 million of asset impairment associated with assets that have been taken out of service, as well as actions taken in connection with recent acquisitions designed to achieve our targeted synergies.

Interest Expense

	2017	2016	$ Change	% Change
	(Dollars in thousands)			
Interest expense	$ 24,337	$ 20,246	$ 4,091	20.2 %
Amortization of bank fees	3,496	1,353	2,143	158.4 %
Interest capitalization	(79)	(52)	(27)	51.9 %
Interest expense	$ 27,754	$ 21,547	$ 6,207	28.8 %

Interest expense in 2017 increased $6.2 million compared with 2016. The increase in interest expense was due to an increase in the average long-term debt balance during 2017, compared with 2016 and an increase of the amortization of debt issuance costs associated with the Credit Facility, partially offset by a favorable average borrowing rate as a result of the refinancing completed in the first quarter of 2017.

Income Tax Expense

On December 22, 2017, U.S. federal tax legislation, commonly referred to as the Tax Cuts and Jobs Act (the “Tax Act”), was signed into law, significantly changing the U.S. corporate income tax system. These changes include a federal statutory rate reduction from 35% to 21% effective January 1, 2018. Changes in tax rates and tax law are accounted for in the period of enactment. Accordingly, the Company’s U.S. net deferred tax assets were re-measured to reflect the reduction in the federal statutory rate, resulting in a $21.5 million increase in income tax expense for the year ended December 31, 2017. The Tax Act also changed the U.S. taxation of worldwide income. Accordingly, we have assessed the one-time mandatory deemed repatriation tax on accumulated foreign subsidiaries’ previously untaxed foreign earnings and profits and have preliminarily determined no tax is due.

Additional provisions of the Tax Act which may have an impact to the Company include, but are not limited to, the repeal of the domestic production deduction, limitations on interest expense, accelerated depreciation that will allow for full expensing of qualified property, provisions related to performance-based executive compensation and international provisions, which generally establish a territorial-style system for taxing foreign-source income of domestic multinational corporations.

We have recognized the provisional tax impacts related to the Tax Act under the guidance of SEC Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (“SAB 118”). The ultimate impact may differ from these provisional amounts due to additional analysis, changes in interpretations and assumptions, additional regulatory guidance that may be issued, and actions we may take as a result of the Tax Act. Pursuant to SAB 118, adjustments to the provisional amounts recorded by the Company as of December 31, 2017, that are identified within a subsequent measurement period of up to one year from the enactment date will be included as an adjustment to income tax expense in the period the amounts are determined.

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In 2017, we recorded an income tax expense of $52.8 million, or 47.7% of income before income taxes, compared to an income tax expense of $17.9 million, or 28.6% of income before income taxes in 2016. The 2017 effective tax rate is greater than the statutory income tax rate of 35% primarily as a result of a net effect of a $21.5 million expense related to re-measuring the U.S. deferred tax assets as a result of the Tax Act, $5.6 million net expense related to uncertain tax positions and $8.0 million benefit related to foreign tax rate differences. The 2016 effective tax rate is less than the statutory income tax rate of 35%, primarily as a result of a $5.5 million net benefit related to greater levels of income earned in lower tax jurisdictions, $4.8 million net benefit for the release of valuation allowances related to deferred tax assets that were utilized in the current year, $2.0 million in net benefit for the release of valuation allowance, which are deemed no longer necessary based upon changes in the current and expected future years operating profits, $1.8 million benefit related to notional interest deductions, $2.8 million benefit for the generation of tax credits offset by a $4.1 expense related to the impairment of book basis goodwill and a $2.1 million expense related to non-deductible expenses.

Results of Operations - Segment Information

Comparison of the years ended December 31, 2018 and 2017

Performance Coatings

					Change due to				
	2018	2017	$ Change	% Change	Price	Volume / Mix	Currency	Acquisitions	Other
	(Dollars in thousands)								
Segment net sales	$ 733,926	$ 594,029	$ 139,897	23.6 %	$ 27,082	$ 4,824	$ (3,714)	$ 111,706	$ —
Segment gross profit	165,708	145,797	19,911	13.7 %	27,082	(842)	1,707	28,046	(36,082)
Gross profit as a % of segment net sales	22.6 %	24.5 %							

Net sales increased in Performance Coatings by $139.9 million compared with the prior year, primarily from sales of Endeka of $89.0 million, SPC of $10.1 million, Quimicer of $7.4 million and Gardenia of $3.3 million, and increases in sales of frits and glazes, digital inks and porcelain enamel of $14.9 million, $8.0 million and, $5.2 million, respectively. The increase in net sales was driven by higher product pricing of $27.1 million, sales from acquisitions of $111.7 million and favorable volume and mix of $4.8 million, partially offset by unfavorable foreign currency impacts of $3.7 million. Gross profit increased $19.9 million from the prior-year, primarily driven by favorable product pricing impacts of $27.1 million, gross profit from acquisitions of $28.0 million, favorable foreign currency impacts of $1.7 million and lower manufacturing costs of $0.9 million, partially offset by higher raw material costs of $37.0 million and lower sales volume and mix of $0.8 million.

	2018	2017	$ Change	% Change
	(Dollars in thousands)			
Segment net sales by Region				
EMEA	$ 475,435	$ 346,199	$ 129,236	37.3 %
Latin America	100,818	106,640	(5,822)	(5.5) %
Asia Pacific	108,623	94,722	13,901	14.7 %
United States	49,050	46,468	2,582	5.6 %
Net sales	$ 733,926	$ 594,029	$ 139,897	