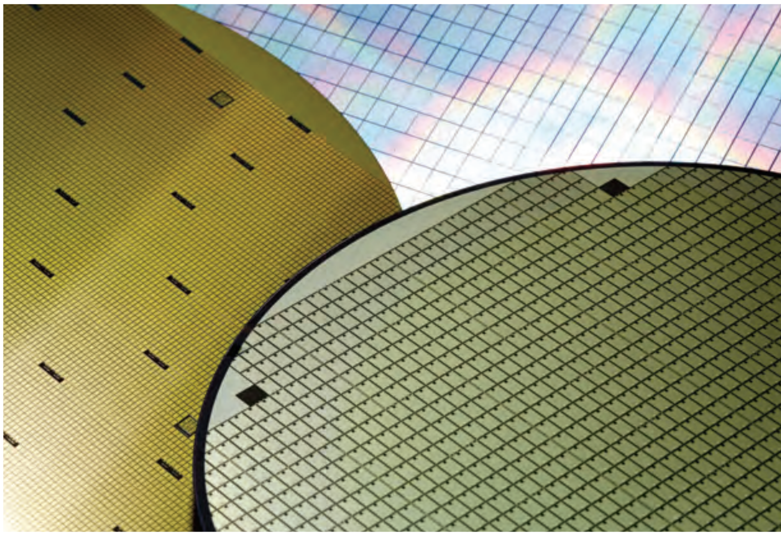
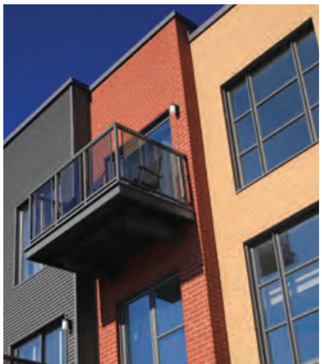
WE'RE A LEADER IN

functional coatings and color solutions

2016 ANNUAL REPORT AND FORM 10-K



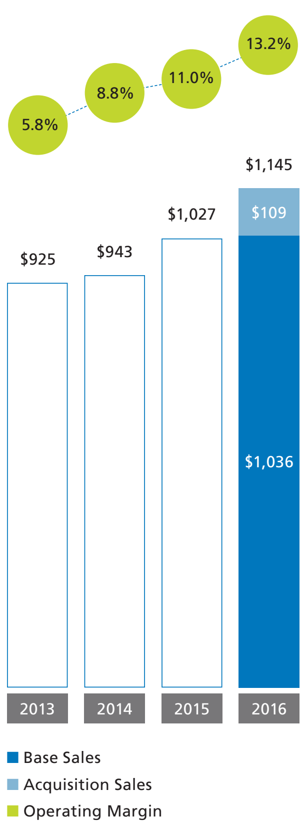




FERRO CORPORATION (NYSE: FOE) is a leading global supplier of technology-based functional coatings and color solutions. Ferro supplies functional coatings for glass, metal, ceramic and other substrates and color solutions in the form of specialty pigments and colorants for a broad range of industries and applications. Ferro products are sold into the building and construction, automotive, electronics, industrial products, household furnishings and appliances markets. The Company divides its businesses into three reporting segments: Performance Coatings (metal and ceramic coatings), Performance Colors and Glass (glass coatings), and Pigments, Powders and Oxides (color solutions). Headquartered in Mayfield Heights, Ohio, the Company has approximately 5,125 associates globally.

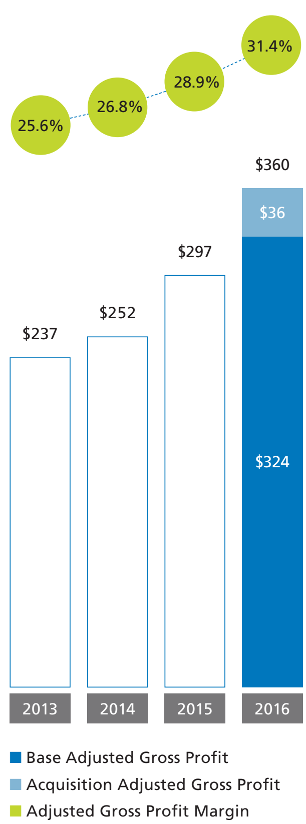
FINANCIAL HIGHLIGHTS

(Dollars in millions)

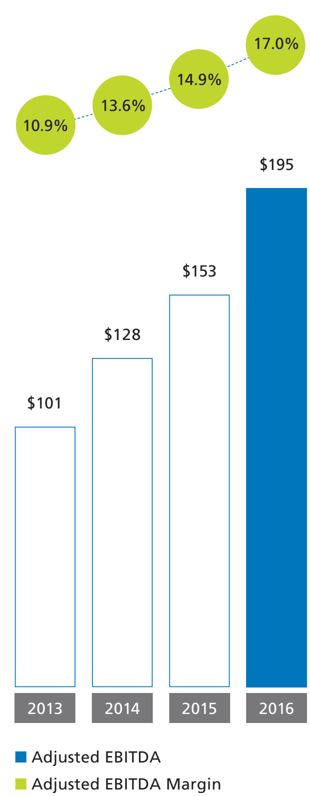
NET SALES



ADJUSTED GROSS PROFIT



ADJUSTED EBITDA



Non-GAAP Financial Information: Continuing Operations excluding Discontinued Operations and Other Divestitures; Adjusted Gross Profit Margin; Constant Currency Results; Adjusted Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA); are non-GAAP measures. These non-GAAP measures have been reconciled to the comparable GAAP measures within tables immediately following the Company's Annual Report on Form 10-K.

Over the past four years, the Company has been transformed from a diversified specialty chemicals company into a focused provider of functional coatings and color solutions. Through the transformation, profitability has improved substantially, as we upgraded the business portfolio, reduced expenses, and optimized manufacturing capabilities. **The Company is now well-positioned to accelerate organic and inorganic growth.**

FELLOW SHAREHOLDERS:

2016 was another successful year for Ferro Corporation. Our commercial operations teams around the world delivered increased sales volumes and gross profit margins in all three business segments while maintaining a disciplined focus on managing costs, resulting in increased adjusted EPS and cash flow. We moved forward with our inorganic growth initiatives by acquiring five more companies that extend and enhance our portfolio of products and services and by integrating and generating value from prior-year acquisitions. We also drove organic growth through new product development and through utilization of technological, manufacturing and geographic synergies across our businesses.

Taking a longer view, we have leveraged our strengths to improve performance through the three phases of the value creation strategy initiated in late 2012. The first phase of the strategy was devoted to simplifying the business, removing redundancies and reducing costs. In the second phase – the portfolio evolution stage – we harvested non-core businesses to transform the Company into a focused provider of functional coatings and color solutions. In 2016, we transitioned to the third phase, which focuses on accelerated growth. We are now squarely within this phase and look forward to executing on our robust organic and inorganic pipelines.

Through this transformation, we have created an asset-light, heavy-touch business model. This model prioritizes maintaining an efficient global manufacturing footprint with relatively low fixed costs, while providing continuous, highly-responsive technical support for the needs of our customers, especially in the areas of product development and manufacturing processes. This asset-light, heavy-touch model, coupled with our high product quality and reliability of supply, give Ferro significant competitive advantages. These are just some of the reasons we maintain a leadership position in the vast majority of our revenue base.

STRATEGIC PROGRESS IN 2016 PERFORMANCE

Our success in transforming Ferro and building a more attractive, higher-value-added business portfolio generated strong performance in 2016.

On a constant currency basis, our net sales in 2016 increased to $1.15 billion from $1.03 billion, an 11.1 percent improvement over 2015. Gross profit increased to $351.2 million from $301.7 million, an increase of 16.4 percent, and gross margin expanded 260 basis points to 30.7 percent from 28.1 percent in 2015.

Income from continuing operations was $44.6 million, or $0.51 per diluted share. On an adjusted basis, 2016 earnings per diluted share increased 28.0 percent to $1.09 from $0.85.

Adjusted EBITDA grew to $194.6 million, 17.0 percent of sales, from 14.4 percent of sales in 2015. Net cash provided by operations was $62.6 million, an increase of 22.3 percent. Adjusted free cash flow from continuing operations was $84.5 million, up 11.9 percent over 2015.

PLATFORMS FOR CONTINUING GROWTH

We are eager to build on the successful execution of our strategy to date and to further enhance the Company's growth profile.

Our portfolio consists of three main businesses:

- Performance Coatings;
- Performance Colors and Glass; and
- Pigments, Powders and Oxides.

We leverage our strengths across these business platforms to provide our customers with superior products and services. These include:

- Color innovation, glass science and technology, application science, particle engineering, and custom formulation;
- Manufacturing infrastructure and technical expertise in multiple locations around the globe; and
- Deep experience working collaboratively with our customers to develop product solutions.

Performance Coatings supplies glass coatings and decorative systems for ceramic tile and metal substrates, such as appliances and cookware. The adjusted gross margin for this business is 26.5 percent of sales. Our strategy for this business is to continue to expand at the higher end of the tile coatings market and establish low-cost positions in high-growth geographic markets.

Performance Colors and Glass is a leading supplier of glass coatings for glass substrates for automotive, containers and dinnerware, electronics and industrial applications. The adjusted gross margin for this business is 36.7 percent of sales. Our growth strategy is to expand into adjacent markets, extend our capabilities to new glass applications and substrates, and enhance our position in new glass coating technologies, including organic coatings for glass.

"Our success in transforming Ferro and building a more attractive, higher-value-added business portfolio generated strong performance in 2016."

Pigments, Powders and Oxides is a leader in the production of high-value inorganic and organic pigments and color solutions for a variety of substrates and applications such as paints, plastics, concrete, and other construction materials. The adjusted gross margin of this business is 34.2 percent of sales. We have a horizontal and vertical strategy for this segment: increasing our portfolio of high-end organic and inorganic pigments, as well as functionalizing and altering pigments to increase their value to customers. The oxides, or Surface Technologies business, a leading provider of polishes for plastics lenses and automobile finishing, is pursuing organic growth as it extends its particle engineering and formulation expertise into precision polishes for substrates in high-technology applications, such as semiconductors and smartphones. Longer term, we see growth opportunities for Ferro in other surface treatment technologies, and applying these treatments to a broader range of substrates.

PRIORITIES FOR GROWTH

As we move forward, we have multiple avenues for growth and enhanced profitability. Our focus is on delivering value-enhancing acquisitions and sustained organic growth, coupled with continuous optimization of our business processes.

> "We are confident that the Company is positioned for continued value creation and we are excited about building on the momentum generated in 2016."

Our target is to invest \$100 million – \$150 million per year in strategic acquisitions that strengthen our product and technology portfolios, enhance our market positions and expand our global reach, although we may consider opportunities that would have us investing more than that in any given year. Early in 2017, we closed a successful refinancing, which provides greater capacity and flexibility to continue our growth strategy.

Executing our strategy both organically and inorganically has lifted our overall gross profitability. Gross profit margins have benefited from an improved mix of higher-value products; increased activity in select markets; customer and product line rationalization; and leaner, more efficient manufacturing operations.

We are confident that the Company is positioned for continued value creation, and we are excited about building on the momentum generated in 2016. There will be challenges in 2017, including the potential for increasing raw material costs and continued volatility in foreign currency markets; however, we have mitigation strategies in place to help offset these risks. Consequently, we are expecting another year of solid growth in sales and earnings.

Our confidence about Ferro's future is rooted in our outstanding associates. The accomplishments over the past four years would not have been possible without their extraordinary execution, diligence and creativity. We are very grateful to our global team for their hard work and dedication.

Thank you for your confidence and investment in our company. We look forward to sharing more information about our progress in the coming months.

Peter T. Thomas
Chairman, President and Chief Executive Officer

March 15, 2017

Non-GAAP Financial Information: Adjusted Earnings per Diluted Share, Adjusted Gross Profit Margin, Constant Currency Results, Adjusted Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA), Return on Invested Capital (ROIC) and Continuing Operations Free Cash Flow are non-GAAP measures. These non-GAAP measures have been reconciled to the comparable GAAP measures within tables immediately following the Company's Annual Report on Form 10-K.

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, 2016

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 and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). YES ☒ NO ☐

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

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

Large accelerated filer ☒ Accelerated filer ☐ Non-accelerated filer ☐ Smaller reporting company ☐
(Do not check if a smaller reporting company)

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, 2016, was approximately $1,096,926,000.

On January 31, 2017, there were 83,438,992 shares of Ferro Corporation Common Stock, par value $1.00 outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Proxy Statement for Ferro Corporation's 2017 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 41 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 size 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 provide glass-based 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 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 four business units, which comprise three reportable segments listed below:

- Tile Coating Systems(1)
- Porcelain Enamel(1)
- Performance Colors and Glass
- Pigments, Powders and Oxides

(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 20 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K.

Markets and Customers

Ferro's products are used in a variety of product applications in markets including:

- Appliances
- Automobiles
- Building and renovation
- Electronics
- Household furnishings
- Industrial products
- Packaging

Many of our products are used as coatings on our customers' products, such as glazes and decorations on tile, glass and dinnerware. Other products are supplied to customers as powders that are used to manufacture electronic components and other products. Still other products are added during our customers' manufacturing processes to provide desirable properties to their end product. Often, our products are a small portion of the total cost of our customers' products, but they can be critical to the appearance or functionality of those products.

Our customers include manufacturers of ceramic tile, major appliances, construction materials, automobile parts, automobile, 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 2016, 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. 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 this quarter is 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 price, product quality and performance, customer service and technical support, and our ability to develop custom products to meet specific customer requirements.

We are a worldwide leader in the production of glass enamels, porcelain enamels, 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.

Raw Materials and Supplier Relations

Raw materials widely used in our operations include:

Metal Oxides:

- Aluminum oxide(1)
- Cobalt oxide(1)(2)
- Iron Oxide(1)
- Lead Oxide(1)
- Nickel oxide(1)(2)
- Titanium dioxide(1)(2)
- Zinc oxide(2)
- Zirconium dioxide(2)

Precious and Non-precious Metals:

- Bismuth(1)
- Chrome(1)(2)
- Copper(1)
- Gold(1)
- Silver(1)

Other Inorganic Materials:

- Boron(2)
- Clay(2)
- Feldspar(2)
- Lithium(2)
- Silica(2)
- Zircon(2)

Energy:

- Electricity
- Natural gas

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(1) Primarily used by the Performance Colors and Glass and the Pigments, Powders and Oxides 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 2016 that significantly affected our manufacturing operations, but we are subject to volatile raw material costs that can affect our results of operations.

Environmental Matters

As part of the production of some of our products, we handle, process, use and store hazardous materials. As a result, we operate manufacturing facilities that are subject to a broad array of environmental laws and regulations in the countries in which we operate, particularly for plant wastes and emissions. In addition, some of our products are subject to restrictions under laws or regulations such as California's Proposition 65 or the European Union's ("EU") chemical substances directive. The costs to comply with complex environmental laws and regulations 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 regulations to which our operations are subject and that, to the extent we may not be in compliance with such regulations, 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 protection and improvements in a timely manner consistent with available technology. Although we cannot precisely predict future environmental 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 protection were $1.4 million in 2016, $5.5 million in 2015, and $0.7 million in 2014. 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, changing governmental regulations and legal standards regarding liability, and evolving technologies. We adjust these liabilities periodically as remediation 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 $27.3 million in 2016, $25.6 million in 2015, and $22.7 million in 2014.

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 2034. 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, 2016, we employed 5,125 full-time employees, including 4,326 employees in our foreign consolidated subsidiaries and 799 in the United States ("U.S."). Total employment increased by 218 in our foreign subsidiaries and by 61 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 12.5% of our U.S. workforce. Approximately 8.1% of all U.S. employees are affected by labor agreements that expire in 2017, and we expect to complete renewals of these agreements with no significant disruption to the related businesses. 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:

Consolidated Subsidiaries:

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

Unconsolidated Affiliates:

- China
- Ecuador
- Egypt
- Indonesia
- Italy
- Spain
- South Korea

Financial information for geographic areas is included in Note 20 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K. More than 70% of our net sales are outside of the U.S. Our customers represent more than 30 industries and operate in approximately 100 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 Web site, 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, legal and ethical policies, Guidelines for Determining Director Independence, and charters for our Audit Committee, Compensation Committee and Governance and Nomination Committee are available free of charge on our Web site 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, such as building and renovation, major appliances, transportation, and electronics, are cyclical or closely tied to consumer demand. Consumer demand is difficult to accurately forecast 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, productivity gains, 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, improving manufacturing processes, 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 70% of our net sales during 2016 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 international operations include the following:

- New and different legal and regulatory requirements and enforcement mechanisms in the U.S. and other countries;
- U.S. and other export licenses may be difficult to obtain and we may be subject to import or export duties or import quotas 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 foreign 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, and political instability in certain countries.

We have subsidiaries in Turkey and in Egypt, countries with recent political strains 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.

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.

As part of our strategy, we have and 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, technologies, services and products of the acquired product lines or businesses, 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 time frame that we anticipate, or at all, which could adversely affect our business or results of operations.

We have a presence 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 and the Asia-Pacific region, including the People's Republic of China, Latin America, 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 and cost-savings initiatives, including restructuring programs, to 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 optimization and cost-savings initiatives, including restructuring programs, and may undertake additional optimization and cost-savings initiatives in the future. These initiatives involve, among other things, restructuring programs that involve plant closures and staff reductions. Although we expect these initiatives to help us achieve incremental cost savings and operational efficiencies, we may not be able to implement and/or administer these initiatives, including plant closures and staff reductions, in the manner contemplated, which could cause the initiatives to fail to achieve the desired results. Additionally, the implementation of these initiatives may result in impairment charges, some of which could be material. Even if we do implement and administer these initiatives in the manner contemplated, they may not produce the desired results. 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 failure to introduce new products could affect our sales, profitability and liquidity.

One way that we remain competitive is by developing and introducing new and improved products on an ongoing basis. Customers continually evaluate our products in comparison to those offered by our competitors. A failure to introduce new products at the right time that are price competitive and that provide the performance and other features required by 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 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 and distribution of our products; to receive, process, and ship orders on a timely basis; 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 of time, due to events including but not limited to programming errors, computer viruses and security breaches. Information privacy and 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, and prevention of privacy or security breaches cannot be assured. In addition, the processing and storage of certain information is increasingly subject to privacy and data security regulations and such regulations are country-specific and subject to differing interpretations and may be inconsistent among jurisdictions. 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. In addition, third-party service providers are responsible for managing a significant portion of our information systems, and we are subject to risk as a result of possible information privacy and security breaches of those third parties. The consequences of these risks could adversely impact our results of operations, financial condition, and cash flows.

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 New Credit Facility, entered into on February 14, 2017, contains a number of restrictive covenants, including those described in more detail in Note 8 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 New 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 revolving credit 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 New Credit Facility may be accelerated and become immediately due and payable. The New Credit Facility is described in more detail in "Capital Resources and Liquidity" under Item 7 and in Note 8 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, 2016, we had approximately $574.5 million of short-term and long-term debt with varying maturities and approximately $35.1 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, 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 8 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K.

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, which we use 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.

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 do not apply to sales involving other customers or industries and 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.

Regulatory authorities in the U.S., European Union and elsewhere are taking a much 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 or 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, customers may avoid purchasing some products in favor of 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.

The markets for our products 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 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.

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 of some countries may not protect our rights to the same extent as the laws 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.

Our operations are subject to operating hazards and, as a result, 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.

We have limited or no redundancy for certain of our manufacturing facilities, and damage to or interference with those facilities could interrupt our operations, 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, 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 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. In addition, our business interruption insurance would not compensate us for the loss of opportunity and potential adverse impact on relations with our existing customers resulting from our inability to produce products for them.

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 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. Recently, 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 additional 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.

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, 2016, we had $80.3 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 10 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K.

We may not be successful in implementing our strategies to increase our return on invested capital.

We are taking steps to generate a higher return on invested capital. 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.

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 and seek the consent or advice of these unions and/or works councils. These regulations and laws, coupled with the requirement to 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 12.5% of our U.S. employees as of December 31, 2016, are subject to collective bargaining arrangements or similar arrangements. Approximately 8.1% of all U.S. employees are affected by labor agreements that expire in 2017, and we expect to complete renewals of these agreements with no significant disruption to the related businesses. 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 obligation. 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 12 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K.

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

We have been implementing and operating 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.

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 making 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 injury to consumers, as well as commercial risks. Injury to consumers could result from, among other things, 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.

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

We are from time to time exposed to certain legal proceedings, which may include claims involving product liability, infringement of intellectual property rights of third parties 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. Future claims or lawsuits, if they were to result in a ruling adverse to us, could give rise to substantial liability, which could have a material adverse effect on our business, operating results or financial condition.

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 7 to the consolidated financial statements under Item 8 of this Form 10-K.

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, 2016, that a one percent increase in interest rates would cause interest expense to increase by $5.6 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 8 to the consolidated financial statements under Item 8 of this Form 10-K.

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 8 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K.

We may not pay dividends on our common stock at any time in the foreseeable future.

Holders of our common stock are entitled to receive such dividends as our Board of Directors from time to time may declare out of funds legally available for such purposes. Our Board of Directors has no obligation to declare dividends under Ohio law or our amended Articles of Incorporation. We may not pay dividends on our common stock at any time in the foreseeable future. Any determination by our Board of Directors to pay dividends in the future will be based on various factors, including our financial condition, results of operations and current anticipated cash needs and any limits our then-existing credit facility and other debt instruments place on our ability to pay dividends.

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 18,000 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:

Pigments, Powders and Oxides-U.S.: Penn Yan, New York and Norcross, Georgia. Outside the U.S.: Colombia, China, India, Belgium, France, Romania, Spain and Brazil.

Performance Colors and Glass-U.S.: Washington, 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, and Thailand.

In addition, we lease manufacturing facilities for the Performance Colors and Glass segment in the United Kingdom; Germany; Japan; Italy; King of Prussia, Pennsylvania; and Vista, California. We also lease manufacturing facilities for the Performance Coatings segment in Italy and Poland. In some instances, the manufacturing facilities are used for two or more segments. Leased facilities range in size from 15,000 sq. ft. to over 100,000 sq. ft.

Item 3 — *Legal Proceedings*

There are various lawsuits and claims pending against the Company and its consolidated subsidiaries. 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.

Executive Officers of the Registrant

The executive officers of the Company as of March 1, 2017, 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 — 61

Chairman of the Board of Directors, 2014

President and Chief Executive Officer, 2013

Interim President and Chief Executive Officer, 2012

Mark H. Duesenberg — 55

Vice President, General Counsel and Secretary, 2008

Benjamin J. Schlater — 41

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

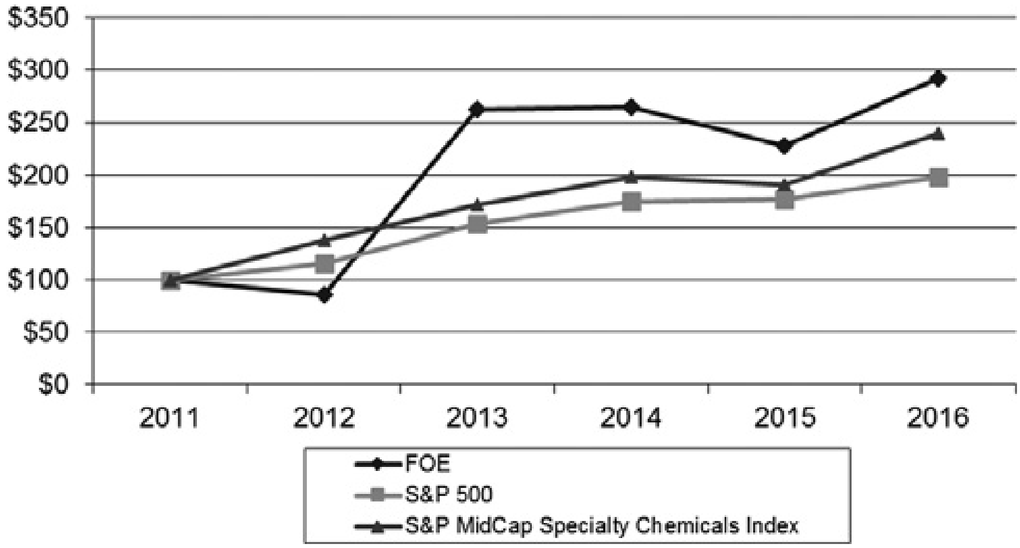
PART II

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, 2017, we had 901 shareholders of record for our common stock, and the closing price of the common stock was $14.14 per share.

The chart below compares Ferro's cumulative total shareholder return for the five years ended December 31, 2016, 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, 2011. At December 31, 2016, the closing price of our common stock was $14.33 per share.

COMPARISON OF FIVE-YEAR CUMULATIVE TOTAL RETURNS



The quarterly high and low intra-day sales prices and dividends declared per share for our common stock during 2016 and 2015 were as follows:

	2016			2015		
	High	Low	Dividends	High	Low	Dividends
First Quarter	$12.76	$ 8.47	$—	$13.49	$11.11	$—
Second Quarter	14.88	11.42	—	17.09	12.15	—
Third Quarter	14.70	11.80	—	17.07	10.75	—
Fourth Quarter	16.17	12.46	—	13.30	10.06	—

The restrictive covenants contained in our Credit Facility limit the amount of dividends we can pay on our common stock. 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.

The Company's Board of Directors approved share repurchase programs, under which the Company is authorized to repurchase up to $100 million of the Company's outstanding shares of Common Stock on the open market, including through a Rule 10b5-1 plan, or in privately negotiated transactions.

The Company repurchased 1,175,437 shares of common stock at an average price of $9.72 per share for a total cost of $11.4 million during 2016. Under the share repurchase programs, the Company has repurchased an aggregate of 4,458,345 shares of common stock, at an average price of $11.21 per share, for a total cost of $50.0 million. As of December 31, 2016, $50.0 million may still be purchased under the programs.

The following table summarizes purchases of our common stock by the Company and affiliated purchasers during the three months ended December 31, 2016:

	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, 2016 to October 31, 2016	—	$—	—	$50,000,000
November 1, 2016 to November 30, 2016	—	$—	—	$50,000,000
December 1, 2016 to December 31, 2016	—	$—	—	$50,000,000
Total	—		—	

Item 6 — *Selected Financial Data*

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

	2016	2015	2014	2013	2012
	(Dollars in thousands, except for per share data)				
Net sales	$ 1,145,292	$ 1,075,341	$ 1,111,626	$ 1,188,582	$ 1,267,695
Income (loss) from continuing operations	44,577	99,883	(8,609)	63,905	(386,104)
Basic earnings (loss) per share from continuing operations attributable to Ferro Corporation common shareholders	0.52	1.16	(0.10)	0.73	(4.49)
Diluted earnings (loss) per share from continuing operations attributable to Ferro Corporation common shareholders	0.51	1.14	(0.10)	0.72	(4.49)
Cash dividends declared per common shares	—	—	—	—	—
Total assets	1,283,769	1,225,351	1,091,554	1,004,781	1,074,841
Long-term debt, including current portion	563,033	470,805	302,383	265,226	293,915

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, $3.4 million and $4.3 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, 2013 and 2012, respectively.

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 2012 through 2014. In 2016, we completed the disposition of the Europe-based Polymer Additives business, which is presented as discontinued operations in 2012 through 2016.

In 2014, we sold substantially all of the assets in our Specialty Plastics business, which is presented as discontinued operations in 2012 through 2014.

In 2013, we sold our Pharmaceuticals business, which is presented as discontinued operations in 2012 through 2013.

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

Overview

During the year ended December 31, 2016, net sales increased $70.0 million, or 6.5%, compared with 2015. The increase was driven by an increase in sales in Pigments, Powders and Oxides of $81.6 million, partially offset by a decrease in sales in Performance Coatings of $6.4 million and Performance Colors and Glass of $5.3 million. Gross profit increased $49.5 million compared with 2015. As a percentage of net sales, gross profit rate increased approximately 260 basis points to 30.7%, from 28.1% in the prior year.

For the year ended December 31, 2016, selling, general and administrative ("SG&A") expenses increased $24.8 million, or 11.4%, compared with 2015, primarily driven by the increase in expense in pension and other postretirement benefits of $14.9 million.

For the year ended December 31, 2016, net loss was $19.9 million, compared with net income of $63.1 million in 2015, and net loss attributable to common shareholders was $20.8 million, compared with net income attributable to common shareholders of $64.1 million in 2015. Income from continuing operations was $44.6 million for the year ended December 31, 2016, compared with income from continuing operations of $99.9 million in 2015.

2016 Transactional Activity

Business Acquisitions

Acquisition of Cappelle: As discussed in Note 4, in the fourth quarter of 2016, the Company acquired 100% of the share capital of Belgium-based Cappelle Pigments NV ("Cappelle"), a leader in specialty, high-performance inorganic and organic pigments used in coatings, inks and plastics, for €40.0 million (approximately $42.4 million).

Acquisition of ESL: As discussed in Note 4, in the fourth quarter of 2016, the Company acquired 100% of the membership interest of Electro-Science Laboratories, Inc. ("ESL"), a leader in electronic packaging materials for $78.0 million.

Acquisition of Delta Performance Products: As discussed in Note 4, in the third quarter of 2016, the Company acquired certain assets of Delta Performance Products, LLC, for a cash purchase price of $4.4 million.

Acquisition of Pinturas: As discussed in Note 4, in the second quarter of 2016, the Company acquired 100% of the equity of privately held Pinturas Benicarló, S.L. ("Pinturas") for €16.5 million in cash (approximately $18.4 million).

Acquisition of Ferer: As discussed in Note 4, in the first quarter of 2016, the Company completed the purchase of 100% of the equity of privately held Istanbul-based Ferer Dis Ticaret Ve Kimyasallar Anonim Sirketi A.S. ("Ferer") for approximately $9.4 million in cash.

Disposition of the Europe-based Polymer Additives business

As discussed in Note 3, in the third quarter of 2016, the Company completed the disposition of the Europe-based Polymer Additives business to Plahoma Two AG, an affiliate of the LIVIA Group.

Outlook

The Company delivered strong performance throughout 2016. Sales increased 6.5% primarily due to acquisitions acquired within the last year. In addition, gross profit, as a percentage of net sales, increased to 30.7% from 28.1%. Partially offsetting the higher gross profit were increased SG&A costs, primarily driven by an increase in pension and postretirement benefits expense and incentive compensation expense. Our effective tax rate for 2016 was 28.6%.

For 2017, we expect gross margin will continue to improve. We anticipate benefitting from strategic actions taken to improve growth in our core businesses and will continue to benefit from recent acquisitions. Raw material costs are expected to increase in 2017, however our expectation is to offset these cost increases through pricing actions, product reformulations and optimization actions. In addition, foreign currency exchange rates continue to be volatile, and we anticipate changes in rates will adversely impact reported results.

We remain focused on the integration of our recent acquisitions and continue to work toward achieving the identified synergies. We will continue to focus on opportunities to optimize our cost structure and make our business processes and systems more efficient, and to leverage tax planning opportunities. We continue to expect cash flow from operating activities to be positive for 2017, providing additional liquidity.

Results of Operations — Consolidated

Comparison of the years ended December 31, 2016 and 2015

For the year ended December 31, 2016, income from continuing operations was $44.6 million, compared with income from continuing operations of $99.9 million in 2015. For the year ended December 31, 2016, net loss was $19.9 million, compared with net income of $63.1 million in 2015. For the year ended December 31, 2016, net loss attributable to common shareholders was $20.8 million, or $0.25 loss per share, compared with net income attributable to common shareholders of $64.1 million, or $0.74 earnings per share in 2015.

Net Sales

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Net sales	$ 1,145,292	$ 1,075,341	$ 69,951	6.5%
Cost of sales	794,075	773,661	20,414	2.6%
Gross profit	$ 351,217	$ 301,680	$ 49,537	16.4%
Gross profit as a % of net sales	30.7%	28.1%		

Net sales increased by $70.0 million, or 6.5%, in the year ended December 31, 2016, compared with the prior year. The net sales increase was driven by higher sales in Pigments, Powders and Oxides of $81.6 million, partially offset by a decrease in sales in Performance Colors and Glass of $5.3 million and Performance Coatings of $6.4 million. The increase in net sales was primarily driven by the sales from Nubiola of $66.3 million and sales from Al Salomi of $22.1 million, partially offset by a decrease in sales of frits and glazes from Latin America of $23.9 million.

Gross Profit

Gross profit increased $49.5 million, or 16.4%, in 2016 to $351.2 million, compared with $301.7 million in 2015 and, as a percentage of net sales, it increased 260 basis points to 30.7%. The significant driver of the increased gross profit was strong performance in our Pigments, Powders and Oxides segment which exceeded prior-year gross profit by $38.6 million, primarily driven by sales from Nubiola. The increase in gross profit was primarily due to an increase in sales volumes and mix of $48.6 million, decreases in raw material costs of $21.0 million and decreases in manufacturing costs of $11.1 million, partially offset by unfavorable product pricing of $15.0 million and unfavorable foreign currency impacts of $9.1 million.

Geographic Revenues

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

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Geographic Revenues on a sales origination basis				
Europe	$ 515,055	$ 474,400	$ 40,655	8.6 %
United States	300,187	281,976	18,211	6.5 %
Asia Pacific	179,464	161,027	18,437	11.4 %
Latin America	150,586	157,938	(7,352)	(4.7)%
Net sales	$ 1,145,292	$ 1,075,341	$ 69,951	6.5 %

The increase in net sales of $70.0 million, compared with 2015, was driven by increased sales from Europe, Asia Pacific and the United States, partially mitigated by a decrease in sales from Latin America. The increase from Europe was primarily attributable to Nubiola sales of $24.6 million and an increase in Performance Coatings sales of $11.2 million and the increase from Asia Pacific was attributable to an increase in sales in all segments. The increase from the United States was attributable to an increase in sales in Pigments, Powders and Oxides of $29.4 million, partially offset by lower sales in Performance Colors and Glass of $11.5 million. The decrease in sales from Latin America was attributable to the sale of our interest in an operating affiliate in Venezuela in 2015 which contributed $8.4 million in net sales.

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

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Geographic Revenues on a shipped-to basis				
Europe	$ 501,231	$ 466,861	$ 34,370	7.4 %
Asia Pacific	244,057	220,806	23,251	10.5 %
United States	239,771	213,531	26,240	12.3 %
Latin America	160,233	174,143	(13,910)	(8.0)%
Net sales	$ 1,145,292	$ 1,075,341	$ 69,951	6.5 %

Selling, General and Administrative Expense

The following table includes SG&A components with significant changes between 2016 and 2015.

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Personnel expenses	$ 119,785	$ 114,386	$ 5,399	4.7 %
Business development	12,890	13,527	(637)	(4.7)%
Stock-based compensation	7,245	8,868	(1,623)	(18.3)%
Incentive compensation	10,852	4,982	5,870	117.8 %
Pension and other postretirement benefits	16,417	1,494	14,923	998.9 %
Bad debt	1,383	667	716	107.3 %
All other expenses	73,130	72,975	155	0.2 %
Selling, general and administrative expenses	$ 241,702	$ 216,899	$ 24,803	11.4 %

SG&A expenses were $24.8 million higher in 2016 compared with the prior year. As a percentage of net sales, SG&A expenses increased 90 basis points from 20.2% in 2015 to 21.1% in 2016. The most significant driver of the increase in SG&A expenses in 2016 was the change in the mark-to-market loss and curtailment and settlement effects on our defined benefit pension plans and postretirement health care and life insurance benefit plans of $8.1 million, and is included within the pension and other postretirement benefits line above. The expense in 2016 was higher than the prior year due to the loss from expected returns on plan assets exceeding actual returns and a decrease in the discount rate compared with the prior year. Excluding the impacts of the pension and other postretirement benefits expense, SG&A expenses decreased 30 basis points from 20.0% in 2015 to 19.7% in 2016. The increase in personnel expenses was attributable to the acquisitions acquired which contributed $5.5 million and the increase in incentive compensation was a result of the Company's performance relative to targets for certain awards compared with the prior year.

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.

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Strategic services	$ 116,807	$ 107,729	$ 9,078	8.4%
Functional services	106,798	95,320	11,478	12.0%
Incentive compensation	10,852	4,982	5,870	117.8%
Stock-based compensation	7,245	8,868	(1,623)	(18.3)%
Selling, general and administrative expenses	$ 241,702	$ 216,899	$ 24,803	11.4%

SG&A expenses were $24.8 million higher in 2016, compared with 2015. The increase in SG&A expenses was driven by higher expenses in functional services due to the increase in pension and other postretirement benefit expense. The increase in strategic expenses was due to the increased expenses of $8.7 million associated with the acquisitions acquired within the last year and an increase in bad debt expense of $0.7 million in 2016, compared with 2015.

Restructuring and Impairment Charges

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Employee severance	$ 1,353	$ 4,015	$ (2,662)	(66.3)%
Goodwill impairment	13,198	—	13,198	NM%
Other restructuring costs	1,356	5,640	(4,284)	(76.0)%
Restructuring and impairment charges	$ 15,907	$ 9,655	$ 6,252	64.8%

Restructuring and impairment charges increased by $6.3 million in 2016, compared with 2015. The increase was driven by an impairment charge within our Tile Coating Systems reporting unit, a component of our Performance Coatings operating segment in 2016 of $13.2 million. This increase was partially mitigated by a decrease in employee severance cost of $2.7 million in 2016, compared with 2015 and the early termination cost of a contract associated with restructuring a corporate function of $2.8 million in 2015.

Interest Expense

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Interest expense	$ 20,246	$ 15,464	$ 4,782	30.9%
Amortization of bank fees	1,353	1,125	228	20.3%
Interest capitalization	(52)	(1,426)	1,374	(96.4)%
Interest expense	$ 21,547	$ 15,163	$ 6,384	42.1%

Interest expense in 2016 increased $6.4 million compared with 2015, primarily due to an increase in the average long-term debt balance for the 2016 period compared with 2015, as well as less interest capitalization associated with long-term capital projects, which was driven by the substantial completion of the Antwerp, Belgium facility in the fourth quarter of 2015.

Income Tax Expense

In 2016, we recorded an income tax expense of $17.9 million, or 28.6% of income before income taxes, compared to an income tax benefit of $45.1 million, or (82.3%) of income before income taxes in 2015. The 2016 effective tax rate is less than the statutory income tax rate of 35%, primarily as a result of a $5.5 million 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 allowances, 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 million expense related to the impairment of book basis goodwill and a $2.1 million expense related to non-deductible expenses. The 2015 effective tax rate was less than the statutory income tax rate of 35% primarily as a result of a $3.8 million benefit related to greater levels of income earned in lower tax jurisdictions, $3.1 million benefit for the release of the valuation allowances related to deferred tax assets that were utilized in the current year and $63.3 million benefit for the release of valuation allowances in certain jurisdictions, which are deemed no longer necessary based upon a change from a cumulative three-year loss to income and our expectation of sufficient future taxable income to be able to realize the respective benefits, offset by $2.4 million expense related to new uncertain tax positions and $1.7 million expense related to non-deductible expenses.

Comparison of the years ended December 31, 2015 and 2014

For the year ended December 31, 2015, income from continuing operations was $99.9 million, compared with a loss from continuing operations of $8.6 million in 2014. For the year ended December 31, 2015, net income was $63.1 million, compared with net income of $86.2 million in 2014. For the year ended December 31, 2015, net income attributable to common shareholders was $64.1 million, or $0.74 earnings per share, compared with net income attributable to common shareholders of $86.1 million, or $0.99 earnings per share in 2014.

Net Sales

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Net sales	$ 1,075,341	$ 1,111,626	$ (36,285)	(3.3)%
Cost of sales	773,661	826,541	(52,880)	(6.4)%
Gross profit	$ 301,680	$ 285,085	$ 16,595	5.8%
Gross profit as a % of net sales	28.1%	25.6%		

Net sales decreased by $36.3 million, or 3.3% in the year ended December 31, 2015, compared with the prior year. Net sales decreased $36.3 million, primarily driven by a decrease in sales in Performance Coatings and Performance Colors and Glass of $55.2 million and $30.9 million, respectively, partially mitigated by an increase in net sales in Pigments, Powders and Oxides of $49.8 million. The main driver of the decrease in net sales was unfavorable foreign currency impacts, which totaled approximately $132.4 million, and unfavorable pricing impacts of $16.6 million, partially mitigated by $56.9 million of sales from Nubiola, which was acquired in the third quarter of 2015, and $56.0 million of sales from Vetriceramici, which was acquired in the fourth quarter of 2014.

Gross Profit

Gross profit increased $16.6 million, or 5.8% in 2015 to $301.7 million, compared with $285.1 million in 2014 and as a percentage of net sales, it increased 250 basis points to 28.1%. The significant driver of the increased gross profit was strong performance in our Pigments, Powders and Oxides segment which exceeded prior-year gross profit by $17.2 million, primarily driven by Nubiola, which was acquired in the third quarter of 2015. Gross profit was negatively impacted by a charge of $5.8 million related to a purchase price adjustment from the acquisition of Nubiola, for step up of inventory acquired and subsequently sold in the third quarter that will not recur.

Geographic Revenues

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

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Geographic Revenues on a sales origination basis				
Europe	$ 474,400	$ 499,045	$ (24,645)	(4.9)%
United States	281,976	263,452	18,524	7.0%
Asia Pacific	161,027	188,099	(27,072)	(14.4)%
Latin America	157,938	161,030	(3,092)	(1.9)%
Net sales	$ 1,075,341	$ 1,111,626	$ (36,285)	(3.3)%

The decline in net sales of $36.3 million, compared with 2014, was driven by decreased sales from Europe, Asia Pacific and Latin America, partially mitigated by an increase in sales from the United States. The decline in sales from Europe was due to lower sales in Performance Colors and Glass and Performance Coatings of $23.0 million and $18.7 million, respectively, and was largely due to unfavorable foreign currency impacts. The decrease from Europe was partially mitigated by increased sales in Pigments, Powders and Oxides of $17.1 million, driven by sales from Nubiola, which was acquired in the third quarter of 2015. The decline from Asia Pacific was driven by lower sales of $22.6 million in Performance Coatings, lower sales of $4.5 million in Performance Colors and Glass and the result of the sale of our North American and Asian metal powders business, which comprised $7.5 million of the decrease. The lower sales from Latin America was due to lower sales in Performance Coatings and Performance Colors and Glass of $8.9 million and $7.4 million, respectively, partially mitigated by higher sales in Pigments, Powders and Oxides of $13.2 million. The decline in sales from Latin America in Performance Coatings was primarily due to the unfavorable foreign currency impacts related to the change in currency exchange mechanisms in Venezuela during the first quarter of 2015 and the sale of our operating affiliate in Venezuela in the fourth quarter of 2015. The higher sales from the United States in 2015 compared to 2014, was driven by higher sales volumes within Pigments, Powders and Oxides and Performance Colors and Glass, partially offset by lower sales in Performance Coatings.

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

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Geographic Revenues on a shipped-to basis				
Europe	$ 466,861	$ 489,019	$ (22,158)	(4.5)%
Asia Pacific	220,806	231,348	(10,542)	(4.6)%
United States	213,531	205,456	8,075	3.9 %
Latin America	174,143	185,803	(11,660)	(6.3)%
Net sales	$ 1,075,341	$ 1,111,626	$ (36,285)	(3.3)%

Selling, General and Administrative Expense

The following table includes SG&A components with significant changes between 2015 and 2014.

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Personnel expenses	$ 114,386	$ 107,159	$ 7,227	6.7 %
Business development	13,527	3,468	10,059	290.1 %
Stock-based compensation	8,868	9,679	(811)	(8.4)%
Incentive compensation	4,982	11,598	(6,616)	(57.0)%
Pension and other postretirement benefits	1,494	85,081	(83,587)	(98.2)%
Bad debt	667	2,657	(1,990)	(74.9)%
All other expenses	72,975	67,120	5,855	8.7 %
Selling, general and administrative expenses	$ 216,899	$ 286,762	$ (69,863)	(24.4)%

SG&A expenses were $69.9 million lower in 2015 compared with the prior year. As a percentage of net sales, SG&A expenses decreased 560 basis points from 25.8% in the prior year to 20.2% in 2015. The most significant driver of the decrease in SG&A expenses in 2015 was the change in the mark-to-market loss and curtailment and settlement effects on our defined benefit pension plans and postretirement health care and life insurance benefit plans of $80.3 million, and is included within the pension and other postretirement benefits line above. The expense in 2014 was primarily related to changes in actuarial assumptions used in calculating the value of the U.S. pension liability. In addition, during 2014, the Company adopted the use of new mortality tables within its calculation assumptions, which had a one-time impact of increasing the liability. The new mortality tables reflect underlying increases in life expectancy of participants, thus driving longer benefit payment periods. The impact of the change in mortality assumption on the U.S. pension liability was an increase of the liability of approximately $18 million. Excluding the impacts of the pension and other postretirement benefits expense, SG&A expenses increased 190 basis points from 18.1% in 2014 to 20.0% in 2015. Included in SG&A expenses were $8.1 million and $12.5 million of expenses attributable to Nubiola and Vetriceramici, which were acquired in the third quarter of 2015 and the fourth quarter of 2014, respectively. The increase in business development costs of $10.1 million was a result of higher costs associated with professional fees that were related to business development activities. These increases were offset by lower incentive compensation expense of $6.6 million, which is based on certain performance metrics, and lower bad debt expenses of $2.0 million. The decrease in SG&A is also a result of foreign currency impacts.

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

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Strategic services	$ 107,729	$ 101,296	$ 6,433	6.4%
Functional services	95,320	164,189	(68,869)	(41.9)%
Incentive compensation	4,982	11,598	(6,616)	(57.0)%
Stock-based compensation	8,868	9,679	(811)	(8.4)%
Selling, general and administrative expenses	$ 216,899	$ 286,762	$ (69,863)	(24.4)%

SG&A expenses were $69.1 million lower in 2015, compared with 2014. The decrease in SG&A expenses was driven by lower expenses in functional services from the change in the mark-to-market loss and curtailment and settlement effects on our defined benefit pension plans and postretirement health care and life insurance benefit plans of $80.3 million, partially offset by an increase in business development expenses of $10.1 million. Lower SG&A expenses were also driven by lower incentive and stock-based compensation expense, partially offset by higher expenses in strategic services driven by the Vetriceramici and Nubiola acquisitions.

Restructuring and Impairment Charges

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Employee severance	$ 4,015	$ 2,744	$ 1,271	46.3%
Lease termination costs	—	2,468	(2,468)	100.0%
Other restructuring costs	5,640	3,637	2,003	55.1%
Restructuring and impairment charges	$ 9,655	$ 8,849	$ 806	9.1%

Restructuring and impairment charges increased in 2015 compared with 2014. The primary drivers were the increase in employee severance cost of $1.3 million in 2015 compared with 2014 and the early termination cost of a contract associated with restructuring a corporate function of $2.8 million during in 2015. The increase in restructuring and impairment charges was partially mitigated by a decrease of $2.5 million due to a lease termination charge that occurred in 2014.

Interest Expense

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Interest expense	$ 15,464	$ 16,895	$ (1,431)	(8.5)%
Amortization of bank fees	1,125	1,337	(212)	(15.9)%
Interest capitalization	(1,426)	(1,969)	543	(27.6)%
Interest expense	$ 15,163	$ 16,263	$ (1,100)	(6.8)%

Interest expense in 2015 decreased $1.1 million compared with 2014, primarily due to the redemption of the 7.875% Senior Notes and refinancing of the 2013 Revolving Credit Facility during the third quarter of 2014. The decrease was partially offset by less interest capitalization associated with long-term capital projects, which was driven by the substantial completion of the Antwerp, Belgium facility in the fourth quarter of 2015.

Income Tax Expense

In 2015, we recorded an income tax benefit of $45.1 million, or (82.3%) of income before income taxes, compared to an income tax benefit of $34.2 million, or 79.9% of loss before taxes in 2014. The 2015 effective tax rate was less than the statutory income tax rate of 35% primarily as a result of $3.8 million benefit related to greater levels of income earned in lower tax jurisdictions, a $3.1 million benefit for the release of the valuation allowances related to deferred tax assets that were utilized in the current year and $63.3 million benefit for the release of valuation allowances in certain jurisdictions, which are deemed no longer necessary based upon a change from a cumulative three-year loss to income and our expectation of sufficient future taxable income to be able to realize the respective benefits, offset by $2.4 million expense related to new uncertain tax positions and $1.7 million expense related to non-deductible expenses. The 2014 effective tax rate was greater than the statutory income tax rate of 35% primarily as a result of a $17.4 million benefit related to the release of valuation allowances for deferred tax assets that were utilized in the 2014, the release of valuation allowances deemed no longer necessary and the expiration of fully valued tax attributes, $15.2 million of benefit related to 2014 domestic foreign tax credit generated and utilized, and foreign tax rate differences from the statutory income tax rate of 35%.

Results of Operations — Segment Information

Comparison of the years ended December 31, 2016 and 2015

Performance Coatings

					Change due to			
	2016	2015	$ Change	% Change	Price	Volume / Mix	Currency	Other
	(Dollars in thousands)							
Segment net sales	$ 526,981	$ 533,370	$ (6,389)	(1.2)%	$ (15,923)	43,979	(34,445)	$ —
Segment gross profit	139,454	126,945	12,509	9.9 %	(15,923)	23,181	(7,265)	12,516
Gross profit as a % of segment net sales	26.5 %	23.8 %						

Net sales declined in Performance Coatings compared with 2015, primarily driven by a decrease in sales of $20.9 million in frits and glazes, and $8.4 million due to the sale of our Venezuela business, partially mitigated by $22.1 million in sales from Al Salomi. The decrease in net sales was impacted by unfavorable foreign currency impacts of $34.4 million and lower product pricing of $15.9 million, partially offset by increased sales volume and mix of $44.0 million. Gross profit increased $12.5 million from 2015, primarily driven by lower manufacturing costs of $4.6 million, higher sales volumes and mix of $23.2 million, and lower raw material costs of $7.9 million, partially offset by unfavorable product pricing impacts of $15.9 million and unfavorable foreign currency impacts of $7.3 million.

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Segment net sales by Region				
Europe	$ 289,780	$ 278,581	$ 11,199	4.0 %
Latin America	101,565	123,152	(21,587)	(17.5)%
Asia Pacific	89,573	85,850	3,723	4.3 %
United States	46,063	45,787	276	0.6 %
Net sales	$ 526,981	$ 533,370	$ (6,389)	(1.2)%

The net sales decrease of $6.4 million was driven by declines in sales from Latin America, partially mitigated by an increase in sales from Europe, Asia Pacific and the United States. The sales decline from Latin

America included a decrease in sales in frits and glazes of $23.9 million and a decrease in sales from Venezuela of $8.4 million, partially mitigated by increased sales in digital inks and opacifiers of $5.7 million and $5.3 million, respectively. The increase in sales from Europe was primary attributable to $22.1 million in sales from Al Salomi, partially offset by decreased sales in digital inks and Vetriceramici products of $5.7 million and $4.6 million, respectively. The increase from Asia Pacific was primarily due to increased sales in digital inks and frits and glazes of $2.7 million and $2.5 million, partially offset by decreased sales in porcelain enamel of $1.3 million. The increase from the United States was fully attributable to increased sales in porcelain enamel of $0.3 million.

Performance Colors and Glass

					Change due to			
	2016	**2015**	**$ Change**	**% Change**	**Price**	**Volume / Mix**	**Currency**	**Other**
	(Dollars in thousands)							
Segment net sales	$ 371,464	$ 376,769	$ (5,305)	(1.4)%	$ 587	$ (951)	$ (4,941)	$ —
Segment gross profit	133,716	128,209	5,507	4.3 %	587	(3,224)	(1,636)	9,780
Gross profit as a % of segment net sales	36.0 %	34.0 %						

Net sales decreased compared with 2015, primarily driven by lower sales of our electronics products and industrial products of $3.1 million and $2.8 million, respectively. Net sales were impacted by unfavorable foreign currency impacts of $4.9 million and unfavorable volume and mix of $1.0 million, partially mitigated by higher product pricing of $0.6 million. Gross profit increased from 2015, primarily due to lower raw material costs of $7.9 million, lower manufacturing costs of $1.9 million and higher product pricing of $0.6 million, partially offset by lower sales volumes and mix of $3.2 million and unfavorable foreign currency impacts of $1.6 million.

	2016	**2015**	**$ Change**	**% Change**
	(Dollars in thousands)			
Segment net sales by Region				
Europe	$ 160,475	$ 157,174	$ 3,301	2.1%
United States	132,432	143,919	(11,487)	(8.0)%
Asia Pacific	59,121	56,082	3,039	5.4%
Latin America	19,436	19,594	(158)	(0.8)%
Net sales	$ 371,464	$ 376,769	$ (5,305)	(1.4)%

The net sales decline of $5.3 million was driven by lower sales from the United States and Latin America, partially mitigated by increased sales from Europe and Asia Pacific. The decrease in sales from the United States was attributable to lower sales across all product lines, and the decline in sales from Latin America was primarily due to lower sales of decoration products of $0.2 million. The increase in sales from Europe was partially attributable to increased sales of electronics and automobile products of $2.3 million and $1.4 million, respectively, partially offset by a decrease in sales in industrial products of $0.9 million. The increase in sales from Asia Pacific was primarily due to higher sales of automotive products of $3.4 million, partially offset by lower sales in decoration products of $0.3 million.

Pigments, Powders and Oxides

	2016	2015	$ Change	% Change	Change due to Price	Volume / Mix	Currency	Other
	(Dollars in thousands)							
Segment net sales	$ 246,847	$ 165,202	$ 81,645	49.4 %	$ 368	82,100	(823)	$ —
Segment gross profit	84,293	45,678	38,615	84.5 %	368	28,615	(186)	9,818
Gross profit as a % of segment net sales	34.1 %	27.6 %						

Net sales increased compared with 2015, primarily due to higher sales from Nubiola products of $66.3 million, an increase in sales of surface technology products and of pigments of $6.1 million and $5.7 million, respectively, and an increase in sales from Cappelle of $2.2 million. Net sales were positively impacted by higher volumes and mix of $82.1 million and favorable product pricing of $0.4 million, partially offset by unfavorable foreign currency impacts of $0.8 million. Gross profit increased from 2015, primarily due to higher sales volumes and mix of $28.6 million, favorable raw material costs of $5.2 million, lower manufacturing costs of $4.6 million and favorable product pricing of $0.4 million, partially offset by unfavorable foreign currency impacts of $0.2 million. Gross profit was negatively impacted by a charge of $5.8 million in 2015, related to a purchase price adjustment from the acquisition of Nubiola for step up of inventory acquired and subsequently sold that will not recur.

	2016	2015	$ Change	% Change
	(Dollars in thousands)			
Segment net sales by Region				
United States	$ 121,692	$ 92,270	$ 29,422	31.9%
Europe	64,800	38,645	26,155	67.7%
Asia Pacific	30,770	19,095	11,675	61.1%
Latin America	29,585	15,192	14,393	94.7%
Net sales	$ 246,847	$ 165,202	$ 81,645	49.4%

The increase in net sales of $81.6 million compared with 2015 was due to higher sales across all regions. The increase in sales from the United States was driven by increased sales from Nuiobla of $17.7 million and increased sales in surface technology and pigments of $6.1 million and $3.6 million, respectively. The increase in sales from Europe and Latin America was driven by sales from Nubiola of $24.6 million and $14.6 million, respectively. The increase in sales from Asia Pacific was primarily driven by sales from Nubiola of $9.3 million and pigments of $2.5 million.

Comparison of the years ended December 31, 2015 and 2014

Performance Coatings

	2015	2014	$ Change	% Change	Change due to Price	Volume / Mix	Currency	Other
	(Dollars in thousands)							
Segment net sales	$ 533,370	$ 588,538	$ (55,168)	(9.4)%	$ (19,411)	$ 55,049	$ (90,806)	$ —
Segment gross profit	126,945	131,043	(4,098)	(3.1)%	(19,411)	15,053	(18,667)	18,927
Gross profit as a % of segment net sales	23.8 %	22.3 %						

Net sales decreased in Performance Coatings compared with 2014 due to lower sales of frits and glazes, colors, porcelain enamels, digital inks and other tile product lines of $54.3 million, $17.9 million, $17.8 million, $12.8 million and $6.9 million, respectively. The sales decline was partially mitigated by an increase of $54.5 million in sales from

Vetriceramici, which was acquired in the fourth quarter of 2014. A substantial portion of the decline in sales was attributed to unfavorable foreign currency impacts of $90.8 million and lower product pricing of $19.4 million, partially mitigated by favorable mix and higher sales volumes of $22.7 million and $32.3 million, respectively. Gross profit decreased from 2014, and was driven by lower product pricing impacts of $19.4 million and unfavorable foreign currency impacts of $18.7 million, partially mitigated by favorable volume and mix of $15.1 million, lower manufacturing costs of $11.1 million and favorable raw material impacts of $7.8 million.

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Segment net sales by Region				
Europe	$ 278,581	$ 297,324	$ (18,743)	(6.3)%
Latin America	123,152	132,015	(8,863)	(6.7)%
Asia Pacific	85,850	108,419	(22,569)	(20.8)%
United States	45,787	50,780	(4,993)	(9.8)%
Net sales	$ 533,370	$ 588,538	$ (55,168)	(9.4)%

The net sales decrease of $55.2 million compared with 2014 reflected lower sales in all regions. The decline from Asia Pacific was driven by lower sales of frits and glaze products, digital inks, porcelain enamels, and colors of $12.4 million, $4.0 million, $3.3 million, and $2.9 million respectively. The decline in sales from Europe was attributable to lower sales of our porcelain enamel products, partially mitigated by higher sales of tile products, including Vetriceramici sales. The decline in sales from Latin America compared to 2014 was due to lower sales in colors and porcelain enamel products, partially mitigated by higher sales of digital inks products. The decline from the United States was attributable to porcelain enamel products.

Performance Colors and Glass

					Change due to			
	2015	2014	$ Change	% Change	Price	Volume / Mix	Currency	Other
	(Dollars in thousands)							
Segment net sales	$ 376,769	$ 407,674	$ (30,905)	(7.6)%	$ 2,451	$ 2,707	$ (36,063)	$ —
Segment gross profit	128,209	134,964	(6,755)	(5.0)%	2,451	(6,798)	(12,278)	9,870
Gross profit as a % of segment net sales	34.0 %	33.1 %						

Net sales decreased $30.9 million in 2015 compared with 2014, with decreases of $18.0 million in decoration, $6.4 million in industrial products, $7.1 million in automotive, and $0.9 million in electronics, partially mitigated by an increase in sales of $1.5 million from Vetriceramici, which was acquired in the fourth quarter of 2014. Net sales reflected unfavorable foreign currency impacts of $36.1 million and lower sales volume of $5.3 million, partially mitigated by favorable mix of $8.0 million and higher product pricing of $2.5 million. Gross profit decreased from 2014, due to unfavorable foreign currency impacts of $12.3 million, unfavorable sales volumes and mix of $6.8 million, and higher manufacturing costs of $1.0 million, partially mitigated by favorable raw material impacts of $10.9 million and higher product pricing impacts of $2.5 million.

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Segment net sales by Region				
Europe	$ 157,174	$ 180,175	$ (23,001)	(12.8)%
United States	143,919	139,937	3,982	2.8%
Asia Pacific	56,082	60,537	(4,455)	(7.4)%
Latin America	19,594	27,025	(7,431)	(27.5)%
Net sales	$ 376,769	$ 407,674	$ (30,905)	(7.6)%

The decrease in net sales of $30.9 million compared with 2014, was primarily driven by lower sales in decoration products and industrial products from Europe of $8.0 million and $7.5 million, respectively, and lower sales of decoration products from Latin America and Asia Pacific of $8.3 million and $3.0 million. The decrease was partially mitigated by higher sales in electronics products from the United States of $4.0 million.

Pigments, Powders and Oxides

					Change due to			
	2015	2014	$ Change	% Change	Price	Volume / Mix	Currency	Other
	(Dollars in thousands)							
Segment net sales	$ 165,202	$ 115,414	$ 49,788	43.1 %	$ 400	$ 54,910	$ (5,522)	$ —
Segment gross profit	45,678	28,480	17,198	60.4 %	400	13,099	(1,250)	4,949
Gross profit as a % of segment net sales	27.6 %	24.7 %						

Net sales increased compared with 2014, primarily due to higher volume and mix of $54.9 million, of which $56.9 million is related to sales from the Nubiola acquisition in the third quarter of 2015. The increase in sales is also due to favorable product pricing impacts of $0.4 million, partially mitigated by unfavorable foreign currency impacts of $5.5 million. Gross profit increased from 2014 and was a result of favorable volume and mix of $13.1 million, lower manufacturing costs of $3.6 million, favorable raw material impacts of $1.3 million, and higher product pricing of $0.4 million, partially offset by unfavorable foreign currency impacts of $1.2 million. Gross profit was negatively impacted by a charge of $5.8 million related to a purchase price adjustment from the acquisition of Nubiola, which was acquired in the third quarter of 2015, for step up of inventory acquired and subsequently sold in the third quarter that will not recur.

	2015	2014	$ Change	% Change
	(Dollars in thousands)			
Segment net sales by Region				
United States	$ 92,270	$ 72,735	$ 19,535	26.9 %
Europe	38,645	21,546	17,099	79.4 %
Asia Pacific	19,095	19,143	(48)	(0.3)%
Latin America	15,192	1,990	13,202	663.4 %
Net sales	$ 165,202	$ 115,414	$ 49,788	43.1 %

The increase in net sales of $49.8 million in 2015 compared with 2014, was due to higher sales from the United States, Europe and Latin America. The increase in sales from the United States was driven by increases of $4.8 million in surface finishing products, $0.6 million in pigments, and $15.2 million by sales from Nubiola, which was acquired in the third quarter of 2015, partially offset by a decrease in sales of $0.5 million in liquid coatings. The increase in sales from Europe and Latin America was driven by sales from Nubiola of $21.2 million and $13.7 million, respectively, partially offset by a decrease in sales of $4.1 million and $0.5 million in pigments, respectively.

Summary of Cash Flows for the years ended December 31, 2016, 2015, and 2014

	2016	2015	2014
	(Dollars in thousands)		
Net cash provided by operating activities	$ 62,630	$ 51,202	$ 60,473
Net cash (used for) provided by investing activities	(150,822)	(244,600)	75,204
Net cash provided by (used for) financing activities	81,997	119,726	(18,143)
Effect of exchange rate changes on cash and cash equivalents	(6,603)	(8,448)	(5,362)
(Decrease) increase in cash and cash equivalents	$ (12,798)	$ (82,120)	$ 112,172

Operating activities. Cash flows from operating activities increased $11.4 million in 2016 compared to 2015. The increase was due to lower cash outflows for other assets and liabilities of $28.0 million and higher earnings after consideration of non-cash items of $30.4 million, partially offset by higher cash outflows for working capital of $43.2 million.

Cash flows from operating activities decreased $9.3 million in 2015 compared to 2014. The change was driven by lower net income of $23.1 million. The decrease was partially mitigated by reduced payments associated with restructuring activities of $9.8 million and by a cash inflows of $12.2 million in 2015 related to working capital, compared to cash outflows of $12.3 million in 2014.

Investing activities. Cash flows from investing activities increased approximately $93.8 million in 2016. The increase was primarily due to lower cash outflows for business combinations of $72.6 million and lower capital expenditures of $18.1 million which was driven by lower spend for the Antwerp, Belgium facility. This facility was substantially completed in the fourth quarter of 2015.

Cash flows from investing activities decreased approximately $319.8 million in 2015 compared with 2014. The decrease was driven primarily by business acquisitions, net of cash acquired, of $202.2 million in 2015, compared to cash used for business acquisitions in 2014 of $115.6 million, partially offset by net proceeds from the sales of our North America-based Polymer Additives assets and Specialty Plastics business in 2014 of $149.5 million and $88.3 million, respectively. Capital expenditures decreased $10.7 million in 2015 compared with 2014.

Financing activities. Cash flows from financing activities decreased $37.7 million in 2016 compared with 2015, driven by the $50.0 million prepayment on the term loan facility that was made in January 2016 and a net borrowing decrease on the revolving credit facility of $28.4 million, partially mitigated by decreased purchase of treasury stock of $27.1 million and an increase in net borrowings on loans payable of $11.9 million.

Cash flows from financing activities increased $137.9 million in 2015 compared with 2014. The increase was primarily the result of net borrowings on the revolving credit facility of $170.0 million in 2015 compared to a repayment of $9.2 million in 2014. Net borrowings in 2015 were primarily used to fund acquisitions, the Company's share repurchase program, and for other general business use. Further, we had a cash outflow of $41.0 million in 2014, related to repayment of debt outstanding under our accounts receivable securitization program, which expired during the year.

We have paid no dividends on our common stock since 2009.

Capital Resources and Liquidity

Major debt instruments that were outstanding during 2016 are described below.

Credit Facility

On July 31, 2014, the Company entered into a credit facility (the "Credit Facility") with a group of lenders to refinance the majority of its then outstanding debt. The Credit Facility consisted of a $200 million secured revolving line of credit with a term of five years and a $300 million secured term loan facility with a term of seven years. On January 25, 2016, the Company amended the Credit Facility by entering into the Incremental Assumption Agreement (the "Incremental Agreement") to increase the revolving line of credit commitment amount from $200 million to $300 million. The Company then used a portion of the increase in the revolving line of credit to repay $50 million of the term loan facility. The Credit Facility was amended and a portion of the outstanding term loan was repaid to increase the amount of total liquidity available under the Credit Facility and reduce the total cost of borrowings. On August 29, 2016, the Company amended the Credit Facility by entering into the Second Incremental Assumption Agreement (the "Second Incremental Agreement") to increase the revolving line of credit commitment amount to $400 million. The increase in the revolving line of credit commitment was used for general corporate purposes, including acquisitions.

Principal payments on the term loan facility of $0.75 million quarterly, are payable commencing December 31, 2014, with the remaining balance due on the maturity date. At December 31, 2016, the Company had borrowed $243.3 million under the term loan facility, taking into account all prior quarterly payments and the $50 million prepayment that was made in January 2016, at an annual rate of 4.0%. There are no additional borrowings available under the term loan facility.

Certain of the Company's U.S. subsidiaries have guaranteed the Company's obligations under the Credit Facility and such obligations are secured by (a) substantially all of the personal property of the Company and the U.S. subsidiary guarantors and (b) a pledge of 100% of the stock of most of the Company's U.S. subsidiaries and 65% of most of the stock of the Company's first tier foreign subsidiaries.

Interest Rate — Term Loan: The interest rates applicable to the term loans will be, at the Company's option, equal to either a base rate or a London Interbank Offered Rate ("LIBOR") rate plus, in both cases, an applicable margin.

- The base rate will be the highest of (i) the federal funds rate plus 0.50%, (ii) syndication agent's prime rate or (iii) the daily LIBOR rate plus 1.00%.
- The applicable margin for base rate loans is 2.25%.
- The LIBOR rate will be set as quoted by Bloomberg and shall not be less than 0.75%.
- The applicable margin for LIBOR rate loans is 3.25%.
- For LIBOR rate loans, the Company may choose to set the duration on individual borrowings for periods of one, two, three or six months, with the interest rate based on the applicable LIBOR rate for the corresponding duration.

Interest Rate — Revolving Credit Line: The interest rates applicable to loans under the revolving credit line will be, at the Company's option, equal to either a base rate or a LIBOR rate plus an applicable variable margin. The variable margin will be based on the ratio of (a) the Company's total consolidated debt outstanding at such time to (b) the Company's consolidated EBITDA computed for the period of four consecutive fiscal quarters most recently ended.

- The base rate will be the highest of (i) the federal funds rate plus 0.50%, (ii) syndication agent's prime rate or (iii) the daily LIBOR rate plus 1.00%.
- The applicable margin for base rate loans will vary between 1.50% and 2.00%.
- The LIBOR rate will be set as quoted by Bloomberg for U.S. Dollars.
- The applicable margin for LIBOR Rate Loans will vary between 2.50% and 3.00%.
- For LIBOR rate loans, the Company may choose to set the duration on individual borrowings for periods of one, two, three or six months, with the interest rate based on the applicable LIBOR rate for the corresponding duration.

At December 31, 2016, the Company had borrowed $311.6 million under the revolving credit facilities at a weighted average interest rate of 3.5%. The borrowing on the revolving credit line was used to fund the acquisitions, the share repurchase programs, and for other general business purposes. After reductions for outstanding letters of credit secured by these facilities, we had $84.1 million of additional borrowings available under the revolving credit facilities at December 31, 2016.

The Credit Facility contains customary restrictive covenants including, but not limited to, 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 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 revolving credit facility, the Company is subject to financial covenants regarding the Company's outstanding net indebtedness and interest coverage ratios.

If an event of default occurs, all amounts outstanding under the Credit Facility may be accelerated and become immediately due and payable. The Company was in compliance with our maximum leverage ratio covenant, as defined within our Credit Facility, as of September 30, 2016. The financial covenants are not applicable as of December 31, 2016, due to the refinancing of the Credit Facility, which is described below.

On February 14, 2017, the Company entered into a new credit facility (the "New Credit Facility") with a group of lenders to refinance its outstanding Credit Facility and to provide liquidity for ongoing working capital requirements and general corporate purposes. The New Credit Facility consists of a $400 million secured revolving line of credit with a term of five years, a $357.5 million secured term loan facility with a term of seven years and a €250 million secured euro term loan facility with a term of seven years. Refer to Note 8 for further details on the New Credit Facility.

Off Balance Sheet Arrangements

Consignment and Customer Arrangements for Precious Metals. We use precious metals, primarily silver, in the production of some of our products. We obtain most precious metals from financial institutions under consignment agreements (generally referred to as our precious metals consignment program). The financial institutions retain ownership of the precious metals and charge us fees based on the amounts we consign and the period of consignment. These fees were $0.8 million, $0.8 million and $0.8 million for 2016, 2015, and 2014 respectively. We had on hand precious metals owned by participants in our precious metals consignment program of $28.7 million at December 31, 2016 and $20.5 million at December 31, 2015, measured at fair value based on market prices for identical assets and net of credits.

The consignment agreements under our precious metals program involve short-term commitments that typically mature within 30 to 90 days of each transaction and are typically renewed on an ongoing basis. As a result, the Company relies on the continued willingness of financial institutions to participate in these arrangements to maintain this source of liquidity. On occasion, we have been required to deliver cash collateral. While no deposits were outstanding at December 31, 2016, or December 31, 2015, we may be required to furnish cash collateral in the future based on the quantity and market value of the precious metals under consignment and the amount of collateral-free lines provided by the financial institutions. The amount of cash collateral required is subject to review by the financial institutions and can be changed at any time at their discretion, based in part on their assessment of our creditworthiness.

Bank Guarantees and Standby Letters of Credit.

At December 31, 2016, the Company and its subsidiaries had bank guarantees and standby letters of credit issued by financial institutions that totaled $6.4 million. These agreements primarily relate to Ferro's insurance programs, foreign energy purchase contracts and foreign tax payments.

Other Financing Arrangements

We maintain other lines of credit to provide global flexibility for Ferro's short-term liquidity requirements. These facilities are uncommitted lines for our international operations and totaled $7.3 million at December 31, 2016. We had $6.7 million of additional borrowings available under these lines at December 31, 2016.

Liquidity Requirements

Our primary sources of liquidity are available cash and cash equivalents, available lines of credit under the Credit Facility, and cash flows from operating activities. As of December 31, 2016, we had $45.6 million of cash and cash equivalents. Substantially all of our cash and cash equivalents were held by foreign subsidiaries. Cash generated in the U.S. is generally used to pay down amounts outstanding under our revolving credit facility and for general corporate purposes, including acquisitions. If needed, we could repatriate the majority of cash held by foreign subsidiaries without the need to accrue and pay U.S. income taxes. We do not anticipate a liquidity need requiring such repatriation of these funds to the U.S.

Our liquidity requirements primarily include debt service, purchase commitments, labor costs, working capital requirements, restructuring expenditures, capital investments, precious metals cash collateral requirements, and postretirement obligations. We expect to meet these requirements in the long term through cash provided by operating activities and availability under existing credit facilities or other financing arrangements. Cash flows from operating activities are primarily driven by earnings before noncash charges and changes in working capital needs. In 2016, cash flows from financing and operating activities were used to fund our investing activities. Additionally, we used the borrowings available under the Credit Facility to fund the acquisitions, the share repurchase programs, and for other general business purposes. We had additional borrowing capacity $112.0 million at December 31, 2016, available under various credit facilities, primarily our revolving credit facility.

Our credit facilities contain a number of restrictive covenants, including those described in more detail in Note 8 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K. These covenants include customary operating restrictions, including, but not limited to, 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. We are also subject to customary financial covenants under our credit facilities, including a leverage ratio and an interest coverage ratio. These covenants under our credit facilities restrict the amount of our borrowings, reducing our flexibility to fund ongoing operations and strategic initiatives. These facilities are described in more detail in "Capital Resources and Liquidity" under Item 7 and in Note 8 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K. The most critical of these ratios is the leverage ratio for the revolving credit facility. The Company was in compliance with the covenants, as defined within our Credit Facility, as of September 30, 2016. The financial covenants are not applicable as of December 31, 2016, due to the refinancing of the Credit Facility. Refer to Note 8 for further details on the New Credit Facility.

Difficulties experienced in global capital markets could affect the ability or willingness of counterparties to perform under our various lines of credit, forward contracts, and precious metals program. These counterparties are major, reputable, multinational institutions, all having investment-grade credit ratings, except for one, which is not rated. Accordingly, we do not anticipate counterparty default. However, an interruption in access to external financing could adversely affect our business prospects and financial condition.

We assess on an ongoing basis our portfolio of businesses, as well as our financial and capital structure, to ensure that we have sufficient capital and liquidity to meet our strategic objectives. As part of this process, from time to time we evaluate the possible divestiture of businesses that are not critical to our core strategic objectives and, where appropriate, pursue the sale of such businesses and assets such as sales we completed in 2014 and 2016. We also evaluate and pursue acquisition opportunities that we believe will enhance our strategic position such as the acquisitions we completed in 2016, 2015 and 2014. Generally, we publicly announce material divestiture and acquisition transactions only when we have entered into definitive agreements relating to those transactions.

The Company's aggregate amount of contractual obligations for the next five years and thereafter is set forth below:

	2017	2018	2019	2020	2021	Thereafter	Totals
	(Dollars in thousands)						
Loans Payable (1)	$ 11,452	$ —	$ —	$ —	$ —	$ —	$ 11,452
Long-term debt (2)	6,105	5,612	316,813	4,601	232,176	2,634	567,941
Interest (3)	106	73	33	17	7	7	243
Operating lease obligations	8,435	5,966	5,193	3,825	2,645	4,398	30,462
Purchase commitments (4)	54,664	10,632	9,241	6,875	6,737	12,696	100,845
Taxes (5)	15,799	—	—	—	—	—	15,799
Retirement and other postemployment benefits(6)	9,590	9,411	—	—	—	—	19,001
	$ 106,151	$ 31,694	$ 331,280	$ 15,318	$ 241,565	$ 19,735	$ 745,743

(1) Loans Payable includes our loans payable to banks.

(2) Long-term debt excludes imputed interest and executory costs on capitalized lease obligations and unamortized issuance costs on the term loan facility.

(3) Interest represents only contractual payments for fixed-rate debt.

(4) Purchase commitments are noncancelable contractual obligations for raw materials and energy.

(5) We have not projected payments past 2017 due to uncertainties in estimating the amount and period of any payments. The amount above relates to our current income tax liability as of December 31, 2016. We have $27.8 million in gross liabilities related to unrecognized tax benefits, including $3.1 million of accrued interest and penalties that are not included in the above table since we cannot reasonably predict the timing of cash settlements with various taxing authorities.

(6) The funding amounts are based on the minimum contributions required under our various plans and applicable regulations in each respective country. We have not projected contributions past 2018 due to uncertainties regarding the assumptions involved in estimating future required contributions.

Critical Accounting Policies

When we prepare our consolidated financial statements we are required to make estimates and assumptions that affect the amounts we report in the consolidated financial statements and footnotes. We consider the policies discussed below to be more critical than other policies because their application requires our most subjective or complex judgments. These estimates and judgments arise because of the inherent uncertainty in predicting future events. Management has discussed the development, selection and disclosure of these policies with the Audit Committee of the Board of Directors.

Revenue Recognition

We recognize sales typically when we ship goods to our customers and when all of the following criteria are met:

- Persuasive evidence of an arrangement exists;
- The selling price is fixed or determinable;
- Collection is reasonably assured; and
- Title and risk of loss has passed to our customers.

In order to ensure the revenue recognition in the proper period, we review material sales contracts for proper cut-off based upon the business practices and legal requirements of each country. For sales of products containing precious metals, we report revenues gross along with their corresponding cost of sales to arrive at gross profit. We record revenues this way because we act as the principal in the transactions into which we enter.

Restructuring and Cost Reduction Programs

In recent years, we have developed and initiated a global cost reduction program with the objectives of leveraging our global scale, realigning and lowering our cost structure, and optimizing capacity utilization. Management continues to evaluate our businesses, and therefore, there may be additional provisions for new optimization and cost-savings initiatives, as well as changes in estimates to amounts previously recorded, as payments are made or actions are completed.

Restructuring charges include both termination benefits and asset writedowns. We estimate accruals for termination benefits based on various factors including length of service, contract provisions, local legal requirements, projected final service dates, and salary levels. We also analyze the carrying value of long-lived assets and record estimated accelerated depreciation through the anticipated end of the useful life of the assets affected by the restructuring or record an asset impairment. In all likelihood, this accelerated depreciation will result in reducing the net book value of those assets to zero at the date operations cease. While we believe that changes to our estimates are unlikely, the accuracy of our estimates depends on the successful completion of numerous actions. Changes in our estimates could increase our restructuring costs to such an extent that it could have a material impact on the Company's results of operations, financial position, or cash flows. Other events, such as negotiations with unions and works councils, may also delay the resulting cost savings.

Accounts Receivable and the Allowance for Doubtful Accounts

Ferro sells its products to customers in diversified industries throughout the world. No customer or related group of customers represents greater than 10% of net sales or accounts receivable. We perform ongoing credit evaluations of our customers and require collateral principally for export sales, when industry practices allow and as market conditions dictate, subject to our ability to negotiate secured terms relative to competitive offers. We regularly analyze significant customer accounts and provide for uncollectible accounts based on historical experience, customer payment history, the length of time the receivables are past due, the financial health of the customer, economic conditions, and specific circumstances, as appropriate. Changes in these factors could result in additional allowances. Customer accounts we conclude to be uncollectible or to require excessive collection costs are written off against the allowance for doubtful accounts. Historically, write-offs of uncollectible accounts have been within our expectations.

Goodwill

We review goodwill for impairment each year using a measurement date of October 31st or more frequently in the event of an impairment indicator. We annually, or more frequently as warranted, evaluate the appropriateness of our reporting units utilizing operating segments as the starting point of our analysis. In the event of a change in our reporting units, we would allocate goodwill based on the relative fair value. We estimate the fair values of the reporting units associated with these assets using the average of both the income approach and the market approach, which we believe provides a reasonable estimate of the reporting units' fair values, unless facts and circumstances exist that indicate more representative fair values. The income approach uses projected cash flows attributable to the reporting units over their useful lives and allocates certain corporate expenses to the reporting units. We use historical results, trends and our projections of market growth, internal sales efforts and anticipated cost structure assumptions to estimate future cash flows. Using a risk-adjusted, weighted-average cost of capital, we discount the cash flow projections to the measurement date. The market approach estimates a price reasonably expected to be paid by a market participant in the purchase of similar businesses. If the fair value of any reporting unit was determined to be less than its carrying value, we would proceed to the second step and obtain comparable market values or independent appraisals of its assets and liabilities to determine the amount of any impairment.

The significant assumptions and ranges of assumptions we used in our impairment analyses of goodwill at October 31, 2016 and 2015, were as follows:

Significant Assumptions	2016	2015
Weighted-average cost of capital	10.75% - 13.5%	11.5% - 12.75%
Residual growth rate	3.0%	3.0%

Our estimates of fair value can be adversely affected by a variety of factors. Reductions in actual or projected growth or profitability at our reporting units due to unfavorable market conditions or significant increases in cost structure could lead to the impairment of any related goodwill. Additionally, an increase in inflation, interest rates or the risk-adjusted, weighted-average cost of capital could also lead to a reduction in the fair value of one or more of our reporting units and therefore lead to the impairment of goodwill.

Based on our 2016 annual impairment test performed as of October 31, 2016, we recognized an impairment loss of $13.2 million in our Tile Coating Systems reporting unit, a component of our Performance Coatings segment. For the remaining reporting units tested for impairment, the fair values exceeded the carrying values of the respective reporting units by amounts ranging from 27.2% to 303.7% at the 2016 measurement date. The lowest cushion relates to goodwill associated with the Performance Coatings reportable segment, which had a goodwill balance of $28.1 million at December 31, 2016. A future potential impairment is possible for any of these reporting units if actual results are materially less than forecasted results. Some of the factors that could negatively affect our cash flows and, as a result, not support the carrying values of our reporting units are: new environmental regulations or legal restrictions on the use of our products that would either reduce our product revenues or add substantial costs to the manufacturing process, thereby reducing operating margins; new technologies that could make our products less competitive or require substantial capital investment in new equipment or manufacturing processes; and substantial downturns in economic conditions.

Long-Lived Asset Impairment

The Company's long-lived assets include property, plant and equipment, and intangible assets. We review property, plant and equipment and intangible assets for impairment whenever events or circumstances indicate that their carrying values may not be recoverable. The following are examples of such events or changes in circumstances:

- An adverse change in the business climate or market price of a long-lived asset or asset group;
- An adverse change in the extent or manner in which a long-lived asset or asset group is used or in its physical condition;
- Current operating losses for a long-lived asset or asset group combined with a history of such losses or projected or forecasted losses that demonstrate that the losses will continue; or
- A current expectation that, more likely than not, a long-lived asset or asset group will be sold or otherwise significantly disposed of before the end of its previously estimated useful life.

The carrying amount of property, plant and equipment and intangible assets is not recoverable if the carrying value of the asset group exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset group. In the event of impairment, we recognize a loss for the excess of the recorded value over fair value. The long-term nature of these assets requires the estimation of cash inflows and outflows several years into the future and only takes into consideration technological advances known at the time of review.

Income Taxes

The breadth of our operations and complexity of income tax regulations require us to assess uncertainties and make judgments in estimating the ultimate amount of income taxes we will pay. Our income tax expense, deferred tax assets and liabilities, and reserves for unrecognized tax benefits reflect management's best assessment of estimated current and future taxes to be paid. The final income taxes we pay are based upon many factors, including existing income tax laws and regulations, negotiations with taxing authorities in various jurisdictions, outcomes of tax litigation, and resolution of disputes arising from federal, state and international income tax audits. The resolution of these uncertainties may result in adjustments to our income tax assets and liabilities in the future.

Deferred income taxes result from differences between the financial and tax basis of our assets and liabilities. We adjust our deferred income tax assets and liabilities for changes in income tax rates and income tax laws when changes are enacted. We record valuation allowances to reduce deferred income tax assets when it is more likely than not that a tax benefit will not be realized. Significant judgment is required in evaluating the need for and the magnitude of appropriate valuation allowances against deferred income tax assets. The realization of these assets is dependent on generating future taxable income, our ability to carry back or carry forward net operating losses and credits to offset tax liabilities, as well as successful implementation of various tax strategies to generate tax where net operating losses or credit carryforwards exist. In evaluating our ability to realize the deferred income tax assets, we rely principally on the reversal of existing temporary differences, the availability of tax planning strategies, and forecasted income.

We recognize a tax benefit from an uncertain tax position when it is more likely than not that the position will be sustained upon examination, including resolutions of any related appeals or litigation processes, based on the technical merits. Our estimate of the potential outcome of any uncertain tax positions is subject to management's assessment of relevant risks, facts, and circumstances existing at that time. We record a liability for the difference between the benefit recognized and measured based on a more-likely-than-not threshold and the tax position taken or expected to be taken on the tax return. To the extent that our assessment of such tax positions changes, the change in estimate is recorded in the period in which the determination is made. We report tax-related interest and penalties as a component of income tax expense.

Derivative Financial Instruments

We use derivative financial instruments in the normal course of business to manage our exposure to fluctuations in interest rates, foreign currency exchange rates, and precious metal prices. The accounting for derivative financial instruments can be complex and can require significant judgment. Generally, the derivative financial instruments that we use are not complex, and observable market-based inputs are available to measure their fair value. We do not engage in speculative transactions for trading purposes. Financial instruments, including derivative financial instruments, expose us to counterparty credit risk for nonperformance. We manage our exposure to counterparty credit risk through minimum credit standards and procedures to monitor concentrations of credit risk. We enter into these derivative financial instruments with major, reputable, multinational financial institutions. Accordingly, we do not anticipate counter-party default. We continuously evaluate the effectiveness of derivative financial instruments designated as hedges to ensure that they are highly effective. In the event the hedge becomes ineffective, we discontinue hedge treatment. Except as noted below, we do not expect any changes in our risk policies or in the nature of the transactions we enter into to mitigate those risks.

We manage foreign currency risks in a wide variety of foreign currencies principally by entering into forward contracts to mitigate the impact of currency fluctuations on transactions arising from international trade. Our objective in entering into these forward contracts is to preserve the economic value of nonfunctional currency cash flows. Our principal foreign currency exposures relate to the Euro, the Thailand Baht, the Indonesian Rupiah, the Japanese Yen, and the Romanian Leu. We mark these forward contracts to fair value based on market prices for comparable contracts and recognize the resulting gains or losses as other income or expense from foreign currency transactions.

Precious metals (primarily silver, gold, platinum and palladium) represent a significant portion of raw material costs in our electronics products. When we enter into a fixed price sales contract at the customer's request to establish the price for the precious metals content of the order, we also enter into a forward purchase arrangement with a precious metals supplier to completely cover the value of the precious metals content. Our current precious metal contracts are designated as normal purchase contracts, which are not marked to market.

We also purchase portions of our energy requirements, including natural gas and electricity, under fixed price contracts to reduce the volatility of cost changes. Our current energy contracts are designated as normal purchase contracts, which are not marked to market.

Pension and Other Postretirement Benefits

We sponsor defined benefit plans in the U.S. and many countries outside the U.S., and we also sponsor retiree medical benefits for a segment of our salaried and hourly work force within the U.S. The U.S. pension plans and retiree medical plans represent approximately 89% of pension plan assets, 73% of benefit obligations and 24% of net periodic pension expense as of December 31, 2016.

The assumptions we use in actuarial calculations for these plans have a significant impact on benefit obligations and annual net periodic benefit costs. We meet with our actuaries annually to discuss key economic assumptions used to develop these benefit obligations and net periodic costs.

We determine the discount rate for the U.S. pension and retiree medical plans based on a bond model. Using the pension plans' projected cash flows, the bond model considers all possible bond portfolios that produce matching cash flows and selects the portfolio with the highest possible yield. These portfolios are based on bonds with a quality rating of AA or better under either Moody's Investor Services, Inc. or Standard & Poor's Rating Group, but exclude certain bonds, such as callable bonds, bonds with small amounts outstanding, and bonds with unusually high or low yields. The discount rates for the non-U.S. plans are based on a yield curve method, using AA-rated bonds applicable in their respective capital markets. The duration of each plan's liabilities is used to select the rate from the yield curve corresponding to the same duration.

For the market-related value of plan assets, we use fair value, rather than a calculated value. The market-related value recognizes changes in fair value in a systematic and rational manner over several years. We calculate the expected return on assets at the beginning of the year for defined benefit plans as the weighted-average of the expected return for the target allocation of the principal asset classes held by each of the plans. In determining the expected returns, we consider both historical performance and an estimate of future long-term rates of return. The Company consults with and considers the opinion of its actuaries in developing appropriate return assumptions. Our target asset allocation percentages are 35% fixed income, 60% equity, and 5% other investments for U.S. plans and 75% fixed income, 24% equity, and 1% other investments for non-U.S. plans. In 2016, investment returns on average plan assets were approximately 7% within the U.S. plans and 23% within non-U.S. plans. In 2015, actual return on plan assets, were lower than the expected return. Future actual pension expense will depend on future investment allocation and performance, changes in future discount rates and various other factors related to the population of participants in the Company's pension plans.

All other assumptions are reviewed periodically by our actuaries and us and may be adjusted based on current trends and expectations as well as past experience in the plans. During the fourth quarter of 2014, the Company adopted the use of new mortality tables within its calculation assumptions, which had a one-time impact of increasing the liability. The new mortality tables reflect underlying increases in life expectancy of participants, thus driving longer benefit payment periods. The impact of the change in mortality assumption on the U.S. pension liability was an increase of the liability of approximately $18 million.

The following table provides the sensitivity of net annual periodic benefit costs for our pension plans, including a U.S. nonqualified retirement plan, and the retiree medical plan to a 25-basis-point decrease in both the discount rate and asset return assumption:

	25 Basis Point Decrease in Discount Rate	25 Basis Point Decrease in Asset Return Assumption
	(Dollars in thousands)	
U.S. pension plans	$ (465)	$ 681
U.S. retiree medical plan	(34)	N/A
Non-U.S. pension plans	(63)	17
Total	$ (562)	$ 698

The following table provides the rates used in the assumptions and the changes between 2016 and 2015:

	2016	2015	Change
Discount rate used to measure the benefit cost:			
U.S. pension plans	4.70%	4.25%	0.45%
U.S. retiree medical plan	4.50%	3.95%	0.55%
Non-U.S. pension plans	3.12%	2.72%	0.40%
Discount rate used to measure the benefit obligation:			
U.S. pension plans	4.40%	4.70%	(0.30)%
U.S. retiree medical plan	4.20%	4.50%	(0.30)%
Non-U.S. pension plans	2.24%	3.12%	(0.88)%
Expected return on plan assets:			
U.S. pension plans	8.20%	8.20%	—%
Non-U.S. pension plans	3.41%	3.50%	(0.09)%

Our overall net periodic benefit cost for all defined benefit plans was $20.2 million in 2016 and $1.5 million in 2015. The change is mainly the result of increased mark to market actuarial net losses in 2016.

For 2017, assuming expected returns on plan assets and no actuarial gains or losses, we expect our overall net periodic benefit income to be approximately $1.2 million, compared with income of approximately $0.1 million in 2016 on a comparable basis.

Inventories

We value inventory at the lower of cost or market, with cost determined utilizing the first-in, first-out (FIFO) method. We periodically evaluate the net realizable value of inventories based primarily upon their age, but also upon assumptions of future usage in production, customer demand and market conditions. Inventories have been reduced to the lower of cost or realizable value by allowances for slow moving or obsolete goods. If actual circumstances are less favorable than those projected by management in its evaluation of the net realizable value of inventories, additional write-downs may be required. Slow moving, excess or obsolete materials are specifically identified and may be physically separated from other materials, and we rework or dispose of these materials as time and manpower permit.

Environmental Liabilities

Our manufacturing facilities are subject to a broad array of environmental laws and regulations in the countries in which they are located. The costs to comply with complex environmental laws and regulations are significant and will continue for the foreseeable future. We expense these recurring costs 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 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. Inherent uncertainties exist in such evaluations primarily due to unknown conditions, changing governmental regulations and legal standards regarding liability, and evolving technologies. We adjust these liabilities periodically as remediation efforts progress or as additional technical or legal information becomes available.

Impact of Newly Issued Accounting Pronouncements

Refer to Note 2 to the consolidated financial statements under Item 8 of this Annual Report on Form 10-K for a discussion of accounting standards we recently adopted or will be required to adopt.

Item 7A — *Quantitative and Qualitative Disclosures about Market Risk*

The primary objective of the following information is to provide forward-looking quantitative and qualitative information about our exposure to instruments that are sensitive to fluctuations in interest rates, foreign currency exchange rates, and costs of raw materials and energy.

Our exposure to interest rate risk arises from our debt portfolio. We manage this risk by controlling the mix of fixed versus variable-rate debt after considering the interest rate environment and expected future cash flows. Our objective is to limit variability in earnings, cash flows and overall borrowing costs caused by changes in interest rates, while preserving operating flexibility.

We operate internationally and enter into transactions denominated in foreign currencies. These transactions expose us to gains and losses arising from exchange rate movements between the dates foreign currencies are recorded and the dates they are settled. We manage this risk by entering into forward currency contracts that substantially offset these gains and losses.

We are subject to cost changes with respect to our raw materials and energy purchases. We attempt to mitigate raw materials cost increases through product reformulations, price increases and productivity improvements. We enter into forward purchase arrangements with precious metals suppliers to completely cover the value of the precious metals content of fixed price sales contracts. These agreements are designated as normal purchase contracts, which are not marked to market, and had purchase commitments totaling $1.8 million at December 31, 2016. In addition, we purchase portions of our natural gas, electricity and oxygen requirements under fixed price contracts to reduce the volatility of these costs. These energy contracts are designated as normal purchase contracts, which are not marked to market, and had purchase commitments totaling $99.1 million at December 31, 2016.

The notional amounts, carrying amounts of assets (liabilities), and fair values associated with our exposure to these market risks and sensitivity analysis about potential gains (losses) resulting from hypothetical changes in market rates are presented below:

	December 31, 2016	December 31, 2015
	(Dollars in thousands)	
Variable-rate debt:		
Carrying amount	$ 551,085	$ 461,717
Fair value	570,441	466,571
Change in annual interest expense from 1% change in interest rates	5,611	4,690
Fixed-rate debt:		
Carrying amount	8,228	4,610
Fair value	7,315	3,956
Change in fair value from 1% increase in interest rates	NM	NM
Change in fair value from 1% decrease in interest rates	NM	NM
Foreign currency forward contracts:		
Notional amount	338,186	338,418
Carrying amount and fair value	350	(1,207)
Change in fair value from 10% appreciation of U.S. dollar	15,589	19,814
Change in fair value from 10% depreciation of U.S. dollar	(19,054)	(24,217)

NM — Not meaningful

Item 8 — *Financial Statements and Supplementary Data*

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Shareholders of Ferro Corporation
Cleveland, Ohio

We have audited the accompanying consolidated balance sheets of Ferro Corporation and subsidiaries (the "Company") as of December 31, 2016 and 2015, and the related consolidated statements of operations, comprehensive (loss) income, equity, and cash flows for each of the three years in the period ended December 31, 2016. Our audits also included the financial statement schedule listed in the Index at Item 15. These financial statements and financial statement schedule are the responsibility of the Company's management. Our responsibility is to express an opinion on the financial statements and financial statement schedule based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, such consolidated financial statements present fairly, in all material respects, the financial position of Ferro Corporation and subsidiaries as of December 31, 2016 and 2015, and the results of their operations and their cash flows for each of the three years in the period ended December 31, 2016, in conformity with accounting principles generally accepted in the United States of America. Also, in our opinion, such financial statement schedule, when considered in relation to the basic consolidated financial statements taken as a whole, present fairly, in all material respects, the information set forth therein.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the Company's internal control over financial reporting as of December 31, 2016, based on the criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated March 1, 2017, expressed an unqualified opinion on the Company's internal control over financial reporting.

/s/ Deloitte & Touche LLP

Cleveland, Ohio
March 1, 2017

FERRO CORPORATION AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF OPERATIONS

	Years Ended December 31,		
	2016	2015	2014
	(Dollars in thousands, except per share amounts)		
Net sales	$ 1,145,292	$ 1,075,341	$ 1,111,626
Cost of sales	794,075	773,661	826,541
Gross profit	351,217	301,680	285,085
Selling, general and administrative expenses	241,702	216,899	286,762
Restructuring and impairment charges	15,907	9,655	8,849
Other expense (income):			
Interest expense	21,547	15,163	16,263
Interest earned	(630)	(363)	(118)
Loss on extinguishment of debt	—	—	14,384
Foreign currency losses, net	12,906	4,495	1,159
Miscellaneous (income) expense, net	(2,660)	1,048	622
Income (loss) before income taxes	62,445	54,783	(42,836)
Income tax expense (benefit)	17,868	(45,100)	(34,227)
Income (loss) from continuing operations	44,577	99,883	(8,609)
(Loss) income from discontinued operations, net of income taxes	(64,464)	(36,779)	94,840
Net (loss) income	(19,887)	63,104	86,231
Less: Net income (loss) attributable to noncontrolling interests	930	(996)	160
Net (loss) income attributable to Ferro Corporation common shareholders	$ (20,817)	$ 64,100	$ 86,071
Amounts attributable to Ferro Corporation:			
Income (loss) from continuing operations, net of income tax	43,647	100,879	(8,769)
(Loss) income from discontinued operations, net of income tax	(64,464)	(36,779)	94,840
(Loss) income attributable to Ferro Corporation	$ (20,817)	$ 64,100	$ 86,071
Weighted-average common shares outstanding	83,298	86,718	86,920
Incremental common shares attributable to performance shares, deferred stock units, restricted stock units, and stock options	1,612	1,715	—
Weighted-average diluted shares outstanding	84,910	88,433	86,920
Earnings (loss) per share attributable to Ferro Corporation common shareholders:			
Basic earnings (loss):			
Continuing operations	$ 0.52	$ 1.16	$ (0.10)
Discontinued operations	(0.77)	(0.42)	1.09
	$ (0.25)	$ 0.74	$ 0.99
Diluted earnings (loss):			
Continuing operations	$ 0.51	$ 1.14	$ (0.10)
Discontinued operations	(0.76)	(0.42)	1.09
	$ (0.25)	$ 0.72	$ 0.99

See accompanying notes to consolidated financial statements.

FERRO CORPORATION AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF COMPREHENSIVE (LOSS) INCOME

	Years Ended December 31,		
	2016	**2015**	**2014**
	(Dollars in thousands)		
Net (loss) income	$(19,887)	$ 63,104	$ 86,231
Other comprehensive loss, net of income tax:			
Foreign currency translation loss	(47,101)	(40,801)	(29,415)
Reclassification adjustment for foreign currency translation included in net (loss) income	1,115	—	—
Postretirement benefit liabilities gain (loss)	330	(77)	(1,054)
Other comprehensive loss, net of income tax	(45,656)	(40,878)	(30,469)
Total comprehensive (loss) income	(65,543)	22,226	55,762
Less: Comprehensive income (loss) attributable to noncontrolling interests	599	(2,361)	(11)
Comprehensive (loss) income attributable to Ferro Corporation	$ (66,142)	$ 24,587	$ 55,773

See accompanying notes to consolidated financial statements.

FERRO CORPORATION AND SUBSIDIARIES

CONSOLIDATED BALANCE SHEETS

	December 31, 2016	December 31, 2015
	(Dollars in thousands)	
ASSETS		
Current assets		
Cash and cash equivalents	$ 45,582	$ 58,380
Accounts receivable, net	259,687	231,970
Inventories	229,847	184,854
Deferred income taxes	—	12,088
Other receivables	37,814	34,088
Other current assets	9,087	15,695
Current assets held-for-sale	—	16,215
Total current assets	582,017	553,290
Other assets		
Property, plant and equipment, net	262,026	260,429
Goodwill	148,296	145,669
Intangible assets, net	137,850	106,633
Deferred income taxes	106,454	87,385
Other non-current assets	47,126	48,767
Non-current assets held-for-sale	—	23,178
Total assets	$1,283,769	$1,225,351
LIABILITIES AND EQUITY		
Current liabilities		
Loans payable and current portion of long-term debt	$ 17,310	$ 7,446
Accounts payable	127,655	120,380
Accrued payrolls	35,859	28,584
Accrued expenses and other current liabilities	65,203	54,664
Current liabilities held-for-sale	—	7,156
Total current liabilities	246,027	218,230
Other liabilities		
Long-term debt, less current portion	557,175	466,108
Postretirement and pension liabilities	162,941	148,249
Other non-current liabilities	62,594	66,990
Non-current liabilities held-for-sale	—	1,493
Total liabilities	1,028,737	901,070
Equity		
Ferro Corporation shareholders' equity:		
Common stock, par value $1 per share; 300.0 million shares authorized; 93.4 million shares issued; 83.4 million and 84.0 million shares outstanding at December 31, 2016, and December 31, 2015, respectively	93,436	93,436
Paid-in capital	306,566	314,854
Retained earnings	114,690	135,507
Accumulated other comprehensive loss	(106,643)	(61,318)
Common shares in treasury, at cost	(160,936)	(166,020)
Total Ferro Corporation shareholders' equity	247,113	316,459
Noncontrolling interests	7,919	7,822
Total equity	255,032	324,281
Total liabilities and equity	$1,283,769	$1,225,351

See accompanying notes to consolidated financial statements.

FERRO CORPORATION AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF EQUITY

	Ferro Corporation Shareholders							
	Common Shares in Treasury							
	Shares	Amount	Common Stock	Paid-in Capital	Retained (Deficit) Earnings	Accumulated Other Comprehensive Income (Loss)[(a)]	Non-controlling Interests	Total Equity
	(In thousands)							
Balances at December 31, 2013	6,730	$(143,802)	$93,436	$318,055	$ (14,664)	$ 8,493	$12,325	$273,843
Net income	—	—	—	—	86,071	—	160	86,231
Other comprehensive (loss)	—	—	—	—	—	(30,298)	(171)	(30,469)
Stock-based compensation transactions	(285)	7,744	—	(651)	—	—	—	7,093
Distributions to noncontrolling interests	—	—	—	—	—	—	(682)	(682)
Balances at December 31, 2014	6,445	(136,058)	93,436	317,404	71,407	(21,805)	11,632	336,016
Net income (loss)	—	—	—	—	64,100	—	(996)	63,104
Other comprehensive (loss)	—	—	—	—	—	(39,513)	(1,365)	(40,878)
Purchase of treasury stock	3,283	(38,571)	—	—	—	—	—	(38,571)
Stock-based compensation transactions	(297)	8,609	—	(2,550)	—	—	—	6,059
Sale of noncontrolling interest							(581)	(581)
Distributions to noncontrolling interests	—	—	—	—	—	—	(868)	(868)
Balances at December 31, 2015	9,431	(166,020)	93,436	314,854	135,507	(61,318)	7,822	324,281
Net (loss) income	—	—	—	—	(20,817)	—	930	(19,887)
Other comprehensive loss	—	—	—	—	—	(45,325)	(331)	(45,656)
Purchase of treasury stock	1,175	(11,429)	—	—	—	—	—	(11,429)
Stock-based compensation transactions	(610)	16,513	—	(8,288)	—	—	—	8,225
Distributions to noncontrolling interests	—	—	—	—	—	—	(502)	(502)
Balances at December 31, 2016	9,996	$(160,936)	$93,436	$306,566	$114,690	$(106,643)	$ 7,919	$255,032

(a) Accumulated translation adjustments were ($107.7) million, ($62.1) million, and ($22.6) million and accumulated postretirement benefit liability adjustments were $1.1 million, $0.8 million, and $0.9 million at December 31, 2016, 2015, and 2014, respectively, all net of tax.

See accompanying notes to consolidated financial statements.

FERRO CORPORATION AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF CASH FLOWS

	2016	2015	2014
	(Dollars in thousands)		
Cash flows from operating activities			
Net (loss) income	$ (19,887)	$ 63,104	$ 86,231
Adjustments to reconcile net (loss) income to net cash provided by operating activities:			
(Gain) loss on sale of assets and businesses	(2,764)	1,836	(124,026)
Depreciation and amortization	46,805	41,061	35,384
Interest amortization	1,353	1,125	3,106
Restructuring and impairment charges	50,868	13,270	11,564
Loss on extinguishment of debt	—	—	14,384
Provision for allowance for doubtful accounts	1,383	639	2,731
Retirement benefits	14,436	(5,986)	55,755
Deferred income taxes	(11,451)	(66,328)	(21,310)
Stock-based compensation	7,245	8,868	9,679
Changes in current assets and liabilities, net of effects of acquisitions:			
Accounts receivable	(21,893)	20,208	(5,667)
Inventories	(10,271)	6,562	(12,575)
Other receivables and other current assets	(3,006)	4,147	(8,570)
Accounts payable	1,162	(14,605)	5,936
Accrued expenses and other current liabilities	11,626	(23,547)	(12,515)
Other operating activities	(2,976)	848	20,366
Net cash provided by operating activities	62,630	51,202	60,473
Cash flows from investing activities			
Capital expenditures for property, plant and equipment and other long-lived assets	(24,945)	(43,087)	(53,768)
Proceeds from sale of businesses, net	—	—	237,830
Proceeds from sale of assets	3,634	642	6,740
Business acquisitions, net of cash acquired	(129,511)	(202,155)	(115,598)
Net cash (used in) provided by investing activities	(150,822)	(244,600)	75,204
Cash flows from financing activities			
Net borrowings (repayments) under loans payable (1)	4,596	(7,261)	(41,101)
Proceeds from revolving credit facility	355,743	242,390	457,907
Principal payments on term loan facility	(53,000)	(3,000)	(750)
Principal payments on revolving credit facility	(214,188)	(72,390)	(467,112)
Proceeds from term loan facility	—	—	300,000
Repayment of 7.875% Senior Notes	—	—	(260,451)
Payment of debt issuance costs	(711)	—	(7,071)
Proceeds from exercise of stock options	1,140	404	684
Purchase of treasury stock	(11,429)	(38,571)	—
Other financing activities	(154)	(1,846)	(249)
Net cash provided by (used for) financing activities	81,997	119,726	(18,143)
Effect of exchange rate changes on cash and cash equivalents	(6,603)	(8,448)	(5,362)
(Decrease) increase in cash and cash equivalents	(12,798)	(82,120)	112,172
Cash and cash equivalents at beginning of period	58,380	140,500	28,328
Cash and cash equivalents at end of period	$ 45,582	$ 58,380	$ 140,500
Cash paid during the period for:			
Interest	$ 17,486	$ 16,188	$ 28,536
Income taxes	$ 19,734	$ 21,364	$ 9,376

(1) Includes cash flows related to loans payable to banks, the payment of the assumption of debt relating to acquisitions and our domestic accounts receivable sales program.

See accompanying notes to consolidated financial statements.

FERRO CORPORATION AND SUBSIDIARIES

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
Years ended December 31, 2016, 2015 and 2014

1. Our Business

Ferro Corporation ("Ferro," "we," "us" or "the Company") 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. 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. We differentiate ourselves in our industry by the consistent high quality of our products, combined with delivery of localized technical service and customized application technology support. Our value-added technical 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. We manage our businesses through four business units that are differentiated from one another by product type. We have grouped these units by their product type below:

- Tile Coating Systems
- Porcelain Enamel
- Performance Colors and Glass
- Pigments, Powders and Oxides

We produce our products primarily in the Europe-Middle East region, the U.S., the Asia-Pacific region, and Latin America.

We sell our products directly to customers and through the use of agents or distributors throughout the world. Our products are sold principally in Europe, the U.S., the Asia-Pacific region, and Latin America. Our customers manufacture products to serve a variety of end markets, including building and renovation, electronics, automobiles, appliances, household furnishings, packaging, and industrial products.

The Company owned 51% of an operating affiliate in Venezuela that was a consolidated subsidiary of Ferro. During the fourth quarter of 2015, we sold the operating affiliate in Venezuela for a cash purchase price of $0.5 million. During 2015, the Ministry of Economy, Finance, and Public Banking, and the Central Bank of Venezuela published a new exchange rate, the Foreign Exchange Marginal System ("SIMADI"). We concluded in March 2015 that SIMADI was the most relevant exchange mechanism available, and began using SIMADI to translate the local currency financial statements. As a result of the revaluation, we recognized a $1.9 million foreign currency loss and a $2.6 million loss due to lower of cost or market charges against our inventory, prior to the adjustment for losses allocated to our noncontrolling interest partner, which is recorded within Foreign currency losses, net and Cost of sales, respectively, in our consolidated statement of operations for the year ended December 31, 2015.

In the first quarter of 2014, the Venezuelan government expanded and introduced alternative market mechanisms for monetary exchange between the local currency, the Bolivar, and the United States Dollar. As a result of changes in the political and economic environment in the country, we began to remeasure the monetary assets and liabilities of the entity utilizing the most relevant exchange mechanism available, which we concluded to be SICAD I in the first quarter of 2014. The impact of the remeasurement in 2014, prior to adjustment for losses allocated to our noncontrolling interest partner, was a loss of $1.6 million, which is recorded within Foreign currency losses, net in our consolidated statement of operations for the year ended December 31, 2014.

During the second quarter of 2014, substantially all of the assets and liabilities of our Specialty Plastics and Polymer Additives reportable segments were classified as held-for-sale in the accompanying consolidated balance sheets. As further discussed in Note 3, the Specialty Plastics sale closed on July 1, 2014, and the North America-based Polymer Additives sale closed on December 19, 2014. Therefore, the Specialty Plastics and North America-based Polymer Additives operating results, net of income tax, have been classified as discontinued operations in the accompanying consolidated statements of operations for all periods presented. In the third quarter of 2016, we completed the disposition of the Europe-based Polymer Additives business and have classified the related operating results, net of income tax, as discontinued operations in the accompanying consolidated statements of operations for all periods presented.

2. Significant Accounting Policies

Principles of Consolidation

Our consolidated financial statements include the accounts of the parent company and the accounts of its subsidiaries. When we consolidate our financial statements, we eliminate intercompany transactions, accounts and profits. When we exert significant influence over an investee but do not control it, we account for the investment and the investment income using the equity method. These investments are reported in the Other non-current assets section of our balance sheet. We consolidate four legal entities in which we do not own 100% of the equity interests, either directly or indirectly through our subsidiaries. These entities have non-controlling interest ownerships ranging from 5% to 41%.

When we acquire a subsidiary, its financial results are included in our consolidated financial statements from the date of the acquisition. When we dispose of a subsidiary, its financial results are included in our consolidated financial statements until the date of the disposition. In the event that a disposal group meets the criteria for discontinued operations, prior periods are adjusted to reflect the classification.

Certain prior year amounts have been reclassified to conform to the current year's presentation within the operating activities section of the Consolidated Statements of Cash Flows.

Use of Estimates and Assumptions in the Preparation of Financial Statements

We prepare our consolidated financial statements in conformity with accounting principles generally accepted in the United States, which requires us to make estimates and to use judgments and assumptions that affect the timing and amount of assets, liabilities, equity, revenues and expenses recorded and disclosed. The more significant estimates and judgments relate to revenue recognition, restructuring and cost reduction programs, goodwill, asset impairment, income taxes, pension and other postretirement benefits, inventories, and environmental liabilities. Actual outcomes could differ from our estimates, resulting in changes in revenues or costs that could have a material impact on the Company's results of operations, financial position, or cash flows.

Foreign Currency Translation

The financial results of our operations outside of the U.S. are recorded in local currencies, which generally are also the functional currencies for financial reporting purposes. The results of operations outside of the U.S. are translated from these functional currencies into U.S. dollars using the average monthly currency exchange rates. We use the average currency exchange rate for these results of operations as a reasonable approximation of the results had specific currency exchange rates been used for each individual transaction. Foreign currency transaction gains and losses are recorded as incurred as Other expense (income) in the consolidated statements of operations. Assets and liabilities are translated into U.S. dollars using exchange rates at the balance sheet dates, and we record the resulting foreign currency translation adjustment as a separate component of Accumulated other comprehensive loss in equity.

Revenue Recognition

We typically recognize sales when we ship goods to our customers and when all of the following criteria are met:

- Persuasive evidence of an arrangement exists;
- The selling price is fixed or determinable;
- Collection is reasonably assured; and
- Title and risk of loss has passed to our customers.

In order to ensure the revenue recognition in the proper period, we review material sales contracts for proper cut-off based upon the business practices and legal requirements of each country. For sales of all products, including those containing precious metals, we report revenues gross along with their corresponding cost of sales to arrive at gross profit. We record revenues this way because we act as the principal in the transactions into which we enter.

The amount of shipping and handling fees invoiced to our customers at the time our product is shipped is included in net sales. Credit memos issued to customers for sales returns, discounts allowed and sales adjustments are recorded when they are incurred as a reduction of sales.

Additionally, we provide certain of our customers with incentive rebate programs to promote customer loyalty and encourage greater product sales. We accrue customer rebates over the rebate periods based upon estimated attainments of the provisions in the rebate agreements and record these rebate accruals as reductions of sales.

Research and Development Expenses

Research and development expenses are expensed as incurred and are included in Selling, general and administrative expenses. Total expenditures for product and application technology, including research and development, customer technical support and other related activities, were approximately $27.3 million for 2016, $25.6 million for 2015 and $22.7 million for 2014.

Restructuring Programs

We expense costs associated with exit and disposal activities designed to restructure operations and reduce ongoing costs of operations when we incur the related liabilities or when other triggering events occur. After the appropriate level of management having the authority approves the detailed restructuring plan and the appropriate criteria for recognition are met, we establish accruals for employee termination costs. The accruals are estimates that are based upon factors including statutory and union requirements, affected employees' lengths of service, contract provisions, salary level, and health care benefit choices. We also analyze the carrying value of affected long-lived assets for impairment and reductions in their remaining estimated useful lives. In addition, we record the fair value of any new or remaining obligations when existing operating lease contracts are terminated or abandoned as a result of our exit and disposal activities.

Asset Impairment

The Company's long-lived assets include property, plant and equipment, goodwill, and intangible assets. We review property, plant and equipment and intangible assets for impairment whenever events or circumstances indicate that their carrying values may not be recoverable. The following are examples of such events or changes in circumstances:

- An adverse change in the business climate or market price of a long-lived asset or asset group;
- An adverse change in the extent or manner in which a long-lived asset or asset group is used or in its physical condition;
- Current operating losses for a long-lived asset or asset group combined with a history of such losses or projected or forecasted losses that demonstrate that the losses will continue; or
- A current expectation that, more likely than not, a long-lived asset or asset group will be sold or otherwise significantly disposed of before the end of its previously estimated useful life.

The carrying amount of property, plant and equipment and intangible assets is not recoverable if the carrying value of the asset group exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset group. In the event of impairment, we recognize a loss for the excess of the recorded value over fair value. The long-term nature of these assets requires the estimation of cash inflows and outflows several years into the future and only takes into consideration technological advances known at the time of review.

We review goodwill for impairment annually using a measurement date of October 31, primarily due to the timing of our annual budgeting process, or more frequently in the event of an impairment indicator. The fair value of each reporting unit that has goodwill is estimated using the average of both the income approach and the market approach, which we believe provides a reasonable estimate of the reporting unit's fair value, unless facts or circumstances exist which indicate a more representative fair value. The income approach is a discounted cash flow model, which uses projected cash flows attributable to the reporting unit, including an allocation of certain corporate expenses based primarily on a proportional sales method. We use historical results, trends and our projections of market growth, internal sales efforts and anticipated cost structure assumptions to estimate future cash flows. Using a risk-adjusted, weighted-average cost of capital, we discount the cash flow projections to the measurement date. The market approach estimates a price reasonably expected to be paid by a market participant in the purchase of the reporting units based on a comparison to similar businesses. If the fair value of any reporting unit was determined to be less than its carrying value, we would obtain comparable market values or independent appraisals of its net assets.

Derivative Financial Instruments

As part of our risk management activities, we employ derivative financial instruments, primarily foreign currency forward contracts, to hedge certain anticipated transactions, firm commitments, or assets and liabilities denominated in foreign currencies. We also purchase portions of our energy and precious metal requirements under fixed price forward purchase contracts designated as normal purchase contracts.

We record derivatives on our balance sheet as either assets or liabilities that are measured at fair value. For derivative instruments that are designated and qualify as cash flow hedges, the gain or loss on the derivative is reported as a component of other comprehensive income and reclassified from accumulated other comprehensive loss into earnings when the hedged transaction affects earnings. As of December 31, 2016, we did not have any derivative instruments classified as cash flow hedges. The ineffective portion, if any, in the change in value of these derivatives is immediately recognized in earnings. For derivatives that are not designated as hedges, the gain or loss on the derivative is recognized in current earnings. We use derivatives only to manage well-defined risks and do not use derivatives for speculative purposes.

Postretirement and Other Employee Benefits

We recognize postretirement and other employee benefits as employees render the services necessary to earn those benefits. We determine defined benefit pension and other postretirement benefit costs and obligations with the assistance of third parties who perform certain actuarial calculations. The calculations and the resulting amounts recorded in our consolidated financial statements are affected by assumptions including the discount rate, expected long-term rate of return on plan assets, the annual rate of change in compensation for plan-eligible employees, estimated changes in costs of healthcare benefits, mortality tables, and other factors. We evaluate the assumptions used on an annual basis.

Income Taxes

We account for income taxes in accordance with Accounting Standards Codification ("ASC") Topic 740, Income Taxes, which requires the recognition of deferred tax assets and liabilities for the expected future tax effects of events that have been included in the financial statements. Under this method, deferred tax assets and liabilities are determined based on the differences between the financial statements and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in income in the period that includes the enactment date.

We record deferred tax assets to the extent we believe these assets will more likely than not be realized. In making such determination, we consider all available positive and negative evidence, including future reversals of existing taxable temporary differences, projected future income, tax planning strategies, and recent financial operations.

We recognize a tax benefit from an uncertain tax position when it is more likely than not that the position will be sustained upon examination, including resolutions of any related appeals or litigation processes, based on the technical merits.

We recognize interest and penalties related to uncertain tax positions within the income tax expense line in the accompanying consolidated statements of operations.

Cash Equivalents

We consider all highly liquid instruments with original maturities of three months or less when purchased to be cash equivalents. These instruments are carried at cost, which approximates fair value.

Accounts Receivable and the Allowance for Doubtful Accounts

Ferro sells its products to customers in diversified industries throughout the world. No customer or related group of customers represents greater than 10% of net sales or accounts receivable. We perform ongoing credit evaluations of our customers and require collateral principally for export sales, when industry practices allow and as market conditions dictate, subject to our ability to negotiate secured terms relative to competitive offers. We regularly analyze significant customer accounts and provide for uncollectible accounts based on historical experience, customer payment history, the length of time the receivables are past due, the financial health of the customer, economic conditions and specific circumstances, as appropriate. Changes in these factors could result in additional allowances. Customer accounts we conclude to be uncollectible or to require excessive collection costs are written off against the allowance for doubtful accounts. Historically, write-offs of uncollectible accounts have been within our expectations. Detailed information about the allowance for doubtful accounts is provided below:

	2016	2015	2014
	(Dollars in thousands)		
Allowance for doubtful accounts	$ 8,166	$ 7,784	$ 10,325
Bad debt expense	1,383	667	2,657

We had an asset securitization program for Ferro's U.S. trade accounts receivable where we sold undivided variable percentage interests in our domestic receivables to various purchasers, and could obtain up to $50 million in the form of cash or letters of credit. Advances received under this program were accounted for as borrowings secured by the receivables and are included in net cash provided by financing activities. The purchasers had no recourse to Ferro's other assets for failure of payment of the receivables as a result of the lack of creditworthiness, or financial inability to pay, of the related obligor. In May 2014, the program expired and amounts outstanding were repaid at that time.

Inventories

We value inventory at the lower of cost or market, with cost determined utilizing the first-in, first-out (FIFO) method. We periodically evaluate the net realizable value of inventories based primarily upon their age, but also upon assumptions of future usage in production, customer demand and market conditions. Inventories have been reduced to the lower of cost or market value by allowances for slow moving or obsolete goods.

We maintain raw materials on our premises that we do not own, including precious metals consigned from financial institutions and customers, and consigned to our broker; and raw materials consigned to vendors. Although we have physical possession of the goods, their value is not reflected on our balance sheet because we do not have title.

We obtain precious metals under consignment agreements with financial institutions for periods of one year or less. These precious metals are primarily silver, gold, platinum, and palladium and are used in the production of certain products for our customers. Under these arrangements, the financial institutions own the precious metals, and accordingly, we do not report these precious metals as inventory on our consolidated balance sheets although they physically are in our possession. These agreements are cancelable by either party at the end of each consignment period, however, because we have access to a number of consignment arrangements with available capacity, our consignment needs can be shifted among the other participating institutions in order to ensure our supply. In certain cases, these financial institutions can require cash deposits to provide additional collateral beyond the value of the underlying precious metals. The financial institutions charge us fees for these consignment arrangements, and these fees are recorded as cost of sales.

Property, Plant and Equipment

We record property, plant and equipment at historical cost. In addition to the original purchased cost, including transportation, installation and taxes, we capitalize expenditures that increase the utility or useful life of existing assets. For constructed assets, we capitalize interest costs incurred during the period of construction. We expense repair and maintenance costs, including the costs of major planned overhauls of equipment, as incurred. We depreciate property, plant and equipment on a straight-line basis, generally over the following estimated useful lives of the assets:

Buildings	20 to 40 years
Machinery and equipment	5 to 15 years

Other Capitalized Costs

We capitalize the costs of computer software developed or obtained for internal use after the preliminary project stage has been completed, and management, with the relevant authority, authorizes and commits to funding a computer software project, and it is probable that the project will be completed and the software will be used to perform the function intended. External direct costs of materials and services consumed in developing or obtaining internal-use computer software, payroll and payroll-related costs for employees who are directly associated with the project, and interest costs incurred when developing computer software for internal use are capitalized within Intangible assets. Capitalization ceases when the project is substantially complete, generally after all substantial testing is completed. We expense training costs and data conversion costs as incurred. We amortize software on a straight-line basis over its estimated useful life, which has historically been in a range of 1 to 10 years.

Environmental Liabilities

As part of the production of some of our products, we handle, process, use and store hazardous materials. As part of these routine processes, we expense recurring costs associated with control and disposal of hazardous materials as they are incurred. Occasionally we are subject to ongoing, pending or threatened litigation related to the handling of these materials or other matters. If, based on available information, we believe that we have incurred a liability and we can reasonably estimate the amount, we accrue for environmental remediation and other contingent liabilities. We disclose material contingencies if the likelihood of the potential loss is reasonably possible but the amount is not reasonably estimable.

In estimating the amount to be accrued for environmental remediation, we use assumptions about:

- Remediation requirements at the contaminated site;
- The nature of the remedy;
- Existing technology;
- The outcome of discussions with regulatory agencies;
- Other potentially responsible parties at multi-party sites; and
- The number and financial viability of other potentially responsible parties.

We actively monitor the status of sites, and, as assessments and cleanups proceed, we update our assumptions and adjust our estimates as necessary. Because the timing of related payments is uncertain, we do not discount the estimated remediation costs.

Recently Adopted Accounting Pronouncement

In November 2015, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2015-17, *Income Taxes: Topic 740: Balance Sheet Classification of Deferred Taxes*. ASU 2015-17 requires deferred tax assets and liabilities to be classified as noncurrent in a classified statement of financial position. During the second quarter of 2016, we elected to prospectively adopt ASU 2015-17, thus reclassifying current deferred tax assets to non-current on the accompanying consolidated balance sheets. The prior reporting period was not retrospectively adjusted. Other than this reclassification, the adoption of ASU 2015-17 did not have an impact on the Company's consolidated financial statements.

New Accounting Standards

In January 2017, the FASB issued ASU 2017-04, *Intangibles — Goodwill and Other: Topic 350: Simplifying the Test for Goodwill Impairment.* ASU 2017-04 is intended to simplify the subsequent measurement of goodwill by eliminating Step 2 from the goodwill impairment test. This pronouncement is effective for its annual or any interim goodwill impairment tests in fiscal years beginning after December 15, 2019. Early adoption is permitted. The Company is in the process of assessing the impact that the adoption of this ASU will have on our consolidated financial statements.

In January 2017, the FASB issued ASU 2017-01, *Business Combinations: Topic 805: Clarifying the Definition of a Business.* ASU 2017-01 is intended to clarify the definition of a business with the objective of adding guidance to assist entities with evaluating whether transactions should be accounted for as acquisitions (or dispositions) of assets or businesses. This pronouncement is effective for its annual periods beginning after December 15, 2017, including interim periods within those periods. The Company is in the process of assessing the impact that the adoption of this ASU will have on our consolidated financial statements.

In October 2016, the FASB issued ASU 2016-16, *Income Taxes: Topic 740: Intra-Entity Transfers of Assets Other Than Inventory.* ASU 2016-16 is intended to improve the accounting for the income tax consequences of intra-entity transfers of assets other than inventory. This pronouncement is effective for its annual periods beginning after December 15, 2017, including interim reporting periods within those annual reporting periods. Early adoption is permitted. The Company is in the process of assessing the impact that the adoption of this ASU will have on our consolidated financial statements.

In August 2016, the FASB issued ASU 2016-15, *Statement of Cash Flow: Topic 230: Classification of Certain Cash Receipts and Cash Payments.* ASU 2016-15 is intended to address eight specific cash flow issues with the objective of reducing the existing diversity in practice. This pronouncement is effective for fiscal years beginning after December 15, 2017, and interim periods within those fiscal years. Early adoption is permitted. The Company is in the process of assessing the impact that the adoption of this ASU will have on our consolidated financial statements.

In March 2016, the FASB issued ASU 2016-09, *Compensation – Stock Compensation: Topic 718: Improvements to Employee Share-Based Payment Accounting.* ASU 2016-09 is intended to simplify several aspects of the accounting for share-based payment transactions, including the income tax consequences, classification of awards as either equity or liabilities, and classification on the statement of cash flows. This pronouncement is effective for annual periods beginning after December 15, 2016, and interim periods within those annual periods. Early adoption is permitted. The Company is in the process of assessing the impact that the adoption of this ASU will have on our consolidated financial statements.

In February 2016, the FASB issued ASU 2016-02, *Leases: Topic 842.* ASU 2016-02 requires companies to recognize a lease liability and asset on the balance sheet for operating leases with a term greater than one year.

This pronouncement is effective for fiscal years beginning after December 15, 2018, and interim periods within those fiscal years. Early adoption is permitted. The Company is in the process of assessing the impact that the adoption of this ASU will have on our consolidated financial statements.

In May 2014, the FASB issued ASU 2014-09, *Revenue from Contracts with Customers: Topic 606*. This ASU replaces nearly all existing U.S. GAAP guidance on revenue recognition. The standard prescribes a five-step model for recognizing revenue, the application of which will require significant judgment. This standard is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2017. Our evaluation of ASU 2014-09 is ongoing. While we anticipate some changes to revenue recognition for certain customer contracts, we do not currently believe ASU 2014-09 will have a material effect on our consolidated financial statements.

No other new accounting pronouncements issued or with effective dates during fiscal 2016 had or are expected to have a material impact of the Company's consolidated financial statements.

3. Discontinued Operations

Polymer Additives

During 2014, we commenced a process to market for sale all of the assets of our Polymer Additives business. We determined that the criteria to classify these assets as held-for-sale under ASC Topic 360, Property, Plant and Equipment, were met. For purposes of applying the guidance within ASC 360, the assets have been categorized into two disposal groups: (1) our Europe-based Polymer Additives assets, including the Antwerp, Belgium dibenzoates manufacturing assets, and related Polymer Additives European headquarters and lab facilities and (2) the remainder of the Polymer Additives assets, our North America-based Polymer Additives business. During 2014, we sold substantially all of the assets related to our North America-based Polymer Additives business for a cash purchase price of $153.5 million. The transaction resulted in net proceeds of $149.5 million after expenses, and a gain of approximately $72.7 million. We have classified the operating results and gain on sale, net of income tax, as discontinued operations in the accompanying consolidated statements of operations for all relevant periods presented.

During 2016, the Company completed the disposition of the Europe-based Polymer Additives business to Plahoma Two AG, an affiliate of the LIVIA Group. The Company made a capital contribution of €12 million (approximately $13.6 million) to its subsidiaries that owned the assets prior to the close of the sale. In 2016, an impairment charge of $50.9 million was recorded under ASC Topic 360 Property, Plant and Equipment. The charge was calculated as the difference of the executed transaction price and the carrying value of the assets. The impairment charge included $1.1 million associated with the reclassification of foreign currency translation loss from Accumulated other comprehensive loss. The Europe-based Polymer Additives operating results, net of income tax, are classified as discontinued operations in the accompanying consolidated statements of operations for all periods presented and the assets and liabilities are classified as held-for-sale in the accompanying consolidated balance sheet at December 31, 2015, as the criteria to do so under ASC Topic 360, Property, Plant and Equipment were met as of the respective reporting dates.

Specialty Plastics

During 2014, we sold substantially all of the assets related to our Specialty Plastics business to A. Schulman, Inc. and its wholly owned subsidiary, A. Schulman Castellon, S.L.U. (collectively "Schulman") for a cash purchase price of $91.0 million. The transaction resulted in net proceeds of $88.3 million after expenses, and a gain of approximately $54.9 million. Assets included in the transaction were Ferro's plastics manufacturing sites in Stryker, Ohio; Evansville and Plymouth, Indiana; Carpentersville, Illinois; and Castellon, Spain. We have classified the Specialty Plastics operating results and gain on sale, net of income tax, as discontinued operations in the accompanying consolidated statements of operations for all relevant periods presented.

The table below summarizes results for Polymer Additives and Specialty Plastics, for the years ended December 31, 2016, 2015 and 2014, which are reflected in our consolidated statements of operations as discontinued operations. Interest expense has been allocated to the discontinued operations based on the ratio of net assets of each business to consolidated net assets excluding debt.

	2016	2015	2014
	(Dollars in thousands)		
Net sales	$ 18,481	$ 33,825	$ 343,348
Cost of sales	28,473	53,213	295,697
Gross (loss) profit	(9,992)	(19,388)	47,651
Selling, general and administrative expenses	3,094	4,189	17,737
Restructuring and impairment charges	50,902	11,792	21,769
Interest expense	325	763	3,846
Gain on sale of business, net	—	—	(127,579)
Miscellaneous (income) expense, net	(392)	647	1,090
(Loss) income from discontinued operations before income taxes	(63,921)	(36,779)	130,788
Income tax expense	543	—	35,948
(Loss) income from discontinued operations, net of income taxes	$ (64,464)	$ (36,779)	$ 94,840

The following table summarizes the assets and liabilities which are classified as held-for-sale at December 31, 2015:

	December 31, 2015
Accounts receivable, net	$ 4,028
Inventories	9,733
Other current assets	2,454
Current assets held-for-sale	16,215
Property, plant and equipment, net	22,973
Other non-current assets	205
Non-current assets held-for-sale	23,178
Total assets held-for-sale	$39,393
Accounts payable	$ 5,736
Accrued expenses and other current liabilities	1,420
Current liabilities held-for-sale	7,156
Other non-current liabilities	1,493
Total liabilities held-for-sale	$ 8,649

4. Acquisitions

Cappelle

On December 9, 2016, the Company acquired 100% of the share capital of Belgium-based Cappelle Pigments NV ("Cappelle"), a leader in specialty, high-performance inorganic and organic pigments used in coatings, inks and plastics, for €40.0 million (approximately $42.4 million). The acquired business contributed net sales of $2.2 million and net loss attributable to Ferro Corporation of $1.8 million for the period from December 9, 2016, to December 31, 2016. The loss attributable to Ferro Corporation was primarily driven by purchase price adjustments.

The information included herein has been prepared based on the allocation of the purchase price using the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management. The Company preliminarily recorded $3.5 million of goodwill, $24.1 million of personal and real property, $3.5 million of a deferred tax liability, debt of $10.3 million and $28.6 million of net working capital on the consolidated balance sheet.

ESL

On October 31, 2016, the Company acquired 100% of the membership interest of Electro-Science Laboratories, Inc. ("ESL"), a leader in electronic packaging materials for $78.0 million. ESL is headquartered in King of Prussia, Pennsylvania. The acquisition of ESL enhances the Company's position in the electronic packaging materials space with complementary products, and offers a platform for growth in our Performance Colors and Glass segment. ESL produces thick-film pastes and ceramics tape systems that enable important functionality in a wide variety of industrial and consumer applications. The acquired business contributed net sales of $6.1 million and net income attributable to Ferro Corporation of $0.5 million for the period from October 31, 2016, to December 31, 2016. The Company incurred acquisition costs during the year ended December 31, 2016 of $1.9 million, which is included in Selling, general and administrative expenses in our consolidated statements of operations.

The information included herein has been prepared based on the allocation of the purchase price using the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management. The Company preliminarily recorded $39.5 million of intangible assets, $19.9 million of goodwill, $2.9 million of personal and real property, $2.0 million of a deferred tax liability related to the amortizable intangibles assets and $17.7 million of net working capital on the consolidated balance sheet.

Delta Performance Products

On August 1, 2016, the Company acquired certain assets of Delta Performance Products, LLC, for a cash purchase price of $4.4 million. The information included herein has been prepared based on the allocation of the purchase price using the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management. The Company preliminarily recorded $3.2 million of amortizable intangible assets, $0.4 million of goodwill, $0.2 million of a deferred tax asset and $0.6 million of net working capital on the consolidated balance sheet.

Pinturas

On June 1, 2016, the Company acquired 100% of the equity of privately held Pinturas Benicarló, S.L. ("Pinturas") for €16.5 million in cash (approximately $18.4 million). The information included herein has been prepared based on the preliminary allocation of the purchase price using estimates of the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management. As of December 31, 2016, the purchase price allocation is subject to further adjustment until all information is fully evaluated by the Company. The Company preliminarily recorded $8.8 million of amortizable intangible assets, $3.9 million of goodwill, $0.7 million of personal and real property, $2.7 million of a deferred tax liability related to the amortizable intangible assets, and $7.7 million of net working capital on the consolidated balance sheet.

Ferer

On January 5, 2016, the Company completed the purchase of 100% of the equity of privately held Istanbul-based Ferer Dis Ticaret Ve Kimyasallar Anonim Sirketi A.S. ("Ferer") on a cash-free and debt-free basis for $9.4 million in cash. The information included herein has been prepared based on the preliminary allocation of the purchase price using estimates of the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management. As of December 31, 2016, the purchase price allocation is subject to further adjustment until all information is fully evaluated by the Company. The Company preliminarily recorded $3.3 million of amortizable intangible assets, $4.5 million of goodwill, $0.6 million of personal and real property, $0.7 million of a deferred tax liability related to the amortizable intangible assets, and $1.7 million of net working capital on the consolidated balance sheet.

Al Salomi

On November 17, 2015, the Company acquired 100% of the equity of Egypt-based tile coatings manufacturer Al Salomi for Frits and Glazes ("Al Salomi") for Egyptian Pound ("EGP") 307 million (approximately $38.2 million), including the assumption of debt. The acquired business contributed net sales of $24.4 million and net loss attributable to Ferro Corporation of $11.8 million for the year ended December 31, 2016, and net sales of $2.3 million and net loss attributable to Ferro Corporation of $0.5 million for the period ending November 17, 2015, to December 31, 2015.

The information included herein has been prepared based on the allocation of the purchase price using the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management. The Company recorded $15.0 million of amortizable intangible assets, $14.3 million of goodwill, $10.7 million of personal and real property, $4.8 million of a deferred tax liability related to the amortizable intangible assets, and $3.0 million of net working capital on the consolidated balance sheet.

Nubiola

On July 7, 2015, the Company acquired the entire share capital of Corporación Química Vhem, S.L., Dibon USA, LLC and Ivory Corporation, S.A. (together with their direct and indirect subsidiaries, "Nubiola") on a cash-free and debt-free basis for €167 million (approximately $184.2 million). The acquisition was funded with excess cash and borrowings under the Company's existing revolving credit facility. See Note 8 for additional detail on the revolving credit facility. During the second quarter of 2016, the Company finalized a purchase price adjustment for the settlement of an escrow that reduced the fair value of the net assets acquired to $168.1 million. As a result of the purchase price adjustment, the carrying amount of goodwill decreased $11.7 million, amortizable intangible assets decreased $6.4 million and the related deferred tax liability decreased $1.9 million. The impact of the change on the consolidated statements of operations was not material. Nubiola is a worldwide producer of specialty inorganic pigments and the world's largest producer of Ultramarine Blue. Nubiola also produces specialty Iron Oxides, Chrome Oxide Greens and Corrosion Inhibitors. Nubiola has production facilities in Spain, Colombia, Romania, and India and a joint venture in China.

The information included herein has been prepared based on the allocation of the purchase price using the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management.

The following table summarizes the purchase price allocations:

	July 7, 2015
	(Dollars in thousands)
Net working capital[1]	$ 46,642
Cash and equivalents	19,966
Personal property	39,444
Real property	28,510
Intangible assets	26,757
Other assets and liabilities	(20,733)
Goodwill	27,498
Net assets acquired	$ 168,084

(1) Net working capital is defined as current assets, less cash, less current liabilities.

The acquired business contributed net sales of $123.2 million and net income attributable to Ferro Corporation of $24.4 million for the year ended December 31, 2016, and net sales of $56.9 million and net income attributable to Ferro Corporation of $0.3 million for the period from July 7, 2015, to December 31, 2015. The Company incurred acquisition related costs of $5.4 million for the year ended December 31, 2015, which is recorded within Selling, general and administrative expenses, in our consolidated statements of operations.

The fair value of the receivables acquired is $24.5 million, with a gross contractual amount of $25.2 million. The Company recorded acquired intangible assets subject to amortization of $21.1 million, which is comprised of $5.4 million of customer relationships and $15.7 million of technology/know-how, which will be amortized over 20 years and 15 years, respectively. The Company recorded acquired indefinite-lived intangible assets of $5.6 million related to trade names and trademarks. Goodwill is calculated as the excess of the purchase price over the fair values of the assets acquired and the liabilities assumed in the acquisition and is a result of anticipated synergies. Goodwill is not deductible for tax purposes.

The following unaudited pro froma information represents the consolidated results of the Company as if the Nubiola acquisition occurred as of January 1, 2014:

	2015	2014
	(unaudited) (In thousands, except per share amounts)	
Net sales	$ 1,141,200	$ 1,251,266
Net income attributable to Ferro Corporation common shareholders	$ 69,489	$ 100,187
Net earnings per share attributable to Ferro Corporation common shareholders — Basic	$ 0.80	$ 1.15
Net earnings per share attributable to Ferro Corporation common shareholders — Diluted	$ 0.79	$ 1.15

The unaudited pro forma information has been adjusted with the respect to certain aspects of the acquisition to reflect the following:

- Additional depreciation and amortization expenses that would have been recognized assuming fair value adjustments to the existing Nubiola assets acquired, including intangible assets and fixed assets.
- Elimination of revenue and costs of goods sold for sales from Nubiola to the Company, which would be eliminated as intercompany transactions for Nubiola and the Company on a consolidated basis.
- Increased interest expense due to additional borrowings to fund the acquisition.
- Acquisition-related costs, which were included in the Company's results.
- Adjustments for the income tax effect of the pro forma adjustments related to the acquisition.

Thermark

In February 2015, the Company acquired TherMark Holdings, Inc., a leader in laser making technology, for a cash purchase price of $5.5 million. The Company recorded $4.6 million of amortizable intangible assets, $2.5 million of goodwill, $1.7 million of a deferred tax liability related to the amortizable intangible assets, and $0.1 million of net working capital on our consolidated balance sheet.

Vetriceramici

In 2014, Ferro Coatings Italy S.R.L., a 100% owned subsidiary of Ferro, acquired 100% of the outstanding common shares and voting interest of Vetriceramici S.p.A. ("Vetriceramici") for a purchase price of €87.2 million in cash, or $108.9 million, based on the exchange rate on the closing date of December 1, 2014. Vetriceramici is an Italian manufacturing, marketing and distribution group that offers a range of products to its customers for the production of ceramic tiles, with some diversification in the glass sector. Vetriceramici has manufacturing facilities in Italy and Mexico, a mixing plant in Poland and research and development and sales offices in Italy and Turkey.

The acquired business contributed net sales of $53.7 million and net income attributable to Ferro Corporation of $8.5 million for the year ended December 31, 2016, and net sales of $60.1 million and net income attributable to Ferro Corporation of $11.0 million for the year ended December 31, 2015. The acquired business contributed net sales of $4.1 million and net loss attributable to Ferro of $0.6 million from the date of the acquisition through December 31, 2014. The Company incurred acquisition costs of $1.4 million and $1.7

million during the years ended December 31, 2015, and December 31, 2014, respectively, which is included in Selling, general and administrative expenses in our consolidated statements of operations.

The information included herein has been prepared based on the allocation of the purchase price using the fair value and useful lives of the assets acquired and liabilities assumed, which were determined with the assistance of third parties who performed independent valuations using discounted cash flow and comparative market approaches and estimates made by management.

The following table summarizes the purchase price allocations:

	December 1, 2014
	(Dollars in thousands)
Net working capital(1)	$ 27,055
Real property	8,291
Personal property	12,204
Other assets and liabilities	(13,169)
Intangible assets	42,060
Goodwill	32,431
Net assets acquired	$108,872

(1) Net working capital is defined as current assets less current liabilities.

The fair value of the receivables acquired is $26.0 million, with a gross contractual amount of $27.0 million. The Company recorded acquired intangible assets subject to amortization of $37.9 million, which is comprised of $27.8 million of customer relationships and $10.1 million of technology/know-how, which are amortized over 20 and 10 years, respectively. The Company recorded acquired indefinite-lived intangible assets of $4.2 million related to trade names and trademarks. Goodwill is calculated as the excess of the purchase price over the fair values of the assets acquired and the liabilities assumed in the acquisition and is a result of anticipated synergies. Goodwill has been allocated to the Performance Coatings and Performance Colors and Glass segments of $31.4 million and $1.0 million, respectively. The amount of goodwill that is expected to be deductible for tax purposes is $12.4 million.

Other

In July 2014, the Company acquired certain commercial assets of a reseller of our porcelain enamel products in Turkey for a cash purchase price of $6.7 million, which is recorded in Intangible assets, net on the consolidated balance sheets.

5. Inventories

Inventory at December 31 consisted of the following:

	2016	2015
	(Dollars in thousands)	
Raw materials	$ 72,943	$ 56,291
Work in process	38,859	33,099
Finished goods	118,045	95,464
Total inventories	$ 229,847	$ 184,854

In the production of some of our products, we use precious metals, some of which we obtain from financial institutions under consignment agreements with terms of one year or less. The financial institutions retain ownership of the precious metals and charge us fees based on the amounts we consign. These fees were $0.8 million for 2016, $0.8 million for 2015, and $0.8 million for 2014. We had on hand precious metals owned by participants in our precious metals consignment program of $28.7 million at December 31, 2016, and $20.5 million at December 31, 2015, measured at fair value based on market prices for identical assets.

6. Property, Plant and Equipment

Property, Plant and Equipment at December 31 consisted of the following:

	2016	2015
	(Dollars in thousands)	
Land	$ 37,136	$ 31,009
Buildings	171,809	167,653
Machinery and equipment	477,376	468,485
Construction in progress	15,063	14,544
Total property, plant and equipment	701,384	681,691
Total accumulated depreciation	(439,358)	(421,262)
Property, plant and equipment, net	$ 262,026	$ 260,429

Depreciation expense was $37.9 million for 2016, $36.2 million for 2015, and $31.3 million for 2014. Noncash investing activities for capital expenditures, consisting of new capital leases during the year and unpaid capital expenditure liabilities at year end, were $5.0 million for 2016, $6.6 million for 2015, and $7.9 million for 2014.

As discussed in Note 3 — Discontinued Operations, our Europe-based Polymer Additives assets have been classified as held-for-sale under ASC Topic 360, Property, Plant and Equipment until the ultimate sale of the business in 2016. As such, at each historical reporting date, these assets were tested for impairment comparing the fair value of the assets less costs to sell to the carrying value. The fair value was determined using both the market approach and income approach, utilizing Level 3 measurements within the fair value hierarchy, which indicated the fair value less costs to sell was less than the carrying value. As a result of the analysis, the assets had a carrying value that exceeded fair value, resulting in impairment charges totaling $50.9 million, $11.8 million and $21.6 million that are included in (Loss) income from discontinued operations, net of income taxes, in our consolidated statements of operations for the years ended December 31, 2016, 2015 and 2014, respectively.

The following table present information about the Company's impairment charges on assets that were measured on a fair value basis for the years ended December 31, 2016, 2015 and 2014. The table also indicates the level within the fair value hierarchy of the valuation techniques used by the Company to determine the fair value:

	Fair Value Measurements Using				Total
Description	Level 1	Level 2	Level 3	Total	(Losses)
			(Dollars in thousands)		
December 31, 2016	$ —	$ —	$ —	$ —	$ (50,902)
December 31, 2015	$ —	$ —	$ 33,711	$ 33,711	$ (11,792)
December 31, 2014	$ —	$ —	$ 37,400	$ 37,400	$ (21,566)

The inputs to the valuation techniques used to measure fair value are classified into the following categories:

Level 1: Quoted market prices in active markets for identical assets or liabilities.

Level 2: Observable market-based inputs or unobservable inputs that are corroborated by market data.

Level 3: Unobservable inputs that are not corroborated by market data.

During 2016, we recorded a $3.9 million gain on sale from the sale proceeds of a closed site in Australia which was recorded in Miscellaneous (income) expense, net in our consolidated statements of operations for the year ended December 31, 2016.

During 2014, we sold non-operating real estate assets located in South Plainfield, New Jersey and in Criciuma, Brazil, which resulted in gains of $1.2 million and $0.4 million, respectively. The gains on sale were offset by losses associated with sale of our corporate related real estate and the write-off of tenant improvements of $3.5 million and $1.3 million, respectively. The net loss of $3.3 million related to these transactions is recorded in Miscellaneous (income) expense, net in our consolidated statements of operations for the year ended December 31, 2014.

7. Goodwill and Other Intangible Assets

Details and activity in the Company's goodwill by segment are as follows:

	Performance Coatings	Pigments, Powders and Oxides	Performance Colors and Glass	Total
	(Dollars in thousands)			
Goodwill, net at December 31, 2014	$ 31,591	9,676	52,466	$ 93,733
Acquisitions	14,305(1)	39,151(2)	2,477(3)	55,933
Other adjustments	(462)	—	—	(462)
Foreign currency adjustments	(1,950)	(33)	(1,552)	(3,535)
Goodwill, net at December 31, 2015	43,484	48,794	53,391	145,669
Acquisitions	—	(7,756)(4),(5)	28,332(5)	20,576
Impairments	(13,198)	—	—	(13,198)
Foreign currency adjustments	(2,196)	(617)	(1,938)	(4,751)
Goodwill, net at December 31, 2016	$ 28,090	$ 40,421	$ 79,785	$ 148,296

(1) During 2015, the Company recorded goodwill related to the Al Salomi acquisition. Refer to Note 4 for additional details.

(2) During 2015, the Company recorded goodwill related to the Nubiola acquisition. Refer to Note 4 for additional details.

(3) During 2015, the Company recorded goodwill related to the TherMark acquisition. Refer to Note 4 for additional details.

(4) During 2016, the Company recorded a purchase price adjustment within the measurement period for goodwill related to the Nubiola acquisition. Refer to Note 4 for additional details.

(5) During 2016, the Company recorded goodwill related to the Delta Performance Products, Ferer, Pinturas, ESL and Cappelle acquisitions. Refer to Note 4 for additional details.

	December 31, 2016	December 31, 2015
	(Dollars in thousands)	
Goodwill, gross	$206,763	$190,938
Accumulated impairment losses	(58,467)	(45,269)
Goodwill, net	$148,296	$145,669

The significant assumptions and ranges of assumptions we used in our impairment analysis of goodwill follow:

Significant Assumptions	2016	2015
Weighted-average cost of capital	10.75% - 13.5%	11.5% - 12.75%
Residual growth rate	3.0%	3.0%

During the fourth quarter of 2016 and 2015, we performed our annual goodwill impairment testing. The test entailed comparing the fair value of our reporting units to their carrying value as of the measurement date of October 31, 2016, and October 31, 2015, respectively. We performed step 1 of the annual impairment test as defined in ASC Topic 350, Intangibles — Goodwill and Other. During our October 31, 2016, goodwill impairment assessment, an impairment indicator was identified within our Tile Coating Systems reporting unit, a component of our Performance Coatings segment. The impairment indicator was indicative of the performance of the reporting unit in total. We compared the carrying value against the fair value, and determined that the carrying value exceeded the fair value. As a result, an impairment loss of $13.2 million has been included in restructuring and impairment charges in the consolidated statement of operations for the year ended December 31, 2016. The Company is not aware of any events or circumstances that occurred between the annual assessment date and December 31, 2016 which would further require a goodwill impairment test.

Description	Fair Value Measurements Using				Total (Losses)
	Level 1	Level 2	Level 3	Total	
	(Dollars in thousands)				
December 31, 2016	$ —	$ —	$ —	$ —	$ (13,198)

Amortizable intangible assets at December 31 consisted of the following:

	Estimated Economic Life	2016	2015
		(Dollars in thousands)	
Gross amortizable intangible assets:			
Patents	10 - 16 years	$ 5,147	$ 5,229
Land rights	20 - 40 years	4,746	4,947
Technology/know-how and other	1 - 30 years	84,837	66,558
Customer relationships	12 - 20 years	80,153	46,320
Total gross amortizable intangible assets		174,883	123,054
Accumulated amortization:			
Patents		(4,981)	(4,880)
Land rights		(2,698)	(2,671)
Technology/know-how and other		(34,775)	(16,473)
Customer relationships		(5,311)	(2,234)
Total accumulated amortization		(47,765)	(26,258)
Amortizable intangible assets, net		$ 127,118	$ 96,796

We amortize amortizable intangible assets on a straight-line basis over the estimated useful lives of the assets. Amortization expense related to amortizable intangible assets was $8.9 million for 2016, $4.9 million for 2015, and $2.3 million for 2014. Aggregate amortization expense for amortizable intangible assets is expected to be approximately $11.4 million for 2017, $11.1 million for 2018, $10.7 million for 2019, $9.5 million for 2020, and $8.4 million for 2021.

Indefinite-lived intangible assets at December 31 consisted of the following:

	2016	2015
	(Dollars in thousands)	
Indefinite-lived intangibles assets:		
Trade names and trademarks	$10,732	$9,837

8. Debt and Other Financing

Loans payable and current portion of long-term debt at December 31 consisted of the following:

	2016	2015
	(Dollars in thousands)	
Loans payable	$ 11,452	$ 2,749
Current portion of long-term debt	5,858	4,697
Loans payable and current portion of long-term debt	$ 17,310	$ 7,446

Long-term debt at December 31 consisted of the following:

	2016	2015
	(Dollars in thousands)	
Revolving credit facility	$ 311,555	$ 170,000
Term loan facility, net of unamortized issuance costs	239,530	291,717
Capital lease obligations	3,720	4,478
Other notes	8,228	4,610
Total long-term debt	563,033	470,805
Current portion of long-term debt	(5,858)	(4,697)
Long-term debt, less current portion	$ 557,175	$ 466,108

The annual maturities of long-term debt for each of the five years after December 31, 2016, are as follows (in thousands):

2017	$ 6,105
2018	5,612
2019	316,813
2020	4,601
2021	232,176
Thereafter	2,634
Total maturities of long-term debt	567,941
Unamortized issuance costs on Term loan facility	(3,720)
Imputed interest and executory costs on capitalized lease obligations	(1,188)
Total long-term debt	$ 563,033

Credit Facility

On July 31, 2014, the Company entered into a credit facility (the "Credit Facility") with a group of lenders to refinance the majority of its then outstanding debt. The Credit Facility consisted of a $200 million secured revolving line of credit with a term of five years and a $300 million secured term loan facility with a term of seven years. The Credit Facility replaces the prior $250 million revolving credit facility (described below) and provided funding to repurchase the 7.875% Senior Notes (descried below). On January 25, 2016, the Company amended the Credit Facility by entering into the Incremental Assumption Agreement (the "Incremental Agreement") to increase the revolving line of credit commitment amount from $200 million to $300 million. The Company then used a portion of the increase in the revolving line of credit to repay $50 million of the term loan facility. The Credit Facility was amended and a portion of the outstanding term loan was repaid to increase the amount of total liquidity available under the Credit Facility and reduce the total cost of borrowings. On August 29, 2016, the Company amended the Credit Facility by entering into the Second Incremental Assumption Agreement (the "Second Incremental Agreement") to increase the revolving line of credit commitment amount to $400 million. The increase in the revolving line of credit commitment will be used for general corporate purposes, including acquisitions.

Principal payments on the term loan facility of $0.75 million quarterly, are payable commencing December 31, 2014, with the remaining balance due on the maturity date. At December 31, 2016, after taking into account all prior quarterly payments and the $50 million prepayment that was made in January 2016, the Company had borrowed $243.3 million under the term loan facility at an annual rate of 4.0%. There are no additional borrowings available under the term loan facility.

Certain of the Company's U.S. subsidiaries have guaranteed the Company's obligations under the Credit Facility and such obligations are secured by (a) substantially all of the personal property of the Company and the U.S. subsidiary guarantors and (b) a pledge of 100% of the stock of most of the Company's U.S. subsidiaries and 65% of most of the stock of the Company's first tier foreign subsidiaries.

Interest Rate – Term Loan: The interest rates applicable to the term loans will be, at the Company's option, equal to either a base rate or a London Interbank Offered Rate ("LIBOR") rate plus, in both cases, an applicable margin.

- The base rate will be the highest of (i) the federal funds rate plus 0.50%, (ii) syndication agent's prime rate or (iii) the daily LIBOR rate plus 1.00%.
- The applicable margin for base rate loans is 2.25%.
- The LIBOR rate will be set as quoted by Bloomberg and shall not be less than 0.75%.
- The applicable margin for LIBOR rate loans is 3.25%.
- For LIBOR rate loans, the Company may choose to set the duration on individual borrowings for periods of one, two, three or six months, with the interest rate based on the applicable LIBOR rate for the corresponding duration.

Interest Rate – Revolving Credit Line: The interest rates applicable to loans under the revolving credit line will be, at the Company's option, equal to either a base rate or a LIBOR rate plus an applicable variable margin. The variable margin will be based on the ratio of (a) the Company's total consolidated debt outstanding at such time to (b) the Company's consolidated EBITDA computed for the period of four consecutive fiscal quarters most recently ended.

- The base rate will be the highest of (i) the federal funds rate plus 0.50%, (ii) syndication agents's prime rate or (iii) the daily LIBOR rate plus 1.00%.
- The applicable margin for base rate loans will vary between 1.50% and 2.00%.
- The LIBOR rate will be set as quoted by Bloomberg for U.S. Dollars.
- The applicable margin for LIBOR Rate Loans will vary between 2.50% and 3.00%.
- For LIBOR rate loans, the Company may choose to set the duration on individual borrowings for periods of one, two, three or six months, with the interest rate based on the applicable LIBOR rate for the corresponding duration.

At December 31, 2016, the Company had borrowed $311.6 million under the revolving credit facilities at a weighted average interest rate of 3.5%. The borrowing on the revolving credit line was used to fund the acquisitions, the share repurchase programs, and for other general business purposes. After reductions for outstanding letters of credit secured by these facilities, we had $84.1 million of additional borrowings available under the revolving credit facilities at December 31, 2016.

The Credit Facility contains customary restrictive covenants including, but not limited to, 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 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 revolving credit facility, the Company is subject to financial covenants regarding the Company's outstanding net indebtedness and interest coverage ratios.

If an event of default occurs, all amounts outstanding under the Credit Facility may be accelerated and become immediately due and payable. The Company was in compliance with the covenants, as defined within our Credit Facility, as of September 30, 2016. The financial covenants are not applicable as of December 31, 2016, due to the refinancing of the Credit Facility which is described below.

New Credit Facility

On February 14, 2017, the Company entered into a new credit facility (the "New Credit Facility") with a group of lenders to refinance its then outstanding credit facility debt and to provide liquidity for ongoing working capital requirements and general corporate purposes.

The New Credit Facility consists of a $400 million secured revolving line of credit with a term of five years, a $357.5 million secured term loan facility with a term of seven years and a €250 million secured euro term loan facility with a term of seven years. The term loans are payable in equal quarterly installments in an amount equal to 0.25% of the original principal amount of the term loans, with the remaining balance due on the maturity date thereof. In addition, the Company is required, on an annual basis, to make a prepayment of term loans until they are fully paid and then to the revolving loans in an amount equal to a portion of the Company's excess cash flow, as calculated pursuant to the New Credit Facility.

Subject to the satisfaction of certain conditions, the Company can request additional commitments under the revolving line of credit or term loans in the aggregate principal amount of up to $250 million to the extent that existing or new lenders agree to provide such additional commitments and/or term loans and certain additional debt subject to satisfaction of certain covenant levels.

Certain of the Company's U.S. subsidiaries have guaranteed the Company's obligations under the New Credit Facility and such obligations are secured by (a) substantially all of the personal property of the Company and the U.S. subsidiary guarantors and (b) a pledge of 100% of the stock of certain of the Company's U.S. subsidiaries and 65% of the stock of certain of the Company's direct foreign subsidiaries.

Interest Rate — Term Loans: The interest rates applicable to the U.S. term loans will be, at the Company's option, equal to either a base rate or a LIBOR rate plus, in both cases, an applicable margin. The interest rates applicable to the Euro term loans will be a Euro Interbank Offered Rate ("EURIBOR") rate plus an applicable margin.

- The base rate for U.S. term loans will be the highest of (i) the federal funds rate plus 0.50%, (ii) syndication agent's prime rate or (iii) the daily LIBOR rate plus 1.00%. The applicable margin for base rate loans is 1.50%.
- The LIBOR rate for U.S. term loans shall not be less than 0.75% and the applicable margin for LIBOR rate U.S. term loans is 2.50%.

- The EURIBOR rate for Euro term loans shall not be less than 0% and the applicable margin for EURIBOR rate loans is 2.75%.
- For LIBOR rate term loans and EURIBOR rate term loans, the Company may choose to set the duration on individual borrowings for periods of one, two, three or six months, with the interest rate based on the applicable LIBOR rate or EURIBOR rate, as applicable, for the corresponding duration.

Interest Rate – Revolving Credit Line: The interest rates applicable to loans under the revolving credit line will be, at the Company's option, equal to either a base rate or a LIBOR rate plus, in both cases, an applicable variable margin. The variable margin will be based on the ratio of (a) the Company's total consolidated debt outstanding at such time to (b) the Company's consolidated EBITDA computed for the period of four consecutive fiscal quarters most recently ended.

- The base rate for revolving loans will be the highest of (i) the federal funds rate plus 0.50%, (ii) syndication agent's prime rate or (iii) the daily LIBOR rate plus 1.00%. The applicable margin for base rate loans will vary between 0.75% to 1.75%.
- The LIBOR rate for revolving loans shall not be less than 0% and the applicable margin for LIBOR rate revolving loans will vary between 1.75% and 2.75%.
- For LIBOR rate revolving loans, the Company may choose to set the duration on individual borrowings for periods of one, two, three or six months, with the interest rate based on the applicable LIBOR rate for the corresponding duration.

The New Credit Facility contains customary restrictive covenants including, but not limited to, 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 New 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 revolving credit 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 Credit Agreement may be accelerated and become immediately due and payable.

7.875% Senior Notes and 2013 Revolving Credit Facility

In conjunction with the redemption of the 7.875% Senior Notes and the termination of the 2013 Revolving Credit Facility in the third quarter of 2014, the Company recorded a charge of $14.4 million, which is comprised of a repurchase premium of $10.5 million and the write-off of unamortized issuance costs of $3.9 million. This charge is included within Loss on debt extinguishment in the consolidated statements of operations for the year ended December 31, 2014.

Other Financing Arrangements

We maintain other lines of credit to provide global flexibility for Ferro's short-term liquidity requirements. These facilities are uncommitted lines for our international operations and totaled $7.3 million at December 31, 2016, and $8.0 million at December 31, 2015. The unused portions of these lines provided additional liquidity of $6.7 million at December 31, 2016, and $7.3 million at December 31, 2015.

9. Financial Instruments

The following table presents financial instrument assets (liabilities) at the carrying amount, fair value and classification within the fair value hierarchy:

	December 31, 2016				
	Carrying Amount	Fair Value			
		Total	Level 1	Level 2	Level 3
	(Dollars in thousands)				
Cash and cash equivalents	$ 45,582	$ 45,582	$ 45,582	$ —	$ —
Loans payable	(11,452)	(11,452)	—	(11,452)	—
Revolving credit facility	(311,555)	(318,389)	—	(318,389)	—
Term loan facility(1)	(239,530)	(252,052)	—	(252,052)	—
Other long-term notes payable	(8,228)	(7,315)	—	(7,315)	—
Foreign currency forward contracts, net	350	350	—	350	—

	December 31, 2015				
	Carrying Amount	Fair Value			
		Total	Level 1	Level 2	Level 3
	(Dollars in thousands)				
Cash and cash equivalents	$ 58,380	$ 58,380	$ 58,380	$ —	$ —
Loans payable	(2,749)	(2,749)	—	(2,749)	—
Revolving credit facility	(170,000)	(169,019)	—	(169,019)	—
Term loan facility(1)	(291,717)	(297,552)	—	(297,552)	—
Other long-term notes payable	(4,610)	(3,956)	—	(3,956)	—
Foreign currency forward contracts, net	(1,207)	(1,207)	—	(1,207)	—

(1) The carrying value of the term loan facility is net of unamortized debt issuance costs.

The fair values of cash and cash equivalents are based on the fair values of identical assets. The fair values of loans payable are based on the present value of expected future cash flows and approximate their carrying amounts due to the short periods to maturity. The fair values of the revolving credit facility, the term loan facility and the other long-term notes payable are based on the present value of expected future cash flows and interest rates that would be currently available to the company for issuance of similar types of debt instruments with similar terms remaining maturities adjusted for the Company's non-performance risk.

Derivative Instruments

Foreign currency forward contracts. We manage foreign currency risks principally by entering into forward contracts to mitigate the impact of currency fluctuations on transactions. These forward contracts are not formally designated as hedges. Gains and losses on these foreign currency forward contracts are netted with gains and losses from currency fluctuations on transactions arising from international trade, primarily intercompany transactions, and reported as Foreign currency losses, net in the consolidated statements of operations. Net foreign currency loss was approximately $12.9 million in 2016, $4.5 million in 2015, and $1.2 million in 2014, which is primarily comprised of the foreign exchange impact on transactions in countries where it is not economically feasible for us to enter into hedging arrangements and hedging inefficiencies, such as timing of transactions. In 2016, the net foreign currency loss includes a $9.1 million loss from the devaluation of the Egyptian pound and a loss on a foreign contract related to the Euro dominated purchase of the Cappelle acquisition of $1.2 million. In 2015, the net foreign currency loss includes a loss on a foreign currency contract related to the Euro dominated purchase of the Nubiola acquisition of $2.7 million. We incurred net losses of $2.7 million in 2016, net gains of $8.3 million in 2015 and net gains of $10.5 million in 2014, arising from the change in fair value of our financial instruments, which are netted against the related net gains and losses on international trade transactions. The fair values of these contracts are based on market prices for comparable contracts. The notional amount of foreign currency forward contracts was $338.2 million at December 31, 2016, and $338.4 million at December 31, 2015.

The following table presents the effect on our consolidated statements of operations for the years ended December 31, 2016, 2015 and 2014, respectively, of foreign currency forward contracts:

	Amount of (Loss) Gain Recognized in Earnings			
	2016	2015	2014	Location of (Loss) Gain in Earnings
	(Dollars in thousands)			
Foreign currency forward contracts	$ (2,714)	$ 8,304	$ 10,526	Foreign currency losses, net

The following table presents the fair value on our consolidated balance sheets at December 31 of foreign currency forward contracts:

	2016	2015	Balance Sheet Location
	(Dollars in thousands)		
Asset derivatives:			
Foreign currency forward contracts	$ 1,854	$ 913	Other current assets
Liability derivatives:			
Foreign currency forward contracts	$ (1,504)	$ (2,120)	Accrued expenses and other current liabilities

10. Income Taxes

Income tax expense (benefit) is based on our earnings (losses) from continuing operations before income taxes as presented in the following table:

	2016	2015	2014
	(Dollars in thousands)		
U.S.	$ 7,416	$ 10,520	$ (69,868)
Foreign	55,029	44,263	27,032
Total	$ 62,445	$ 54,783	$ (42,836)

Our income tax expense (benefit) from continuing operations consists of the following components:

	2016	2015	2014
	(Dollars in thousands)		
Current:			
U.S. federal	$ 4,616	$ 146	$ (25,712)
Foreign	24,675	21,041	12,181
State and local	28	41	(1,272)
Total current	29,319	21,228	(14,803)
Deferred:			
U.S. federal	379	(56,521)	1,168
Foreign	(11,830)	(3,764)	(20,684)
State and local	—	(6,043)	92
Total deferred	(11,451)	(66,328)	(19,424)
Total income tax expense (benefit)	$ 17,868	$ (45,100)	$ (34,227)

In addition, income tax (benefit) expense that we allocated directly to Ferro Corporation shareholders' equity is detailed in the following table:

	2016	2015	2014
	(Dollars in thousands)		
Postretirement benefit liability adjustments	$ 30	$ 32	$ (45)
Stock options exercised	(2,355)	—	(835)
Total income tax (benefit) expense allocated to Ferro Corporation shareholders' equity	$ (2,325)	$ 32	$ (880)

A reconciliation of the U.S. federal statutory income tax rate and our effective tax rate follows:

	2016	2015	2014
U.S. federal statutory income tax rate	35.0%	35.0%	35.0%
Goodwill dispositions and impairments	8.3	(0.2)	0.8
Non-deductible expenses	3.4	3.0	—
Miscellaneous	3.2	1.7	(6.7)
Uncertain tax positions	1.7	4.3	(4.3)
Net adjustment of prior-year accrual, including tax audit settlements	1.5	0.2	(8.1)
U.S. tax costs of foreign dividends	0.6	1.7	4.7
Foreign substitute tax payment	—	(3.9)	—
Domestic production activities deduction	(0.2)	—	3.1
State taxes	(0.7)	0.6	5.4
Tax rate changes	(0.7)	3.4	(4.6)
Foreign currency	(1.6)	2.3	(0.1)
Notional interest deduction	(2.8)	(2.8)	—
Other tax credits	(2.9)	(2.3)	7.8
Adjustment of valuation allowances	(7.4)	(118.4)	30.7
Foreign tax rate difference	(8.8)	(6.9)	16.2
Effective tax rate	28.6%	(82.3)%	79.9%

We have refundable income taxes of $9.2 million at December 31, 2016, and $5.6 million at December 31, 2015, classified as Other receivables on our consolidated balance sheets. We also have income taxes payable of $15.8 million at December 31, 2016, and $8.6 million at December 31, 2015, classified as Accrued expenses and other current liabilities on our consolidated balance sheets.

The components of deferred tax assets and liabilities at December 31 were:

	2016	2015
	(Dollars in thousands)	
Deferred tax assets:		
Pension and other benefit programs	$ 51,189	$ 46,348
Foreign operating loss carryforwards	30,352	35,925
Accrued liabilities	20,942	19,036
U.S foreign tax credit carryforwards	19,753	23,620
Other credit carryforwards	11,277	13,379
Other	5,643	3,955
State and local operating loss carryforwards	3,975	4,540
Currency differences	3,138	—
Inventories	1,962	2,454
Allowance for doubtful accounts	1,744	1,701
Domestic operating loss carryforwards	—	1,837
Capitalized interest	—	1,749
Capitalized research costs	—	552
Total deferred tax assets	149,975	155,096
Deferred tax liabilities:		
Property, plant and equipment and intangibles — depreciation and amortization	28,418	26,051
Other	3,091	2,475
Unremitted earnings of foreign subsidiaries	779	616
Total deferred tax liabilities	32,288	29,142
Net deferred tax assets before valuation allowance	117,687	125,954
Valuation allowance	(37,354)	(55,043)
Net deferred tax assets	$ 80,333	$ 70,911

The amounts of foreign operating loss carryforwards, foreign tax credit carryforwards, and other credit carryforwards included in the table of temporary differences are net of reserves for unrecognized tax benefits.

At December 31, 2016, we had $3.1 million of tax benefits from domestic operating loss carryforwards and $31.6 million from foreign operating loss carryforwards, some of which can be carried forward indefinitely and others that expire in one to twenty years. At December 31, 2016, we had $41.6 million of tax benefits from tax credit carryforwards, some of which can be carried forward indefinitely. These operating loss carryforwards and tax credit carryforwards expire as follows:

	Operating Loss Carryforwards	Tax Credit Carryforwards
	(Dollars in thousands)	
Expiring in:		
2017	$ 4,694	$ 6,935
2018-2022	11,281	11,616
2023-2027	2,723	14,938
2028-2032	1,992	5,359
2033-2037	2,232	813
2038-Indefinitely	11,739	1,908
Total	$ 34,661	$ 41,569

We assess the available positive and negative evidence to estimate if sufficient future taxable income will be generated to utilize the existing deferred tax assets. A significant piece of objective negative evidence evaluated by jurisdiction was the cumulative loss incurred over the three-year period ended December 31, 2016. Such objective evidence limits the ability to consider other subjective evidence such as our projections for future income.

Based on this assessment, the Company has recorded a valuation allowance of $37.3 million in order to measure only the portion of the deferred tax assets that more likely than not will be realized. The most significant items that changed the valuation allowance from 2015 to 2016 primarily related to the release of valuation allowances related to deferred tax assets that were utilized in the current year, the recording of a valuation allowance to reduce the amount of deferred tax assets to a balance more likely than not to be realized, the removal of a valuation allowance deemed no longer necessary based upon the expiration of the deferred tax asset or removal for jurisdictions which were liquidated in the current year and no longer necessary, and the release of a valuation allowance based upon a change in the current and expected future years operating profits which will result in continued profitability that will more likely than not allow for the utilization of a deferred tax asset balance.

We classified net deferred income tax assets as of December 31 as detailed in the following table:

	2016	2015
	(Dollars in thousands)	
Current assets	$ —	$ 12,088
Non-current assets	106,454	87,385
Current liabilities	—	(1,074)
Non-current liabilities	(26,121)	(27,488)
Net deferred tax assets	$ 80,333	$ 70,911

Activity and balances of unrecognized tax benefits are summarized below:

	2016	2015	2014
		(Dollars in thousands)	
Balance at beginning of year	$ 34,541	$ 36,879	$ 38,739
Additions based on tax positions related to the current year	1,445	2,664	3,411
Additions for tax positions of prior years	170	4,136	1,908
Reductions for tax positions of prior years	(2,827)	(1,135)	(2,551)
Reductions as a results of expiring statutes of limitations	(2,718)	(6,259)	(700)
Foreign currency adjustments	(526)	(1,744)	(1,953)
Settlements with taxing authorities	—	—	(1,975)
Balance at end of year	$ 30,085	$ 34,541	$ 36,879

The total amount of unrecognized tax benefits that, if recognized, would affect the effective rate was $11.0 million at December 31, 2016, and $11.0 million at December 31, 2015. The Company recognizes interest accrued and penalties related to unrecognized tax benefits as part of income tax expense. The Company recognized $0.1 million of expense in 2016, $0.6 million of expense in 2015, and $0.9 million of benefit in 2014 for interest, net of tax, and penalties. The Company accrued $3.1 million at December 31, 2016, and $3.1 million at December 31, 2015, for payment of interest, net of tax, and penalties.

We anticipate that $2.8 million of liabilities for unrecognized tax benefits, including accrued interest and penalties, may be reversed within the next 12 months. These liabilities relate to international tax issues and are expected to reverse due to the expiration of the applicable statute of limitations periods and the anticipation of the closure of tax examinations.

The Company conducts business globally, and, as a result, the U.S. parent company or one of its subsidiaries files income tax returns in the U.S. federal jurisdiction and various state and foreign jurisdictions. In the normal course of business, the U.S. parent company and its subsidiaries are subject to examination by taxing authorities throughout the world. With few exceptions, we are not subject to federal, state, local or non-U.S. income tax examinations for years before 2005.

At December 31, 2016, we provided $0.8 million for deferred income taxes on $7.8 million of undistributed earnings of foreign subsidiaries. We have not provided deferred income taxes on undistributed earnings of approximately $83.7 million, since we intend to indefinitely reinvest the earnings and it is not practicable to estimate the additional taxes that might be payable on the eventual remittance of such earnings.

11. Contingent Liabilities

The Company had bank guarantees and standby letters of credit issued by financial institutions that totaled $6.4 million at December 31, 2016, and $8.1 million at December 31, 2015. These agreements primarily relate to Ferro's insurance programs, foreign energy purchase contracts and foreign tax payments. If the Company fails to perform its obligations, the guarantees and letters of credit may be drawn down by their holders, and we would be liable to the financial institutions for the amounts drawn.

We have recorded environmental liabilities of $7.2 million at December 31, 2016, and $7.4 million at December 31, 2015, for costs associated with the remediation of certain of our properties that have been contaminated. The balance at December 31, 2016, and December 31, 2015, was primarily comprised of liabilities related to a non-operating facility in Brazil, and for retained environmental obligations related to a site in the United States that was part of the sale of our North American and Asian metal powders product lines in 2013. The costs include legal and consulting fees, site studies, the design and implementation of remediation plans, post-remediation monitoring, and related activities. The ultimate liability could be affected by numerous uncertainties, including the extent of contamination found, the required period of monitoring and the ultimate cost of required remediation.

In 2013, the Supreme Court in Argentina ruled unfavorably related to certain export taxes associated with a divested operation. As a result of this ruling, we have recorded a liability of $8.7 million at December 31, 2016, and $7.8 million at December 31, 2015. The liability that has been recorded represents our estimate of the amount that is probable and estimable.

There are various lawsuits and claims pending against the Company and its consolidated subsidiaries. We do not currently expect the ultimate liabilities, if any, and expenses related to such lawsuits and claims to materially affect the consolidated financial position, results of operations, or cash flows of the Company.

12. Retirement Benefits

Defined Benefit Pension Plans

	U.S. Pension Plans			Non-U.S. Plans		
	2016	2015	2014	2016	2015	2014
	(Dollars in thousands)					
Service cost	$ 16	$ 17	$ 16	$ 1,372	$ 1,478	$ 1,767
Interest cost	15,552	18,718	19,746	3,319	3,560	5,105
Expected return on plan assets	(19,735)	(29,168)	(28,139)	(1,712)	(2,623)	(3,151)
Amortization of prior service cost	11	12	12	37	259	61
Mark-to-market actuarial net losses	9,127	18,807	71,583	11,180	5,085	17,494
Curtailment and settlement effects (gains) losses	—	(12,640)	—	688	35	(123)
Special termination benefits	—	—	—	330	35	40
Net periodic benefit cost (credit)	$ 4,971	$ (4,254)	$ 63,218	$ 15,214	$ 7,829	$ 21,193
Weighted-average assumptions:						
Discount rate	4.70%	4.25%	5.25%	3.12%	2.72%	4.12%
Rate of compensation increase	N/A	N/A	N/A	3.16%	3.28%	2.88%
Expected return on plan assets	8.20%	8.20%	8.20%	3.41%	3.50%	4.44%

In 2016, the mark-to-market actuarial net loss on the U.S. pension plans of $9.1 million consisted of a charge of $5.7 million to remeasure the liability based on a lower discount rate compared with the prior year, and a $3.4 million of loss from expected returns on plan assets exceeding actual returns. The mark-to-market actuarial net loss of $11.2 million for non-U.S. plans was primarily driven by remeasurement of the respective liabilities at lower discount rates.

In 2015, the mark-to-market actuarial net loss on the U.S. pension plans of $18.8 million primarily consisted of $20.8 million of loss from expected returns on plan assets exceeding actual returns, partially offset by an increase in the discount rate compared with the prior year. The mark-to-market actuarial net loss of $5.1 million for non-U.S. plans primarily consisted of $11.0 million of loss from expected returns on plan assets exceeding actual returns, partially offset by an increase in the discount rate. In 2015, the Company initiated and executed on a buyout of terminated vested participants in our U.S. defined benefit pension plan. In October 2015, the buyout was funded and reduced plan assets and liability by $71 million and resulted in a settlement gain of $12.6 million.

In 2014, the mark-to-market actuarial net loss on the U.S. pension plans of $71.6 million consisted of $69.8 million of losses due to a decrease in the discount rate compared with the prior year and a change in the underlying mortality assumption, in addition to $1.8 million of loss from expected returns on plan assets exceeding actual returns. In 2014, the discount rate used to value the liability declined by 100 basis points compared with the prior year, thereby increasing the value of the liability by $50.3 million. Additionally, during the fourth quarter of 2014, the Company adopted the use of new mortality tables within its valuation assumptions, which increased the liability. The new mortality tables reflect underlying increases in life expectancy of the participants, thus driving longer benefit payment periods. The impact of the change in mortality assumption on the U.S. pension liability was an increase of $17.8 million. The mark-to-market actuarial net loss of $17.5 million for non-U.S. plans primarily consisted of $30.8 million of losses due to decreases in the respective plans' discount rates and the change in mortality assumptions compared with 2014, partially offset by $13.2 million of gains from actual returns on plan assets exceeding expectations.

	U.S. Pension Plans		Non-U.S. Pension Plans	
	2016	2015	2016	2015
	(Dollars in thousands)			
Change in benefit obligation				
Benefit obligation at beginning of year	$ 346,951	$ 454,030	$ 123,764	$ 146,706
Service cost	16	17	1,372	1,478
Interest cost	15,552	18,718	3,319	3,560
Curtailments	—	—	—	—
Amendments	—	—	—	189
Settlements	(144)	(71,290)	(34,528)	(579)
Special termination benefits	—	—	330	35
Plan participants' contributions	—	—	54	20
Benefits paid	(22,918)	(23,144)	(3,195)	(3,179)
Actuarial loss (gain)	5,745	(31,380)	20,490	(11,142)
Exchange rate effect	—	—	(8,116)	(13,324)
Benefit obligation at end of year	$ 345,202	$ 346,951	$ 103,490	$ 123,764
Accumulated benefit obligation at end of year	$ 345,202	$ 346,951	$ 93,401	$ 118,680
Change in plan assets:				
Fair value of plan assets at beginning of year	$ 278,735	$ 381,147	$ 63,649	$ 82,345
Actual return on plan assets	16,354	(8,379)	10,977	(13,638)
Employer contributions	522	401	3,060	4,979
Plan participants' contributions	—	—	54	20
Benefits paid	(22,918)	(23,144)	(3,195)	(3,179)
Effect of settlements	(144)	(71,290)	(34,746)	(579)
Exchange rate effect	—	—	(6,116)	(6,299)
Fair value of plan assets at end of year	$ 272,549	$ 278,735	$ 33,683	$ 63,649
Amounts recognized in the balance sheet:				
Other non-current assets	$ —	$ —	$ 484	$ 841
Accrued expenses and other current liabilities	(579)	(729)	(2,070)	(1,834)
Postretirement and pension liabilities	(72,074)	(67,487)	(68,221)	(59,122)
Funded status	$ (72,653)	$ (68,216)	$ (69,807)	$ (60,115)

During 2016, the Company settled a pension obligation in Great Britain for an amount of $32.2 million, which is included in settlements for the Non-U.S. pension.

	U.S. Pension Plans		Non-U.S. Pension Plans	
	2016	2015	2016	2015
	(Dollars in thousands)			
Weighted-average assumptions as of December 31:				
Discount rate	4.40%	4.70%	2.24%	3.12%
Rate of compensation increase	N/A	N/A	3.14%	3.16%
Pension plans with benefit obligations in excess of plan assets:				
Benefit obligations	$ 345,202	$ 346,951	$ 73,903	$ 66,291
Plan assets	272,549	278,735	3,612	5,336
Pension plans with accumulated benefit obligations in excess of plan assets:				
Projected benefit obligations	$ 345,202	$ 346,951	$ 73,393	$ 65,777
Accumulated benefit obligations	345,202	346,951	63,538	60,888
Plan assets	272,549	278,735	3,179	4,881

Activity and balances in Accumulated other comprehensive loss related to defined benefit pension plans are summarized below:

	U.S. Pension Plans		Non-U.S. Pension Plans	
	2016	2015	2016	2015
	(Dollars in thousands)			
Prior service (cost):				
Balance at beginning of year	$ (18)	$ (30)	$ (425)	$ (636)
Amounts recognized as net periodic benefit costs	11	12	37	259
Exchange rate effects	—	—	123	(48)
Balance at end of year	$ (7)	$ (18)	$ (265)	$ (425)
Estimated amounts to be amortized in 2017	$ (7)		$ (37)	

The overall investment objective for defined benefit pension plan assets is to achieve the highest level of investment return that is compatible with prudent investment practices, asset class risk and current and future benefit obligations of the plans. Based on the potential risks and expected returns of various asset classes, the Company establishes asset allocation ranges for major asset classes. For U.S. plans, the target allocations are 35% fixed income, 60% equity, and 5% other investments. For non-U.S. plans, the target allocations are 75% fixed income, 24% equity, and 1% other investments. The Company invests in funds and with asset managers that track broad investment indices. The equity funds generally capture the returns of the equity markets in the U.S., Europe, Japan, and Asia Pacific and also reflect various investment styles, such as growth, value, and large or small capitalization. The fixed income funds generally capture the returns of government and investment-grade corporate fixed income securities in the U.S. and Europe and also reflect various durations of these securities.

We base the expected return on plan assets at the beginning of the year on the weighted-average expected return for the target asset allocations of the major asset classes held by each plan. In determining the expected return, the Company considers both historical performance and an estimate of future long-term rates of return. The Company consults with and considers the opinion of its actuaries in developing appropriate return assumptions.

The fair values of our pension plan assets at December 31, 2016, by asset category are as follows:

	Level 1	Level 2	Level 3	Total
		(Dollars in thousands)		
U.S. plans:				
Fixed income:				
Cash and cash equivalents	$ 3	$ —	$ —	$ 3
Guaranteed deposits	—	1,817	—	1,817
Mutual funds	85,580	—	—	85,580
Commingled funds	—	777	371	1,148
Equities:				
U.S. common stocks	4,057	—	—	4,057
Mutual funds	156,675	—	—	156,675
Commingled funds	—	1,096	—	1,096
Real estate	—	—	22,173	22,173
Total	$ 246,315	$ 3,690	$ 22,544	$ 272,549
Non-U.S. plans				
Fixed income:				
Guaranteed deposits	$ 97	$ 726	$ 26,332	$ 27,155
Mutual funds	365	—	—	365
Other	3,679	2,153	—	5,832
Equities:				
Mutual funds	200	—	—	200
Real estate	—	—	84	84
Other assets	47	—	—	47
Total	$ 4,388	$ 2,879	$ 26,416	$ 33,683

The fair values of our pension plan assets at December 31, 2015, by asset category are as follows:

	Level 1	Level 2	Level 3	Total
		(Dollars in thousands)		
U.S. plans:				
Fixed income:				
Cash and cash equivalents	$ 44	$ —	$ —	$ 44
Guaranteed deposits	—	1,956	—	1,956
Mutual funds	88,672	—	—	88,672
Commingled funds	—	879	366	1,245
Equities:				
U.S. common stocks	3,148	—	—	3,148
Mutual funds	162,332	—	—	162,332
Commingled funds	—	1,264	—	1,264
Real estate	—	—	20,074	20,074
Total	$ 254,196	$ 4,099	$ 20,440	$ 278,735
Non-U.S. plans				
Fixed income:				
Cash and cash equivalents	$ 299	$ —	$ —	$ 299
Guaranteed deposits	142	2,148	54,006	56,296
Mutual funds	171	—	—	171
Other	4,188	2,267	—	6,455
Equities:				
Mutual funds	319	—	—	319
Real estate	—	—	59	59
Other assets	50	—	—	50
Total	$ 5,169	$ 4,415	$ 54,065	$ 63,649

The Company's U.S. pension plans held 0.3 million shares of the Company's common stock with a market value of $4.1 million at December 31, 2016, and 0.3 million shares with a market value of $3.1 million at December 31, 2015.

Level 3 assets consist primarily of guaranteed deposits and real estate investments. The guaranteed deposits in Level 3 are in the form of contracts with insurance companies that secure the payment of benefits and are valued based on discounted cash flow models using the same discount rate used to value the related plan liabilities. The real estate investments in Level 3 are in the form of commingled funds invested in non-public real estate development and investment companies and are valued based on estimated capitalization factors applied to the earnings streams from portfolio properties and fee income, discounted cash flows of development projects, and estimated market values of undeveloped land, all of which are reduced by reported liabilities and appropriate taxes.

A rollforward of Level 3 assets is presented below. Unrealized gains included in earnings were $13.0 million in 2016 and $0 million in 2015.

	Guaranteed deposits	Real estate	Commingled funds	Other assets	Total
			(Dollars in thousands)		
Balance at December 31, 2014	$ 28,929	$ 17,648	$ 489	$ 2	$ 47,068
Purchases	31,157	—	—	—	31,157
Sales	(282)	—	—	—	(282)
(Losses) gains included in earnings	(2,342)	2,485	(123)	(2)	18
Exchange rate effect	(3,456)	—	—	—	(3,456)
Balance at December 31, 2015	$ 54,006	$ 20,133	$ 366	$ —	$ 74,505
Sales	(33,084)	—	—	—	(33,084)
Gains included in earnings	10,867	2,124	5	—	12,996
Exchange rate effect	(5,457)	—	—	—	(5,457)
Balance at December 31, 2016	$ 26,332	$ 22,257	$ 371	$ —	$ 48,960

We expect to contribute approximately $0.6 million to our U.S. pension plans and $2.4 million to our non-U.S. pension plans in 2017.

We estimate that future pension benefit payments, which reflect expected future service, will be as follows:

	U.S. Plans	Non-U.S. Plans
	(Dollars in thousands)	
2017	$ 23,590	$ 4,256
2018	23,442	3,534
2019	23,469	4,164
2020	23,470	3,767
2021	23,529	3,734
2022-2026	116,026	21,698

Postretirement Health Care and Life Insurance Benefit Plans

	2016	2015	2014
	(Dollars in thousands)		
Net periodic benefit cost:			
Interest expense	$ 944	$ 970	$ 1,205
Amortization of prior service credit	—	—	(105)
Mark-to-market actuarial net (gain) loss	(164)	(3,051)	499
Curtailment (gain) recognized	—	—	(930)
Total net periodic benefit cost (credit)	$ 780	$ (2,081)	$ 669
Weighted-average assumptions:			
Discount rate	4.50%	3.95%	4.90%
Current trend rate for health care costs	6.60%	7.10%	7.30%
Ultimate trend rate for health care costs	4.50%	4.50%	4.50%
Year that ultimate trend rate is reached	2036	2028	2028

A one-percentage-point change in the assumed health care cost trend rates would have the following effect:

	1-Percentage-Point Increase	1-Percentage-Point Decrease
	(Dollars in thousands)	
Effect on total of service and interest costs components	$ 60	$ (52)
Effect on postretirement benefit obligation	1,262	(1,106)

	2016	2015
	(Dollars in thousands)	
Change in benefit obligation:		
Benefit obligation at beginning of year	$ 22,030	$ 25,717
Interest cost	944	970
Curtailments	—	—
Benefits paid	(1,754)	(1,606)
Actuarial (loss)	(164)	(3,051)
Benefit obligation at end of year	$ 21,056	$ 22,030
Change in plan assets:		
Fair value of plan assets at beginning of year	$ —	$ —
Employer contributions	1,754	1,606
Benefits paid	(1,754)	(1,606)
Fair value of plan assets at end of year	$ —	$ —
Amounts recognized in the balance sheet:		
Accrued expenses and other current liabilities	$ (2,208)	$ (2,345)
Postretirement and pension liabilities	(18,848)	(19,685)
Funded status	$ (21,056)	$ (22,030)
Weighted-average assumptions as of December 31:		
Discount rate	4.20%	4.50%
Current trend rate for health care costs	6.50%	6.60%
Ultimate trend rate for health care costs	4.50%	4.50%
Year that ultimate rend rate is reached	2036	2036

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 provides subsidies for certain drug costs to companies that provide coverage that is actuarially equivalent to the drug coverage under Medicare Part D. We estimate that future postretirement health care and life insurance benefit payments will be as follows:

	Before Medicare Subsidy	After Medicare Subsidy
	(Dollars in thousands)	
2017	$ 2,208	$ 1,970
2018	2,139	1,911
2019	2,069	1,851
2020	1,987	1,779
2021	1,907	1,710
2022-2026	8,147	7,330

Other Retirement Plans

We also have defined contribution retirement plans covering certain employees. Our contributions are determined by the terms of the plans and are limited to amounts that are deductible for income taxes. Generally, benefits under these plans vest over a period of five years from date of employment. The largest plan covers salaried and most hourly employees in the U.S. In this plan, the Company contributes a percentage of eligible employee basic compensation and also a percentage of employee contributions. The expense applicable to these plans was $4.2 million, $3.4 million, and $4.9 million in 2016, 2015, and 2014, respectively.

13. Stock-based Compensation

On May 22, 2013, our shareholders approved the 2013 Omnibus Incentive Plan (the "Plan"), which was adopted by the Board of Directors on February 22, 2013, subject to shareholder approval. The Plan's purpose is to promote the Company's long-term financial interests and growth by attracting, retaining and motivating high quality key employees and directors, motivating such employees and directors to achieve the Company's short- and long-range performance goals and objectives, thereby aligning their interests with those of its shareholders. The Plan reserves 4,400,000 shares of common stock to be issued for grants of several different types of long-term incentives including stock options, stock appreciation rights, restricted shares, performance shares, other common stock based awards, and dividend equivalent rights.

The 2010 Long Term Incentive Plan (the "Previous Plan") was replaced by the Plan, and no future grants have been made under the Previous Plan. However, any outstanding awards or grants made under the Previous Plan will continue until the end of their specified terms.

Stock options, performance share units, deferred stock units, and restricted share units were the only grant types outstanding at December 31, 2016. Stock options, performance share units, and restricted share units are discussed below. Activities in other grant types were not significant.

Stock Options

General Information

Stock options outstanding at December 31, 2016, have a term of 10 years, vest evenly over three or four years on the anniversary of the grant date, and have an exercise price equal to the per share fair market value of our common stock on the grant date. Accelerated vesting is used for options held by employees who meet both the age and years of service requirements to retire prior to the end of the vesting period. In the case of death or retirement, the stock options become 100% vested and exercisable.

Stock Option Valuation Model and Method Information

We estimate the fair value of each stock option on the date of grant using the Black-Scholes option pricing model. We use judgment in selecting assumptions for the model, which may significantly impact the timing and amount of compensation expense, and we base our judgments primarily on historical data. When appropriate, we adjust the historical data for circumstances that are not likely to occur in the future.

The following table details the determination of the assumptions used to estimate the fair value of stock options:

Assumption	Estimation Method
Expected life, in years	Historical stock option exercise experience
Risk-free interest rate	Yield of U.S. Treasury Bonds with remaining maturity equal to expected life of the stock option
Expected volatility	Historical daily price observations of the Company's common stock over a period equal to the expected life of the stock option
Expected dividend yield	Historical dividend rate at the date of grant

The following table details the weighted-average grant-date fair values and the assumptions used for estimating the fair values of stock options granted in the respective years:

	2016	2015	2014
Weighted-average grant-date fair value	$4.94	$8.45	$9.54
Expected life, in years	6.0	6.0	6.0
Risk-free interest rate	1.4%–1.6%	1.9%–2.1%	2.0%–2.2%
Expected volatility	52.0%–53.6%	55.0%–80.1%	82.7%–86.3%
Expected dividend yield	—%	—%	—%

Stock Option Activity Information

A summary of stock option activity follows:

	Number of Options	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term	Aggregate Intrinsic Value
Outstanding at December 31, 2015	1,900,320	11.30		
Granted	341,800	9.65		
Exercised	(196,925)	5.79		
Forfeited or expired	(226,345)	17.27		
Outstanding at December 31, 2016	1,818,850	$10.85	5.51	$7,827
Exercisable at December 31, 2016	1,372,895	$14.37	4.47	$6,193
Vested or expected to vest at December 31, 2016	1,721,357	$10.88	5.48	$7,409

We calculated the aggregate intrinsic value in the table above by taking the total pretax difference between our common stock's closing market value per share on the last trading day of the year and the stock option exercise price for each grant and multiplying that result by the number of shares that would have been received by the option holders had they exercised all their in-the-money stock options.

Information related to stock options exercised follows:

	2016	2015	2014
	(Dollars in thousands)		
Proceeds from the exercise of stock options	$ 1,140	$ 404	$ 684
Intrinsic value of stock options exercised	1,496	457	1,129
Income tax benefit related to stock options exercised	524	160	395

Stock-Based Compensation Expense Information

A summary of amounts recorded and to be recorded for stock-based compensation related to stock options follows:

	2016	2015	2014
	(Dollars in thousands)		
Compensation expense recorded in Selling, general and administrative expenses	$ 1,388	$ 1,736	$ 2,626
Deferred income tax benefits related to compensation expense	486	608	919
Total fair value of stock options vested	1,757	1,664	2,545
Unrecognized compensation cost	513	702	779
Expected weighted-average recognition period for unrecognized compensation, in years	2.1	2.6	2.2

Performance Share Units

General Information

Performance share units, expressed as shares of the Company's common stock, are earned only if the Company meets specific performance targets over a three-year period. The grants have a duration of three years.

The Plan allows for payout of up to 200% of the vesting-date fair value of the awards. We pay half of the earned value in cash and half in unrestricted shares of common stock. The portion of the grants that will be paid in cash are treated as liability awards, and therefore, we remeasure our liability and the related compensation expense at each balance sheet date, based on fair value. We treat the portion of the grants that will be settled with common stock as equity awards, and therefore, the amount of stock-based compensation we record over the performance period is based on the fair value on the grant date. The compensation expense and number of shares expected to vest for all performance share units are adjusted for the achievement of the performance share units' performance conditions, based upon our best estimate using available information.

Performance Share Unit Valuation Model and Method Information

The estimated fair value of performance share units granted in 2016, 2015 and 2014 is based on the closing price of the Company's stock on the date of issuance and recorded based on achievement of target performance metrics. As of December 31, 2016, we had 0.2 million, 0.2 million and 0.2 million performance share units outstanding associated with our 2016, 2015 and 2014 grants, respectively.

The weighted average grant date fair value of our performance share units was $10.07 for shares granted in 2016, $12.32 for shares granted in 2015 and $13.09 for shares granted in 2014. All performance share units are initially expensed at target and are evaluated each reporting period for likelihood of achieving the performance criteria, and the expense is adjusted, as appropriate.

Performance Share Unit Activity Information

A summary of performance share unit activity follows:

	Number of Units	Weighted-Average Remaining Contractual Term
Outstanding at December 31, 2015	889,220	
Granted	291,500	
Earned	(342,973)	
Forfeited or expired	(183,757)	
Outstanding at December 31, 2016	653,990	2.0
Expected to vest at December 31, 2016	653,990	2.0

Performance Share Expense Information

A summary of amounts recorded and to be recorded for stock-based compensation related to performance share units follows:

	2016	2015	2014
	(Dollars in thousands)		
Compensation expense recorded in Selling, general and administrative expenses	$ 3,437	$ 4,669	$ 3,520
Deferred income tax benefits related to compensation expense	1,203	1,634	1,232
Unrecognized compensation cost	3,733	2,858	3,390
Expected weighted-average recognition period for unrecognized compensation, in years	2.0	1.5	2.2

Restricted Share Units

In 2016, 0.3 million and in 2015 and 2014, 0.2 million restricted share units were granted, and fair value is determined based on the closing price of the Company's stock on the date of issuance. Restricted share units are expressed as equivalent shares of the Company's common stock, and have a three-year vesting period. Total expense included in Selling general and administrative expense related to restricted share units granted in 2016, 2015 and 2014 was $1.7 million, $1.7 million and $0.4 million, respectively. Total unrecognized compensation cost in 2016, 2015 and 2014 was $2.4 million, $2.9 million and $2.3 million, respectively.

Directors' Deferred Compensation

Separate from the Plan, the Company has established the Ferro Corporation Deferred Compensation Plan for Non-employee Directors, permitting its non-employee directors to voluntarily defer all or a portion of their compensation. The voluntarily deferred amounts are placed in individual accounts in a benefit trust known as a "rabbi trust" and invested in the Company's common stock with dividends reinvested in additional shares. All disbursements from the trust are made in the Company's common stock. The stock held in the rabbi trust is classified as treasury stock in shareholders' equity and the deferred compensation obligation that is required to be settled in shares of the Company's common stock, is classified as paid-in capital. The rabbi trust held 0.2 million shares, valued at $2.1 million, at December 31, 2016, and 0.3 million shares, valued at $3.2 million, at December 31, 2015.

14. Restructuring and Cost Reduction Programs

Our restructuring and cost reduction program has been developed with the objective of leveraging our global scale, realigning and lowering our cost structure and optimizing capacity utilization. Total charges resulting from these activities were $2.7 million in 2016, $9.5 million in 2015, and $8.8 million in 2014, which is reported as Restructuring and impairment charges in our consolidated statement of operations. Descriptions of the restructuring program follow:

Global Cost Reduction Program

In 2013, we initiated a Global Cost Reduction Program that was designed to address 3 key areas of the company — (1) business realignment, (2) operational efficiency and (3) corporate and back office functions. Business realignment was targeted at right-sizing our commercial management organizations globally. The operational efficiency component of the program was designed to improve the efficiency of our plant operations and supply chain. The corporate and back office initiative is principally comprised of work that we are doing with our strategic partners in the areas of finance and accounting and information technology outsourcing.

We have summarized the charges associated with this restructuring program by major type of charges below:

	Employee Severance	Other Costs	Total
	(Dollars in thousands)		
Expected restructuring charges:			
Global Cost Reduction Program	$29,857	$22,479	$52,336
Total expected restructuring charges	$29,857	$22,479	$52,336
Restructuring charges incurred:			
Global Cost Reduction Program	$ 2,744	$ 6,105	$ 8,849
Charges incurred in 2014	$ 2,744	$ 6,105	$ 8,849
Global Cost Reduction Program	4,015	5,519	9,534
Charges incurred in 2015	$ 4,015	$ 5,519	$ 9,534
Global Cost Reduction Program	1,353	1,356	2,709
Charges incurred in 2016	$ 1,353	$ 1,356	$ 2,709
Cumulative restructuring charges incurred:			
Global Cost Reduction Program	29,857	22,479	52,336
Cumulative restructuring charges incurred as of December 31, 2016	$29,857	$22,479	$52,336

We have summarized the charges associated with the restructuring programs by segments below:

	Total Expected Charges	2016	2015	2014	Cumulative Charges To Date
	(Dollars in thousands)				
Performance Coatings	$ 4,104	$ 192	$ 204	$ 527	$ 4,104
Performance Colors and Glass	19,061	205	2,300	1,279	19,061
Pigments, Powders and Oxides	2,939	630	1,970	80	2,939
Segment Total	26,104	1,027	4,474	1,886	26,104
Corporate Restructuring Charges	26,232	1,682	5,060	6,963	26,232
Total Restructuring Charges	$52,336	$2,709	$9,534	$8,849	$52,336

We have summarized the activities and accruals related to our restructuring and cost reduction programs below:

	Employee Severance	Other Costs	Total
	(Dollars in thousands)		
Balance at December 31, 2013	$ 6,183	$ 4,579	$ 10,762
Restructuring charges	2,744	6,105	8,849
Cash payments	(8,337)	(9,669)	(18,006)
Non-cash items	(71)	(78)	(149)
Balance at December 31, 2014	$ 519	$ 937	$ 1,456
Restructuring charges	$ 4,015	$ 5,519	$ 9,534
Cash payments	(3,832)	(4,341)	(8,173)
Non-cash items	(9)	(38)	(47)
Balance at December 31, 2015	$ 693	$ 2,077	$ 2,770
Restructuring charges	$ 1,353	$ 1,356	$ 2,709
Cash payments	(1,634)	(1,089)	(2,723)
Non-cash items	(173)	(855)	(1,028)
Balance at December 31, 2016	$ 239	$ 1,489	$ 1,728

We expect to make cash payments to settle the remaining liability for employee severance benefits and other costs primarily over the next twelve months where applicable, except where legal or contractual obligations would require it to expand beyond that period.

15. Leases

Rent expense for all operating leases was $9.8 million in 2016, $9.1 million in 2015, and $13.4 million in 2014.

The Company has a number of capital lease arrangements primarily relating to buildings and equipment. Assets held under capital leases and included in property, plant and equipment at December 31 follow:

	2016	2015
	(Dollars in thousands)	
Gross amounts capitalized		
Buildings	$ 3,100	$ 3,100
Equipment	3,989	4,086
	7,089	7,186
Accumulated amortization		
Buildings	(3,100)	(3,100)
Equipment	(2,079)	(1,595)
	(5,179)	(4,695)
Net assets under capital leases	$ 1,910	$ 2,491

At December 31, 2016, future minimum lease payments under all non-cancelable leases are as follows:

	Capital Leases	Operating Leases
	(Dollars in thousands)	
2017	$ 961	$ 8,435
2018	897	5,966
2019	753	5,193
2020	485	3,825
2021	279	2,645
Thereafter	1,533	4,398
Net minimum lease payments	$ 4,908	$ 30,462
Less amount representing imputed interest and executory costs	1,188	
Present value of net minimum lease payments	3,720	
Less current portion	714	
Long-term obligations at December 31, 2016	$ 3,006	

16. Miscellaneous (Income) Expense, Net

Components of Miscellaneous (income) expense, net follow:

	2016	2015	2014
	(Dollars in thousands)		
(Gain) loss on sale of assets	$ (3,891)	$ 57	$ (2,470)
Argentina export tax matter	1,128	1,070	515
Other, net	103	(79)	2,577
Total Miscellaneous (income) expense, net	$ (2,660)	$ 1,048	$ 622

In 2016, we recorded a $3.9 million gain on sale from the sale proceeds of a closed site in Australia which was recorded for the year ended December 31, 2016.

In 2013, the Supreme Court in Argentina ruled unfavorably related to certain export taxes associated with a divested operation. As a result of this ruling, we recorded a $1.1 million charge in 2016, $1.1 million charge in 2015 and $0.5 million charge in 2014 related to interest on the exposures.

17. Earnings (Loss) per Share

Details of the calculations of basic and diluted earnings (loss) per share follow:

	2016	2015	2014
	(Dollars in thousands, except per share amounts)		
Basic earnings (loss) per share computation:			
Net (loss) income attributable to Ferro Corporation common shareholders	$ (20,817)	$ 64,100	$ 86,071
Adjustment for loss (income) from discontinued operations	64,464	36,779	(94,840)
Total	$ 43,647	$ 100,879	$ (8,769)
Weighted-average common shares outstanding	83,298	86,718	86,920
Basic earnings (loss) per share from continuing operations attributable to Ferro Corporation common shareholders	$ 0.52	$ 1.16	$ (0.10)
Diluted earnings (loss) per share computation:			
Net (loss) income attributable to Ferro Corporation common shareholders	$ (20,817)	$ 64,100	$ 86,071
Adjustment for loss (income) from discontinued operations	64,464	36,779	(94,840)
Total	$ 43,647	$ 100,879	$ (8,769)
Weighted-average common shares outstanding	83,298	86,718	86,920
Assumed exercise of stock options	549	432	—
Assumed satisfaction of deferred stock unit conditions	36	—	—
Assumed satisfaction of restricted stock unit conditions	544	338	—
Assumed satisfaction of performance stock unit conditions	483	945	—
Weighted-average diluted shares outstanding	84,910	88,433	86,920
Diluted earnings (loss) per share from continuing operations attributable to Ferro Corporation common shareholders	$ 0.51	$ 1.14	$ (0.10)

The number of anti-dilutive or unearned shares, was 1.7 million, 1.8 million, and 1.4 million common shares for 2016, 2015, and 2014, respectively. These shares were excluded from the calculation of diluted earnings per share due to their anti-dilutive impact.

18. Share Repurchase Program

The Company's Board of Directors approved share repurchase programs, under which the Company is authorized to repurchase up to $100 million of the Company's outstanding shares of Common Stock on the open market, including through a Rule 10b5-1 plan, or in privately negotiated transactions.

The timing and amount of shares to be repurchased will be determined by the Company, based on evaluation of market and business conditions, share price, and other factors. The share repurchase programs do not obligate the Company to repurchase any dollar amount or number of common shares, and may be suspended or discontinued at any time.

The Company repurchased 1,175,437 shares of common stock at an average price of $9.72 per share for a total cost of $11.4 million during 2016 and had repurchased 3,282,908 shares of common stock at average price of $11.75 for a total cost of $38.6 million during 2015. Under the share repurchase programs, the Company has repurchased an aggregate of 4,458,345 shares of common stock, at an average price of $11.21 per share, for a total cost of $50.0 million. As of December 31, 2016, $50.0 million of common stock may still be repurchased under the programs.

19. Accumulated Other Comprehensive Income (Loss)

Changes in Accumulated other comprehensive income (loss) by component, net of income tax, were as follows:

	Postretirement Benefit Liability Adjustments	Translation Adjustments	Other Adjustments	Total
	(Dollars in thousands)			
Balance at December 31, 2013	$ 1,942	$ 6,621	$ (70)	$ 8,493
Other comprehensive income (loss) before reclassifications	—	(29,244)	—	(29,244)
Reclassification to earnings:				
Postretirement benefit liabilities (loss)	(1,054)	—	—	(1,054)
Net current period other comprehensive (loss)	(1,054)	(29,244)	—	(30,298)
Balance at December 31, 2014	888	(22,623)	(70)	(21,805)
Other comprehensive income (loss) before reclassifications	—	(39,436)	—	(39,436)
Reclassification to earnings:				
Postretirement benefit liabilities gain	(77)	—	—	(77)
Net current period other comprehensive (loss)	(77)	(39,436)	—	(39,513)
Balance at December 31, 2015	811	(62,059)	(70)	(61,318)
Other comprehensive income (loss) before reclassifications	—	(46,770)	—	(46,770)
Reclassification to earnings:				
Postretirement benefit liabilities gain	330	—	—	330
Foreign currency translation adjustment(1)	—	1,115	—	1,115
Net current period other comprehensive (loss)	330	(45,655)	—	(45,325)
Balance at December 31, 2016	$ 1,141	$ (107,714)	$ (70)	$ (106,643)

(1) Includes a release of accumulated foreign currency translation of $1.1 million related to the Company's sale of the Europe-based Polymer Additives business (Note 3), which is included in Loss from discontinued operations, net of income taxes in our consolidated statements of operations for the year ended December 31, 2016.

20. Reporting for Segments

As discussed in Note 3, substantially all of the assets and liabilities of the Polymer Additives and the Specialty Plastics reportable segments were sold during 2014 and included in discontinued operations in the consolidated statement of operations for all years presented. The retained assets and operations of the Specialty Plastics reportable segment, which includes the manufacturing facilities in Edison, New Jersey, are reflected within our Pigments, Powders and Oxides reportable segment. All periods presented reflect these changes to the composition of our reportable segments. The Company's reportable segments for 2016 include Performance Coatings, Performance Colors and Glass, and Pigments, Powders and Oxides.

Net sales to external customers by segment are presented in the table below. Sales between segments were not material.

	2016	2015	2014
	(Dollars in thousands)		
Performance Coatings	$ 526,981	$ 533,370	$ 588,538
Performance Colors and Glass	371,464	376,769	407,674
Pigments, Powders and Oxides	246,847	165,202	115,414
Total net sales	$ 1,145,292	$ 1,075,341	$ 1,111,626

Segment gross profit is the metric utilized by management to evaluate segment performance. We measure segment gross profit for internal reporting purposes by excluding certain other cost of sales not directly attributable to business units and pension and other postretirement benefits mark-to-market adjustments. Assets by segment are not regularly reviewed by the chief operating decision maker. Each segment's gross profit and reconciliations to Income (loss) before income taxes are presented in the table below:

	2016	2015	2014
	(Dollars in thousands)		
Performance Coatings	$ 139,454	$ 126,945	$ 131,043
Performance Colors and Glass	133,716	128,209	134,964
Pigments, Powders and Oxides	84,293	45,678	28,480
Other cost of sales	(6,246)	848	(9,402)
Total gross profit	351,217	301,680	285,085
Selling, general and administrative expenses	241,702	216,899	286,762
Restructuring and impairment charges	15,907	9,655	8,849
Other expense, net	31,163	20,343	32,310
Income (loss) before income taxes	$ 62,445	$ 54,783	$ (42,836)

Each segment's capital expenditures for long-lived assets are detailed below:

	2016	2015	2014
	(Dollars in thousands)		
Performance Coatings	$ 9,139	$ 8,148	$ 6,546
Performance Colors and Glass	7,123	6,620	4,216
Pigments, Powders and Oxides	4,867	2,412	453
Total segment expenditures for long-lived assets	21,129	17,180	11,215
Unallocated corporate expenditures for long-lived assets	2,896	3,142	12,127
Total expenditures for long lived assets (1)	$24,025	$20,322	$23,342

(1) Excludes capital expenditures of discontinued operations of $0.9 million, $22.7 million and $30.5 million in 2016, 2015 and 2014, respectively.

We sell our products throughout the world and we attribute sales to countries based on the country where we generate the customer invoice. No single country other than the U.S., Spain, and Germany represent greater than 10% of our net sales. Net sales by geography are as follows:

	2016	2015	2014
	(Dollars in thousands)		
United States	$ 300,187	$ 281,976	$ 263,452
Spain	188,972	174,742	211,449
Germany	111,522	114,757	125,405
Other international	544,611	503,866	511,320
Total net sales	$1,145,292	$1,075,341	$1,111,626

None of our operations in countries other than Spain, U.S., Colombia and Germany owns greater than 10% of consolidated long-lived assets. Long-lived assets that consist of property, plant, and equipment by geography at December 31 are as follows:

	2016	2015
	(Dollars in thousands)	
Spain	$ 51,358	$ 58,657
United States	40,661	38,466
Colombia	30,700	31,595
Germany	24,916	24,890
Other international	114,391	106,821
Total long-lived assets	$ 262,026	$ 260,429

21. Unconsolidated Affiliates Accounted For Under the Equity Method

At December 31, 2016, our percentage of ownership interest in these affiliates ranged from 34% to 50%. Because we exert significant influence over these affiliates, but we do not control them, our investments have been accounted for under the equity method. Investment income from these equity method investments, which is reported in Miscellaneous (income) expense, net was $0.3 million in 2016, $0.8 million in 2015, and $0.8 million in 2014. The balance of our equity method investments, which is reported in Other non-current assets, was $15.1 million at December 31, 2016, and $16.0 million at December 31, 2015.

The income that we record for these investments is equal to our proportionate share of the affiliates' income and our investments are equal to our proportionate share of the affiliates' shareholders' equity based on our ownership percentage. We have summarized below condensed income statement and balance sheet information for the combined equity method investees:

	2016	2015	2014
	(Dollars in thousands)		
Net sales	$42,555	$47,443	$54,469
Gross profit	4,842	4,799	4,896
Income from continuing operations	694	1,887	254
Net income	236	1,292	133

	2016	2015
	(Dollars in thousands)	
Current assets	$ 38,246	$ 40,499
Non-current assets	28,124	27,252
Current liabilities	(16,283)	(15,893)
Non-current liabilities	(16,923)	(14,678)

We had the following transactions with our equity-method investees:

	2016	2015	2014
	(Dollars in thousands)		
Sales	$ 4,589	$ 6,740	$ 5,255
Purchases	758	3,485	7,632
Dividends and interest received	268	332	172
Commission and royalties received	1,003	197	462
Commissions and royalties paid	26	165	34

22. Quarterly Data (Unaudited)

	Net Sales	Gross Profit	Net Income (Loss)	Net Income (Loss) Attributable to Ferro Corporation	Earnings (Loss) Attributable to Ferro Corporation Common Shareholders Per Common Share	
					Basic	Diluted
	(Dollars in thousands, except per share data)					
2015						
Quarter 1	$ 262,772	$ 70,635	$ 9,015	$ 10,970	$ 0.12	$ 0.13
Quarter 2	268,214	77,640	6,785	6,599	0.08	0.08
Quarter 3	279,365	77,028	(3,561)	(4,059)	(0.05)	(0.05)
Quarter 4	264,990	76,377	50,865	50,590	0.59	0.58
Total	$ 1,075,341	$ 301,680	$ 63,104	$ 64,100	$ 0.74	$ 0.72
2016						
Quarter 1	$ 277,451	$ 84,229	$ (9,730)	$ (9,966)	$ (0.12)	$ (0.12)
Quarter 2	297,977	98,373	19,112	18,969	0.23	0.22
Quarter 3	288,527	88,981	(8,674)	(8,884)	(0.11)	(0.11)
Quarter 4	281,337	79,634	(20,595)	(20,936)	(0.25)	(0.25)
Total	$ 1,145,292	$ 351,217	$ (19,887)	$ (20,817)	$ (0.25)	$ (0.25)

Quarterly earnings per share amounts do not always add to the full-year amounts due to the averaging of shares.

Restructuring and impairment charges in 2016 were $0.9 million in the first quarter, $0.8 million in the second quarter, $0 million in the third quarter, and $14.2 million in the fourth quarter. Restructuring and impairment charges in 2015 were $0.5 million in the first quarter, $1.1 million in the second quarter, $3.8 million in the third quarter, and $4.3 million in the fourth quarter. Mark-to-market net losses on our postretirement benefit plans were $20.1 million and $20.8 million in the fourth quarter of 2016 and 2015, respectively.

23. Subsequent Events

On February 14, 2017, the Company entered into a new credit facility (the "New Credit Facility") with a group of lenders to refinance its outstanding Credit Facility and to provide liquidity for ongoing working capital requirements and general corporate purposes. The New Credit Facility consists of a $400 million secured revolving line of credit with a term of five years, a $357.5 million secured term loan facility with a term of seven years and a €250 million euro term loan facility with a term of seven years. Refer to Note 8 for further details on the New Credit Facility.

Item 9 — *Changes in and Disagreements with Accountants on Accounting and Financial Disclosure*

None.

Item 9A — *Controls and Procedures*

Evaluation of Disclosure Controls and Procedures

Ferro is committed to maintaining disclosure controls and procedures that are designed to ensure that information required to be disclosed in its Exchange Act reports is recorded, processed, summarized, and reported within the time periods specified in the U.S. Securities and Exchange Commission's rules and forms, and that such information is accumulated and communicated to its management, including its Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

The Company's management, under the supervision and with the participation of the Chief Executive Officer and the Chief Financial Officer, evaluated the effectiveness of the design and operation of the Company's disclosure controls and procedures, as defined in Exchange Act Rule 13a-15(e), as of December 31, 2016. The Company's disclosure controls and procedures include components of the Company's internal control over financial reporting. Based on that evaluation, management concluded that the disclosure controls and procedures were effective as of December 31, 2016.

Changes in Internal Control over Financial Reporting and Other Remediation

During the fourth quarter of 2016, there were no changes in our internal controls or in other factors that materially affected, or are reasonably likely to materially affect, our internal controls over financial reporting.

Management's Annual Report on Internal Control over Financial Reporting

The Company's management is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Exchange Act Rule 13a-15(f). The Company's internal control system is a process designed by, or under the supervision of, the Company's principal executive and principal financial officers, or persons performing similar functions, and effected by the Company's board of directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with U.S. generally accepted accounting principles ("U.S. GAAP").

The Company's internal control over financial reporting includes policies and procedures that pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect transactions and dispositions of assets; provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with U.S. GAAP, and that receipts and expenditures are being made only in accordance with the authorization of its management and directors; and provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Company's assets that could have a material effect on its consolidated financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate. Entities that management has excluded from its assessment of the Company's internal control over financial reporting are Pinturas Benicarló, S.L. ("Pinturas"), which was acquired on June 1, 2016, Electro-Science Laboratories, LLC ("ESL"), which was acquired on October 31, 2016, and Cappelle Pigments NV (together with their direct and indirect subsidiaries, "Cappelle"), which was acquired on December 9, 2016, whose financial statements constitute 10.1% of the Company's total assets, 1.1% of total net sales, and 3.2% of total net income of the consolidated financial statement amounts as of and for the year ended December 31, 2016.

Management assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2016. In making this assessment, the Company used the control criteria framework of the Committee of Sponsoring Organizations of the Treadway Commission published in its report entitled *Internal Control—Integrated Framework (2013).* Management concluded that the Company's internal control over financial reporting was effective as of December 31, 2016.

Deloitte & Touche LLP, the independent registered public accounting firm that audited the Company's consolidated financial statements, has issued an attestation report on the Company's internal control over financial reporting as of December 31, 2016, which is included below.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Shareholders of Ferro Corporation
Cleveland, Ohio

We have audited the internal control over financial reporting of Ferro Corporation and subsidiaries (the "Company") as of December 31, 2016, based on criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

As described in Management's Annual Report on Internal Control over Financial Reporting, management excluded from its assessment the internal control over financial reporting at Pinturas Benicarló, S.L. ("Pinturas"), which was acquired on June 1, 2016, Electro-Science Laboratories, LLC ("ESL"), which was acquired on October 31, 2016, and Cappelle Pigments NV (together with their direct and indirect subsidiaries, "Cappelle"), which was acquired on December 9, 2016, and whose financial statements constitute 10.1% of the Company's total assets, 1.1% of total net sales, and 3.2% of total net income of the consolidated financial statement amounts as of and for the year ended December 31, 2016. Accordingly, our audit did not include the internal control over financial reporting at Pinturas, ESL and Cappelle. The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Annual Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit.

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

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

Because of the inherent limitations of internal control over financial reporting, including the possibility of collusion or improper management override of controls, material misstatements due to error or fraud may not be prevented or detected on a timely basis. Also, projections of any evaluation of the effectiveness of the internal control over financial reporting to future periods are subject to the risk that the controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2016, based on the criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the consolidated financial statements and financial statement schedule as of and for the year ended December 31, 2016, of the Company and our report dated March 1, 2017, expressed an unqualified opinion on those financial statements and financial statement schedule.

/s/ Deloitte & Touche LLP

Cleveland, Ohio
March 1, 2017

Item 9B — *Other Information*

None.

PART III

Item 10 — *Directors, Executive Officers and Corporate Governance*

The information on Ferro's directors is contained under the heading "Election of Directors" of the Proxy Statement for Ferro Corporation's 2017 Annual Meeting of Shareholders and is incorporated here by reference. The information about the Audit Committee and the Audit Committee financial expert is contained under the heading "Corporate Governance — Board Committees — Audit Committee" of the Proxy Statement for Ferro Corporation's 2017 Annual Meeting of Shareholders and is incorporated here by reference. Information on Ferro's executive officers is contained under the heading "Executive Officers of the Registrant" in Part 1 of this Annual Report on Form 10-K. Section 16(a) filing information is contained under the heading "Security Ownership of Certain Beneficial Owners and Management — Section 16(a) Beneficial Ownership Reporting Compliance" of the Proxy Statement for Ferro Corporation's 2017 Annual Meeting of Shareholders and is incorporated here by reference.

Ferro has adopted a series of policies dealing with business and ethics. These policies apply to all Ferro Directors, officers and employees. A summary of these policies may be found on Ferro's Web site and the full text of the policies is available in print, free of charge, by writing to: General Counsel, Ferro Corporation, 6060 Parkland Blvd. Suite 250, Mayfield Heights, Ohio, 44124, USA. Exceptions, waivers and amendments of those policies may be made, if at all, only by the Audit Committee of the Board of Directors, and, in the event any such exceptions, waivers or amendments are granted, a description of the change or event will be posted on Ferro's Web site (www.ferro.com) within four business days. Ferro maintains a worldwide hotline that allows employees throughout the world to report confidentially any detected violations of these legal and ethical conduct policies consistent with local legal requirements and subject to local legal limitations.

Item 11 — *Executive Compensation*

The information on executive compensation is contained under the headings "Executive Compensation Discussion & Analysis" and "2016 Executive Compensation" of the Proxy Statement for Ferro Corporation's 2017 Annual Meeting of Shareholders and is incorporated here by reference.

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

The information on security ownership of certain beneficial owners and management is contained under the headings "Security Ownership of Certain Beneficial Owners and Management — Stock Ownership by Other Major Shareholders" and "Security Ownership of Certain Beneficial Owners and Management — Stock Ownership by Director and Executive Officers" of the Proxy Statement for Ferro Corporation's 2017 Annual Meeting of Shareholders and is incorporated here by reference.

The numbers of shares issued and available for issuance under Ferro's equity compensation plans as of December 31, 2016, were as follows:

Equity Compensation Plan	Number of Shares to Be Issued on Exercise of Outstanding Options, and Other Awards	Weighted-Average Exercise Price of Outstanding Options, and Other Awards	Number of Shares Remaining Available for Future Issuance Under Equity Compensation Plans(1)
Approved by Ferro Shareholders	3,353,750(2)	$5.88	2,610,048(3)
Not Approved by Ferro Shareholders	164,118	—	—
Total	3,517,868	$5.88(4)	2,610,048

(1) Excludes shares listed under "Number of Shares to Be Issued on Exercise of Outstanding Options and Other Awards."

(2) Includes options and other awards issued under the Company's 2013 Omnibus Incentive Compensation Plan and prior equity compensation plans.

(3) Shares are only available under the 2013 Omnibus Incentive Plan and may be issued as stock options, stock appreciation rights, restricted shares or units, performance shares or units, and other common stock-based awards.

(4) Weighted-average exercise price of outstanding options and other awards; excludes phantom units.

A description follows of the material features of each plan that was not approved by Ferro shareholders:

- *Executive Employee Deferred Compensation Plan.* The Executive Employee Deferred Compensation Plan allows participants to defer up to 75% of annual base salary and up to 100% of incentive cash bonus awards and cash performance share payouts. Participants may elect to have all or a portion of their deferred compensation accounts deemed to be invested in shares of Ferro Common Stock and credited with hypothetical appreciation, depreciation, and dividends. When distributions are made from this Plan in respect of such shares, the distributions are made in actual shares of Ferro Common Stock.
- *Supplemental Executive Defined Contribution Plan.* The Supplemental Executive Defined Contribution Plan allows participants to be credited annually with matching and basic pension contributions that they would have received under the Company's 401(k) plan except for the applicable IRS limitations on compensation and contributions. Contributions vest at 20% for each year of service, are deemed invested in Ferro Common Stock and earn dividends. Distributions are made in Ferro Common Stock or in cash.

Item 13 — *Certain Relationships and Related Transactions, and Director Independence*

There are no relationships or transactions that are required to be reported. The information about director independence is contained under the heading "Corporate Governance — Director Independence" of the Proxy Statement for Ferro Corporation's 2017 Annual Meeting of Shareholders and is incorporated here by reference.

Item 14 — *Principal Accountant Fees and Services*

The information contained under the heading "Accounting Firm Information — Fees" of the Proxy Statement for Ferro Corporation's 2017 Annual Meeting of Shareholders is incorporated here by reference.

PART IV

Item 15 — *Exhibits and Financial Statement Schedules*

The following documents are filed as part of this Annual Report on Form 10-K:

(a) The consolidated financial statements of Ferro Corporation and subsidiaries contained in Part II, Item 8 of this Annual Report on Form 10-K:

- Consolidated Statements of Operations for the years ended December 31, 2016, 2015 and 2014;
- Consolidated Statements of Comprehensive (Loss) Income for the years ended December 31, 2016, 2015 and 2014;
- Consolidated Balance Sheets at December 31, 2016 and 2015;
- Consolidated Statements of Equity for the years ended December 31, 2016, 2015 and 2014;
- Consolidated Statements of Cash Flows for the years ended December 31, 2016, 2015 and 2014; and
- Notes to Consolidated Financial Statements

(b) Schedule II — Valuation and Qualifying Accounts and Reserves for the years ended December 31, 2016, 2015 and 2014, contained on page 114 of this Annual Report on Form 10-K. All other schedules have been omitted because the material is not applicable or is not required as permitted by the rules and regulations of the U.S. Securities and Exchange Commission, or the required information is included in the consolidated financial statements.

(c) The exhibits listed in the Exhibit Index beginning on page 115 of this Annual Report on Form 10-K.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized.

FERRO CORPORATION

By /s/ Peter T. Thomas

Peter T. Thomas
Chairman, President and Chief Executive Officer

Date: March 1, 2017

Pursuant to the requirements of the Securities Exchange Act of 1934, this Annual Report on Form 10-K has been signed below by the following persons on behalf of the Registrant and in their indicated capacities as of the 1st day of March, 2017.

/s/ Peter T. Thomas Peter T. Thomas	Chairman, President and Chief Executive Officer (Principal Executive Officer)
/s/ Benjamin J. Schlater Benjamin J. Schlater	Vice President and Chief Financial Officer (Principal Financial Officer)
/s/ James A. Barna James A. Barna	Corporate Controller and Chief Accounting Officer (Principal Accounting Officer)
/s/ Richard J. Hipple Richard J. Hipple	Director
/s/ Gregory E. Hyland Gregory E. Hyland	Director
/s/ David A. Lorber David A. Lorber	Director
/s/ Timothy K. Pistell Timothy K. Pistell	Director
/s/ Andrew M. Ross Andrew M. Ross	Director
/s/ Allen A. Spizzo Allen A. Spizzo	Director
/s/ Ronald P. Vargo Ronald P. Vargo	Director

FERRO CORPORATION AND SUBSIDIARIES

SCHEDULE II — VALUATION AND QUALIFYING ACCOUNTS AND RESERVES
Years Ended December 31, 2016, 2015 and 2014

	Balance at Beginning of Period	Additions Charged (Reductions Credited) to Costs and Expenses	Deductions	Adjustment for Differences in Exchange Rates	Balance at End of Period
			(Dollars in thousands)		
Allowance for Possible Losses on Collection of Accounts Receivable:					
Year ended December 31, 2016	$ 7,784	1,383	(820)	(181)	$ 8,166
Year ended December 31, 2015	$ 10,325	667	(1,802)	(1,406)	$ 7,784
Year ended December 31, 2014	$ 12,093	2,657	(3,442)	(983)	$ 10,325
Valuation Allowance on Net Deferred Tax Assets:					
Year ended December 31, 2016	$ 55,043	—	(16,686)[1]	(1,003)	$ 37,354
Year ended December 31, 2015	$147,887	—	(86,597)[1]	(6,247)	$ 55,043
Year ended December 31, 2014	$193,984	—	(37,801)	(8,296)	$147,887

(1) Included within this deduction is $6.8 million and $63.3 million for the years ended December 31, 2016 and 2015, respectively, of valuation allowance release, resulting from the conclusion that the underlying deferred tax assets are more likely than not to be realized.

EXHIBIT INDEX

The following exhibits are filed with this report or are incorporated here by reference to a prior filing in accordance with Rule 12b-32 under the Securities and Exchange Act of 1934.

Exhibit:

2	Plan of acquisition, reorganization, arrangement or successor:
2.1	Sale and Purchase Agreement, dated April 29, 2015, by and among Ferro Corporation, the sellers party thereto, Corporación Química Vhem, S.L. and Dibon USA, LLC (incorporated by reference to Exhibit 2.1 to Ferro Corporation's Current Report on Form 8-K filed July 9, 2015).
2.2	Addendum to Sale and Purchase Agreement, dated July 7, 2015, by and among Ferro Corporation, Ferro Spain Management Company, S.L.U., the sellers party thereto, Corporación Química Vhem, S.L. and Dibon USA, LLC (incorporated by reference to Exhibit 2.2 to Ferro Corporation's Current Report on Form 8-K filed July 9, 2015).
3	Articles of Incorporation and by-laws:
3.1	Eleventh Amended Articles of Incorporation of Ferro Corporation (incorporated by reference to Exhibit 4.1 to Ferro Corporation's Registration Statement on Form S-3, filed March 5, 2008).
3.2	Certificate of Amendment to the Eleventh Amended Articles of Incorporation of Ferro Corporation filed December 29, 1994 (incorporated by reference to Exhibit 4.2 to Ferro Corporation's Registration Statement on Form S-3, filed March 5, 2008).
3.3	Certificate of Amendment to the Eleventh Amended Articles of Incorporation of Ferro Corporation filed June 23, 1998 (incorporated by reference to Exhibit 4.3 to Ferro Corporation's Registration Statement on Form S-3, filed March 5, 2008).
3.4	Certificate of Amendment to the Eleventh Amended Articles of Incorporation of Ferro Corporation filed October 14, 2011 (incorporated by reference to Exhibit 3.1 to Ferro Corporation's Current Report on Form 8-K, filed October 17, 2011).
3.5	Certificate of Amendment to the Eleventh Amended Articles of Incorporation of Ferro Corporation filed on April 25, 2014 (incorporated by reference to Exhibit 3.5 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2014).
3.6	Ferro Corporation Amended and Restated Code of Regulations; Amended and Restated as of December 8, 2016 (incorporated by reference to Exhibit 3.1 to Ferro Corporation's Current Report on Form 8-K filed December 12, 2015).
4	Instruments defining rights of security holders, including indentures:
4.1	Senior Indenture, dated as of March 5, 2008, by and between Ferro Corporation and U.S. Bank National Association (incorporated by reference to Exhibit 4.5 to Ferro Corporation's Registration Statement on Form S-3, filed March 5, 2008).
4.2	First Supplemental Indenture, dated August 19, 2008, by and between Ferro Corporation and U.S. Bank National Association (with Form of 6.50% Convertible Senior Notes due 2013) (incorporated by reference to Exhibit 4.2 to Ferro Corporation's Current Report on Form 8-K, filed August 19, 2008).
4.3	Form of Indenture, by and between Ferro Corporation and Wilmington Trust FSB (incorporated by reference to Exhibit 4.1 to Ferro Corporation's Registration Statement on Form S-3ASR, filed July 27, 2010).

4.4 First Supplemental Indenture, dated August 24, 2010, by and between Ferro Corporation and Wilmington Trust FSB (with Form of 7.875% Senior Notes due 2018) (incorporated by reference to Exhibit 4.1 to Ferro Corporation's Current Report on Form 8-K, filed August 24, 2010).

4.5 Second Supplemental Indenture, dated July 31, 2014, by and between Ferro Corporation and Wilmington Trust, National Association (incorporated by reference to Exhibit 4.1 to Ferro Corporation's Current Report on Form 8-K, filed August 5, 2014).

The Company agrees, upon request, to furnish to the U.S. Securities and Exchange Commission a copy of any instrument authorizing long-term debt that does not authorize debt in excess of 10% of the total assets of the Company and its subsidiaries on a consolidated basis.

10 Material Contracts:

10.1 Credit Agreement, dated as of July 31, 2014, among Ferro Corporation, the lenders party thereto, PNC Bank, National Association, as the administrative agent, collateral agent and a letter of credit issuer, JPMorgan Chase Bank N.A., as the syndication agent and as a letter of credit issuer, and the various financial institutions and other persons from time to time party hereto (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed August 5, 2014).

10.2 Incremental Assumption Agreement, dated January 25, 2016, by and among Ferro Corporation , PNC Bank, National Association, as the administrative agent, the collateral agent and as an issuer, JPMorgan Chase Bank, N.A., as an issuer, and various financial institutions as lenders (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K filed January 26, 2016).

10.3 Second Incremental Assumption Agreement, dated August 29, 2016, by and among Ferro Corporation, PNC Bank, National Association, as the administrative agent, the collateral agent and as an issuer, JPMorgan Chase Bank, N.A., as an issuer, and various financial institutions as lenders. (incorporated by reference to Exhibit 4.1 to Ferro Corporation's current Report on Form 8K, filed August 30, 2016).

10.4 Retention Agreement, dated September 1, 2016, by and between Jeffrey L. Rutherford and Ferro Corporation (incorporated by reference to Exhibit 10.2 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended September 30, 2016).*

10.5 Third Amendment to Third Amended and Restated Credit Agreement, dated March 28, 2013, by and among Ferro Corporation, certain of Ferro Corporation's subsidiaries, PNC Bank, National Association, as the Administrative Agent and the Collateral Agent, and various financial institutions as Lenders (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed March 28, 2013).

10.6 Second Amendment to Third Amended and Restated Credit Agreement, dated June 15, 2012, by and among Ferro Corporation, certain of Ferro Corporation's subsidiaries, PNC Bank, National Association, as the Administrative Agent and the collateral Agent, and various financial institutions as Lenders (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed June 19, 2012).

10.7 First Amendment to Third Amended and Restated Credit Agreement, Amended and Restated Pledge and Security Agreement and Amended and Restated Subsidiary Guaranty (Domestic) (incorporated by reference to Exhibit 3.1 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2011).

10.8 Third Amended and Restated Credit Agreement, dated August 24, 2010, by and among Ferro Corporation, PNC Bank, National Association, as the Administrative Agent, the Collateral Agent and the Issuer, and JPMorgan Chase Bank, N.A. and Bank of America, N.A., as the Syndication Agents (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed August 24, 2010).

10.9	First Amendment to Second Amended and Restated Credit Agreement, dated July 26, 2010, by and among Ferro Corporation, the several banks and other financial institutions or entities listed on the signature pages hereto as Lenders, Credit Suisse AG, Cayman Islands Branch, as Original Term Loan Administrative Agent, and PNC Bank, National Association, as New Term Loan Administrative Agent and as Revolving Loan Administrative Agent (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed July 27, 2010).
10.10	Second Amended and Restated Credit Agreement, dated October 26, 2009, among Ferro Corporation and certain of its subsidiaries; various financial institutions; Credit Suisse, Cayman Islands Branch; PNC Bank, National Association; National City Bank; KeyBank National Association; and Citigroup Global Markets, Inc. (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed October 27, 2009).
10.11	Amendment and Restatement and Resignation and Appointment Agreement, dated October 26, 2009, among Ferro Corporation; the several banks and other financial institutions or entities listed on the signature pages thereto; Credit Suisse, Cayman Islands Branch,; National City Bank; and PNC Bank, National Association (incorporated by reference to Exhibit 10.2 to Ferro Corporation's Current Report on Form 8-K, filed October 27, 2009).
10.12	Second Amendment to Purchase and Contribution Agreement by and between Ferro Corporation and Ferro Finance Corporation (incorporated by reference to Exhibit 10.2 to Ferro Corporation's Current Report on Form 8-K, filed March 29, 2013).
10.13	First Amendment to Purchase and Contribution Agreement, dated as of May 31, 2011, between Ferro Corporation and Ferro Finance Corporation (incorporated by reference to Exhibit 10.2 to Ferro Corporation's Current Report on Form 8-K, filed June 3, 2011).
10.14	Purchase and Contribution Agreement, dated June 2, 2009, between Ferro Corporation and Ferro Finance Corporation (incorporated by reference to Exhibit 10.2 to Ferro Corporation's Current Report on Form 8-K, filed June 3, 2009).
10.15	Fourth Amendment to Amended and Restated Receivables Purchase Agreement, dated as of September 20, 2013, by and among PNC Bank, National Association, Ferro Finance Corporation and Market Street Funding LLC (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Quarter Report on Form 10-Q for the quarter ended September 30, 2013.
10.16	Third Amendment to Amended and Restated Receivables Purchase Agreement, dated as of May 28, 2013, among Ferro Finance Corporation, Ferro Corporation, Market Street Funding LLC and PNC Bank, National Association (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed May 30, 2013).
10.17	Second Amendment to Amended and Restated Receivables Purchase Agreement among Ferro Finance Corporation, Ferro Corporation, Market Street Funding LLC and PNC Bank, National Association, as Agent and LC Bank (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed March 29, 2013).
10.18	First Amendment to Amended and Restated Receivables Purchase Agreement, dated as of May 29, 2012, among Ferro Finance Corporation, Ferro Corporation, Market Street Funding, LLC, and PNC Bank, National Association (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed May 31, 2012).
10.19	Amended and Restated Receivables Purchase Agreement, dated as of May 31, 2011, among Ferro Finance Corporation, Ferro Corporation, Market Street Funding, LLC, and PNC Bank, National Association (incorporated by reference to Exhibit 10.3 to Ferro Corporation's Current Report on Form 8-K, filed June 3, 2011).
10.20	Ferro Corporation Employee Stock Option Plan (incorporated by reference to Exhibit 10.13 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2011).*

10.21 Ferro Corporation 2003 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.16 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.22 Form of Terms of Incentive Stock Option Award Grants under the Ferro Corporation 2003 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.17 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.23 Form of Terms of Performance Share Awards under the Ferro Corporation 2003 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.18 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.24 Ferro Corporation 2006 Long-Term Incentive Plan (incorporated by reference to Exhibit 10.17 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2011).*

10.25 Form of Terms of Performance Share Awards under the Ferro Corporation 2003 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.18 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.26 Form of Terms of Nonstatutory Stock Option Grants under the Ferro Corporation 2006 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.21 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.27 Form of Terms of Performance Share Awards under the Ferro Corporation 2006 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.22 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.28 Form of Terms of Restricted Share Awards under the Ferro Corporation 2006 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.23 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.29 Form of Terms of Deferred Stock Unit Awards under the Ferro Corporation 2013 Omnibus Incentive Plan (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2014).*

10.30 Form of Terms of Deferred Stock Unit Awards under the Ferro Corporation 2006 Long-Term Incentive Compensation Plan (incorporated by reference to Exhibit 10.24 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2008).*

10.31 Ferro Corporation 2010 Long-Term Incentive Plan (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed May 6, 2010).*

10.32 Form of Terms of Nonstatutory Stock Option Grants under the Ferro Corporation 2010 Long-Term Incentive Plan (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2012).*

10.33 Form of Terms of Performance Share Unit Awards under the Ferro Corporation 2010 Long-Term Incentive Plan (incorporated by reference to Exhibit 10.2 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2012).*

10.34 Form of Terms of Restricted Share Unit Awards under the Ferro Corporation 2010 Long-Term Incentive Plan (incorporated by reference to Exhibit 10.3 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2012).*

10.35 Ferro Corporation 2013 Omnibus Incentive Plan (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed May 23, 2013).*

10.36 Form of Terms of Nonstatutory Stock Options Grants under the Ferro Corporation 2013 Omnibus Incentive Plan (incorporated by reference to Exhibit 10.5 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2013.*

10.37	Form of Terms of Performance Share Unit Awards under the Ferro Corporation 2013 Omnibus Incentive Plan (incorporated by reference to Exhibit 10.6 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2013.*
10.38	Form of Terms of Restricted Share Unit Awards under the Ferro Corporation 2013 Omnibus Incentive Plan (incorporated by reference to Exhibit 10.7 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2013.*
10.39	Terms of Retention Restricted Stock Units Award for Mr. Peter T. Thomas (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed on December 30, 2014).*
10.40	Amendment to the Ferro Corporation Deferred Compensation Plan for Executive Employees (incorporated by reference to Exhibit 10.18 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2009).*
10.41	Ferro Corporation Deferred Compensation Plan for Executive Employees (incorporated by reference to Exhibit 10.28 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2012).*
10.42	Ferro Corporation Deferred Compensation Plan for Non-Employee Directors (incorporated by reference to Exhibit 10.29 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2012).*
10.43	Ferro Corporation Deferred Compensation Plan for Non-Employee Directors Trust Agreement (incorporated by reference to Exhibit 10.26 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2011).*
10.44	Ferro Corporation Supplemental Defined Benefit Plan for Executive Employees (incorporated by reference to Exhibit 10.31 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2012.*
10.45	Amendment to the Ferro Corporation Supplemental Defined Contribution Plan for Executive Employees (incorporated by reference to Exhibit 10.23 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2009).*
10.46	Ferro Corporation Supplemental Defined Contribution Plan for Executive Employees (incorporated by reference to Exhibit 10.31 to Ferro Corporation's Annual Report on Form 10-K for the year ended December 31, 2012).*
10.47	Form of Indemnification Agreement (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed June 26, 2013).*
10.48	Change in Control Agreement, dated March 22, 2013, between Peter T. Thomas and Ferro Corporation (incorporated by reference to Exhibit 10.5 to Ferro Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31,2013).*
10.49	Form of Change in Control Agreement, dated May 2, 2012, between Jeffrey R. Rutherford and Ferro Corporation (incorporated by reference to Exhibit 10.2 to Ferro's Current Report on Form 8-K filed on December 22, 2010).*
10.50	Form of Change in Control Agreement, dated January 1, 2009 (Mark H. Duesenberg, and Ann E. Killian have entered into this form of change in control agreement) (incorporated by reference to Exhibit 10.2 to Ferro Corporation's Current Report on Form 8-K, filed January 7, 2009).*
10.51	Ferro Corporation Executive Separation Policy (incorporated by reference to Exhibit 10.1 to Ferro Corporation's Current Report on Form 8-K, filed June 28, 2010).*
10.55	Letter Agreement, dated November 12, 2012, between Peter T. Thomas and Ferro Corporation (incorporated by reference to Exhibit 10.41 to Ferro Corporation's Form 10-K for the year ended December 31, 2012).*

10.56	Letter Agreement, dated November 12, 2012, between Jeffry L. Rutherford and Ferro Corporation (incorporated by reference to Exhibit 10.28 to Ferro Corporation's Form 10-K for the year ended December 31, 2012).*
12	Ratio of Earnings to Fixed Charges and Ratio of Earnings to Combined Fixed Charges and Preferred Stock Dividends.
21	List of Subsidiaries.
23.1	Consent of Independent Registered Public Accounting Firm.
31.1	Certification of Principal Executive Officer Pursuant to Rule 13a-14(a)/15d-14(a).
31.2	Certification of Principal Financial Officer Pursuant to Rule 13a-14(a)/15d-14(a).
32.1	Certification of Principal Executive Officer Pursuant to 18 U.S.C. 1350.
32.2	Certification of Principal Financial Officer Pursuant to 18 U.S.C. 1350.
101	XBRL Documents:
101.INS	XBRL Instance Document.**

* Indicates management contract or compensatory plan, contract or arrangement in which one or more Directors and/or executives of Ferro Corporation may be participants.

** In accordance with Rule 406T of Regulation S-T, the XBRL related information in Exhibit 101 to this Annual Report on Form 10-K shall not be deemed to be "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, or otherwise subject to the liability of that section, and shall not be part of any registration statement or other document filed under the Securities Act of 1933 or the Securities Exchange Act of 1934, except as shall be expressly set forth by specific reference in such filing.

To supplement the consolidated financial statements presented in accordance with U.S. GAAP in this Annual Report on Form 10-K, certain non-GAAP financial measures as defined by SEC rules are used in the Shareholders Letter. The non-GAAP measures included in this annual report have been reconciled to the comparable GAAP measures within the tables shown on the following seven pages.

Ferro Corporation and Subsidiaries
Reconciliation of Reported to Adjusted Financials
For the Twelve Months Ended December 31, 2013, 2014, 2015 and 2016
(unaudited)

	Net Sales				Gross Profit					Total SG&A	Operating Income
(Dollars in millions)	**PCG**	**PPO**	**PC**	**Ferro Total**	**PCG**	**PPO**	**PC**	**Other**	**Ferro Total**	**Ferro Total**	**Ferro Total**
						2016					
As Reported from Continuing Operations (GAAP)	$ 371.5	$ 246.8	$ 527.0	$ 1,145.3	$ 133.7	$ 84.3	$ 139.5	$ (6.2)	$ 351.2	$ 241.7	$ 109.5
Special Items:											
Non-GAAP Adjustments[1]					2.6	0.2		5.5	8.3	(33.6)	41.9
Total Special Items	—	—	—	—	2.6	0.2	—	5.5	8.3	(33.6)	41.9
Constant Currency FX Impact[2]											
As Adjusted from Continuing Operations (Non-GAAP measure)	$ 371.5	$ 246.8	$ 527.0	$ 1,145.3	$ 136.4	$ 84.5	$ 139.5	$ (0.7)	$ 359.6	$ 208.1	$ 151.5
						2015					
As Reported from Continuing Operations (GAAP)	$ 376.8	$ 165.2	$ 533.4	$ 1,075.3	$ 128.2	$ 45.7	$ 126.9	$ 0.8	$ 301.7	$ 216.9	$ 84.8
Special Items:											
Sold Business Venezuela			(8.4)	(8.4)			0.7		0.7	(0.1)	0.8
Nubiola Purchase Price Adj (“PPA”)						5.8			5.8	—	5.8
Non-GAAP Adjustments[1]								(1.8)	(1.8)	(28.1)	26.3
Total Special Items	—	—	(8.4)	(8.4)	—	5.8	0.7	(1.8)	4.7	(28.2)	32.9
Constant Currency FX Impact[2]	(4.9)	(0.8)	(34.3)	(40.1)	(1.6)	(0.2)	(7.3)	(0.0)	(9.1)	(4.6)	(4.6)
As Adjusted from Continuing Operations (Non-GAAP measure)	$ 371.8	$ 164.4	$ 490.6	$ 1,026.8	$ 126.6	$ 51.3	$ 120.4	$ (1.0)	$ 297.3	$ 184.1	$ 113.1
						2014					
As Reported from Continuing Operations (GAAP)	$ 407.7	$ 115.4	$ 588.5	$ 1,111.6	$ 135.0	$ 28.5	$ 131.0	$ (9.4)	$ 285.1	$ 286.8	$ (1.7)
Special Items:											
Sold Business Venezuela			(19.8)	(19.8)			(3.4)		(3.4)	(1.8)	(1.6)
Non-GAAP Adjustments[1]								5.7	5.7	(94.6)	100.3
Total Special Items	—	—	(19.8)	(19.8)	—	—	(3.4)	5.7	2.3	(96.3)	98.7
Constant Currency FX Impact[2]	(43.9)	(6.3)	(98.5)	(148.7)	(13.5)	(1.3)	(20.6)	0.5	(35.0)	(20.7)	(14.3)
As Adjusted from Continuing Operations (Non-GAAP measure)	$ 363.8	$ 109.1	$ 470.3	$ 943.1	$ 121.4	$ 27.2	$ 107.0	$ (3.2)	$ 252.4	$ 169.8	$ 82.6
						2013					
As Reported from Continuing Operations (GAAP)	$ 390.0	$ 198.2	$ 600.4	$ 1,188.6	$ 112.8	$ 36.2	$ 134.1	$ (5.5)	$ 277.7	$ 150.8	$ 126.9
Special Items:											
Sold Business Venezuela and Metal Powders & Solar product lines		(83.0)	(19.0)	(102.0)		(6.0)	(3.6)		(9.6)	(5.6)	(3.9)
Non-GAAP Adjustments[1]								4.0	4.0	62.4	(58.4)
Total Special Items	—	(83.0)	(19.0)	(102.0)	—	(6.0)	(3.6)	4.0	(5.6)	56.8	(62.4)
Constant Currency FX Impact[2]	(44.7)	(5.4)	(111.1)	(161.2)	(11.7)	(1.2)	(22.2)	0.1	(35.1)	(24.1)	(11.0)
As Adjusted from Continuing Operations (Non-GAAP measure)	$ 345.3	$ 109.8	$ 470.3	$ 925.4	$ 101.1	$ 29.1	$ 108.3	$ (1.5)	$ 237.0	$ 183.5	$ 53.5

1. Non-GAAP adjustments are associated with several different types of non-recurring items that were recorded in “Cost of sales” and “Selling, general and administrative expenses” during the four years covered in the table from 2013 to 2016. For 2016, the adjustments to “Cost of sales” primarily include amortization of purchase accounting adjustments related to our recent acquisitions and pension and other post-retirement benefit mark-to-market adjustments. The adjustments to “Selling, general and administrative expenses” include legal, professional and other expenses related to certain business development activities as well as fees associated with certain reorganization projects and pensions and other post retirement benefit mark-to-market adjustment. For 2015, the adjustments to “Cost of Sales” primarily include pension and other post-retirement benefit mark-to-market adjustments. The adjustments to “Selling general and administrative expenses” primarily include legal, professional and other expenses related to certain business development activities as well as fees associated with certain reorganization projects and pensions and other post retirement benefit mark-to-market adjustments. For 2014 and 2013, the adjustments include pension and other post-retirement benefit mark-to-market adjustments, certain severance costs, ongoing costs at facilities that were idled, gain/loss on divestitures, proxy contest related costs and certain business development activities, and certain costs related to divested assets and product lines.
2. Reflects the remeasurement of 2015, 2014, and 2013 reported and adjusted results using 2016 average exchange rates, resulting in constant currency comparative figures to 2016 reported and adjusted results.

It should be noted that adjusted net sales, gross profit, selling, general and administrative expenses and operating income referred to above are financial measures not required by, or presented in accordance with, accounting principles generally accepted in the United States (U.S. GAAP). These non-GAAP financial measures should be considered as a supplement to, and not as a substitute for, the financial measures prepared in accordance with U.S. GAAP and a reconciliation of these financial measures to the most comparable U.S. GAAP financial measures is presented. The adjusted items presented above exclude certain special items including certain business development activities, gains/loss on sale of assets, pension and other postretirement benefit mark-to-market adjustments, the amortizations of purchase accounting adjustments related to our recent acquisitions and discontinued operations and other divestitures adjusted for constant currency FX impact. We believe this data provides investors with additional information on the underlying operations and trends of the business and enables period-to-period comparability of financial performance.

Ferro Corporation and Subsidiaries
Reconciliation of Reported to Adjusted EBITDA from Continuing Operations
For the Twelve Months Ended December 31, 2013, 2014, 2015 and 2016
(unaudited)

(Dollars in millions)	2013	2014	2015	2016
Net income (loss) attributable to Ferro Corporation common shareholders (GAAP)	$ 71.9	$ 86.1	$ 64.1	$ (20.8)
Less: Net income (loss) attributable to noncontrolling interests	0.5	0.2	(1.0)	0.9
(Income) loss from discontinued operations, net of income taxes	(8.5)	(94.8)	36.8	64.5
Restructuring and impairment charges	40.9	8.8	9.7	15.9
Other (income) expense, net	(12.4)	16.0	5.2	9.6
Interest expense	20.2	16.3	15.2	21.5
Income tax expense (benefit)	14.3	(34.2)	(45.1)	17.9
Depreciation and amortization	37.7	34.3	42.2	48.2
Less: interest amortization expense and other	(2.9)	(3.1)	(1.1)	(1.4)
Reported EBITDA	**161.6**	**29.5**	**125.8**	**156.3**
Cost of sales adjustments	4.0	5.7	0.8	4.7
SG&A adjustments	(62.4)	94.6	28.1	33.6
Adjusted EBITDA (Non-GAAP measure)	**103.2**	**129.8**	**154.7**	**194.6**
Less: Sold Business Venezuela and Metal Powders & Solar product lines	2.4	1.7	1.8	—
Adjusted EBITDA (Non-GAAP measure) from continuing operations[1]	**$ 100.8**	**$ 128.1**	**$ 152.9**	**$ 194.6**

1. Adjusted EBITDA from continuing operations is net income (loss) attributable to Ferro Corporation common shareholders before the effects of income (loss) attributable to noncontrolling interest, restructuring and impairment charges, other (income) expense net, interest expense, income tax expense, depreciation and amortization, non-GAAP adjustments to cost of sales and non-GAAP adjustments to SG&A, from continuing operations excluding discontinued operations and other divestitures.

It should be noted that adjusted EBITDA from continuing operations is a financial measure not required by, or presented in accordance with, accounting principles generally accepted in the United States (U.S. GAAP). This non-GAAP financial measure should be considered as a supplement to, and not as a substitute for, the financial measures prepared in accordance with U.S. GAAP and a reconciliation of these financial measures to the most comparable U.S. GAAP financial measures is presented. Adjusted EBITDA from continuing operations is net income attributable to Ferro Corporation common shareholders before the effects of net income (loss) attributable to noncontrolling interest, discontinued operations and other divestitures, restructuring and impairment charges, other expense (income), net, interest expense, income tax expense, depreciation and amortization, non-GAAP adjustments to cost of sales and non-GAAP adjustments to SG&A. We believe this data provides investors with additional information on the underlying operations and trends of the business and enables period-to-period comparability of financial performance.

Ferro Corporation and Subsidiaries
Supplemental Information
Constant Currency Schedule of Adjusted Operating Profit (unaudited)

(Dollars in thousands)	Twelve Months Ended December 31,			
	2015	Adjusted 2015[1]	2016	2016 vs Adjusted 2015
Segment net sales				
Performance Coatings	$ 533,370	$ 494,902	$ 526,981	$ 32,079
Performance Colors and Glass	376,769	371,828	371,464	(364)
Pigments, Powders and Oxides	165,202	164,379	246,847	82,468
Total segment net sales	$1,075,341	$1,031,109	$1,145,292	$114,183
Segment adjusted gross profit				
Performance Coatings	$ 129,583	$ 121,761	$ 139,454	$ 17,693
Performance Colors and Glass	128,209	126,573	136,365	9,792
Pigments, Powders and Oxides	45,678	45,492	84,457	38,965
Other costs of sales	(1,017)	(1,017)	(719)	298
Total adjusted gross profit[2]	$ 302,453	$ 292,809	$ 359,557	$ 66,748
Adjusted selling, general and administrative expenses				
Strategic services	107,704	105,059	116,132	11,073
Functional services	67,284	65,371	73,878	8,507
Incentive compensation	4,982	4,763	10,852	6,089
Stock-based compensation	8,868	8,868	7,245	(1,623)
Total adjusted selling, general and administrative expenses[3]	$ 188,838	$ 184,061	$ 208,107	$ 24,046
Adjusted operating profit	$ 113,615	$ 108,748	$ 151,450	$ 42,702
Adjusted operating profit as a % of net sales	10.6%	10.5%	13.2%	

(1) Reflects the remeasurement of 2015 reported and adjusted local currency results using 2016 exchange rates, resulting in constant currency comparative figures to 2016 reported and adjusted results. See the "Reconciliation of Reported Income to Adjusted Income" table for non-GAAP adjustments applicable to the twelve-month comparative periods, respectively.

(2) Refer to the "Reconciliation of Adjusted Gross Profit (unaudited)" table for the reconciliation of gross profit to adjusted gross profit for the twelve months ended December 31, 2016 and 2015, respectively.

(3) Refer to the "Reconciliation of Reported Income to Adjusted Income" table for the reconciliation of SG&A expenses to adjusted SG&A expenses for the twelve months ended December 31, 2016 and 2015, respectively.

It should be noted that the adjusted 2015 results is a financial measure not required by, or presented in accordance with, accounting principles generally accepted in the United States (U.S. GAAP). These non-GAAP financial measures should be considered as a supplement to, and not as a substitute for, the financial measures prepared in accordance with U.S. GAAP and a reconciliation of these financial measures to the most comparable U.S. GAAP financial measures is presented. We believe this data provides investors additional information on the underlying operations and trends of the business and enables period-to-period comparability of financial performance.

Ferro Corporation and Subsidiaries
Supplemental Information
Reconciliation of Reported Income to Adjusted Income
For the Twelve Months Ended December 31 (unaudited)

(Dollars in thousands, except per share amounts)	Cost of sales	Selling general and administrative expenses	Restructuring and impairment charges	Other expense (income), net	Income tax expense (benefit)[4]	Net (loss) income attributable to common shareholders	Diluted (loss) earnings per share
				2016			
As reported	$ 794,075	$ 241,702	$ 15,907	$ 31,163	$ 17,868	$ (20,817)	$ (0.25)
Special items:							
Restructuring	—	—	(15,907)	—	878	15,029	0.2
Pension[1]	(4,548)	(15,595)	—	—	6,713	13,430	0.2
Other[2]	(3,792)	(18,000)	—	(7,240)	8,205	20,827	0.3
Discontinued operations	—	—	—	—	—	64,464	0.8
Total special items[5]	(8,340)	(33,595)	(15,907)	(7,240)	15,796	113,750	1.34
As adjusted	$ 785,735	$ 208,107	$ —	$ 23,923	$ 33,664	$ 92,933	$ 1.09
				2015			
As reported	$ 773,661	$ 216,899	$ 9,655	$ 20,343	$ (45,100)	$ 64,100	$ 0.72
Special items:							
Restructuring	—	—	(9,655)	—	3,132	6,523	0.07
Pension[1]	1,697	(10,428)	—	—	—	8,731	0.10
Other[3]	(2,470)	(17,633)	—	(6,091)	66,017	(39,823)	(0.45)
Discontinued operations	—	—	—	—	—	36,779	0.42
Noncontrolling interest	—	—	—	—	—	(1,453)	(0.02)
Total special items[5]	(773)	(28,061)	(9,655)	(6,091)	69,149	10,757	0.12
As adjusted	$ 772,888	$ 188,838	$ —	$ 14,252	$ 24,049	$ 74,857	$ 0.85

(1) The adjustment relates to pension and other postretirement benefit mark-to-market adjustments.

(2) The adjustments to "Cost of Sales" primarily include amortization of purchase accounting adjustments related to our recent acquisitions. The adjustments to "Selling general and administrative expenses" include legal, professional and other expenses related to certain business development activities, as well as fees associated with certain reorganization projects; and, the adjustments to "Other expense (income), net" primarily relate to the gain on an asset sale that was recognized during the year, to the finalization of the purchase price for the acquisition of Vetriceramici, impacts of currency-related items in Egypt, and the impact of the loss on a foreign currency contract associated with the purchase of Cappelle.

(3) The adjustments to "Cost of sales" relate to impacts of currency-related items in Venezuela; the adjustments to "Selling general and administrative expenses" primarily include legal, professional and other expenses related to certain business development activities, as well as fees associated with certain reorganization projects; and, the adjustments to "Other expense (income), net" primarily relate to impacts of currency-related items in Venezuela and Argentina, loss on sale of assets and the impact of the loss on a foreign currency contract associated with the purchase of Nubiola.

(4) The tax rate reflects the reported tax rate, adjusted for non-GAAP adjustments being tax effected at the respective statutory rate where the item originated.

(5) Due to rounding, total earnings per share related to special items does not always add to the total adjusted earnings per share.

It should be noted that adjusted income, earnings per share and other adjusted items referred to above are financial measures not required by, or presented in accordance with, accounting principles generally accepted in the United States (U.S. GAAP). These non-GAAP financial measures should be considered as a supplement to, and not as a substitute for, the financial measures prepared in accordance with U.S. GAAP and a reconciliation of these financial measures to the most comparable U.S. GAAP financial measures is presented. The adjusted items presented above exclude certain special items including certain business development activities, gains/loss on sale of assets, the impact of currency related items in Venezuela, pension and other postretirement benefit mark-to-market adjustments, the amortizations of purchase accounting adjustments related to our recent acquisitions and discontinued operations. We believe this data provides investors with additional information on the underlying operations and trends of the business and enables period-to-period comparability of financial performance.

Ferro Corporation and Subsidiaries
Supplemental Information
Reconciliation of Net (loss) income attributable to Ferro Corporation common shareholders to Adjusted EBITDA (unaudited)

(Dollars in thousands)	Twelve Months Ended December 31, 2016	2015
Net (loss) income attributable to Ferro Corporation common shareholders	$ (20,817)	$ 64,100
Less: Net income (loss) attributable to noncontrolling interests	930	(996)
Loss from discontinued operations, net of income taxes	64,464	36,779
Restructuring and impairment charges	15,907	9,655
Other expense, net	9,616	5,180
Interest expense	21,547	15,163
Income tax expense (benefit)	17,868	(45,100)
Depreciation and amortization	48,158	42,186
Less: interest amortization expense and other	(1,353)	(1,125)
Cost of sales adjustments[1]	4,721	773
SG&A adjustments[1]	33,595	28,061
Adjusted EBITDA	$ 194,636	$ 154,676
Net sales	$1,145,292	$1,075,341
Adjusted EBITDA as a % of net sales	17.0%	14.4%

(1) For details of Non-GAAP adjustments, refer to the "Reconciliation of Reported Income to Adjusted Income" table for the reconciliation of cost of sales to adjusted cost of sales and SG&A to adjusted SG&A for the twelve months ended December 31, 2016 and 2015, respectively.

It should be noted that adjusted EBITDA is a financial measure not required by, or presented in accordance with, accounting principles generally accepted in the United States (U.S. GAAP). This non-GAAP financial measure should be considered as a supplement to, and not as a substitute for, the financial measures prepared in accordance with U.S. GAAP and a reconciliation of these financial measures to the most comparable U.S. GAAP financial measures is presented. Adjusted EBITDA is net income attributable to Ferro Corporation common shareholders before the effects of net income (loss) attributable to noncontrolling interest, discontinued operations, restructuring and impairment charges, other expense (income), net, interest expense, income tax expense, depreciation and amortization, non-GAAP adjustments to cost of sales and non-GAAP adjustments to SG&A. We believe this data provides investors with additional information on the underlying operations and trends of the business and enables period-to-period comparability of financial performance.

Ferro Corporation and Subsidiaries
Supplemental Information
Adjusted Free Cash Flow from Continuing Operations (unaudited)

	Twelve Months Ended December 31, 2016	Twelve Months Ended December 31, 2015
	As Adjusted	
Adjusted EBITDA[1]	$ 194,636	$ 154,676
Capital expenditures	(24,025)	(20,322)
Working capital	(33,280)	(5,374)
Cash income taxes	(19,734)	(21,364)
Cash interest	(17,486)	(16,188)
Pension	(5,336)	(4,086)
Incentive compensation payments	(8,802)	(14,584)
Other	(1,435)	2,724
Adjusted free Cash Flow from Continuing Operations	84,538	75,482
Discontinued operations	(32,534)	(46,342)
Restructuring/Other	(5,152)	(16,273)
(Outflows) from M&A activity	(149,152)	(223,303)
Stock repurchase	(11,429)	(38,571)
Change in Net Debt	$(113,729)	$(249,007)

(1) See the "Reconciliation of Net (loss) income attributable to Ferro Corporation Common Shareholders to Adjusted EBITDA" table for the reconciliation of net income attributable to Ferro Corporation common shareholders to adjusted EBITDA.

It should be noted that adjusted EBITDA and adjusted free cash flow from continuing operations are financial measures not required by, or presented in accordance with, accounting principles generally accepted in the United States (U.S. GAAP). These non-GAAP financial measures should be considered as a supplement to, and not as a substitute for, the financial measures prepared in accordance with U.S. GAAP and a reconciliation of these financial measures to the most comparable U.S. GAAP financial measures is presented. Adjusted EBITDA is net income before the effects of income (loss) attributable to noncontrolling interest, discontinued operations, restructuring and impairment charges, other expense (income) net, interest expense, income tax expense, depreciation and amortization, non-GAAP adjustments to cost of sales, and non-GAAP adjustments to SG&A. Adjusted Free Cash Flow from Continuing Operations is adjusted EBITDA less capital expenditures, changes in working capital, cash income taxes, cash interest, pension contributions, incentive compensation payments, and other continuing operations cash items. We believe this data provides investors with additional information on the underlying operations and trends of the business and enables period-to-period comparability of financial performance. In addition, these measures are used in the calculation of certain incentive compensation programs for selected employees.

Ferro Corporation and Subsidiaries
Supplemental Information
Reconciliation of Adjusted Gross Profit (unaudited)

(Dollars in thousands)	**Twelve Months Ended December 31,**	
	2016	**2015**
Performance Coatings	$ 526,981	$ 533,370
Performance Colors and Glass	371,464	376,769
Pigments, Powders and Oxides	246,847	165,202
Total net sales	$1,145,292	$1,075,341
Total net sales	$1,145,292	$1,075,341
Adjusted cost of sales[1]	785,735	772,888
Adjusted gross profit	$ 359,557	$ 302,453
Adjusted gross profit percentage	31.4%	28.1%

(1) Refer to the "Reconciliation of Reported Income to Adjusted Income" table for the reconciliation of cost of sales to adjusted cost of sales for the twelve months ended December 31, 2016 and 2015, respectively.

It should be noted that adjusted cost of sales and adjusted gross profit are financial measures not required by, or presented in accordance with, accounting principles generally accepted in the United States (U.S. GAAP). These non-GAAP financial measures should be considered as a supplement to, and not as a substitute for, the financial measures prepared in accordance with U.S. GAAP and a reconciliation of these financial measures to the most comparable U.S. GAAP financial measures is presented. Adjusted gross profit and adjusted cost of sales exclude certain items, primarily comprised of the cost of goods sold portion of the pension and other postretirement benefit mark-to-market adjustments in the twelve months ended December 31, 2016 and 2015, the amortization of purchase accounting adjustments related to our recent acquisitions in the twelve months ended December 31, 2016 and the impact of currency-related items in Venezuela in the twelve months ended December 31, 2015. We believe this data provides investors with additional information on the underlying operations and trends of the business and enables period-to-period comparability of financial performance.

CORPORATE INFORMATION

EXCHANGE LISTING

New York Stock Exchange Common Stock
Stock symbol: FOE

EXECUTIVE OFFICES

Ferro Corporation
6060 Parkland Boulevard
Suite 250
Mayfield Heights, OH 44124
216-875-5600

INVESTOR CONTACT

Kevin Cornelius Grant
Manager, Investor Relations
216-875-5451
Email: investor@ferro.com

FORM 10-K

Ferro Corporation's Form 10-K report filed with the Securities and Exchange Commission for the year ended December 31, 2016, is available to shareholders at no cost at the Company's website (www.ferro.com) or upon request.

AUTOMATIC DIVIDEND REINVESTMENT AND STOCK PURCHASE PLAN

This Plan provides an opportunity for shareholders to purchase additional shares of Ferro common stock by automatic reinvestment of dividends and by optional periodic cash payments.

The Plan is administered by Computershare.

Any questions or correspondence about the Plan should be addressed to:

Computershare
P.O. Box 30170
College Station, TX 77842-3170
Toll Free: 800-622-6757 (U.S., Canada, Puerto Rico)
Toll: 781-575-4735 (Non-U.S.)
Email: web.queries@computershare.com

BROKERAGE ACCOUNTS

To reduce communication delays that exist for some Ferro shareholders who hold their stock in brokerage accounts, the Company will send its various printed communications directly to these shareholders. If you would like to take advantage of this service, please write to:

Treasury Department
Ferro Corporation
6060 Parkland Boulevard
Suite 250
Mayfield Heights, OH 44124, U.S.A.

Please indicate the number of Ferro shares owned and the name and address of the brokerage firm that administers your account.

STOCK TRANSFER AGENT/REGISTRAR AND DIVIDEND DISBURSING AGENT

Computershare
P.O. Box 30170
College Station, TX 77842-3170
Toll Free: 800-622-6757 (U.S., Canada, Puerto Rico)
Toll: 781-575-4735 (Non-U.S.)
Email: web.queries@computershare.com

INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Deloitte & Touche LLP
127 Public Square
Suite 3300
Cleveland, OH 44114

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6060 Parkland Boulevard
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216.875.5600