GRAFTech International

2020

ANNUAL REPORT

MAXIMIZING STEEL PRODUCTIVITY
THROUGH TECHNOLOGY AND SERVICE LEADERSHIP

ABOUT

GRAFTECH

GrafTech International Ltd. is a leading manufacturer of high-quality graphite electrode products essential to the production of electric arc furnace steel and other ferrous and non-ferrous metals. The Company has a competitive portfolio of low cost graphite electrode manufacturing facilities, including three of the highest capacity facilities in the world. We are the only large-scale graphite electrode producer that is substantially vertically integrated into petroleum needle coke, a key raw material for graphite electrode manufacturing. This unique position provides competitive advantages in product quality and cost.

FINANCIAL

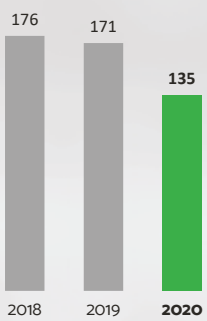
HIGHLIGHTS

Key Financial Measures (dollars in millions, except per share amounts)	2018	2019	**2020**
Net sales	$1,896	$1,791	**$1,224**
Net income	$854	$745	**$434**
Earnings per share [1]	$2.87	$2.58	**$1.62**
Adjusted EBITDA from continuing operations [2]	$1,205	$1,048	**$659**

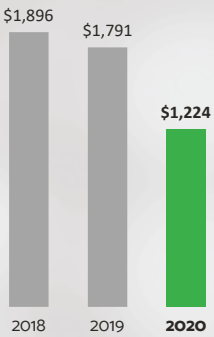
Highlights

Sales volume (in thousand metric tons) [3]	176	171	**135**
Production volume (in thousand metric tons) [4]	179	177	**134**
Operating cash flow (in millions)	$837	$805	**$564**
Capital expenditures (in millions)	$68	$64	**$36**

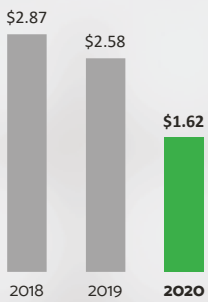
Sales Volume
(in thousand metric tons)



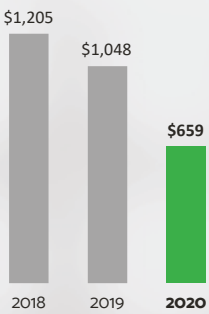
Net Sales
(dollars in millions)



Earnings per Share
(dollars)

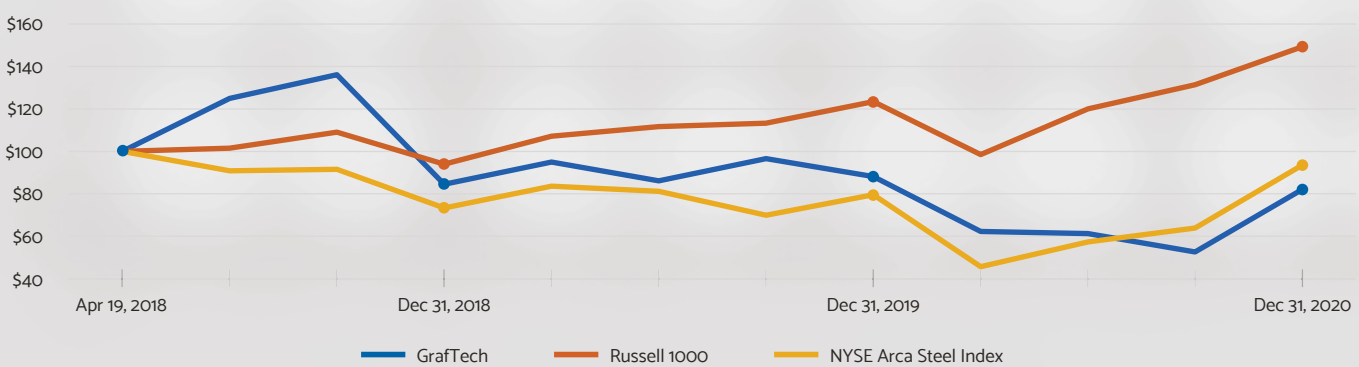


Adjusted EBITDA from Continuing Operations[2]
(dollars in millions)



Stock Performance

The following graph compares the cumulative total shareholder returns of our common shares, the Russell 1000 index and the NYSE Arca Steel index, with dividends assumed to be reinvested when received. The graph assumes the investing of $100 from April 18, 2018 (the date of our IPO) through December 31, 2020. The performance reflected below is not necessarily indicative of future performance.



(1) Earnings per share represents diluted earnings per share. 2018 earnings per share give effect to the 3,022,259.23 to one stock split that occurred on April 12, 2018.
(2) Non-GAAP measure, see pages 43-44 of the enclosed Annual Report on Form 10-K for the year ended December 31, 2020 for reconciliation.
(3) Effective the first quarter of 2019, we have recast the sales volume above to include only graphite electrodes manufactured by GrafTech for which revenue has been recognized during the period. This better reflects management's assessment of our profitability and excludes resales of low grade graphite electrodes manufactured by third party suppliers. For comparability purposes, the prior period has been recast to conform to this presentation.
(4) Production volume reflects graphite electrodes produced during the period.

LETTER TO STOCKHOLDERS

David J. Rintoul
President and Chief Executive Officer

Fellow Stockholders,

As I reflect upon 2020, I would like to acknowledge and thank our global team for their tireless work, diligence and commitment to our culture of continuous improvement in responding to the challenges faced during the year. We significantly improved our safety track record, remained fully operational while maintaining excellent customer service levels, delivered strong financial results and strengthened our balance sheet in 2020.

Our culture of continuous improvement is exemplified by our core value of health and safety excellence, which remains a top priority. Our 2020 total recordable injury rate improved to 0.51, a 46% improvement over 2019, continuing our improving trend over the past three years. I am very proud of the persistence of our team as we work to reach our ultimate goal of every employee going home safely every day.

2020 Results

In 2020, we delivered another year of strong results, including $434 million of net income, $1.62 of earnings per share, $659 million of adjusted EBITDA(1) and $564 million of cash flow from operations. Our full year adjusted EBITDA margins were 54%(2). Additionally, we converted 80% of our adjusted EBITDA for the year into free cash flow(3) of $528 million.

We also made significant progress strengthening our capital structure in 2020 by continuing our commitment to reduce debt and maintain balance sheet flexibility. Over the course of the year, we reduced debt by $400 million and improved the maturity profile of our long-term debt. We issued $500 million of 4.625% senior secured notes due December 2028 and used the proceeds from those notes to repay a portion of our secured term loans due February 2025. This effectively extended the maturity of $500 million of our long-term debt by nearly four years, further enhancing our financial flexibility.

Operationally, we continued to capitalize on our competitive advantages, including our substantial vertical integration into petroleum needle coke, our low cost structure, and the services and solutions we provide our customers. We sold 135 thousand metric tons of graphite electrodes in 2020 and worked extremely hard to serve our customers and develop mutually beneficial solutions to certain of the challenges they faced. Our plants remained operational throughout the year, meeting all of our customer requirements and achieving an on-time delivery rate of 97%.

Further, we are proud of the progress we made in our sustainability initiatives in 2020. Our sustainability strategy encompasses activities as varied as our community involvement and outreach in Monterrey, Mexico, our capture of energy generated at our Seadrift Coke facility to create an additional source of electricity for the area, and our emission reduction efforts that include the installation of control technology on the equipment at our sites. We are fully committed to advancing these efforts across our global organization. We also launched our inaugural sustainability report in September 2020 and expect to issue the report on an annual basis.

Future Outlook

We are seeing a recovery in the global steel markets with improvement in steel pricing and capacity utilization rates. Assuming that the strength in the steel industry continues, we expect the graphite electrode industry to improve in the second half of 2021, and we are well positioned to serve our customers in these improving market conditions.

In 2021, we anticipate another year of significant cash flow generation. We expect to use the majority of our cash flow to further strengthen our balance sheet and began the year repaying $150 million of our term loan in February. We also plan to reinvest in our business during the year, both through maintaining our high quality, low cost global operating assets and targeting high return operational improvements.

As we look forward, the long-term outlook remains strong for our business. The environmental and economic advantages of electric arc furnace (EAF) steel production positions both that industry and the graphite electrode industry for growth as the global shift to EAF steel production continues. Our product is a mission-critical component to the EAF steel industry with no known substitute, and we have a sustainable competitive advantage from our low cost structure and vertical integration into our key raw material, petroleum needle coke.

In closing, we again thank our global team members and their families for their contributions. Our success in 2020 would not have been possible without their efforts. We also thank our stockholders, customers, and communities for your continued support. Please know that we appreciate and value your continued investment, confidence and partnership with GrafTech. I look forward to another safe and profitable year ahead.

David J. Rintoul
President and Chief Executive Officer
March 17, 2021

(1) Non-GAAP measure, see pages 43-44 of the enclosed Annual Report on Form 10-K for the year ended December 31, 2020 for reconciliation.
(2) Non-GAAP measure, Adjusted EBITDA margin is calculated as Adjusted EBITDA divided by net sales (2020 Adjusted EBITDA of $659 million/2020 net sales of $1.224 billion).
(3) Non-GAAP measure, free cash flow is calculated as net cash provided by operating activities less capital expenditures (2020 net cash provided by operating activities of $564 million – 2020 capital expenditures of $36 million). Free Cash Flow conversion is calculated as Free Cash Flow divided by Adjusted EBITDA (2020 Free Cash Flow of $528 million/2020 Adjusted EBITDA of $659 million).

Statements regarding the Company that are not historical facts are "forward-looking statements" that involve risks and uncertainties. Certain of the risks and uncertainties to which the Company is subject are described in the "Forward Looking Statements" and "Risk Factors" sections of the enclosed Form 10-K and the Company's other applicable filings with the Securities and Exchange Commission. See pages 4-6 and 19-34 of the enclosed 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, 2020

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: 1-13888

GRAFTech International

GRAFTECH INTERNATIONAL LTD.

(Exact name of registrant as specified in its charter)

Delaware	27-2496053
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification Number)
982 Keynote Circle Brooklyn Heights, Ohio	44131
(Address of principal executive offices)	(Zip Code)

Registrant's telephone number, including area code: (216) 676-2000

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, $0.01 par value per share	**EAF**	**New York Stock Exchange**

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

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

Yes ☒ No ☐

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

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

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

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

Large accelerated filer ☐ Accelerated filer ☒ Non-accelerated filer ☐

Smaller reporting company ☐ Emerging growth company ☐

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

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report.☒

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

The aggregate market value of the voting and non-voting common stock held by non-affiliates of the registrant as of June 30, 2020 was $542.4 million, based on the closing price of the registrant's common stock as reported on the New York Stock Exchange as of the last business day of the registrant's most recently completed second quarter.

On February 16, 2021, 267,191,799 shares of our common stock were outstanding, par value $0.01 per share.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the definitive proxy statement (the "Definitive Proxy Statement") to be filed with the Securities and Exchange Commission relative to the registrant's 2021 Annual Meeting of Stockholders are incorporated by reference into Part III of this Report.

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References herein to the "Company", "we", "our", or "us" refer collectively to GrafTech International Ltd. and its subsidiaries.

Presentation of Financial, Market and Legal Data

We present our financial information on a consolidated basis. Unless otherwise noted, when we refer to dollars, we mean U.S. dollars.

Certain market and industry data included in this Annual Report on Form 10-K for the year ended December 31, 2020 (the "Annual Report" or "report") has been obtained from third-party sources that we believe to be reliable. Market estimates are calculated by using independent industry publications, government publications and third-party forecasts in conjunction with our assumptions about our markets. We have not independently verified such third-party information. We cannot guarantee the accuracy or completeness of this market and market share data and have not independently verified it. None of the sources has consented to the disclosure or use of data in this Annual Report. While we are not aware of any misstatements regarding any market, industry or similar data presented herein, such data involves risks and uncertainties and is subject to change based on various factors, including those discussed under the headings "Forward-Looking Statements" and "Risk Factors" in this Annual Report.

Forward-Looking Statements

Some of the statements under "Management's Discussion and Analysis of Financial Condition and Results of Operations," and elsewhere in this report may contain forward-looking statements that reflect our current views with respect to, among other things, future events and financial performance. You can identify these forward-looking statements by the use of forward-looking words such as "will," "may," "plan," "estimate," "project," "believe," "anticipate," "expect," "foresee", "intend," "should," "would," "could," "target," "goal," "continue to," "positioned to," "are confident", or the negative versions of those words or other comparable words. Any forward-looking statements contained in this report are based upon our historical performance and on our current plans, estimates and expectations considering information currently available to us. The inclusion of this forward-looking information should not be regarded as a representation by us that the future plans, estimates, or expectations contemplated by us will be achieved. Our expectations and targets are not predictions of actual performance and historically our performance has deviated, often significantly, from our expectations and targets. These forward-looking statements are subject to various risks and uncertainties and assumptions relating to our operations, financial results, financial condition, business, prospects, growth strategy and liquidity. Accordingly, there are or will be important factors that could cause our actual results to differ materially from those indicated in these statements. We believe that these factors include, but are not limited to:

- the ultimate impact that the COVID-19 pandemic has on our business, results of operations, financial condition and cash flows;
- the cyclical nature of our business and the selling prices of our products may lead to periods of reduced profitability and net losses in the future;
- the possibility that we may be unable to implement our business strategies, including our ability to secure and maintain longer-term customer contracts, in an effective manner;
- the risks and uncertainties associated with litigation, arbitration, and like disputes, including the recently filed stockholder litigation and disputes related to contractual commitments;
- the possibility that global graphite electrode overcapacity may adversely affect graphite electrode prices;
- pricing for graphite electrodes has historically been cyclical and the price of graphite electrodes may continue to decline in the future;
- the sensitivity of our business and operating results to economic conditions and the possibility others may not be able to fulfill their obligations to us in a timely fashion or at all;
- our dependence on the global steel industry generally and the electric arc furnace steel industry in particular;
- the competitiveness of the graphite electrode industry;
- our dependence on the supply of petroleum needle coke;
- our dependence on supplies of raw materials (in addition to petroleum needle coke) and energy;

- our manufacturing operations are subject to hazards;
- changes in, or more stringent enforcement of, health, safety and environmental regulations applicable to our manufacturing operations and facilities;
- the legal, compliance, economic, social and political risks associated with our substantial operations in multiple countries; the possibility that fluctuation of foreign currency exchange rates could materially harm our financial results;
- the possibility that our results of operations could deteriorate if our manufacturing operations were substantially disrupted for an extended period, including as a result of equipment failure, climate change, regulatory issues, natural disasters, public health crises, such as the COVID-19 pandemic, political crises or other catastrophic events;
- our dependence on third parties for certain construction, maintenance, engineering, transportation, warehousing and logistics services;
- the possibility that we are unable to recruit or retain key management and plant operating personnel or successfully negotiate with the representatives of our employees, including labor unions;
- the possibility that we may divest or acquire businesses, which could require significant management attention or disrupt our business;
- the sensitivity of goodwill on our balance sheet to changes in the market;
- the possibility that we are subject to information technology systems failures, cybersecurity attacks, network disruptions and breaches of data security;
- our dependence on protecting our intellectual property;
- the possibility that third parties may claim that our products or processes infringe their intellectual property rights;
- the possibility that significant changes in our jurisdictional earnings mix or in the tax laws of those jurisdictions could adversely affect our business;
- the possibility that our indebtedness could limit our financial and operating activities or that our cash flows may not be sufficient to service our indebtedness;
- the possibility that restrictive covenants in our financing agreements could restrict or limit our operations;
- the fact that borrowings under certain of our existing financing agreements subject us to interest rate risk;
- the possibility of a lowering or withdrawal of the ratings assigned to our debt;
- the possibility that disruptions in the capital and credit markets could adversely affect our results of operations, cash flows and financial condition, or those of our customers and suppliers;
- the possibility that highly concentrated ownership of our common stock may prevent minority stockholders from influencing significant corporate decisions;
- the possibility that we may not pay cash dividends on our common stock in the future;
- the fact that our stockholders have the right to engage or invest in the same or similar businesses as us;
- the possibility that the market price of our common stock could be negatively affected by sales of substantial amounts of our common stock in the public markets, including by Brookfield Asset Management Inc. and its affiliates;
- the fact that certain provisions of our Amended and Restated Certificate of Incorporation and our Amended and Restated By-Laws could hinder, delay or prevent a change of control;
- the fact that the Court of Chancery of the State of Delaware will be the exclusive forum for substantially all disputes between us and our stockholders; and
- the loss of our status as a "controlled company" within the meaning of the New York Stock Exchange corporate governance standards which will result in us no longer qualifying for exemptions from certain corporate governance requirements.

These factors should not be construed as exhaustive and should be read in conjunction with the risk factors and other cautionary statements that are included in this report. The forward-looking statements made in this report relate only to events as of the date on which the statements are made. We do not undertake any obligation to publicly update or review any forward-looking statement except as required by law, whether as a result of new information, future developments or otherwise.

If one or more of these or other risks or uncertainties materialize, or if our underlying assumptions prove to be incorrect, our actual results may vary materially from what we may have expressed or implied by these forward-looking statements. We caution that you should not place undue reliance on any of our forward-looking statements. You should specifically consider the factors identified in this report that could cause actual results to differ before making an investment decision to purchase our common stock. Furthermore, new risks and uncertainties arise from time to time, and it is impossible for us to predict those events or how they may affect us.

For a more complete discussion of these and other factors, see "Risk Factors" in Part I of this report.

Item 1. Business

Our company

GrafTech International Ltd. is a leading manufacturer of high-quality graphite electrode products essential to the production of electric arc furnace ("EAF") steel and other ferrous and non-ferrous metals. We believe that we have the most competitive portfolio of low-cost ultra-high power ("UHP") graphite electrode manufacturing facilities in the industry, including three of the highest capacity facilities in the world. We are the only large scale graphite electrode producer that is substantially vertically integrated into petroleum needle coke, a key raw material for graphite electrode manufacturing. This unique position provides us with competitive advantages in product quality and cost. Founded in 1886, we have 135 years of experience in the research and development ("R&D") of graphite- and carbon-based solutions, and our intellectual property portfolio is extensive. We currently have graphite electrode manufacturing facilities in Calais, France, Pamplona, Spain, Monterrey, Mexico and St. Marys, Pennsylvania. Our customers include major steel producers and other ferrous and non-ferrous metal producers in Europe, Russia and other Commonwealth of Independent States countries, the Middle East and Africa (collectively, "EMEA"), the Americas and Asia-Pacific ("APAC"), which sell their products into the automotive, construction, appliance, machinery, equipment and transportation industries. Our vision is to provide highly engineered graphite electrode services, solutions and products to EAF operators. Based on the high-quality of our graphite electrodes, reliability of our petroleum needle coke supply and our excellent customer service, we believe that we are viewed as a preferred supplier to the global EAF steel producer market.

Graphite electrodes are an industrial consumable product used primarily in EAF steel production, one of the two primary methods of steel production and the steelmaking technology used by all "mini-mills." Electrodes act as conductors of electricity in the furnace, generating sufficient heat to melt scrap metal, iron ore or other raw materials used to produce steel or other metals. We estimate that, on average, the cost of graphite electrodes represents only approximately 1% to 5% of the total production cost of steel in a typical EAF, but they are essential to EAF steel production. Graphite electrodes are currently the only known commercially available products that have the high levels of electrical conductivity and the capability to sustain the high levels of heat generated in EAF steel production. As a result, EAF steel manufacturers require a reliable supply of high-quality graphite electrodes. Graphite electrodes are also used in steel refining in ladle furnaces and in other processes, such as the production of titanium dioxide, stainless steel, aluminum, silicon metals and other ferrous and non-ferrous metals.

With the growth of EAF production, electrode production has become focused on the manufacture of UHP electrodes. The production of UHP electrodes requires an extensive proprietary manufacturing process and material science knowledge, including the use of higher quality needle coke blends. We primarily compete in the UHP graphite electrode market.

Petroleum needle coke, a crystalline form of carbon derived from decant oil, is the key raw material we use in the production of graphite electrodes. We achieved substantial vertical integration with this critical raw material source through our acquisition of Seadrift Coke L.P. ("Seadrift") in November 2010, significantly reducing our reliance on other suppliers. The petroleum needle coke industry is highly concentrated. We believe Seadrift is one of the largest petroleum needle coke producers in the world. We also believe that the quality of Seadrift's petroleum needle coke is superior for graphite electrode production compared to most of the petroleum needle coke available to our peers on the open market, allowing us to produce high-quality electrodes in a cost-efficient manner. Additionally, we believe that this vertical integration provides a significant cost advantage relative to our competitors.

As a leading producer of graphite electrodes, we believe we are well-positioned to be a key provider to the EAF steel making industry. In 2018, we completed an operational improvement and debottlenecking initiative to increase production capacity at our three primary operating facilities in Calais, France, Pamplona, Spain, and Monterrey, Mexico, by approximately

20% to a total of 202,000 metric tons ("MT").[1] We have begun a series of projects at our Monterrey and St. Marys facilities that will shift graphitization and machining of additional volume of semi-finished product from Monterrey to St. Marys. We expect these projects will further optimize our manufacturing footprint by improving environmental performance and production flexibility at both facilities and also leverage cost efficiencies at our St. Marys facility.

Graphite electrodes are an essential consumable in the EAF steel production process and require a long lead time to manufacture, and our strategic customers are highly focused on securing certainty of supply of reliable, high-quality graphite electrodes. We believe we are uniquely capable among graphite electrode producers to pursue our long-term take-or-pay contracting strategy due to our substantial vertical integration into petroleum needle coke production.

On August 15, 2015, we became an indirect wholly owned subsidiary of Brookfield Asset Management Inc. (together with its affiliates, "Brookfield"). In April 2018, we completed our initial public offering ("IPO"). Our common stock is listed on the NYSE under the symbol "EAF." Brookfield owned approximately 55.3% of our common stock as of December 31, 2020 and 47.8% as of February 16, 2021.

Our executive offices are located at 982 Keynote Circle, Brooklyn Heights, Ohio 44131 and our telephone number is (216) 676-2000. Our website address is www.graftech.com. Information on, or accessible through, our website is not part of this Annual Report. We have included our website address only as an inactive textual reference and do not intend it to be an active link to our website.

Competitive strengths

We are one of the largest producers of graphite electrodes in the world, accounting for approximately a quarter of global production capacity (excluding China), and we believe our strategically positioned global footprint provides us with competitive advantages.

We believe our facilities are among the most strategically located and lowest cost, large-scale graphite electrode manufacturing plants in the world. Of the graphite electrode manufacturing facilities currently operating, we estimate that our three primary operating manufacturing facilities represent approximately a quarter of estimated production capacity for graphite electrodes outside of China, making us a critical supplier to global EAF steel manufacturers. Our manufacturing facilities are located in the Americas and EMEA, providing us with access to low-cost and reliable energy sources, logistical and freight advantages in sourcing raw materials and shipping our graphite electrodes to our customers compared to our competitors, and excellent visibility into the large North American and European EAF steelmaking markets. Our experience in producing graphite electrodes for a varied global customer base positions us to meet customer requirements across a range of product types and quality levels, including support and technical services, further distinguishing us from our competitors.

We are a pure-play provider of an essential consumable for EAF steel producers, the fastest-growing sector of the steel industry.

According to the World Steel Association ("WSA"), since 2000, EAF steelmaking grew at an annual pace of approximately 3%, compared with 1% for steelmaking overall, excluding China. As a result of the increasing global availability of steel scrap and the more resilient, high-variable cost and environmentally friendly EAF model, we expect EAF steel producers to continue to grow at a faster rate than blast oxygen furnace ("BOF") producers globally. Additionally, EAF steel producers are increasingly able to utilize higher quality scrap and iron units, their two primary raw materials, to produce higher quality steel grades and capture market share from BOF producers, while maintaining a favorable cost structure. The EAF method produces approximately 25% of the carbon dioxide ("CO_2") emissions of a BOF facility and does not require the smelting of virgin iron ore or the burning of coal. Additionally, as a result of significantly increased steel production in China since 2000, the supply of Chinese scrap is expected to increase substantially, which may result in lower scrap prices and provide the Chinese steel manufacturing industry with local scrap feedstock that was not historically available. We believe these trends will allow EAF steel producers to increase their market share and grow at a faster rate than BOF steel producers resulting in increasing demand for graphite electrodes.

We believe we have the industry's most efficient production platform of high production capacity assets with substantial vertical integration.

Over the past decade, we have rationalized inefficient plants during the downturn and more recently completed a manufacturing footprint optimization program. We believe that the optimization of our graphite electrode plant network will continue to drive improved fixed cost absorption. Moreover, our Calais, Pamplona, Monterrey and St. Marys facilities each provides unique cost advantages given its scale and access to low cost, reliable energy sources.

Seadrift provides a substantial portion of our petroleum needle coke supply needs internally at a competitive cost and allows us to maximize capacity utilization more efficiently than competitors, who may be more constrained by a limited or

[1] Production capacity reflects expected maximum production volume during the period under normal operating conditions, standard product mix and expected maintenance outage. Actual production may vary.

costly petroleum needle coke supply. Seadrift is one of only five petroleum needle coke facilities in the world outside of China, and we believe it is one of the largest petroleum needle coke producers in the world.

We are the only petroleum needle coke producer in the world specifically focused on the production of graphite electrodes.

Our production of petroleum needle coke specifically for graphite electrodes provides us the opportunity to produce super premium petroleum needle coke of the highest quality and allows us to tailor graphite electrodes for customer requirements. Seadrift has approximately 140,000 MT of petroleum needle coke production capacity, which we believe makes it one of the largest petroleum needle coke producers in the world. Sourcing the majority of our petroleum needle coke internally allows us to offer our customers certainty of supply, further enhancing our competitive position and supporting our long-term take-or-pay contracts strategy. To align with our long-term contract profile, we have hedged the decant oil required to produce substantially all of the graphite electrodes sold under these contracts, providing us with substantial visibility into our future raw material costs. We believe our use of petroleum needle coke is a further competitive advantage, as the use of pitch needle coke, an alternative raw material, results in longer bake times during graphite electrode production.

We provide highly engineered graphite electrode products and are competitively positioned to provide services and solutions to EAF operators.

We utilize our own R&D facility as well as process engineers located at plant sites to constantly work at process and product improvements. This work has yielded the development of new products over the last 18 months, which have improved our competitive position. In addition, we believe that our ArchiTech Furnace Productivity System ("ArchiTech") continues to provide a competitive advantage. ArchiTech, which has been installed at customer furnaces around the world, enables our engineers to work with our customers seamlessly to maximize the performance of their furnaces and provide real-time diagnostics and troubleshooting. This remote functionality has been particularly helpful during the COVID-19 pandemic. We believe our customers value our high-quality products and customer service, which subsequently improves our commercial opportunities.

Our experienced executive leadership and general managers and flexible workforce have positioned us for future earnings growth.

Our seasoned leadership is committed to earnings growth. Our executive and manufacturing leadership have led manufacturing companies through many cycles and are focused on positioning us for profitable growth in any environment. We have undertaken strategic investments to increase our production capacity in a capital-efficient manner while reducing our cost position.

Graphite electrode industry

EAF steel producers are the primary consumers of graphite electrodes. The size of the electrodes varies depending on the size of the furnace, the size of the furnace's electric transformer and the planned productivity of the furnace. In a typical furnace using alternating electric current and operating at a typical number of production cycles per day, three electrodes are fully consumed (requiring the addition of new electrodes), on average, every 8 to 10 operating hours. UHP graphite electrodes are consumed at a rate of approximately 1.7 kilograms per MT of steel production in EAF facilities.

The actual rate of consumption and addition of electrodes for a particular furnace depends primarily on the efficiency and productivity of the furnace. Therefore, demand for graphite electrodes is directly related to the amount and efficiency of EAF steel production. EAF steel production requires significant heat (as high as 5,000° F) to melt the raw materials, primarily scrap metal, in the furnace. Heat is generated as electricity (as much as 150,000 amps) passes through the electrodes and creates an electric arc between the electrodes and the raw materials.

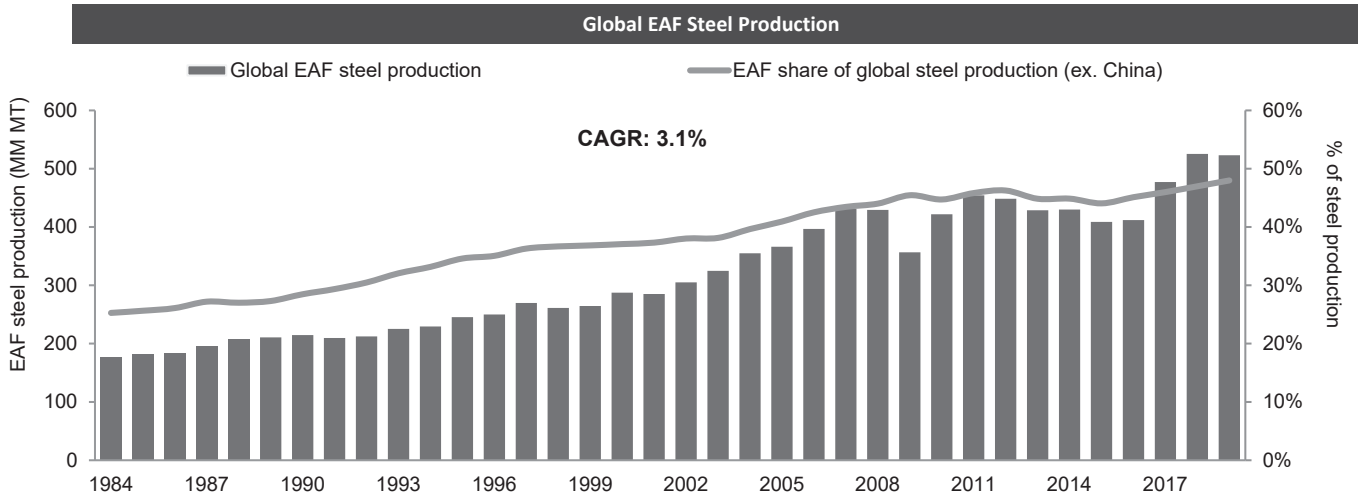
The industry is fairly consolidated, particularly outside of China. The five largest global producers in the industry are Showa Denko K.K., GrafTech, Fangda Carbon New Material Technology Co. LTD, Tokai Carbon Co., Ltd. and Graphite India Limited.

Supply trends

We estimate that from 2014 to 2016, the industry closed or repurposed approximately 20% of global production capacity outside of China, consisting of smaller, higher cost facilities. Based on our experience, high capacity manufacturing facilities can have a significant operating cost advantage as compared to low capacity manufacturing facilities, encouraging producers to consolidate facilities in order to reduce costs. We believe the majority of the production capacity reduction was permanent due to the demolition, long-term environmental remediation and repurposing of most of these lower capacity facilities. Notwithstanding the current market challenges, the consolidation and production capacity reductions in the graphite electrode industry, along with the EAF steel industry's recovery since 2016, lead us to believe that the graphite electrode industry will resume its long-term growth trajectory as the global steel industry recovers from the pandemic.

Demand trends

Our graphite electrodes are primarily used in the EAF steelmaking process, and long-term global growth in that market has driven increased demand for graphite electrodes. EAF steelmaking has historically been the fastest-growing segment of the global steel market. According to the WSA, global EAF steel production grew at a 3.1% compound annual growth rate from 1984 to 2019, while taking market share from other methods of steelmaking in most regions of the world, outside of China. EAF steel producers benefit from their flexibility in sourcing iron units, being able to make steel from either scrap or alternative sources of iron like direct reduced iron and hot briquetted iron, both made directly from iron ore. Most of the growth in EAF steelmaking has taken place in Western Europe and North America, two regions with substantial amounts of scrap available for use in EAFs.



Source: World Steel Association

EAF Steel Production's Outlook

Since 2015, the EAF steel industry has grown at a 6.4% compound annual rate according to the WSA. This recovery has taken place since China began to restructure its steel industry, encouraging consolidation and shutting down excess capacity. China has also begun to implement environmental regulations to improve air quality impacted by CO_2 emissions associated with the burning of coal in BOF steelmaking. Additionally, trade remedies in developed economies such as North America and Western Europe are protecting their domestic steel industries against imports from BOF-steel producing countries, which has resulted in a significant decrease in Chinese steel exports. According to China Customs and Baiinfo, Chinese steel exports declined from 112 million MT in 2015 to 54 million MT in 2020. This resulted in increased steel production outside of China, benefiting EAF steel production.

We believe there is a particular opportunity for EAF steelmaking to take further market share in China as well. China's Ministry of Industry and Information Technology's current draft guidelines call for EAF steelmaking to constitute 20% of overall steel production by 2025, doubling its current share of output. If Chinese EAF steelmaking production capacity were to reach 20%, based on 2019 production levels, that would add 96 million MT of additional EAF steel production for a total of 199 million MT, compared to 2019 EAF steel production in the next largest regions of 90 million MT in Europe, 81 million MT in North America and 63 million MT in India, according to WSA.

Pricing trends

Pricing for graphite electrodes is determined through contract negotiations and spot transactions between producers and consumers. Pricing has historically been cyclical, reflecting the demand trends of the global EAF steelmaking industry and supply of graphite electrodes. Moreover, as petroleum needle coke represents a significant percentage of the raw material cost of graphite electrodes, graphite electrodes have typically been priced at a spread to petroleum needle coke. Over the period from 2008 to 2017, the average graphite electrode spread over petroleum needle coke was approximately $3,200 per MT, on an inflation-adjusted basis using constant 2020 dollars. In tight demand markets, this spread has increased, resulting in higher graphite electrode prices.

There is no widely accepted graphite electrode reference price. Historically, between 2008 and 2017, our weighted average realized price of graphite electrodes was approximately $4,800 per MT (on an inflation-adjusted basis using constant

2020 dollars). During the last demand trough in 2016, our weighted average realized price of graphite electrodes fell to approximately $2,500 per MT in 2016. Following the significant rationalization of graphite electrode production globally, the resumption of growth in EAF steel production, falling scrap prices, reductions in Chinese steel exports, and constrained supply of needle coke, graphite electrode spot prices began to increase in late 2017 and reached record high prices in 2018. These record high spot prices began to retreat in 2019, falling 25% during the year. Prices continued to decline throughout 2020.

During the fourth quarter of 2020, our average price from long-term agreements ("LTAs") was approximately $9,600 per MT and our average price for non-LTA business was approximately $4,900 per MT.

Market prices for graphite electrodes declined throughout 2020, including through the fourth quarter and into the early part of the first quarter of 2021. There is a lag between the time we negotiate price for non-LTA sales and when our electrodes are delivered and recognized in revenue. We estimate that our non-LTA price for electrodes delivered and recognized in revenue for the first six weeks of 2021 averaged approximately $4,200 per MT. Given this impact, for the first half of 2021 we anticipate earnings per share and adjusted EBITDA will decline by high single digits, on a percentage basis, compared to the first half of 2020. We believe market prices for graphite electrodes are now improving and expect this to positively impact our financial results beginning in the second half of 2021.

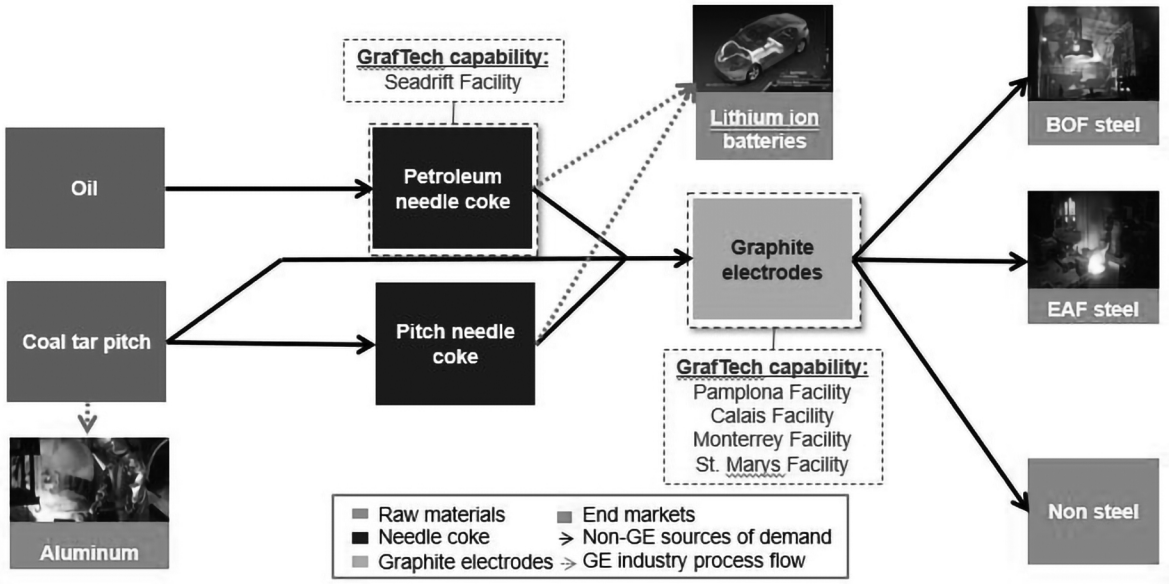
Needle coke industry

Introduction

Needle coke is the primary raw material for the production of graphite electrodes used by EAF steelmakers and producers of aluminum, stainless steel, silicon metals and other ferrous and non-ferrous metals, and is also a primary raw material in the production of lithium-ion batteries used to power electric vehicles. Needle coke is derived from two carbon sources. Petroleum needle coke is produced through a manufacturing process very similar to a refinery. The production process converts decant oil, a byproduct of the gasoline refining process, into petroleum needle coke and generally takes two to three months to produce. Pitch needle coke, used principally by Asian graphite electrode manufacturers, is made from coal tar pitch, a byproduct of coking metallurgical coal used in BOF steelmaking.

Graphite electrode producers combine petroleum needle coke and pitch needle coke with binders and other ingredients to form graphite electrodes. Petroleum needle coke and pitch needle coke, relative to other varieties of coke, are distinguished by their needle-like structure and their quality, which is measured by the presence of impurities, principally sulfur, nitrogen and ash. Petroleum needle coke and pitch needle coke are typically low in these impurities. Additionally, the needle-like structure of petroleum and pitch needle coke creates expansion along the length of the electrode, rather than the width, which reduces the likelihood of fractures. In order to minimize fractures caused by disproportionate expansion over the width of an electrode, and minimize the effect of impurities, large-diameter graphite electrodes (18 inches to 32 inches) employed in high-intensity EAF applications are comprised almost exclusively of petroleum needle coke and pitch needle coke.

The process map below shows the raw materials required to make graphite electrodes, the various consumers of these raw materials, as well as the consumers of graphite electrodes.



Source: Management estimates

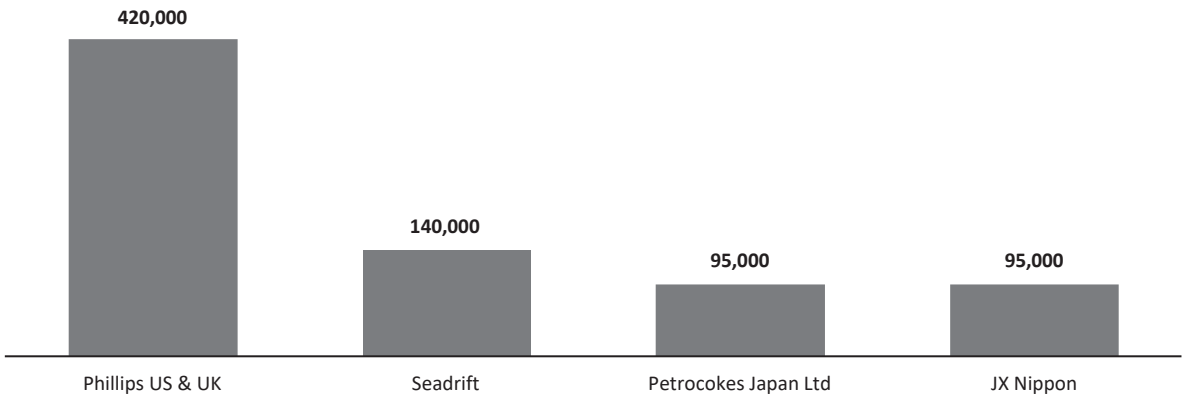
Previously, producers of petroleum needle coke typically agreed to supply petroleum needle coke in twelve-month contracts; however, since 2017, producers of petroleum needle coke have typically used six-month contracts. As a result, our competitors must continually renegotiate supply agreements in response to changing market conditions. We are substantially vertically integrated through our ownership of our Seadrift facility, which provides the majority of our needle coke requirements and insulates us from rapid changes in the needle coke market.

Market size and major producers

The needle coke industry is concentrated. We estimate that Seadrift has approximately one-fifth of the petroleum needle coke production capacity outside China.

Graphite electrode manufacturers prefer petroleum needle coke because of the meaningfully longer bake and graphitizing time required for pitch needle coke. Additionally, the demand for petroleum needle coke in lithium-ion battery manufacturing is growing rapidly. Electric vehicle manufacturers prefer artificial graphite such as petroleum needle coke in lithium-ion batteries because of its greater energy density, providing batteries with longer driving ranges and longevity.

Estimated Petroleum needle coke industry production capacity (excluding China) by company (MT)



Source: Management estimates

Industry trends

Petroleum needle coke production capacity outside of China has remained unchanged for at least the last ten years due to the capital intensity, technical know-how and long lead times required to build greenfield needle coke production facilities and the stringent regulatory process associated with building new needle coke production capacity. Furthermore, we believe that brownfield expansion opportunities in developed countries are generally not available as petroleum needle coke manufacturing is a continuous process with significant costs associated with shutting down and restarting facilities for maintenance or capital investment.

While the vast majority of petroleum needle coke is used in the production of graphite electrodes, the use of needle coke in lithium-ion batteries for electric vehicles is growing with the increased production of these vehicles. According to the International Energy Agency ("IEA"), the global electric car fleet exceeded seven million in 2019, as compared to 17,000 in 2010. The IEA projects that global annual sales of electric cars may range between 13 million and 25 million by 2025. Most electric vehicles rely on lithium-ion batteries as their key performance component. Many manufacturers of lithium-ion batteries for electric vehicles use needle coke as a raw material for carbon anodes in their batteries due to advantages in terms of charging rate and capacity. According to IEA, battery pack capacity has been increasing in recent years and is expected to continue. Based on IEA's estimates for electric vehicle sales and battery pack size, and management estimates for needle coke used in anodes, demand for needle coke from electric vehicles could grow significantly from over 200,000 MT in 2020 to over 700,000 MT in 2025.[2]

Contracts and Customers

In 2017, we reoriented our commercial strategy around a long-term take-or-pay contract framework and restructured our sales force incentives. As graphite electrodes are an essential consumable in the EAF steel production process and require a long lead time to manufacture, we believe our strategic customers are highly focused on securing certainty of supply of reliable, high-quality graphite electrodes. Prior to our long-term take-or-pay contract initiative, our sales of graphite electrodes were generally negotiated annually through purchase orders on an uncontracted, nonbinding basis. The majority of our customers sought to secure orders for a supply of their anticipated volume requirements each upcoming year. The remaining, small balance of our graphite electrode customers purchased their electrodes as needed throughout the year at industry spot prices.

We believe we are uniquely capable among graphite electrode producers to pursue our long-term take-or-pay contracting strategy due to our substantial vertical integration into petroleum needle coke production. All of our petroleum needle coke production is used internally and is not sold to external customers. Demand for petroleum needle coke increased due to the use of needle coke in lithium-ion batteries for electric vehicles, as well as increased demand for graphite electrodes. Consequently, we expect this limited availability of petroleum needle coke will restrict new graphite electrode production. Seadrift, our wholly-owned subsidiary acquired in 2010, provides the majority of our petroleum needle coke requirements and produces sufficient needle coke to supply substantially all of the graphite electrode production that we have contracted under our long-term take-or-pay contracts. We have also hedged the decant oil required to produce substantially all of the graphite electrodes sold under these contracts, providing us substantial visibility into our future raw material costs.

Because the market price of graphite electrodes may be based, in part, on the current or forecasted costs of key raw materials, periods of raw material price volatility may have an impact on the market price. In particular, as petroleum needle coke represents a significant percentage of the raw material cost of graphite electrodes, the price of graphite electrodes has historically been influenced by the price of petroleum needle coke. See "Risk Factors—Risks related to our business and industry—Pricing for graphite electrodes has historically been cyclical, current prices are receding from recent highs, and the price of graphite electrodes may continue to decline in the future." The fixed prices under our contracts prevent us from passing along changes related to our costs of raw materials to our customers. See "Risk Factors—Risks related to our business and industry—We are dependent on the supply of petroleum needle coke. Our results of operations could deteriorate if recent disruptions in the supply of petroleum needle coke continue or worsen for an extended period." However, as described above, we believe our ability to source all of our petroleum needle coke requirements for these contracts from our Seadrift facility and our hedging of our purchases of decant oil mitigates the impact of periodic shortages and price fluctuations of raw materials.

All of our long-term take-or-pay contracts have fixed prices. Within this contract framework, our customers agree to purchase a specified volume of product at the price under the contract. Contract customers are unable to renegotiate or adjust the price under the contract. These fixed prices under the contracts also prevent us from passing along any changes related to the costs of raw materials to contract customers. As a result of the long-term take-or-pay obligation of the contracts, the

[2] Source: IEA Global Electric Vehicle Outlook 2020 for electric vehicle sales and battery pack capacity. This also assumes approximately 0.8 kilogram anode material per kilowatt-hour of battery pack capacity. Anode material is assumed to be approximately 50% synthetic and 50% natural graphite, with a yield of 50%.

customer must purchase the annual contracted volume (or annual volume within the specified range). In the event the customer does not take delivery of the annual volume specified in the contract, our contracts provide for a capacity payment equal to the product of the number of MTs short of the annual volume specified in the contract multiplied by the price under the contract for that contract year.

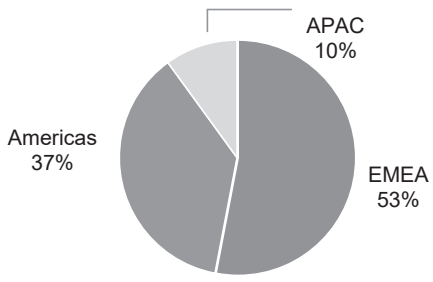
In addition to defining annual volumes and prices, these long-term take-or-pay contracts include significant termination payments (typically, 50% to 70% of remaining contracted revenue) and, in certain cases, parent guarantees and collateral arrangements to manage our customer credit risk. In most cases, the customer can only terminate the contract unilaterally: (i) upon certain bankruptcy events; (ii) if we materially breach certain anti-corruption legislation; (iii) if we are affected by a force majeure event that precludes the delivery of the agreed-to graphite electrodes for more than a six-month period; or (iv) if we fail to ship certain minimum levels during a specified period of time. The customer will also be able to temporarily suspend obligations under the contract due to a force majeure event, as will we, with the contract term being extended by a period equal to the duration of such suspension.

Our contracts provide our customers with certain remedies in the event that we are unable to deliver the contracted volumes of graphite electrodes on a quarterly basis. Our substantially vertically integrated Seadrift plant is particularly important to our ability to provide our customers with a reliable supply of graphite electrodes. Therefore, the likelihood that we will fail to deliver the contracted volume is significantly reduced due to our substantial vertical integration. For a discussion of certain risks related to our long-term take-or-pay contracting initiative, see "Risk Factors—Risks related to our business and industry—We may be unable to implement our business strategies, including our initiative to secure and maintain long-term take-or-pay customer contracts, in an effective manner."

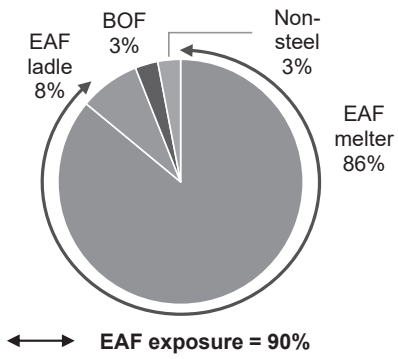
2020 Revenue and production by region and end market

Approximately 94% of our graphite electrodes were purchased by EAF steel producers in 2020. The remaining portion is primarily used in various other ferrous and non-ferrous melting applications, fused materials, chemical processing, and alloy metals. We sell our products in every major geographic region globally. Sales of our products to buyers outside the United States accounted for approximately 79% of net sales in 2020 and 77% of net sales in each of 2018 and 2019. Overall, in 2020, we generated 90% of our net sales from EMEA and the Americas.

2020 Revenue by Region



2020 Graphite Electrode Sales by End Market



We believe our long-term take-or-pay contracting strategy provides us with cash flow visibility and has secured a high-quality customer base. We perform financial and credit reviews of all eligible potential customers prior to entering into these contracts. Less creditworthy customers are required to post a bank guarantee, letter of credit or significant cash prepayment. Sales from our long-term take-or-pay contracts represented 87% and 80% of our net sales in 2020 and 2019, respectively.

Sales and customer service

We differentiate and sell the value of our graphite electrodes primarily based on price, product quality and performance, delivery reliability and customer technical service.

We have a large customer technical service organization, with supporting application engineering and scientific groups and more than 30 engineers and specialists around the world serving in this area. We believe that we are one of the industry leaders in providing value added technical services to our customers.

Our direct sales force currently operates from ten sales offices located around the world. We sell our graphite electrodes primarily through our direct sales force, independent sales representatives and distributors, all of whom are trained and experienced with our products.

We have customer technical service personnel based around the world to assist customers to maximize their production and minimize their costs. A portion of our engineers and technicians provide technical service and advice to key steel and other metals customers. These services relate to furnace applications and operation, as well as furnace upgrades to reduce energy consumption, improve raw material costs and increase output.

We believe we have a competitive advantage in offering customers ArchiTech, which we believe is an advanced support and technical service platform in the graphite electrode industry. ArchiTech, which has been installed in customer furnaces worldwide, enables our engineers to work with our customers seamlessly to maximize the performance of their furnaces and provide real-time diagnostics and troubleshooting.

Distribution

We deploy various demand management and inventory management techniques to seek to ensure that we can meet our customers' delivery requirements while still maximizing the capacity utilization of our production capacity. We can experience significant variation in our customers' delivery requirements as their specific needs vary and change through the year. We generally seek to maintain appropriate inventory levels, taking into account these factors as well as the significant differences in manufacturing cycle times for graphite electrode products and our customers' products.

Finished products are usually stored at our manufacturing facilities. Limited quantities of some finished products are also stored at local warehouses around the world to meet customer needs.

Facilities

We currently manufacture our graphite electrodes in three primary manufacturing facilities strategically located in the Americas and EMEA, two of the largest EAF steelmaking markets. Our locations allow us to serve our customers in the Americas and EMEA efficiently. We believe that we have approximately 202,000 MT of graphite electrode production capacity at our operating sites in Calais, France, Pamplona, Spain, and Monterrey, Mexico.[3] In addition to these three facilities, we have a fourth graphite electrode manufacturing site in St. Marys, Pennsylvania. We have begun a series of projects at our Monterrey and St. Marys facilities that will shift graphitization and machining of additional volume of semi-finished product from Monterrey to St. Marys. We expect these projects will further optimize our manufacturing footprint by improving environmental performance and production flexibility at both facilities and also leverage cost efficiencies at our St. Marys facility. We believe that our business has the lowest manufacturing cost structure of all of our major competitors, primarily due to the large scale of our manufacturing facilities.

Our manufacturing facilities significantly benefit from their size and scale, work force flexibility, access to attractively-priced sources of power and other key raw materials, and our substantial vertical integration with Seadrift. Our Calais, Pamplona, Monterrey and St Marys facilities have access to low-cost sources of electricity with essential logistical infrastructure in place, which is a significant element of our manufacturing costs. Our Seadrift facility currently produces the majority of our petroleum needle coke requirements for our graphite electrode production, allowing us to source our primary raw material internally and at cost, a significant advantage relative to our peers. Seadrift also produces sufficient needle coke to supply substantially all of the graphite electrode production that we have contracted under our long-term take-or-pay contracts.

Manufacturing

We manufacture graphite electrodes ranging in size up to 30 inches in diameter, over 11 feet in length, and weighing as much as 5,900 pounds (2.6 MT). The manufacturing process includes six main processes: screening of raw materials (needle coke) and blending with coal tar pitch followed by forming, or extrusion, of the electrode, baking the electrode, impregnating the electrode with a special pitch that improves strength, re-baking the electrode, graphitizing the electrode using electric resistance furnaces, and machining. The first baking process converts the pitch into hard coke. During the baking process, the electrode pitch volatiles are removed, leaving porosities inside. To improve graphite electrode quality, the electrode is then impregnated with additional coal tar pitch to fill the porosities and baked a second time. After impregnation and re-baking, the manufacturing process continues with graphitization as the electrodes are heated at 5000° F in a special longitudinal furnace to

[3] Production capacity reflects expected maximum production volume during the period under normal operating conditions, standard product mix and expected maintenance outage. Actual production may vary.

convert the carbon into graphite. The graphitization cycle removes additional impurities and improves the electrodes' key qualities: thermal and electrical conductivity, thermal shock resistance performance, lubricity, and abrasion resistance.

High-quality graphite electrodes have low electrical resistivity and strong durability. Resistivity is enhanced by removing impurities during the production process, while durability is determined by the coefficient of thermal expansion ("CTE") of the raw material used to produce the graphite electrode. Lower CTE needle coke produces higher quality electrodes. UHP electrodes used in harsh EAF melter applications have low resistivity and low CTE to maximize efficient use of electricity in the EAF and minimize electrode consumption. The total manufacturing time of a graphite electrode and its associated connecting pin is on average approximately six months from needle coke production to customer delivery. We believe that the period of time required to produce a graphite electrode meaningfully constrains the ability of graphite electrode producers to react to real-time changes in steel market environments and acts as a barrier to entry.

Production of a graphite electrode begins with the production of either petroleum needle coke, our primary raw material, or pitch needle coke. Petroleum needle coke is produced through a manufacturing process very similar to a refinery. The production process converts decant oil, a byproduct of the gasoline refining process, into petroleum needle coke and generally takes two to three months to produce. Needle coke takes its name from the needle-like shape of the coke particles. We produce calcined petroleum needle coke at Seadrift. Seadrift is not dependent on any single refinery for decant oil. While Seadrift has purchased a substantial majority of its raw material inventory from a limited number of suppliers in recent years, we believe that there is a large supply of suitable decant oil in the United States available from a variety of sources. In addition, we use derivatives to hedge the decant oil required to produce substantially all of the graphite electrodes sold under our long-term take-or-pay contracts, providing us with substantial visibility into our future raw material costs.

We purchase the electric power used in our manufacturing processes from local suppliers under contracts with pricing based on rate schedules or price indices. Our electricity costs can vary significantly depending on these rates and usage. Natural gas used in the baking and re-baking processes is purchased from local suppliers primarily under annual volume contracts with pricing based on various natural gas price indices.

Research and development

We have 135 years of experience in the R&D of graphite- and carbon-based solutions. By focusing our management's attention and R&D spending exclusively on the graphite electrode business, we have been able to improve the quality of our graphite electrodes, repositioning ourselves as an industry leader and improving our relationships with strategic customers. Our focus on improving the quality of petroleum needle coke through R&D has led to our petroleum needle coke production at Seadrift being best-in-class for use in the manufacturing of highly durable UHP electrodes. We believe that the above strengths and capabilities provide us with a competitive advantage.

Intellectual property

We believe that our intellectual property, consisting primarily of patents and proprietary know-how, provides us with competitive advantages and is important to our growth opportunities. Our intellectual property portfolio is extensive, with over 150 carbon and graphite U.S. and foreign patents and published patent applications, which we believe is more than any of our major competitors in the businesses in which we operate.

We own, have the right to use or have obtained licenses for various trade names and trademarks used in our businesses. For example, the trade name and trademark UCAR are owned by Union Carbide Corporation (which was acquired by Dow Chemical Company) and are licensed to us on a worldwide, exclusive and royalty-free basis until 2025. This particular license automatically renews for successive ten-year periods. It permits non-renewal by Union Carbide at the end of any renewal period upon five years' notice of non-renewal.

We rely on patent, trademark, copyright and trade secret laws, as well as appropriate agreements to protect our intellectual property. Among other things, we seek to protect our proprietary know-how and information, by requiring employees, consultants, strategic partners and others who have access to such proprietary information and know-how to enter into confidentiality or restricted use agreements.

Insurance

We maintain insurance against civil liabilities relating to personal injuries to third parties, for loss of or damage to property, for business interruptions and for certain environmental matters, that provides coverage, subject to the applicable coverage limits, deductibles and retentions, and exclusions, that we believe are appropriate upon terms and conditions and for premiums that we consider fair and reasonable in the circumstances. There can be no assurance that we will not incur losses beyond the limits of or outside the coverage of our insurance.

Regulatory Matters

Environmental

Our facilities and operations are subject to a wide variety of federal, state, local and foreign environmental laws and regulations. These laws and regulations relate to air emissions, water discharges and solid and hazardous waste generation, treatment, storage, handling, transportation and disposal; the presence of wastes and other substances; the reporting of, responses to and liability for, releases of hazardous substances into the environment; and the import, production, packaging, labeling and transportation of products that are defined as hazardous or toxic or otherwise believed to have potential to harm the environment or human health. These laws and regulations (and the enforcement thereof) are periodically updated and are becoming increasingly stringent. We have incurred substantial costs in the past, and will continue to incur additional costs in the future, to comply with these legal requirements.

We believe that we are currently in compliance in all material respects with the federal, state, local and foreign environmental laws and regulations to which we are subject. We have experienced some level of regulatory scrutiny at most of our current and former facilities and, in some cases, have been required to take or are continuing to take corrective or remedial actions and incur related costs, and may experience further regulatory scrutiny, and may be required to take further corrective or remedial actions and incur additional costs, in the future. Although it has not been the case in the past, these costs could have a material adverse effect on us in the future.

Further, laws and regulations in various jurisdictions impose or may impose, as the case may be, environmental monitoring, reporting and/or remediation requirements if operations cease or property is transferred or sold. We have sold or closed a number of facilities that had operated solid waste management units (landfills) on-site. In most cases where we divested the properties, we have retained ownership of on-site landfills. When our landfills were or are to be sold, we negotiate for contractual provisions providing for financial assurance to be maintained, which we believe will be adequate to protect us from any potential future liability associated with these landfills. When we have closed landfills, we believe that we have done so in material compliance with applicable laws and regulations. We continue to monitor these landfills and observe any reporting obligations we may have with respect to them pursuant to applicable laws and regulations. To date, the costs associated with the retained landfills have not had, and we do not anticipate that future costs will have, a material adverse effect on us.

We have received and may in the future receive notices from the U.S. Environmental Protection Agency (“EPA”) or state environmental protection agencies, as well as claims from other parties, alleging that we are a potentially responsible party (“PRP”) under the Comprehensive Environmental Response, Compensation and Liability Act (the “Superfund Act”) and similar state laws for past and future remediation costs at waste disposal sites and other contaminated properties. Although Superfund Act liability is joint and several, in general, final allocation of responsibility at sites where there are multiple PRPs is made based on each PRP’s relative contribution of hazardous substances to the site. Based on information currently available to us, we believe that any potential liability we may have as a PRP will not have a material adverse effect on us.

Certain of our U.S. facilities have been or will be required to comply with reporting requirements under the Federal Clean Air Act and standards for air emissions that have been or may be adopted by the EPA and state environmental protection agencies pursuant to new and revised regulations, including the possible promulgation of future maximum achievable control technology standards that apply specifically to our manufacturing sector(s), or more generally to our operation(s) or equipment. Achieving compliance with the regulations that have been promulgated to date has resulted in the need for additional administrative and engineered controls, changes to certain manufacturing processes, and increased monitoring and reporting obligations. Similar foreign laws and regulations have been or may also be adopted to establish new standards for air emissions, which may also require best available control technology on our manufacturing operations outside the United States. Based on information currently available to us, we believe that compliance with these regulations will not have a material adverse effect on us.

International accords, foreign laws and regulations, and U.S. federal, state and local laws and regulations have been enacted to address concerns about the effects that CO2 emissions and other identified Green House Gases ("GHGs") may have on the environment and climate worldwide. These effects are widely referred to as climate change. The international community has taken actions to address climate change issues on a global basis. In particular, in December 2015, the 21st Conference of Parties for the UNFCC concluded with more than 190 countries adopting the Paris Agreement, which then came into force and was legally binding on the parties in November 2016. The Paris Agreement sets a goal of limiting the increase in global average temperature and consists of two elements: a legally binding commitment by each participating country to set an emissions reduction target, referred to as “nationally determined contributions” (“NDCs”), with a review of the NDCs that could lead to updates and enhancements every five years beginning in 2023, and a transparency commitment requiring participating countries to disclose in full their progress. Our activities in the European Union ("EU") are subject to the EU

Emissions Trading Scheme ("ETS"), and it is likely that requirements relating to GHG emissions will become more stringent and will continue to expand to other jurisdictions in the future as NDCs under the Paris Agreement are implemented. After withdrawing from the Paris Agreement in 2019, the United States is now rejoining this global initiative. The EPA currently requires reporting of GHG emissions from certain sources and, in the future, the EPA or states may impose permitting obligations on new sources or existing sources that seek to modify their operations that would otherwise result in an increase in certain GHG emissions.

In the EU, the ETS, which was initially enacted under the provisions of the 1997 Kyoto Protocol, requires certain listed energy-intensive industries to participate in an international "cap and trade" system of GHG emission allowances. A third phase of the EU ETS under Directive 2009/29/EC, covers the period 2013 to 2020 and instituted a number of program changes. EU Member States brought into force the necessary laws, regulations and administrative provisions to comply with this EU Directive. Carbon and graphite manufacturing is still not a covered industry sector in the revised Annex 1 of directive 2009/29/EC. However, one of our European manufacturing operations was required to comply with these provisions under a more general fuel combustion category, because its combustion units met the applicability levels. The operations subject to these provisions were eligible to receive free CO2 emission allowances under the member state allocation program. On November 9, 2017, to implement the EU's NDC under the Paris Agreement and other GHG commitments, the European Parliament and Council announced a provisional agreement to revise and make more stringent the ETS during the Phase 4 period of 2021 to 2030. Among other changes, the Phase 4 provisions would further accelerate reduction in the current oversupply of allowances in the ETS market and establish further protections against the risks of carbon leakage. After extensive negotiations, the European Parliament and the Council formally supported the revision in February 2018. The revised EU ETS Directive (Directive (EU) 2018/410) entered into force on April 8, 2018. The EU's current target for 2030 is to achieve a GHG reduction of at least 40% compared to 1990 levels. In addition, in December 2019, the European Commission presented the Communication on The European Green Deal announcing several upcoming legislative proposals for the EU 2050 climate neutrality objective and for increasing the EU 2030 GHG emissions reduction target to at least 50% and towards 55% compared to 1990 levels. Implementation of Phase 4 could increase the cost of our current GHG allowances and require us to obtain additional allowances. Based on information currently available to us, we believe that compliance with international accords, U.S. and foreign laws and regulations concerning climate change which have been promulgated, or that could be promulgated in the future, including Phase 4 and any further GHG initiatives of the ETS, will not have a material adverse effect on us.

Some of our products (including our raw materials) are subject to extensive environmental and industrial hygiene regulations governing the registration and safety analysis of their component substances. For example, in connecting with the EU's REACH or the EU's Classification, Labelling and Packaging Regulation, any key raw material, chemical or substance, including our products, could be classified as having a toxicological or health-related impact on the environment, users of our products, or our employees. Coal tar pitch, which is classified as a substance of very high concern under REACH, is used in certain of our processes, but in a manner that we believe does not require us to obtain a specific authorization under the REACH guidelines. Similarly, the U.S. and other countries are currently enacting new or amending existing chemical control laws.

Estimates of future costs for compliance with U.S. and foreign environmental protection laws and regulations, and for environmental liabilities, are necessarily imprecise due to numerous uncertainties, including the impact of potential new laws and regulations, the availability and application of new and diverse technologies, the extent of insurance coverage, the potential discovery of contaminated properties, or the identification of new hazardous substance disposal sites at which we may be a PRP and, in the case of sites subject to the Superfund Act and similar state and foreign laws, the final determination of remedial requirements and the ultimate allocation of costs among the PRPs. Subject to the inherent imprecision in estimating such future costs, but taking into consideration our experience to date regarding environmental matters of a similar nature and facts currently known, we estimate that our costs and capital expenditures (in each case, before adjustment for inflation) for environmental protection regulatory compliance programs and for remedial response actions will not be material over the next several years. Furthermore, we establish accruals for environmental liabilities when it is probable that a liability has been or will be incurred, and the amount of the liability can be reasonably estimated. We adjust the accrual as new remedial actions or other commitments are made, as well as when new information becomes available that changes the prior estimates previously made and we believe our existing accruals are reasonable.

Data Privacy

We are required to comply with increasingly complex and changing laws and regulations enacted to protect business and personal data in the United States and other jurisdictions. This includes the EU's General Data Protection Regulation ("GDPR"), which enforces rules relating to the protection of processing and movement of personal data. The interpretation and enforcement of such regulations are continuously developing and evolving, and there may be uncertainty with respect to how to comply with them.

Bribery

The U.S. Foreign Corrupt Practices Act ("FCPA") prohibits bribery of public officials to benefit business interests. We are also subject to similar anticorruption laws in other countries where we do business. We operate and sell our products in countries that are rated as high-risk for corruption, which creates the risk of unauthorized conduct by our employees, distributors, or other third-party intermediaries that could be in violation of the FCPA or similar local regulations. We comply with the FCPA's requirements to make and keep books and records that accurately and fairly reflect our transactions and to devise and maintain an adequate system of internal accounting controls.

Import/Export Controls

We are subject to import/export controls, tariffs, and other trade-related regulations and restrictions in the countries in which we have operations or otherwise do business (whether directly or through resellers). In particular, our business activities must comply with U.S. Export Administration Regulations and sanctions administered by the Office of Foreign Asset Controls of the U.S. Treasury Department ("OFAC"). These regulations are complex and require extensive compliance efforts and expenditures. Furthermore, our compliance with these regulations is subject to audit or investigation by governmental authorities and, from time to time, we receive formal and informal inquiries from government agencies and regulators regarding our compliance. These controls, regulations, and restrictions have had, and we believe may continue to have, an impact on our business.

Anticompetition Laws

We are subject to competition laws in the various jurisdictions where we operate. In the U.S., this includes the Sherman Antitrust Act and related federal and state antitrust laws. These laws and regulations generally prohibit competitors from fixing prices, boycotting competitors, or engaging in other conduct that unreasonably restrains competition. In many jurisdictions, compliance with these competition laws is of special importance to us, and our operations may come under scrutiny by competition law authorities due to our competitive position in those jurisdictions.

Securities Laws

We must comply with a wide variety of federal and state securities laws and Delaware corporate law, as well as NYSE rules and regulations. We continue to engage in collaboration with key stakeholders to adapt to changing regulatory expectations.

OSHA

We are subject to a variety of regulations including work-related and community safety laws in the U.S. and other jurisdictions where we operate. In the U.S., the Occupational Safety and Health Act of 1970 mandates general requirements for safe workplaces for all employees and established the Occupational Safety and Health Administration ("OSHA") in the Department of Labor.

Government regulations are subject to change in the future, and accordingly we are unable to assess the possible effect of compliance with future requirements or whether or our compliance with such regulations will materially impact our business, results of operations, or financial condition.

Human Capital Resources

As of December 31, 2020, we had 1,285 employees (excluding contractors), 809 of which were hourly employees. A total of 423 employees were in Europe (including Russia), 607 were in Mexico and Brazil, two were in South Africa, 247 were in the United States and six were in the Asia Pacific region.

As of December 31, 2020, approximately 697 employees or 54%, of our worldwide employees, were covered by collective bargaining or similar agreements that expire, or are subject to renegotiation, at various times through December 31, 2021. We believe that, in general, our relationships with our employees' unions are good and that we will be able to renew or extend our collective bargaining or similar agreements on reasonable terms as they expire. We have not had any material work stoppages or strikes during the past decade.

The health and safety of our global team is our highest priority and is a core value of the Company. Our comprehensive programs strive to achieve zero injuries and no harm done. Leading indicator metrics include training, risk identification and remediation, pre-task planning and planned job observations. Managers report weekly on their key contacts with employees to emphasize our shared commitment to Health, Safety & Environmental performance. In the spirit of

continuous improvement, regular inspections, internal reviews and corporate audits are conducted to foster compliance with our high standards.

Available Information

We make available, free of charge, on or through our web site, our annual reports on Form 10-K, our quarterly reports on Form 10-Q, our current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after we electronically file them with, or furnish them to, the U.S. Securities and Exchange Commission ("SEC"). We maintain our website at http://www.graftech.com. The information contained on our web site is not part of this Report. The SEC maintains a website that contains reports, proxy and information statements, and other information regarding issuers that file electronically. Please see http://www.sec.gov for more information.

Item 1A. Risk Factors

Our business, financial condition, results of operations and cash flow can be affected by a number of factors, whether currently known or unknown, including but not limited to those described below. You should carefully read all of the information included in this report and carefully consider, among other matters, the following risk factors, as well as any discussed under Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations." Although the risks are organized by headings, and each risk is discussed separately, many are interrelated. The occurrence of any of the following risks could materially and adversely affect our business, financial condition, results of operations and cash flow, in which case, the market price of our securities could decline. The following is a summary of our principal Risk Factors.

Risks Factor Summary

Risks related to our business and industry
- Impact of the COVID-19 pandemic
- Cyclical nature of our business
- We may be unable to implement our business strategies
- There may be overcapacity in the graphite electrode market
- Pricing for graphite electrodes is cyclical
- Our business is sensitive to economic conditions
- We are dependent on the EAF steel industry
- We operate in a competitive industry
- Our products are dependent on needle coke supply, raw materials and energy
- Our operations are subject to hazards
- We are subject to a variety of legal, economic, social and political risks
- We could be subject to manufacturing disruptions
- Plant improvements may be delayed or not achieve expected benefits
- We depend on third parties
- We may be subject to information technology failures
- We may not be able to recruit or retain personnel
- Some locations are subject to union negotiations
- We could potentially divest or acquire businesses
- We have significant goodwill
- We depend on our ability to protect our intellectual property

Risks related to our indebtedness
- Our indebtedness could limit our financial and operating activities
- We are subject to covenants related to our 2018 Credit Agreement and 2020 Senior Notes
- Our cash flows may not be sufficient to service our indebtedness

Risks related to tax matters
- Changes to our jurisdictional mix of income could impact us
- We are required to make payments under our Tax Receivable Agreement

Risks related to government agencies
- Health, safety and environmental regulations could impact us
- We are subject to global data and privacy protection laws

Risks related to our common stock
- Our ownership is concentrated
- Certain of our investors have the right to engage or invest in the same or similar businesses
- We may not pay cash dividends on our common stock
- We are subject to provisions that could hinder, delay or prevent a change in control

- Future offerings could be affected by our stock price
- Our stock price could be negatively affected by large sales of our stock

Risks related to our business and industry

The COVID-19 pandemic has had, and is expected to continue to have, an adverse impact on our business, results of operations, financial position and cash flows.

The COVID-19 pandemic and preventative measures taken to contain or mitigate the pandemic have caused, and are continuing to cause, business slowdowns or shutdowns in affected areas and significant disruption in the financial markets and economy both globally and in the United States. In response to the pandemic and related mitigation measures, we began implementing changes in our business in February 2020 to protect our employees and customers, and to support appropriate health and safety protocols, which included: (i) canceling travel and eliminating in-person meetings, (ii) working from home where possible, and (iii) establishing a "Safe-Work Playbook" for our sites. Our plant procedures include temperature measurements where permitted, personal protective equipment, mandatory use of gloves, social distancing, frequent cleaning and disinfecting and the use of daily check sheets to keep team members highly focused on these new procedures. As the pandemic continues, we continue to limit travel and have certain employees working from home on rotations so that all employees are not in our offices at the same time. While all of these measures have been necessary and appropriate, they have resulted in additional costs and have adversely impacted our business and financial performance.

While the outbreak had begun to subside in certain areas of the world where we operate and serve our customers, the infection rates in some of these areas have experienced a resurgence in the spread of COVID-19 and the infection rates in other areas continue to escalate. As a result, we are unable to predict the ultimate impact of the COVID-19 pandemic at this time. The pandemic has adversely affected, and is expected to continue to adversely affect, our business, results of operations, financial position and cash flows. Such effects may be material and the potential impacts include, but are not limited to:

- adverse impacts on our customers, and resultant impacts on demand for our products;
- disruptions at our facilities, including reductions in operating hours, labor shortages and changes in operating procedures, including additional cleaning and disinfecting procedures;
- disruptions in our supply chain due to transportation delays, travel restrictions, raw material cost increases and shortages, and closures of businesses or facilities;
- reductions in our operating effectiveness due to workforce disruptions from COVID-19 restrictions and social distancing resulting from, among other things, "shelter in place" and "stay at home" orders, and the unavailability of key personnel necessary to conduct our business activities; and
- volatility in the global financial markets, which could have a negative impact on our ability to access capital and additional sources of financing in the future.

In addition, we cannot predict the impact that the COVID-19 pandemic will have on our customers, employees, suppliers and distributors, and any adverse impacts on these parties may have a material adverse impact on our business. The impact of the COVID-19 pandemic may also exacerbate other risks discussed in this Annual Report, any of which could have a material effect on us. This situation continues to change rapidly and additional impacts may arise that we are not currently aware of.

Our business is cyclical and the selling prices of our products may lead to periods of reduced profitability and net losses in the future.

We have experienced periods of significant net losses. Our ability to maintain profitability depends on a number of factors, including the growth rate of the graphite electrode industry, the price of our products, the cost to produce our products, the competitiveness of our products and the production capacity at our existing plants. We may incur significant losses in the future for a number of reasons, including due to the other risks described in this Annual Report, and we may encounter unforeseen expenses, difficulties, complications and delays and other unknown events.

We may be unable to implement our business strategies, including our initiative to secure and maintain long-term take-or-pay customer contracts, in an effective manner.

Our future financial performance and success largely depend on our ability to successfully implement our business strategies for growth. We have undertaken, and will continue to undertake, various business strategies to sell a majority of our production capacity through long-term take-or-pay contracts, and improve operating efficiencies and generate cost savings. We

cannot assure you that we will successfully implement our business strategies or that implementing these strategies will sustain or improve and not harm our results of operations. In particular, our ability to successfully implement our strategy to enter into and maintain long-term take-or-pay contracts is subject to certain risks, including customers seeking to renegotiate key terms of their contracts, such as pricing and specified volume commitments, in the event market conditions change during the contract term; our inability to extend contracts when they expire; and a disruption in our access to Seadrift-produced petroleum needle coke, which we will rely on, in part, to deliver the contracted volumes under our long-term contracts. Under market conditions where the price of graphite electrodes is trending downwards, it may be unlikely that customers will commit to long-term take-or-pay contracts. As a result, we cannot assure you that we will successfully implement this strategy or realize the anticipated benefits of these contracts. Recently, because of current market conditions, including the effects of the COVID-19 pandemic, certain customers with long-term contracts have struggled to take their committed volumes, which has resulted in some non-performance and disputes, including a few arbitrations, and we have modified some long-term contracts. In addition, the costs involved in implementing our strategies may be significantly greater than we currently anticipate.

Our business strategies are based on our assumptions about future demand for our products and on our continuing ability to produce our products profitably. Each of these factors depends, among other things, on our ability to finance our operations, maintain high-quality and efficient manufacturing operations, effectively manage our customer relationships while enforcing customer commitments, respond to competitive and regulatory changes, access quality raw materials in a cost-effective and timely manner and retain and attract highly skilled technical, managerial, marketing and finance personnel. Any failure to develop, revise or implement our business strategies in a timely and effective manner may adversely affect our business, financial condition, results of operations or cash flows.

Global graphite electrode overcapacity has adversely affected graphite electrode prices in the past, and may adversely affect them again, which could negatively impact our sales, margins and profitability.

Overcapacity in the graphite electrode industry has adversely affected pricing in the past and may do so again. The rapid growth of Chinese steel production after 2010, which was primarily produced from BOF steelmaking, created a significant global oversupply of steel. Chinese steel exports gained market share from EAF steel producers, creating graphite electrode industry oversupply and inventory de-stocking in this period. Although Chinese steel exports have decreased since 2016, any significant future growth in Chinese steel exports could once again lead to an oversupply of steel, which would adversely affect the price of graphite electrodes.

An increase in global graphite electrode production capacity that outpaces an increase in demand for graphite electrodes could adversely affect the price of graphite electrodes. We believe worldwide graphite electrode supply will increase in 2021 as a result of Chinese capacity additions. While growth in the Chinese EAF steel market may support some of these capacity additions, the additional graphite electrode capacity may exceed local Chinese requirements. Excess production capacity may result in manufacturers producing and exporting electrodes at prices that are lower than prevailing domestic prices, and sometimes at or below their cost of production. Excessive imports into the Americas and EMEA, which markets collectively make up 90% of our net sales, can also exert downward pressure on graphite electrode prices, which negatively affects our sales, margins and profitability.

Pricing for graphite electrodes has historically been cyclical and the price of graphite electrodes may continue to decline in the future.

Pricing for graphite electrodes has historically been cyclical, reflecting the demand trends of the global EAF steelmaking industry and the supply of graphite electrodes. In addition, as petroleum needle coke reflects a significant percentage of the raw material cost of graphite electrodes, graphite electrodes have historically been priced at a spread to petroleum needle coke, which in the past has increased in tight demand markets. Historically, between 2008 and 2017, our weighted average realized price of graphite electrodes was approximately $4,800 per MT (on an inflation-adjusted basis using constant 2020 dollars).

During the last demand trough in 2016, our weighted average realized price of graphite electrodes fell to approximately $2,500 per MT in 2016, on an inflation-adjusted basis using constant 2018 dollars. Following the significant rationalization of graphite electrode production globally, the resumption of growth in EAF steel production, falling scrap prices, reductions in Chinese steel exports and constrained supply of needle coke, graphite electrode prices reached record highs in 2018.

Current prices have receded from the highs of 2018, and the price of graphite electrodes may continue to decline in the future. Supply and demand normalized in 2019, tipping towards overcapacity that exerts downward pressure on graphite electrode prices, and spot prices fell 25% during 2019. Spot prices decreased further in 2020. Current spot prices are below our weighted average contract price for long-term contracted volumes. Our business, financial condition and operating results could be materially and adversely affected to the extent prices for graphite electrodes decline in the future.

Our business and operating results have been and will continue to be sensitive to economic conditions, and a downturn in economic conditions may materially adversely affect our business.

Our operations and performance are materially affected by global and regional economic conditions. As described further below, we are dependent on the steel industry, which historically has been highly cyclical and is affected by general economic conditions. An economic downturn may reduce customer demand, reduce prices for our products or inhibit our ability to produce our products, which would negatively affect our operating results. Our business and operating results have also been and will continue to be sensitive to declining consumer and business confidence, fluctuating commodity prices, volatile exchange rates and other challenges that can affect the economy. Our customers may experience deterioration of their businesses, cash flow shortages and difficulty obtaining financing, leading them to delay or cancel plans to purchase our products or seek to renegotiate the terms of their supply contracts, and they may not be able to fulfill their obligations to us in a timely fashion. Further, suppliers and other business partners may experience similar conditions, which could impact their ability to fulfill their obligations to us. Also, it could be difficult to find replacements for business partners without incurring significant delays or cost increases. These events would negatively impact our revenues and results of operations.

We are dependent on the global steel industry generally and the EAF steel industry in particular, and a downturn in these industries may materially adversely affect our business.

We sell our products primarily to the EAF steel production industry. The steel industry historically has been highly cyclical and is affected significantly by general economic conditions. Significant customers for the steel industry include companies in the automotive, construction, appliance, machinery, equipment and transportation industries, which are industries that were negatively affected by the general economic downturn and the deterioration in financial markets, including severely restricted liquidity and credit availability, in the recent past. In particular, EAF steel production declined approximately 17% from 2008 to 2009 as a result of that general economic downturn and deterioration in financial markets. In addition, EAF steel production declined approximately 10% from 2011 to 2015 due to global steel production overcapacity driven largely by Chinese BOF steel exports.

Our customers, including major steel producers, have in the past experienced and may again experience downturns or financial distress that could adversely impact our ability to collect our accounts receivable on a timely basis or at all.

The graphite industry is highly competitive. Our market share, net sales or net income could decline due to vigorous price and other competition.

Competition in the graphite industry (other than, generally, with respect to new products) is based primarily on price, product differentiation and quality, delivery reliability and customer service. Graphite electrodes, in particular, are subject to rigorous price competition. Competition with respect to new products is, and is expected to continue to be, based primarily on price, performance and cost effectiveness, customer service and product innovation. Competition could prevent implementation of price increases, require price reductions or require increased spending on R&D, marketing and sales that could adversely affect us. In such a competitive market, changes in market conditions, including customer demand and technological development, could adversely affect our competitiveness, sales and/or profitability.

We are dependent on the supply of petroleum needle coke. Our results of operations could deteriorate if recent disruptions in the supply of petroleum needle coke continue or worsen for an extended period.

Petroleum needle coke is our key raw material used in the production of graphite electrodes. Seadrift currently provides the majority of our current petroleum needle coke requirements, and we purchase the remainder from external sources. We plan to rely on Seadrift-produced petroleum needle coke to support the production of substantially all of the contracted volumes of graphite electrodes under our long-term take-or-pay contracts. As a result, a disruption in Seadrift's production of petroleum needle coke could adversely affect our ability to achieve the anticipated benefits of these contracts if we are forced to purchase petroleum needle coke from external sources at a higher cost to support the production of these contracted volumes. If a market shortage of petroleum needle coke occurs, we may be unable to acquire sufficient amounts of petroleum needle coke from external sources to support our remaining needle coke requirements currently used in the production of graphite electrodes for sale in the spot market. As a result, a disruption in the supply of petroleum needle coke could have a material adverse effect on our business, financial condition, results of operations and cash flows.

We are dependent on supplies of raw materials (in addition to petroleum needle coke) and energy. Our results of operations could deteriorate if those supplies increase in cost or are substantially disrupted for an extended period.

We purchase raw materials and energy from a variety of sources. In many cases, we purchase them under short-term contracts or on the spot market, in each case at fluctuating prices. The availability and price of raw materials and energy may be subject to curtailment or change due to:

- limitations, which may be imposed under new legislation or regulation;
- suppliers' allocations to meet demand from other purchasers during periods of shortage (or, in the case of energy suppliers, extended hot or cold weather);
- interruptions or cessations in production by suppliers; and
- market and other events and conditions.

Petroleum and coal products, including decant oil and coal tar pitch, which are our principal raw materials other than petroleum needle coke, and energy, particularly natural gas, have been subject to significant price fluctuations. For example, Seadrift may not always be able to obtain an adequate quantity of suitable low-sulfur decant oil for the manufacture of petroleum needle coke, and capital may not be available to install equipment to allow use of higher sulfur decant oil (which is more readily available in the United States) if supplies of low-sulfur decant oil become more limited in the future. Further, recent low-sulfur emissions regulations adopted by the International Maritime Organization may adversely impact pricing for low-sulfur decant oil.

We have in the past entered into, and may continue in the future to enter into, derivative contracts and short-duration fixed-rate purchase contracts to effectively fix a portion of our exposure to certain products. These hedging strategies may not be available or successful in eliminating our exposure. A substantial increase in raw material or energy prices that cannot be mitigated or passed on to customers or a continued interruption in supply, particularly in the supply of decant oil or energy, would have a material adverse effect on our business, financial condition, results of operations or cash flows. These hedges may be insufficient or ineffective in protecting against the impact of these fluctuations.

Our operations are subject to hazards which could result in significant liability to us.

Our operations are subject to hazards associated with manufacturing and the related use, storage, transportation and disposal of raw materials, products and wastes. These hazards include explosions, fires, severe weather (including but not limited to hurricanes or other adverse weather that may be increasing as a result of climate change) and natural disasters, industrial accidents, mechanical failures, discharges or releases of toxic or hazardous substances or gases, transportation interruptions, human error and terrorist activities. These hazards can cause personal injury and loss of life, severe damage to or destruction of property and equipment as well as environmental damage, and may result in suspension of operations and the imposition of civil and criminal liabilities, including penalties and damage awards. While we believe our insurance policies are in accordance with customary industry practices, such insurance may not cover all risks associated with the hazards of our business and is subject to limitations, including deductibles and maximum liabilities covered. We may incur losses beyond the limits, or outside the coverage, of our insurance policies. In the future, we may not be able to obtain coverage at current levels, and our premiums may increase significantly on coverage that we maintain. Costs associated with unanticipated events in excess of our insurance coverage could have a material adverse effect on our business, competitive or financial position or our ongoing results of operations.

We are subject to a variety of legal, economic, social and political risks associated with our substantial operations in multiple countries, which could have a material adverse effect on our financial and business operations.

A substantial majority of our net sales are derived from sales outside the United States, and a majority of our operations and our property, plant and equipment and other long-lived assets are located outside the United States. As a result, we are subject to risks associated with operating in multiple countries, including:

- currency fluctuations and devaluations in currency exchange rates, including impacts of transactions in various currencies, translation of various currencies into dollars for U.S. reporting and financial covenant compliance purposes, and impacts on results of operations due to the fact that the costs of our non-U.S. operations are primarily incurred in local currencies while their products are primarily sold in dollars and euros;
- imposition of or increase in customs duties and other tariffs;
- imposition of or increases in currency exchange controls, including imposition of or increases in limitations on conversion of various currencies into dollars, euros, or other currencies, making of intercompany loans by subsidiaries or remittance of dividends, interest or principal payments or other payments by subsidiaries;
- imposition of or increases in revenue, income or earnings taxes and withholding and other taxes on remittances and other payments by subsidiaries;
- inflation, deflation and stagflation in any country in which we have a manufacturing facility;

- imposition of or increases in investment or trade restrictions by the United States or other jurisdictions or trade sanctions adopted by the United States;
- compliance with laws on anti-corruption, export controls, customs, sanctions and other laws governing our operations, including in challenging jurisdictions;
- inability to determine or satisfy legal requirements, effectively enforce contract or legal rights, including our rights under our long-term take-or-pay contracts and intellectual property rights, and obtain complete financial or other information under local legal, judicial, regulatory, disclosure and other systems; and
- nationalization or expropriation of assets, and other risks that could result from a change in government or government policy, or from other political, social or economic instability.

Any of these risks could have a material adverse effect on our business, financial condition, results of operations or cash flows, and we may not be able to mitigate these effects.

Our results of operations could deteriorate if our manufacturing operations were substantially disrupted for an extended period for any reason, including equipment failure, climate change, natural disasters, public health crises, political crises or other catastrophic events.

Our manufacturing operations are subject to disruption due to equipment failure, extreme weather conditions, floods, hurricanes and tropical storms and similar events, major industrial accidents, including fires or explosions, cybersecurity attacks, strikes and lockouts, adoption of new laws or regulations, changes in interpretations of existing laws or regulations or changes in governmental enforcement policies, civil disruption, riots, terrorist attacks, war, public health crises, such as the COVID-19 pandemic, and other events. These events may also impact the operations of one or more of our suppliers. For example, the potential physical impacts of climate change on our operations are uncertain and will likely be particular to the geographic circumstances. These physical impacts may include changes in rainfall and storm patterns, shortages of water or other natural resources, changing sea levels, and changing global average temperatures. For instance, our Seadrift facility in Texas and our Calais facility in France are located in geographic areas less than 50 feet above sea level. As a result, any future rising sea levels could have an adverse impact on their operations and on their suppliers. In the event manufacturing operations are substantially disrupted at one of our primary operating facilities, we will not have the ability to increase production at our remaining operating facilities in order to compensate. To the extent any of these events occur, our business, financial condition and operating results could be materially and adversely affected.

Plant operational improvements may be delayed or may not achieve the expected benefits.

Our ability to complete future operational improvements, including the shift of graphitization and machining of additional volume of semi-finished product from Monterrey to St. Marys, may be delayed, interrupted or otherwise limited by the need to obtain environmental and other regulatory approvals, unexpected cost increases, availability of labor and materials, unforeseen hazards such as weather conditions, and other risks customarily associated with construction projects. Moreover, the costs of these activities could have a negative impact on our results of operations. In addition, these operational improvements may not achieve the expected benefits as a result of changes in market conditions, raw material shortages or other unforeseen contingencies.

We depend on third parties for certain construction, maintenance, engineering, transportation, warehousing and logistics services.

We contract with third parties for certain services relating to the design, construction and maintenance of various components of our production facilities and other systems. If these third parties fail to comply with their obligations, the facilities may not operate as intended, which may result in delays in the production of our products and materially adversely affect our ability to meet our production targets and satisfy customer requirements or we may be required to recognize impairment charges. In addition, production delays could cause us to miss deliveries and breach our contracts, which could damage our relationships with our customers and subject us to claims for damages under our contracts. Any of these events could have a material adverse effect on our business, financial condition, results of operations or cash flows.

We also rely primarily on third parties for the transportation of the products we manufacture. In particular, a significant portion of the goods we manufacture are transported to different countries, which requires sophisticated warehousing, logistics and other resources. If any of the third parties that we use to transport products are unable to deliver the goods we manufacture in a timely manner, we may be unable to sell these products at full value or at all, which could cause us to miss deliveries and breach our contracts, which could damage our relationships with our customers and subject us to claims

for damages under our contracts. Any of these events could have a material adverse effect on our business, financial condition, results of operations or cash flows.

We may be subject to information technology systems failures, cybersecurity attacks, network disruptions and breaches of data security, which could compromise our information and expose us to liability.

Our information technology systems are an important element for effectively operating our business. Information technology systems or processes, and the information technology systems or processes of our customers, our third-party service providers, our vendors or other parties that have been entrusted with our information, including risks associated with any failure to maintain or upgrade our systems, network disruptions and breaches of data security could disrupt our operations by impeding our processing of transactions, our ability to protect customer or company information or our financial reporting, leading to increased costs. It is possible that future technological developments could adversely affect the functionality of our computer systems and require further action and substantial funds to prevent or repair computer malfunctions. Our computer systems, including our back-up systems, could be damaged or interrupted by power outages, computer and telecommunications failures, computer viruses, cybercrimes, internal or external security breaches, events such as fires, earthquakes, floods, tornadoes and hurricanes, or errors by our employees. Although we have taken steps to address these concerns by implementing network security, back-up systems and internal control measures, these steps may be insufficient or ineffective. Security and/or privacy breaches, acts of vandalism or terror, computer viruses, misplaced or lost data, programming, and/or human error or other similar events with respect to our information technology systems or processes or the information technology systems or processes of third-parties that have been entrusted with our information expose us to a risk of loss or misuse of this information, litigation and potential liability, which could have a material adverse effect on our business, financial condition, results of operations or cash flows.

We may not be able to recruit or retain key management and plant operating personnel.

Our success is dependent on the management and leadership skills of our key management and plant operating personnel. The loss of any member of our reorganized key management team and personnel or an inability to attract, retain, develop and maintain additional personnel could prevent us from implementing our business strategy. In addition, our future growth and success also depend on our ability to attract, train, retain and motivate skilled managerial, sales, administration, operating and technical personnel. The loss of one or more members of our key management or plant operating personnel, or the failure to attract, retain and develop additional key personnel, could have a material adverse effect on our business, financial condition, results of operations or cash flows.

If we are unable to successfully negotiate with the representatives of our employees, including labor unions, we may experience strikes and work stoppages.

We are party to collective bargaining agreements and similar agreements with our employees. As of December 31, 2020, approximately 697 employees, or 54%, of our worldwide employees, were covered by collective bargaining or similar agreements all of which were covered by agreements that expire, or are subject to renegotiation, at various times through December 31, 2021. Although we believe that, in general, our relationships with our employees are good, we cannot predict the outcome of current and future negotiations and consultations with employee representatives, which could have a material adverse effect on our business. We may not succeed in renewing or extending these agreements on terms satisfactory to us. Although we have not had any material work stoppages or strikes during the past decade, they may occur in the future during renewal or extension negotiations or otherwise. A material work stoppage, strike or other union dispute could adversely affect our business, financial condition, results of operations and cash flows.

We may divest or acquire businesses, which could require significant management attention or disrupt our business.

We may divest or acquire businesses to rationalize or expand our businesses and enhance our cash flows. Any acquisitions that we are able to identify and complete may involve a number of risks, including:

- our inability to successfully or profitably integrate, operate, maintain and manage our newly acquired operations or employees;
- the diversion of our management's attention from our existing business;
- possible material adverse effects on our results of operations during the integration process;
- becoming subject to contingent or other liabilities, including liabilities arising from events or conduct predating the acquisition that were not known to us at the time of the acquisition; and

- our possible inability to achieve the intended objectives of the transaction, including the inability to achieve cost savings and synergies.

Any divestitures may also involve a number of risks, including the diversion of management's attention, significant costs and expenses, the loss of customer relationships and cash flow, and the disruption of the affected business or business operations. Failure to timely complete or consummate an acquisition or a divestiture may negatively affect the valuation of the affected business or business operations or result in restructuring charges.

We have significant goodwill on our balance sheet that is sensitive to changes in the market, which could result in impairment charges.

We had approximately $171 million of goodwill on our balance sheet as of December 31, 2020. Goodwill is tested for impairment annually in the fourth quarter or more often if events or changes in circumstances indicate a potential impairment may exist. Factors that could indicate that our goodwill is impaired include a decline in our stock price and market capitalization, lower than projected operating results and cash flows, and slower growth rates in our industry. Declines in our stock price, lower operating results and any decline in industry conditions in the future could increase the risk of impairment. Impairment testing incorporates our estimates of future operating results and cash flows, estimates of future growth rates, and our judgment regarding the applicable discount rates used on estimated operating results and cash flows. If we determine at a future time that impairment exists, it may result in a significant non-cash charge to earnings and lower stockholders' equity.

Our ability to grow and compete effectively depends on protecting our intellectual property. Failure to protect our intellectual property could adversely affect our business.

We believe that our intellectual property, consisting primarily of patents and proprietary know-how and information, is important to our growth. Failure to protect our intellectual property may result in the loss of the exclusive right to use our technologies. We rely on patent, trademark, copyright and trade secret laws and confidentiality and restricted-use agreements to protect our intellectual property. However, some of our intellectual property is not covered by any patent or patent application or any such agreement. Intellectual property protection does not protect against technological obsolescence due to developments by others or changes in customer needs.

Patents are subject to complex factual and legal considerations. Accordingly, the validity, scope and enforceability of any particular patent can be uncertain. Therefore, we cannot assure you that:

- any of the U.S. or non-U.S. patents now or hereafter owned by us, or that third parties have licensed to us or may in the future license to us, will not be circumvented, challenged or invalidated;
- any of the U.S. or non-U.S. patents that third parties have non-exclusively licensed to us, or may non-exclusively license to us in the future, will not be licensed to others; or
- any of the patents for which we have applied or may in the future apply will be issued at all or with the breadth of claim coverage we seek.

Moreover, patents, even if valid, only provide protection for a specified limited duration. In addition, effective patent, trademark and trade secret protection may be limited or unavailable or we may not apply for it in the United States or in any of the other countries in which we operate.

The protection of our intellectual property rights may be achieved, in part, by prosecuting claims against others who we believe have misappropriated our technology or have infringed upon our intellectual property rights, as well as by defending against misappropriation or infringement claims brought by others against us. Our involvement in litigation to protect or defend our rights in these areas could result in a significant expense to us, adversely affect the development of sales of the related products, and divert the efforts of our technical and management personnel, regardless of the outcome of such litigation.

We cannot assure you that agreements designed to protect our proprietary know-how and information will not be breached, that we will have adequate remedies for any such breach, or that our strategic alliance suppliers and customers, consultants, employees or others will not assert rights against us with respect to intellectual property arising out of our relationships with them.

Third parties may claim that our products or processes infringe their intellectual property rights, which may cause us to pay unexpected litigation costs or damages or prevent us from selling our products or services.

From time to time, we may become subject to legal proceedings, including allegations and claims of alleged infringement or misappropriation by us of the patents and other intellectual property rights of third parties. We cannot assure

you that the use of our patented technology or proprietary know-how or information does not infringe the intellectual property rights of others. In addition, attempts to enforce our own intellectual property claims may subject us to counterclaims that our intellectual property rights are invalid, unenforceable or are licensed to the party against whom we are asserting the claim or that we are infringing that party's alleged intellectual property rights. We may also be obligated to indemnify affiliates or other partners who are accused of violating third parties' intellectual property rights by virtue of those affiliates or partners' agreements with us, and this could increase our costs in defending such claims and our damages.

Legal proceedings involving intellectual property rights, regardless of merit, are highly uncertain and can involve complex legal and scientific analyses, can be time consuming, expensive to litigate or settle and can significantly divert resources, even if resolved in our favor. Our failure to prevail in such matters could result in loss of intellectual property rights or judgments awarding substantial damages and injunctive or other equitable relief against us. If we were to be held liable or discover or be notified that our products or processes potentially infringe or otherwise violate the intellectual property rights of others, we may face a loss of reputation and may not be able to exploit some or all of our intellectual property rights or technology. If necessary, we may seek licenses to intellectual property of others. However, we may not be able to obtain the necessary licenses on terms acceptable to us or at all. Our failure to obtain a license from a third-party for that intellectual property necessary for the production or sale of any of our products could cause us to incur substantial liabilities and/or suspend the production or shipment of products or the use of processes requiring the use of that intellectual property. We may be required to substantially re-engineer our products or processes to avoid infringement.

Any of the foregoing may require considerable effort and expense, result in substantial increases in operating costs, delay or inhibit sales or preclude us from effectively competing in the marketplace, which in turn could have a material adverse effect on our business and financial results.

Risks related to our indebtedness

Our indebtedness could limit our financial and operating activities and adversely affect our ability to incur additional debt to fund future needs and our ability to fulfill our obligations under our existing and future indebtedness.

Our credit agreement (as amended, the "2018 Credit Agreement") provides for (i) an aggregate $2,250 million senior secured term loan facility (the "2018 Term Loan Facility") and (ii) a $250 million senior secured revolving credit facility (the "2018 Revolving Credit Facility" and, together with the 2018 Term Loan Facility, as amended, the "Senior Secured Credit Facilities").

As of December 31, 2020, we had approximately $1,420 million of secured indebtedness outstanding including borrowings under the Senior Secured Credit Facilities and our 4.625% Senior Secured Notes due 2028 (the "2020 Senior Notes"). As of December 31, 2020, we had $246.4 million available for borrowing under the 2018 Revolving Credit Facility (taking into account approximately $3.6 million of outstanding letters of credit issued thereunder).

Interest expense for the years ended December 31, 2020 and December 31, 2019 was $98.1 million and $127.3 million, respectively.

Our substantial indebtedness could:

- require us to dedicate a substantial portion of our cash flow to the payment of principal and interest, thereby reducing the funds available for operations and future business opportunities;
- make it more difficult for us to satisfy our obligations;
- limit our ability to borrow additional money if needed for other purposes, including working capital, capital expenditures, debt service requirements, acquisitions and general corporate or other purposes, on satisfactory terms or at all;
- limit our ability to adjust to changing economic, business and competitive conditions;
- place us at a competitive disadvantage with competitors who may have less indebtedness or greater access to financing;
- make us more vulnerable to an increase in interest rates, a downturn in our operating performance or a decline in general economic conditions; and
- make us more susceptible to changes in credit ratings, which could impact our ability to obtain financing in the future and increase the cost of such financing.

Compliance with our debt obligations under the Senior Secured Credit Facilities and 2020 Senior Notes could materially limit our financial or operating activities, or hinder our ability to adapt to changing industry conditions, which could result in our losing market share, a decline in our revenue or a negative impact on our operating results.

The 2018 Credit Agreement and the indenture governing the 2020 Senior Notes include covenants that could restrict or limit our financial and business operations.

The 2018 Credit Agreement and the indenture governing the 2020 Senior Notes contain a number of restrictive covenants that, subject to certain exceptions and qualifications, restrict or limit our ability and the ability of our subsidiaries to, among other things:

- incur, repay or refinance indebtedness;
- create liens on or sell our assets;
- engage in certain fundamental corporate changes or changes to our business activities;
- make investments or engage in mergers or acquisitions;
- pay dividends or repurchase stock;
- engage in certain affiliate transactions;
- enter into agreements or otherwise restrict our subsidiaries from making distributions or paying dividends to the borrowers under the Senior Secured Credit Facilities or to us or certain of our subsidiaries, as applicable; and
- repay intercompany indebtedness or make intercompany distributions or pay intercompany dividends.

The 2018 Credit Agreement also contains certain affirmative covenants and contains a financial covenant that requires us to maintain a senior secured first lien net leverage ratio not greater than 4.00:1.00 when the aggregate principal amount of borrowings under the 2018 Revolving Credit Facility and outstanding letters of credit issued under the 2018 Revolving Credit Facility (except for undrawn letters of credit in an aggregate amount equal to or less than $35 million), taken together, exceed 35% of the total amount of commitments under the 2018 Revolving Credit Facility.

These covenants and restrictions could affect our ability to operate our business and may limit our ability to react to market conditions or take advantage of potential business opportunities as they arise. Additionally, our ability to comply with these covenants may be affected by events beyond our control, including general economic and credit conditions and industry downturns.

If we fail to comply with the covenants in the 2018 Credit Agreement and the indenture governing the 2020 Senior Notes, and are unable to obtain a waiver or amendment, an event of default would result, and the lenders and noteholders could, among other things, declare outstanding amounts due and payable or, with respect to the 2018 Credit Agreement, refuse to lend additional amounts to us or require deposit of cash collateral in respect of outstanding letters of credit. If we were unable to repay or pay the amounts due, the lenders under the 2018 Credit Agreement and the noteholders could, among other things, proceed against the collateral granted to them to secure the indebtedness, which includes substantially all of our and our U.S. subsidiaries' assets and certain assets of certain of our non-U.S. subsidiaries.

Our cash flows may not be sufficient to service our indebtedness, and if we are unable to satisfy our obligations under our indebtedness, we may be required to seek other financing alternatives, which may not be successful.

Our ability to make timely payments of principal and interest on our debt obligations, including our obligations under the Senior Secured Credit Facilities and 2020 Senior Notes, depends on our ability to generate positive cash flows from operations, which is subject to general economic conditions, competitive pressures and certain financial, business and other factors beyond our control. If our cash flows and capital resources are insufficient to make these payments, we may be required to seek additional financing sources, reduce or delay capital expenditures, sell assets or operations or refinance our indebtedness. These actions could have a material adverse effect on our business, financial conditions and results of operations. In addition, we may not be able to take any of these actions, and, even if successful, these actions may not permit us to meet our scheduled debt service obligations. Our ability to restructure or refinance the debt under the Senior Secured Credit Facilities and the 2020 Senior Notes will depend on, among other things, the condition of the capital markets and our financial condition at the time. We may not be able to restructure or refinance any of our indebtedness on commercially reasonable terms or at all. If we cannot make scheduled payments on our debt, we will be in default and the outstanding principal and interest on our debt

could be declared to be due and payable, in which case we could be forced into bankruptcy or liquidation or required to substantially restructure or alter our business operations or debt obligations.

A lowering or withdrawal of the ratings assigned to our debt by rating agencies may increase our future borrowing costs and reduce our access to capital.

Our debt currently has a non-investment grade rating, and any rating assigned to our debt could be lowered or withdrawn entirely by a rating agency if, in that rating agency's judgment, future circumstances relating to the basis of the rating, such as adverse changes, so warrant. Any future lowering of our ratings likely would make it more difficult or more expensive for us to obtain additional debt financing and affect the market value of the 2020 Senior Notes. Additionally, we enter into various forms of hedging arrangements against currency, interest rate or decant oil price fluctuations. Financial strength and credit ratings are also important to the availability and pricing of these hedging activities, and a downgrade of our credit ratings may make it more costly for us to engage in these activities.

Disruptions in the capital and credit markets, which may occur at any time, could adversely affect our results of operations, cash flows and financial condition, or those of our customers and suppliers.

Disruptions in the capital and credit markets as a result of uncertainty, changing or increased regulation, reduced alternatives or failures of significant financial institutions could adversely affect our access to liquidity needed to conduct or expand our businesses or conduct acquisitions or make other discretionary investments, as well as our ability to effectively hedge our currency or interest rate risks and exposures, which could adversely impact our business, results of operations, financial condition and cash flows. These disruptions may also adversely impact the financial position of our customers and suppliers, which, in turn, could adversely affect our results of operations, financial condition and cash flows.

Risks related to tax matters

Significant changes in our jurisdictional earnings mix or in the tax laws of those jurisdictions could adversely affect our business, financial condition, results or operations and cash flows.

Our future tax rates may be adversely affected by a number of factors, including the enactment of new tax legislation, other changes in tax laws or the interpretation of tax laws, changes in the estimated realization of our net deferred tax assets (arising, among other things, from tax loss carry forwards and our acquisition by Brookfield), changes to the jurisdictions in which profits are determined to be earned and taxed, adjustments to estimated taxes upon finalization of various tax returns, increases in expenses that are not deductible for tax purposes, including write-offs of acquired in-process R&D and impairment of goodwill in connection with acquisitions, changes in available tax credits and additional tax or interest payments resulting from tax audits with various tax authorities. Losses for which no tax benefits can be recorded could materially impact our tax rate and its volatility from period to period. Any significant change in our jurisdictional earnings mix or in the tax laws in those jurisdictions could increase our tax rates and adversely impact our financial results in those periods.

We are required to make payments under a Tax Receivable Agreement for certain tax benefits we may claim in the future, and the amounts we may pay could be significant.

In connection with the completion of our IPO, we entered into a tax receivable agreement (the "Tax Receivable Agreement") that provides Brookfield the right to receive future payments from us of 85% of the amount of cash savings, if any, in U.S. federal income tax and Swiss tax that we and our subsidiaries realize as a result of the utilization of certain tax assets attributable to periods prior to our IPO, including certain federal net operating losses ("NOLs"), previously taxed income under Section 959 of the Code, foreign tax credits, and certain NOLs in GrafTech Switzerland S.A. (collectively, the "Pre-IPO Tax Assets"). In addition, we pay interest on the payments we make to Brookfield with respect to the amount of this cash savings from the due date (without extensions) of our tax return where we realize this savings to the payment date at a rate equal to LIBOR plus 1.00% per annum. The term of the Tax Receivable Agreement commenced on April 23, 2018 and will continue until there is no potential for any future tax benefit payments.

We made our initial payment of approximately $28 million related to the Tax Receivable Agreement in February 2020. We expect that, based on current tax laws, future payments under the Tax Receivable Agreement relating to the Pre-IPO Tax Assets will be approximately $40.9 million in the aggregate. The maximum amount over the term of the agreement is approximately $100 million. This figure does not account for our Pre-IPO Tax Assets attributable to previously taxed income under Section 959 of the Code, the value of which is highly speculative, and certain NOLs in GrafTech Switzerland S.A., which had a nominal value at the time of the IPO. Payments made by us to Brookfield under the Tax Receivable Agreement generally reduce the amount of overall cash flow that might have otherwise been available to us. For more information about the Tax Receivable Agreement, see "Results of operations—Critical accounting policies—Related Party Tax Receivable Agreement."

Risks related to government regulation

Stringent health, safety and environmental regulations applicable to our manufacturing operations and facilities could result in substantial costs related to compliance, sanctions or material liabilities and may affect the availability of raw materials.

We are subject to stringent environmental, health and safety laws and regulations relating to our current and former properties (including former onsite landfills over which we have retained ownership), other properties that neighbor ours or to which we sent wastes for treatment or disposal, as well as our current raw materials, products, and operations. Some of our products (including our raw materials) are subject to extensive environmental and industrial hygiene regulations governing the registration and safety analysis of their component substances. Coal tar pitch, which is classified as a substance of very high concern under the EU's Registration, Evaluation, Authorization and Restriction of Chemical Regulation ("REACH") regulations, is used in certain of our processes but in a manner that we believe does not currently require us to obtain a specific authorization under the REACH guidelines. Violations of these laws and regulations, or of the terms and conditions of permits required for our operations, can result in damage claims, reputational harm, the imposition of substantial fines and criminal sanctions and sometimes require the installation of costly pollution control or safety equipment or costly changes in operations to limit pollution or decrease the likelihood of injuries. In addition, we are currently conducting remediation and/or monitoring at certain current and former properties and may become subject to material liabilities in the future for the investigation and cleanup of contaminated properties, including properties on which we have ceased operations. We have been in the past, and could be in the future, subject to claims alleging personal injury, death or property damage resulting from exposure to hazardous substances, accidents or otherwise for conditions creating an unsafe workplace. Further, alleged noncompliance with or stricter enforcement of, or changes in interpretations of, existing laws and regulations, adoption of more stringent new laws and regulations, discovery of previously unknown contamination or imposition of new or increased requirements could require us to incur costs or become the basis of new or increased liabilities or reputational harm that have a material adverse impact on our operations, costs or results of operations. It is also possible that the impact of safety and environmental regulations on our suppliers could affect the availability and cost of our raw materials.

For example, legislators, regulators and others, as well as many companies, are considering ways to reduce emissions of greenhouse gases ("GHGs") due to scientific, political and public concern that GHG emissions are altering the atmosphere in ways that are affecting, and are expected to continue to affect, the global climate. The EU has established GHG regulations and is revising its emission trading system for the period after 2020 in a manner that may require us to incur additional costs. The United States required reporting of GHG emissions from certain large sources beginning in 2011. Further measures, in the EU and many other countries, may be enacted in the future. In particular, in December 2015, more than 190 countries participating in the United Nations Framework Convention on Climate Change ("UNFCC") reached an international agreement related to curbing GHG emissions (the "Paris Agreement"). Further GHG regulations under the Paris Agreement or otherwise may take the form of a national or international cap-and-trade emissions permit system, a carbon tax, emissions controls, reporting requirements, or other regulatory initiatives. For more information, see the section entitled "Business."

It is possible that some form of regulation of GHG emissions will also be introduced in the future in other countries in which we operate or market our products. Regulation of GHG emissions could impose additional costs, both direct and indirect, on our business, and on the businesses of our customers and suppliers, such as increased energy and insurance rates, higher taxes, new environmental compliance program expenses, including capital improvements, environmental monitoring and the purchase of emission credits, and other administrative costs necessary to comply with current and potential future requirements or limitations that may be imposed, as well as other unforeseen or unknown costs. To the extent that similar requirements and limitations are not imposed globally, this regulation may impact our ability to compete with companies located in countries that do not have these requirements or limitations. We may also experience a change in competitive position relative to industry peers, changes in prices received for products sold and changes to profit or loss arising from increased or decreased demand for our products. The impact of any future GHG regulatory requirements on our global business will be dependent upon the design of the regulatory schemes that are ultimately adopted and, as a result, we are unable to predict their significance to our operations at this time.

Global data and privacy protection laws applicable to us require substantial costs related to compliance, and any failure to comply could result in significant liability to us, including fines and penalties.

We collect data, including personally identifiable information of our employees, in the course of our business activities and transfer such data between our affiliated entities, to and from our business partners and to third-party service providers, which may be subject to global data privacy laws and cross-border transfer restrictions. While we take steps to comply with these legal requirements, any changes to such laws may impact our ability to effectively transfer data across borders in support of our business operations and any breach of such laws may lead to administrative, civil or criminal liability, as well as reputational harm to the Company and its employees. For example, the EU's GDPR, introduced a number of obligations for

subject companies, including obligations relating to data transfers and the security of personal data they process. We take steps to protect the security and integrity of the information we collect, but there is no guarantee that the steps we have taken will prevent inadvertent or unauthorized use or disclosure of such information, or prevent third parties from gaining unauthorized access to this information despite our efforts. Any such incident could result in legal claims or proceedings, liability under laws that protect the privacy of personally identifiable information (including the GDPR) and damage to our reputation.

The cost of ongoing compliance with global data protection and privacy laws and the potential fines and penalties levied in the event of a breach of such laws may have an adverse effect on our business and operations. For example, the GDPR currently provides that supervisory authorities in the EU may impose administrative fines for non-compliance of up to €20,000,000 or 4% of the subject company's annual, group-wide turnover (whichever is higher) and individuals who have suffered damage as a result of a subject company's non-compliance with the GDPR also have the right to seek compensation from such company. We will need to continue dedicating financial resources and management time to compliance efforts with respect to global data protection and privacy laws, including the GDPR.

Risks related to our common stock

If the ownership of our common stock continues to be highly concentrated, it may prevent minority stockholders from influencing significant corporate decisions and may result in conflicts of interest.

As of February 16, 2021, Brookfield owned approximately 47.8% of our outstanding common stock. Accordingly, Brookfield has significant influence over all matters requiring a stockholder vote, including the election of directors; mergers, consolidations and acquisitions; the sale of all or substantially all of our assets and other decisions affecting our capital structure; the amendment of our Amended and Restated Certificate of Incorporation ("Amended Certificate of Incorporation") and our Amended and Restated By-Laws ("Amended By-Laws"); and our winding up and dissolution. This concentration of ownership may delay, deter or prevent acts that would be favored by our other stockholders. The interests of Brookfield may not always coincide with our interests or the interests of our other stockholders. This concentration of ownership may also have the effect of delaying, preventing or deterring a change in control. Also, Brookfield may seek to cause us to take courses of action that, in its judgment, could enhance its investment in us, but that might involve risks to our other stockholders or adversely affect us or our other stockholders. As a result, the market price of our common stock could decline or stockholders might not receive a premium over the then-current market price of our common stock upon a change in control. In addition, this concentration of share ownership may adversely affect the trading price of our common stock because investors may perceive disadvantages in owning shares in a company with significant stockholders.

Certain of our stockholders have the right to engage or invest in the same or similar businesses as us.

Brookfield has other investments and business activities in addition to their ownership of us. Brookfield has the right, and has no duty to abstain from exercising such right, to engage or invest in the same or similar businesses as us, do business with any of our clients, customers or vendors or employ or otherwise engage any of our officers, directors or employees. If Brookfield or any of its officers, directors or employees acquire knowledge of a potential transaction that could be a corporate opportunity, they have no duty, to the fullest extent permitted by law, to offer such corporate opportunity to us, our stockholders or our affiliates.

In the event that any of our directors and officers who is also a director, officer or employee of Brookfield acquires knowledge of a corporate opportunity or is offered a corporate opportunity, provided that this knowledge was not acquired solely in such person's capacity as our director or officer and such person acts in good faith, then to the fullest extent permitted by law such person is deemed to have fully satisfied such person's fiduciary duties owed to us and is not liable to us, if Brookfield pursues or acquires the corporate opportunity or if Brookfield does not present the corporate opportunity to us.

We may not pay cash dividends on our common stock.

We currently pay cash dividends on our common stock in accordance with our dividend policy. We cannot assure you, however, that we will pay dividends in the future in these amounts or at all. Our board of directors may change the timing and amount of any future dividend payments or eliminate the payment of future dividends in its sole discretion, without any prior notice to our stockholders. Our ability to pay dividends will depend upon many factors, including our financial position and liquidity, results of operations, legal requirements, restrictions that may be imposed by the terms of our current and future credit facilities and other debt obligations and other factors deemed relevant by our board of directors. For example, we may or may not be able to, or may decide not to, pay dividends if we are unable, for any reason, to continue our long-term take-or-pay contracts strategy in the future or we experience a significant disruption in our manufacturing operations or our production of petroleum needle coke at Seadrift, that, in either case, inhibits our ability to deliver the contracted volumes under our three- to five-year take-or-pay contracts. In addition, adverse market conditions may lead us to prioritize repaying the principal on our outstanding indebtedness. Our ability to pay dividends on our common stock is also limited as a practical matter by our credit

facilities. In the future, we may also enter into other credit agreements or other borrowing arrangements or issue debt securities that, in each case, restrict or limit our ability to pay cash dividends on our common stock. In addition, since we are a holding company with no operations of our own, our ability to pay dividends is dependent on the ability of our subsidiaries to make distributions to us. Their ability to make such distributions will be subject to their operating results, cash requirements and financial condition. Any change in the level of our dividends or the suspension of the payment thereof could adversely affect the market price of our common stock. See "Dividend Policies and Restrictions."

Certain provisions, including in our Amended Certificate of Incorporation and our Amended By-Laws, could hinder, delay or prevent a change in control, which could adversely affect the price of our common stock.

Our Amended Certificate of Incorporation and Amended By-Laws contain provisions that could make it more difficult for a third-party to acquire us without the consent of our board of directors or Brookfield, including:

- provisions in our Amended Certificate of Incorporation and Amended By-Laws that prevent stockholders from calling special meetings of our stockholders, except where the Delaware General Corporation Law ("DGCL") confers the right to fix the date of such meetings upon stockholders;
- advance notice requirements by stockholders with respect to director nominations and actions to be taken at annual meetings;
- certain rights of Brookfield with respect to the designation of directors for nomination and election to our board of directors;
- no provision in our Amended Certificate of Incorporation or Amended By-Laws provides for cumulative voting in the election of directors, which means that the holders of a majority of the outstanding shares of our common stock can elect all the directors standing for election;
- under our Amended Certificate of Incorporation, our board of directors have authority to cause the issuance of preferred stock from time to time in one or more series and to establish the terms, preferences and rights of any such series of preferred stock, all without approval of our stockholders; and
- nothing in our Amended Certificate of Incorporation precludes future issuances without stockholder approval of the authorized but unissued shares of our common stock.

These provisions may make it difficult and expensive for a third-party to pursue a tender offer, change in control or takeover attempt that is opposed by Brookfield, our management or our board of directors. Public stockholders who might desire to participate in these types of transactions may not have an opportunity to do so, even if the transaction is favorable to stockholders. These anti-takeover provisions could substantially impede the ability of public stockholders to benefit from a change in control or to change our management and board of directors and, as a result, may adversely affect the market price of our common stock and your ability to realize any potential change of control premium.

In addition, in the event of certain changes in control, including if Brookfield's ownership of our outstanding common stock were to fall below 30%, payments to certain of our senior management may be triggered under certain of our compensation arrangements, which could have an adverse impact on us.

Our Amended Certificate of Incorporation provides that the Court of Chancery of the State of Delaware will be the exclusive forum for substantially all disputes between us and our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers, or employees.

Our Amended Certificate of Incorporation provides that the Court of Chancery of the State of Delaware is the exclusive forum for:

- any derivative action or proceeding brought on our behalf;
- any action asserting a breach of fiduciary duty;
- any action asserting a claim against us arising under the DGCL, our Amended Certificate of Incorporation or our Amended By-Laws; and
- any action asserting a claim against us that is governed by the internal-affairs doctrine.

This exclusive forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers, or other employees, which may discourage lawsuits against us and our

directors, officers, and other employees. If a court were to find the exclusive forum provision in our Amended Certificate of Incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving the dispute in other jurisdictions, which could harm our business.

The market price and trading volume of our common stock may be volatile, which could result in rapid and substantial losses for our stockholders.

The market price of our common stock may be highly volatile and could be subject to wide fluctuations. In addition, the trading volume in our common stock may fluctuate and cause significant price variations to occur. If the market price of our common stock declines significantly, you may be unable to resell your shares at or above your purchase price, if at all. The market price of our common stock may fluctuate or decline significantly in the future. Some of the factors that could negatively affect our share price or result in fluctuations in the price or trading volume of our common stock include:

- variations in our quarterly or annual operating results;
- changes in our earnings estimates (if provided) or differences between our actual financial and operating results and those expected by investors and analysts;
- the contents of published research reports about us or our industry or the failure of securities analysts to cover our common stock;
- additions or departures of key management personnel;
- any increased indebtedness we may incur in the future;
- announcements by us or others and developments affecting us;
- actions by institutional stockholders;
- litigation and governmental investigations;
- changes in market valuations of similar companies;
- speculation or reports by the press or investment community with respect to us or our industry in general;
- increases in market interest rates that may lead purchasers of our shares to demand a higher yield;
- announcements by us or our competitors of significant contracts, acquisitions, dispositions, strategic relationships, joint ventures or capital commitments; and
- general market, political and economic conditions, including any such conditions and local conditions in the markets in which our customers are located.

These broad market and industry factors may decrease the market price of our common stock, regardless of our actual operating performance. The stock market in general has from time to time experienced extreme price and volume fluctuations, including in recent months. In addition, in the past, following periods of volatility in the overall market and the market price of a company's securities, securities class action litigation has often been instituted against these companies. This litigation, if instituted against us, could result in substantial costs and a diversion of our management's attention and resources.

Future offerings of debt or equity securities by us may adversely affect the market price of our common stock.

In the future, we may attempt to obtain financing or to further increase our capital resources by issuing additional shares of our common stock or offering debt or other equity securities, including commercial paper, medium-term notes, senior or subordinated notes, debt securities convertible into equity or shares of preferred stock. Future acquisitions could require substantial additional capital in excess of cash from operations. We would expect to finance any future acquisitions through a combination of additional issuances of equity, corporate indebtedness, asset-backed acquisition financing and/or cash from operations.

Issuing additional shares of our common stock or other equity securities or securities convertible into equity may dilute the economic and voting rights of our existing stockholders or reduce the market price of our common stock or both. Upon liquidation, holders of such debt securities and preferred shares, if issued, and lenders with respect to other borrowings would receive a distribution of our available assets prior to the holders of our common stock. Debt securities convertible into equity could be subject to adjustments in the conversion ratio pursuant to which certain events may increase the number of equity

securities issuable upon conversion. Preferred shares, if issued, could have a preference with respect to liquidating distributions or a preference with respect to dividend payments that could limit our ability to pay dividends to the holders of our common stock. Our decision to issue securities in any future offering will depend on market conditions and other factors beyond our control, which may adversely affect the amount, timing or nature of our future offerings. Thus, holders of our common stock bear the risk that our future offerings may reduce the market price of our common stock and dilute their stockholdings in us.

The market price of our common stock could be negatively affected by sales of substantial amounts of our common stock in the public markets.

Sales of substantial amounts of our common stock in the public markets, or the perception that these sales could occur, could cause the market price of our common stock to decline. In particular, the sale in the public markets of our common stock by Brookfield, which, as of February 16, 2021, owned approximately 47.8% of our outstanding common stock, or by our officers and directors, or the perception that these sales may occur, could cause the market price of our common stock to decline. Brookfield may from time to time seek to sell or otherwise dispose of some or all of its shares, including by transferring shares to affiliates, distributing shares to its partners, members or beneficiaries, or selling shares in underwritten offerings, block sales, open market transactions or otherwise. Brookfield and our officers and directors may also sell shares into the public markets in accordance with the requirements of Rule 144, and Brookfield is entitled to request that we facilitate SEC registration of their sales of shares pursuant to the terms of a registration rights agreement. A decline in the price of our common stock might impede our ability to raise capital through the issuance of additional common stock or other equity securities.

The future issuance of additional common stock in connection with our incentive plans, acquisitions or otherwise will dilute all other stockholdings.

As of February 16, 2021, we had an aggregate of 2,717,854,716 shares of common stock authorized but unissued and not otherwise reserved for issuance under our incentive plans. We may issue all of these shares of common stock without any action or approval by our stockholders, subject to certain exceptions. We also intend to continue to evaluate acquisition opportunities and may issue common stock in connection with these acquisitions. Any common stock issued in connection with our incentive plans, acquisitions, the exercise of outstanding stock options or otherwise would dilute the percentage ownership held by public investors.

If securities or industry analysts do not publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock depends in part on the research and reports that securities or industry analysts publish about us or our business. If one or more of the analysts who covers us downgrades our common stock or publishes inaccurate or unfavorable research about our business, our stock price would likely decline. If one or more of these analysts ceases coverage of us or fails to publish reports on us regularly, demand for our common stock could decrease, which could cause our stock price and trading volume to decline.

Item 1B. Unresolved Staff Comments

Not applicable.

Item 2. Properties

We currently operate the following facilities, which are owned or leased as indicated.

Location of Facility	Primary Use	Owned or Leased
Americas		
Brooklyn Heights, Ohio	Corporate Headquarters, Innovation and Technology Center and Sales Office	Leased
Monterrey, Mexico	Graphite Electrode Manufacturing Facility and Sales Office	Owned
St. Marys, Pennsylvania	Graphite Electrode Manufacturing Facility	Owned
Port Lavaca, Texas	Petroleum Needle Coke Manufacturing Facility (Seadrift)	Owned
Salvador, Bahia, Brazil	Graphite Electrode Machine Shop and Sales Office	Owned
Europe		
Calais, France	Graphite Electrode Manufacturing Facility and Sales Office	Owned
Pamplona, Spain	Graphite Electrode Manufacturing Facility and Sales Office	Owned
Bussigny, Switzerland	Global Sales and Production Planning Office	Leased

Item 3. Legal Proceedings

We are involved in various investigations, lawsuits, claims, demands, labor disputes and other legal proceedings, including with respect to environmental and human exposure or other personal injury matters, arising out of or incidental to the conduct of our business. While it is not possible to determine the ultimate disposition of each of these matters and proceedings, we do not believe that their ultimate disposition will have a material adverse effect on our financial position, results of operations or cash flows. Additionally, we are involved in the following legal proceedings.

We are involved in various arbitrations pending before the International Chamber of Commerce with several customers who, among other things, have failed to perform under their LTAs and in certain instances are seeking to modify or frustrate their contractual commitments to us. We intend to vigorously enforce our rights under these agreements.

Pending litigation in Brazil has been brought by employees seeking to recover additional amounts and interest thereon under certain wage increase provisions applicable in 1989 and 1990 under collective bargaining agreements to which employers in the Bahia region of Brazil were a party (including our subsidiary in Brazil). Companies in Brazil have settled claims arising out of these provisions and, in May 2015, the litigation was remanded by the Brazilian Supreme Court in favor of the employees union. After denying an interim appeal by the Bahia region employers on June 26, 2019, the Brazilian Supreme Court finally ruled in favor of the employees union on September 26, 2019. The employers union has determined not to seek annulment of such decision. Separately, on October 1, 2015, a related action was filed by current and former employees against our subsidiary in Brazil to recover amounts under such provisions, plus interest thereon, which amounts together with interest could be material to us. If the Brazilian Supreme Court proceeding above had been determined in favor of the employers union, it would also have resolved this proceeding in our favor. In the first quarter of 2017, the state court initially ruled in favor of the employees. We appealed this state court ruling, and the appellate court issued a decision in our favor on May 19, 2020. The employees have further appealed, and on December 16, 2020, the court upheld the decision in favor of GrafTech Brazil. On February 22, 2021, the employees filed a further appeal, and we intend to vigorously defend our position. As of December 31, 2020, we are unable to assess the potential loss associated with these proceedings as the claims do not currently specify the number of employees seeking damages or the amount of damages being sought.

On September 30, 2020, a stockholder of GTI filed a lawsuit in the Delaware Court of Chancery. The stockholder filed an amended complaint on February 5, 2021, in response to the defendants' motion to dismiss. The amended complaint challenges the fairness of GTI's repurchase of shares of its common stock from Brookfield for $250 million pursuant to a December 3, 2019 share repurchase agreement and also a related block trade by Brookfield of shares of GTI's common stock. The stockholder, on behalf of an alleged class of holders of shares of GTI's common stock as of December 3, 2019 and also purportedly on behalf of GTI, asserts claims for breach of fiduciary duty against certain members of GTI's Board of Directors and Brookfield. The stockholder also challenges the appointment of the newest independent director to GTI's Board of Directors, as allegedly in violation of GTI's Amended and Restated Certificate of Incorporation and the Stockholder Rights Agreement with certain Brookfield entities and affiliates. The stockholder seeks, among other things, an award of monetary relief to GTI and a declaration that the appointment of the newest independent director to the Board of Directors is invalid.

Item 4. Mine Safety Disclosures

Not applicable.

Item 4A. Information about our Executive Officers

The following table sets forth information with respect to our current executive officers, including their ages, as of February 16, 2021. There are no family relationships between any of our executive officers.

Name	Age	Position
David J. Rintoul	63	President and Chief Executive Officer
Quinn J. Coburn	57	Vice President, Chief Financial Officer and Treasurer
Jeremy S. Halford	48	Senior Vice President, Operations and Development
Gina K. Gunning	54	Chief Legal Officer and Corporate Secretary
Iñigo Perez Ortiz	49	Senior Vice President, Commercial

David J. Rintoul became President and CEO and was elected to the board of directors in March 2018. Prior to joining the Company, Mr. Rintoul served as President of U.S. Steel Tubular Products and as a Senior Vice President of United States Steel Corporation ("U.S. Steel"). Before that, Mr. Rintoul has served in various roles at U.S. Steel since 2007, including oversight of U.S. Steel's Slovak and Serbian operations. Mr. Rintoul's career in the steel industry spans 38 years with positions at both integrated and mini mill producers in the United States, Europe and Canada, including extensive mini-mill operational experience at North Star Bluescope Steel in Delta, Ohio from 2001 to 2005 and from construction through full operations at Acme Steel Company in Riverdale, Illinois from 1995 to 2001. Mr. Rintoul holds an Associate's degree in Mechanical Engineering Technology from Sault College of Applied Arts and Technology, a Bachelor's degree in Business Administration from Lake Superior State University and a Master's degree in Business Administration from the University of Notre Dame.

Quinn J. Coburn became CFO in September 2015. Mr. Coburn served as interim CFO beginning in May 2015 after previously serving as Vice President of Finance and Treasurer. He joined the Company in August 2010 after working at NCR Corporation from December 1992 until August 2010, including service as that company's Vice President and Treasurer. Mr. Coburn graduated with a B.S. in Accounting from Utah State University in 1988. He received a Masters of Business Administration from University of Pennsylvania's The Wharton School in 1992.

Jeremy S. Halford joined the Company on May 1, 2019 as Senior Vice President, Operations and Development. Mr. Halford previously served as the President of Arconic Engineered Structures, a producer of highly engineered titanium and aluminum components for the aerospace, defense and oil and gas markets, a position he held since January 2017. Mr. Halford also was President of Doncasters Aerospace, a manufacturer of components and assemblies for the civil and military aero engine and airframe markets, from 2014 to 2016, and Vice President, Global Business Development, Doncasters Group Limited from 2013 to 2014. Previously, he also was President of Mayfran International from 2012 to 2013, and spent seven years at Alcoa in a variety of general management and strategy roles. Mr. Halford holds a Masters of Business Administration degree from Harvard University and a Bachelor of Science degree in Mechanical Engineering from GMI Engineering and Management Institute (now Kettering University).

Gina K. Gunning joined the Company as Chief Legal Officer and Corporate Secretary in July 2018. She has 25 years of law firm and in-house corporate legal experience across multiple industries. Prior to joining GrafTech, she was an Associate General Counsel at FirstEnergy Corp. from 2012 to 2018, where she was responsible for legal matters involving SEC reporting, business development, capital markets, as well as corporate and executive compensation topics. She also served as a partner at Jones Day. Ms. Gunning holds a Juris Doctor from Notre Dame Law School and a Bachelor of Arts in English from the University of Notre Dame.

Iñigo Perez Ortiz joined the Company as Senior Vice President, Commercial in February 2020. Mr. Perez most recently served as Vice President, Europe and Asia, Sales and Customer Service at Alcoa Corporation, a global industry leader in bauxite, alumina, and aluminum products, a position he held since 2017. Previously at Alcoa, Mr. Perez was Commercial Director, Europe and Asia Pacific from 2011 to 2017, Sales Manager, Europe from 2007 to 2011 and Sales Office Manager from 2002 to 2007. Prior to his career at Alcoa, Mr. Perez served in a variety of senior commercial roles at Autopulit S.A., Warner Electric and Babcock Wilcox Espanola, S.A. Mr. Perez holds a Master in Industrial Plans Management, Lean Manufacturing and Engineering degree from Polytechnic University of Barcelona, an Executive Master of Business Administration degree from Instituto de Empresa and a Mining Engineer degree from the University of the Basque Country.

PART II

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

Market Information

Our common stock IPO was completed on April 23, 2018 and our stock is listed on the NYSE under the trading symbol "EAF."

Holders

As of December 31, 2020, there were three holders of record of our common stock.

Dividend Policies and Restrictions

We currently pay a quarterly cash dividend of $0.01 per share, or an aggregate of $0.04 per share on an annualized basis. We expect to continue to pay this dividend out of cash generated from operations; we do not intend to incur indebtedness to fund regular, quarterly dividend payments.

We cannot assure you, however, that we will pay dividends in the future in these amounts or at all. Our board of directors may change the timing and amount of any future dividend payments or eliminate the payment of future dividends in its sole discretion, without any prior notice to our stockholders. Our ability to pay dividends will depend upon many factors, including our financial position and liquidity, results of operations, legal requirements, restrictions that may be imposed by the terms of our current and future credit facilities and other debt obligations and other factors deemed relevant by our board of directors.

For further discussion of the factors that may affect our business and our ability to pay dividends, see "Risk Factors-Risks Related to Our Business and Industry" and "Risk Factors-Risks Related to our Common Stock-We may not pay cash dividends on our common stock."

Repurchases

The table below sets forth the information on a monthly basis regarding GrafTech's purchases of its common stock, par value $0.01 per share, during the fourth quarter of 2020.

Period	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Plans or Programs [1]
October 1 through October 31, 2020	—	$ —	—	$ 59,030,305
November 1 through November 30, 2020	—	—	—	—
December 1 through December 31, 2020	—	$ —	—	—
Total	—		—	$ 59,030,305

[1] Authorization remaining pursuant to our previously announced program to repurchase, which was authorized by our Board of Directors on July 30, 2019 (the "Share Repurchase Program"). The Share Repurchase Program was announced on July 31, 2019 and allows for the purchase of up to $100 million of outstanding shares of our common stock from time to time on the open market, including under Rule 10b5-1 and/or Rule 10b-18 plans. The Share Repurchase Program has no expiration date.

Item 6. Selected Financial Data

The data set forth below should be read in conjunction with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and the Consolidated Financial Statements and Notes thereto.

	Year Ended December 31,				
	2020	**2019**	**2018**	**2017** (d)	**2016** (d)
	(in thousands, except per share amounts)				
Statement of Operations Data:					
Net sales	$ 1,224,361	$ 1,790,793	$ 1,895,910	$ 550,771	$ 437,963
Income (loss) from continuing operations	434,374	744,602	853,888	14,212	(108,869)
Net income (loss)	434,374	744,602	854,219	7,983	(235,843)
Basic and diluted earnings (loss) per common share:					
Income (loss) from continuing operations per share	$ 1.62	$ 2.58	$ 2.87	$ 0.05	$ (0.36)
Weighted average common shares outstanding (a)	267,916	289,057	297,748	302,226	302,226
Dividends per common share (b)	$ 0.12	$ 0.34	$ 7.71	$ —	$ —
Balance sheet data (at period end):					
Total assets	$ 1,432,712	$ 1,526,164	$ 1,505,491	$ 1,199,103	$ 1,172,276
Other long-term obligations (c)	81,478	72,562	72,519	68,907	82,148
Total long-term debt	1,420,000	1,812,682	2,050,311	322,900	356,580
Other financial data:					
Net cash provided by operating activities	$ 563,646	$ 805,316	$ 836,603	$ 36,573	$ 22,815
Net cash used in investing activities	(35,696)	(63,884)	(67,295)	(2,199)	(10,471)
Net cash used in financing activities	(463,683)	(709,631)	(731,044)	(32,995)	(8,317)

(a) Gives effect to the 3,022,259.23-for-1 stock split on our common stock effected on April 12, 2018.

(b) 2018 calculated by total dividends paid of $2,294,265 divided by weighted average shares outstanding. $2,022,000 of these dividends were declared and paid to Brookfield prior to our IPO. All other dividends were declared and paid to all common stockholders.

(c) Represents pension and post-retirement benefits and related costs and miscellaneous other long-term obligations.

(d) 2016 and 2017 results included discontinued operations related to business units that have since been disposed.

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

The following discussion and analysis of our financial condition and results of operations should be read together with our Consolidated Financial Statements and the accompanying notes and other financial information appearing elsewhere in this Annual Report on Form 10-K. Discussion and analysis regarding our financial condition and results of operations for 2019 as compared to 2018 is included in Item 7 of our Annual Report on Form 10-K for the year-ended December 31, 2019, filed with the SEC on February 21, 2020. Information in this section is intended to assist the reader in obtaining an understanding of our Consolidated Financial Statements, the changes in certain key items in those financial statements from year-to-year, the primary factors that accounted for those changes, any known trends or uncertainties that we are aware of that may have a material effect on our future performance, as well as how certain accounting principles affect our Consolidated Financial Statements. This discussion and analysis contains forward-looking statements that involve risks, uncertainties and assumptions. See "Special Note Regarding Forward-Looking Statements." Our actual results could differ materially from those forward-looking statements as a result of many factors, including those discussed in "Risk Factors" and elsewhere in this Form 10-K.

Overview

We are a leading manufacturer of high quality graphite electrode products essential to the production of EAF steel and other ferrous and non-ferrous metals. We believe that we have the most competitive portfolio of low-cost UHP graphite electrode manufacturing facilities in the industry, including three of the highest capacity facilities in the world. We are the only large scale graphite electrode producer that is substantially vertically integrated into petroleum needle coke, a key raw material for graphite electrode manufacturing. Between 1984 and 2011, EAF steelmaking was the fastest-growing segment of the steel sector, with production increasing at an average rate of 3.5% per year, based on WSA data. Historically, EAF steel production has grown faster than the overall steel market due to the greater resilience, more variable cost structure, lower capital intensity and more environmentally friendly nature of EAF steelmaking. This trend was partially reversed between 2011 and 2015 due to global steel production overcapacity driven largely by Chinese BOF steel production. Beginning in 2016, efforts by the Chinese government to restructure China's domestic steel industry have led to limits on BOF steel production and lower export levels, and developed economies, which typically have much larger EAF steel industries, have instituted a number of trade policies in support of domestic steel producers. In response to this increased demand, we modified our commercial strategy and executed long-term take-or-pay contracts with our customers. Since 2000, EAF production has grown at an average rate of 3.2%.

We service customers at over 300 locations across the globe, all of which have been impacted by the COVID-19 pandemic during 2020. In the second half of 2020, we began to see a measured recovery in the global steel markets compared to the second quarter of 2020, with each region recovering at different rates, and anticipate this will have a positive influence on graphite electrode demand. In the fourth quarter of 2020, both the global (ex-China) and U.S. steel market capacity utilization rates improved to over 72%. By late February 2021, the capacity utilization rate in the U.S. steel market was approximately 77%.

The commercial team has worked diligently in 2020 to achieve solid results in the current environment. Full year 2020 sales volumes were 135,000 MT, consisting of long-term agreement ("LTA") volumes of 113,000 MT and non-LTA volumes of 22,000 MT.

During the fourth quarter of 2020, our average price from LTAs was approximately $9,600 per MT and our average price for non-LTA business was approximately $4,900 per MT.

Market prices for graphite electrodes declined throughout 2020, including through the fourth quarter and into the early part of the first quarter of 2021. There is a lag between the time we negotiate price for non-LTA sales and when our electrodes are delivered and recognized in revenue. We estimate that our non-LTA price for electrodes delivered and recognized in revenue for the first six weeks of 2021 averaged approximately $4,200 per MT. Given this impact, for the first half of 2021 we anticipate earnings per share and adjusted EBITDA will decline by high single digits, on a percentage basis, compared to the first half of 2020. We believe market prices for graphite electrodes are now improving and expect this to positively impact our financial results beginning in the second half of 2021.

During the challenging market conditions in 2020, we were able to work with our valued customers to develop mutually beneficial solutions to their challenges, including volume commitments. We are pleased to have successfully negotiated LTA modifications with many of these customers. We also continue to work to preserve our rights under the LTAs in a few arbitrations that arose from some LTA non-performance and other disputes during the year.

COVID-19 and operational update

We continue to proactively manage through the COVID-19 crisis to support the health and safety of our team. Our plants have remained operational and maintained a 97% on-time delivery rate in the fourth quarter of 2020. Our global footprint gives us the flexibility to move or adjust production if needed.

Capital structure and capital allocation

As of December 31, 2020, we had cash and cash equivalents of $145 million and total debt of approximately $1.4 billion.

During 2020, capital allocation included $400 million of debt repayment, $36 million of capital expenditures, $31 million of dividend payments, and $30 million for share repurchases. In 2021, we expect our primary use of cash to continue to be debt repayment. We expect 2021 full year capital expenditures to range between $55 and $65 million.

On December 22, 2020, we issued our $500 million aggregate principal amount of 2020 Senior Notes. The proceeds of the 2020 Senior Notes were used to repay a portion of our secured 2018 Term Loans due February 2025 under the 2018 Credit Agreement .

Industry conditions

The graphite electrode industry has historically followed the growth of the EAF steel industry and, to a lesser extent, the steel industry as a whole, which has been highly cyclical and affected significantly by general economic conditions. Historically, EAF steel production has grown faster than the overall steel market due to the greater resilience, more variable cost structure, lower capital intensity and more environmentally friendly nature of EAF steelmaking.

Increased demand for petroleum needle coke in 2018 and 2019 led to pricing increases in those years. Needle coke prices began to retreat in the second half of 2019 and continued to decline over the course of 2020. Graphite electrodes have typically been priced at a spread to petroleum needle coke. We believe that our substantial vertical integration into petroleum needle coke through our ownership of Seadrift provides a significant cost advantage relative to our competitors. We currently anticipate utilizing all of our needle coke internally, minimizing third-party purchases.

The impact of the COVID-19 pandemic on global steel production and corresponding graphite electrode demand, along with elevated graphite electrode inventories among EAF steel producers, caused market softness in 2020. As a result, our graphite electrode sales volumes decreased in 2020. We expect conditions to improve later in 2021.

Outlook

Our estimated shipments of graphite electrodes for the final two years of the initial term under our LTAs and for the years 2023 through 2024 are as follows:

	2021	2022	2023 through 2024
Estimated LTA volume[(1)]	98-108	95-105	35-45
Estimated LTA revenue[(2)]	$925-$1,025	$910-$1,010	$350-$450[(3)]

(1) In thousands of MT
(2) In millions
(3) Includes expected termination fees from a few customers that have failed to meet certain obligations under their LTAs

Components of results of operations

Net sales

Net sales reflect sales of our products, including graphite electrodes and associated by-products. Several factors affect net sales in any period, including general economic conditions, competitive conditions, customer inventory levels, scheduled plant shutdowns by customers, national vacation practices, changes in customer production schedules in response to seasonal changes in energy costs, weather conditions, strikes and work stoppages at customer plants and changes in customer order patterns including those in response to the announcement of price increases or price adjustments.

Revenue is recognized when a customer obtains control of promised goods. The amount of revenue recognized reflects the consideration to which the Company expects to be entitled to receive in exchange for these goods. See Note 2 "Revenue

from Contracts with Customers" to the Consolidated Financial Statements for more information. Our first quarter is historically the weakest sales quarter.

Cost of sales

Cost of sales includes the costs associated with products invoiced during the period as well as non-inventoried manufacturing overhead costs and outbound transportation costs. Cost of sales includes all costs incurred at our production facilities to make products saleable, such as raw materials, energy costs, direct labor and indirect labor and facilities costs, including purchasing and receiving costs, plant management, inspection costs, product engineering and internal transfer costs. In addition, all depreciation associated with assets used to produce products and make them saleable is included in cost of sales. Direct labor costs consist of salaries, benefits and other personnel-related costs for employees engaged in the manufacturing of our products.

Inventory valuation

Inventories are stated at the lower of cost or market. Cost is principally determined using the “first-in, first-out” (“FIFO”) and average cost, which approximates FIFO, methods. Elements of cost in inventory include raw materials, energy costs, direct labor, manufacturing overhead and depreciation of the manufacturing fixed assets. We allocate fixed production overheads to the costs of conversion based on normal capacity of the production facilities. We recognize abnormal amounts of idle facility expense, freight, handling costs, and wasted materials (spoilage) as current period charges. Market, or net realizable value, is the estimated selling price in the ordinary course of business, less reasonably predictable costs of completion, disposal and transportation.

Research and development

We conduct our R&D both independently and in conjunction with our strategic suppliers, customers and others. Expenditures relating to the development of new products and processes, including improvements to existing products, are expensed as incurred.

Selling and administrative expenses

Selling and administrative expenses include salaries, benefits and other personnel related costs for employees engaged in sales and marketing, customer technical services, engineering, finance, information technology, human resources and executive management. Other costs include outside legal and accounting fees, risk management (insurance), global operational excellence, global supply chain, in-house legal, share-based compensation and certain other administrative and global resources costs. Our “mark-to-market adjustment” refers to our accounting policy regarding pension and other post-employment benefit ("OPEB") plans, where we immediately recognize the change in the fair value of plan assets and net actuarial gains and losses annually in the fourth quarter of each year.

Other expense (income)

Other expense (income) consists primarily of foreign currency impacts on non-operating assets and liabilities and miscellaneous income and expense.

Related party Tax Receivable Agreement (benefit) expense

Related party Tax Receivable Agreement (benefit) expense represents our expense associated with Brookfield's right, as sole pre-IPO stockholder, to receive future payments from us for 85% of the amount of cash savings, if any, in U.S. federal income tax and Swiss tax that we and our subsidiaries realize as a result of the utilization of certain tax assets attributable to periods prior to our IPO.

Interest expense

Interest expense consists primarily of interest expense on our 2018 Term Loan Facility, 2018 Credit Revolving Facility, 2020 Senior Notes, accretion of the fair value adjustment, amortization of debt issuance costs and accretion of original issue discounts.

Income (loss) from discontinued operations

As of June 30, 2016, the Engineered Solutions segment qualified for reporting as discontinued operations, and the disposition of the segment was substantially complete by the end of the third quarter of 2017. All results are reported as gain or loss from discontinued operations, net of tax.

Effects of changes in currency exchange rates

When the currencies of non-U.S. countries in which we have a manufacturing facility decline (or increase) in value relative to the U.S. dollar, this has the effect of reducing (or increasing) the U.S. dollar equivalent cost of sales and other expenses with respect to those facilities. In certain countries in which we have manufacturing facilities, and in certain export markets, we sell in currencies other than the U.S. dollar. Accordingly, when these currencies increase (or decline) in value relative to the U.S. dollar, this has the effect of increasing (or reducing) net sales. The result of these effects is to increase (or decrease) operating profit and net income.

Many of the non-U.S. countries in which we have a manufacturing facility have been subject to significant economic and political changes, which have significantly impacted currency exchange rates. We cannot predict changes in currency exchange rates in the future or whether those changes will have net positive or negative impacts on our net sales, cost of sales or net income.

The impact of these changes in the average exchange rates of other currencies against the U.S. dollar on our net sales was an increase of $3.6 million for the year ended December 31, 2020, a decrease of $6.9 million for the year ended December 31, 2019, and an increase of $10.5 million for the year ended December 31, 2018.

The impact of these changes in the average exchange rates of other currencies against the U.S. dollar on our cost of sales was decreases of $4.9 million and $9.1 million for the years ended December 31, 2020 and 2019, respectively, and an increase of $3.6 million for the year ended December 31, 2018.

As part of our cash management, we also have intercompany loans between our subsidiaries. These loans are deemed to be temporary and, as a result, remeasurement gains and losses on these loans are recorded as currency gains or losses in other income (expense), net, on the Consolidated Statements of Operations.

We have in the past and may in the future use various financial instruments to manage certain exposures to risks caused by currency exchange rate changes, as described under “Quantitative and Qualitative Disclosures about Market Risks".

Key metrics used by management to measure performance

In addition to measures of financial performance presented in our Consolidated Financial Statements in accordance with GAAP (as defined below), we use certain other financial measures and operating metrics to analyze the performance of our company. The “non-GAAP” financial measures consist of EBITDA from continuing operations and adjusted EBITDA from continuing operations, which help us evaluate growth trends, establish budgets, assess operational efficiencies and evaluate our overall financial performance. The key operating metrics consist of sales volume, production volume, production capacity and capacity utilization.

Key financial measures

	For the year ended December 31,		
(in thousands)	**2020**	**2019**	**2018**
Net sales	$ 1,224,361	$ 1,790,793	$ 1,895,910
Net income	$ 434,374	$ 744,602	$ 854,219
EBITDA from continuing operations[(1)]	$ 669,332	$ 1,027,268	$ 1,102,625
Adjusted EBITDA from continuing operations[(1)]	$ 658,946	$ 1,048,259	$ 1,205,021

[(1)] See below for more information and a reconciliation of EBITDA from continuing operations and adjusted EBITDA from continuing operations to net income, the most directly comparable financial measure calculated and presented in accordance with GAAP.

Key operating metrics

In addition to measures of financial performance presented in accordance with GAAP, we use certain operating metrics to analyze the performance of our company. The key operating metrics consist of sales volume, production volume, production capacity and capacity utilization. These metrics align with management's assessment of our revenue performance and profit margin, and will help investors understand the factors that drive our profitability.

Sales volume reflects the total volume of graphite electrodes sold for which revenue has been recognized during the period. For a discussion of our revenue recognition policy, see “—Critical accounting policies—Revenue recognition” in this section. Sales volume helps investors understand the factors that drive our net sales.

Production volume reflects graphite electrodes produced during the period. Production capacity reflects expected maximum production volume during the period under normal operating conditions, standard product mix and expected maintenance downtime. Capacity utilization reflects production volume as a percentage of production capacity. Production volume, production capacity and capacity utilization help us understand the efficiency of our production, evaluate cost of sales and consider how to approach our contract initiative.

	For the year ended December 31,		
(in thousands)	**2020**	**2019**	**2018**
Sales volume (MT)[1]	135	171	176
Production volume (MT)[2]	134	177	179
Production capacity excluding St. Marys (MT)[3][4]	202	202	180
Capacity utilization excluding St. Marys[3][5]	66 %	88 %	99 %
Total production capacity[4][6]	230	230	208
Total capacity utilization[5][6]	58 %	77 %	86 %

[1] Sales volume reflects only graphite electrodes manufactured by GrafTech.
[2] Production volume reflects graphite electrodes we produced during the period.
[3] In the first quarter of 2018, our St. Marys facility began graphitizing a limited amount of electrodes sourced from our Monterrey, Mexico facility.
[4] Production capacity reflects expected maximum production volume during the period under normal operating conditions, standard product mix and expected maintenance outage. Actual production may vary.
[5] Capacity utilization reflects production volume as a percentage of production capacity.
[6] Includes graphite electrode facilities in Calais, France; Monterrey, Mexico; Pamplona, Spain and St. Marys, Pennsylvania.

Non-GAAP financial measures

In addition to providing results that are determined in accordance with generally accepted accounting principles in the United States ("GAAP"), we have provided certain financial measures that are not in accordance with GAAP. EBITDA from continuing operations and adjusted EBITDA from continuing operations are non-GAAP financial measures. We define EBITDA from continuing operations, a non-GAAP financial measure, as net income or loss plus interest expense, minus interest income, plus income taxes, and depreciation and amortization. We define adjusted EBITDA from continuing operations as EBITDA from continuing operations plus any pension and OPEB plan expenses, initial and follow-on public offering and related expenses, non-cash gains or losses from foreign currency remeasurement of non-operating assets and liabilities in our foreign subsidiaries where the functional currency is the U.S. dollar, related party Tax Receivable Agreement (as defined below) adjustments, stock-based compensation, and non-cash fixed asset write-offs. Adjusted EBITDA from continuing operations is the primary metric used by our management and our Board of Directors to establish budgets and operational goals for managing our business and evaluating our performance.

We monitor adjusted EBITDA from continuing operations as a supplement to our GAAP measures, and believe it is useful to present to investors, because we believe that it facilitates evaluation of our period-to-period operating performance by eliminating items that are not operational in nature, allowing comparison of our recurring core business operating results over multiple periods unaffected by differences in capital structure, capital investment cycles and fixed asset base. In addition, we believe adjusted EBITDA from continuing operations and similar measures are widely used by investors, securities analysts, ratings agencies, and other parties in evaluating companies in our industry as a measure of financial performance and debt-service capabilities. We also monitor the ratio of total debt to adjusted EBITDA from continuing operations, because we believe it is a useful and widely used way to assess our leverage.

Our use of adjusted EBITDA from continuing operations has limitations as an analytical tool, and you should not consider it in isolation or as a substitute for analysis of our results as reported under GAAP. Some of these limitations are:

- adjusted EBITDA from continuing operations does not reflect changes in, or cash requirements for, our working capital needs;
- adjusted EBITDA from continuing operations does not reflect our cash expenditures for capital equipment or other contractual commitments, including any capital expenditure requirements to augment or replace our capital assets;
- adjusted EBITDA from continuing operations does not reflect the interest expense or the cash requirements necessary to service interest or principal payments on our indebtedness;
- adjusted EBITDA from continuing operations does not reflect tax payments that may represent a reduction in cash available to us;
- adjusted EBITDA from continuing operations does not reflect expenses relating to our pension and OPEB plans;

- adjusted EBITDA from continuing operations does not reflect the non-cash gains or losses from foreign currency remeasurement of non-operating assets and liabilities in our foreign subsidiaries where the functional currency is the U.S. dollar;
- adjusted EBITDA from continuing operations does not reflect initial and follow-on public offering and related expenses;
- adjusted EBITDA from continuing operations does not reflect related party Tax Receivable Agreement adjustments;
- adjusted EBITDA from continuing operations does not reflect stock-based compensation or the non-cash write-off of fixed assets; and
- other companies, including companies in our industry, may calculate EBITDA from continuing operations and adjusted EBITDA from continuing operations differently, which reduces its usefulness as a comparative measure.

In evaluating EBITDA from continuing operations and adjusted EBITDA from continuing operations, you should be aware that in the future, we will incur expenses similar to the adjustments in the reconciliation presented elsewhere in this Annual Report. Our presentations of EBITDA from continuing operations and adjusted EBITDA from continuing operations should not be construed as suggesting that our future results will be unaffected by these expenses or any unusual or non-recurring items. When evaluating our performance, you should consider EBITDA from continuing operations and adjusted EBITDA from continuing operations alongside other financial performance measures, including our net income and other GAAP measures.

The following table reconciles our non-GAAP key financial measures to the most directly comparable GAAP measures:

	For the year ended December 31,		
(in thousands)	**2020**	**2019**	**2018**
Net income (loss)	$ 434,374	$ 744,602	$ 854,219
Add:			
Discontinued operations	—	—	(331)
Depreciation and amortization	62,963	61,819	66,413
Interest expense	98,074	127,331	135,061
Interest income	(1,750)	(4,709)	(1,657)
Income taxes	75,671	98,225	48,920
EBITDA from continuing operations	$ 669,332	$ 1,027,268	$ 1,102,625
Adjustments:			
Pension and OPEB plan expenses[1]	6,096	6,727	3,893
Initial and follow-on public offerings and related expenses[2]	264	2,056	5,173
Non-cash loss on foreign currency remeasurement[3]	1,297	1,784	818
Stock-based compensation[4]	2,669	2,143	1,152
Non-cash fixed asset write-off[5]	378	4,888	4,882
Related party Tax Receivable Agreement (benefit) expense[6]	(21,090)	3,393	86,478
Adjusted EBITDA from continuing operations	$ 658,946	$ 1,048,259	$ 1,205,021

(1) Service and interest cost of our OPEB plans. Also includes a mark-to-market loss (gain) for plan assets as of December of each year.
(2) Legal, accounting, printing and registration fees associated with the initial and follow-on public offering and related expenses.
(3) Non-cash gains and losses from foreign currency remeasurement of non-operating assets and liabilities of our non-U.S. subsidiaries where the functional currency is the U.S. dollar.
(4) Non-cash expense for stock-based compensation grants.
(5) Non-cash fixed asset write-off recorded for obsolete assets.
(6) Non-cash expense adjustment for future payment to our sole pre-IPO stockholder for tax assets that are expected to be utilized.

Customer base

We are a global company and sell our products in every major geographic market. Sales of these products to buyers outside the United States accounted for approximately 79%, 77% and 78% of our net sales in 2020, 2019 and 2018, respectively.

In 2020, seven of our ten largest customers were based in Europe, two in the United States, and one in Brazil. However, seven of our ten largest customers are multi-national operations.

The following table summarizes information as to our operations in different geographical areas:

	For the year ended December 31,		
(in thousands)	**2020**	**2019**	**2018**
Net sales:			
United States	260,867	403,916	429,599
Americas (excluding the United States)	187,779	348,670	367,561
Asia Pacific	127,415	172,439	131,578
Europe, Middle East, Africa	648,300	865,768	967,172
Total	$1,224,361	$1,790,793	$1,895,910

In 2020, no customer accounted for 10% of our net sales, nor do we believe any customer poses a significant concentration of risk, as sales to one customer could be replaced by demand from other customers.

Results of operations

Results of operations for 2020 as compared to 2019

The tables presented in our period-over-period comparisons summarize our Consolidated Statements of Operations and illustrate key financial indicators used to assess the consolidated financial results. Throughout our Management Discussion and Analysis ("MD&A"), insignificant changes may be deemed not meaningful and are generally excluded from the discussion.

	For the Year Ended December 31,		Increase/	%
(in thousands)	**2020**	**2019**	**Decrease**	**Change**
Net sales	$ 1,224,361	$ 1,790,793	$ (566,432)	(32)%
Cost of sales	563,864	750,390	(186,526)	(25)%
Gross profit	660,497	1,040,403	(379,906)	(37)%
Research and development	3,975	2,684	1,291	48 %
Selling and administrative expenses	67,913	63,674	4,239	7 %
Operating income	588,609	974,045	(385,436)	(40)%
Other expense (income), net	3,330	5,203	(1,873)	(36)%
Related party Tax Receivable Agreement (benefit) expense	(21,090)	3,393	(24,483)	N/A
Interest expense	98,074	127,331	(29,257)	(23)%
Interest income	(1,750)	(4,709)	(2,959)	63 %
Income before provision for income taxes	510,045	842,827	(326,864)	(39)%
Provision for income taxes	75,671	98,225	(22,554)	(23)%
Net income	$ 434,374	$ 744,602	$ (310,228)	(42)%

Net sales. Net sales decreased by $566.4 million, or 32%, from $1.8 billion in 2019 to $1.2 billion in 2020. This decrease was primarily driven by a 21% decrease in sales volume of GrafTech manufactured electrodes and decreased pricing for our products both driven by lower customer demand as a result of the COVID-19 pandemic and prolonged customer destocking taking place for the majority of 2020. The current market for graphite electrodes continues to be competitive, as our industry lags behind the improving fundamentals in the steel industry. If the strength in the steel industry continues, we would expect market conditions for our products to improve later in 2021.

Cost of sales. Cost of sales decreased by $186.5 million, or 25%, from $750.4 million in 2019 to $563.9 million in 2020. This decrease was primarily the result of the lower sales volume and decreased usage of third-party needle coke as we progressed through 2020.

Selling and administrative expenses. Selling and administrative expenses increased by $4.2 million, or 7%, from $63.7 million in 2019 to $67.9 million in 2020 due to increased legal expenses, partially offset by lower bad debt expense in 2020.

Other expense (income), net. Other expense decreased by $1.9 million, from $5.2 million in 2019 to $3.3 million in 2020. This decrease was primarily due to advantageous non-cash foreign currency impacts on non-operating assets and liabilities.

Related party Tax Receivable Agreement (benefit) expense. Related party Tax Receivable Agreement (benefit) expense decreased from an expense of $3.4 million in 2019 to a benefit of $21.1 million in 2020 as a result of revised U.S. income estimates affecting the future usage of our U.S. tax attributes which are required to be reimbursed to Brookfield under the Tax Receivable Agreement.

Interest expense. Interest expense decreased by $29.3 million, or 23%, from $127.3 million in 2019 to $98.1 million in 2020, primarily due to a decreased average term loan outstanding as we repaid $400.0 million of our term loan during 2020 as well as benefiting from lower interest rates. Partially offsetting the increase were the impacts of $3.2 million of accelerated accretion of an original issue discount and $5.2 million of accelerated amortization of the debt issuance costs.

Provision for income taxes. The following table summarizes the provision for income taxes in 2020 and 2019:

	For the Year Ended December 31, 2020	For the Year Ended December 31, 2019
Income tax expense	$ 75,671	$ 98,225
Income from continuing operations before provision for income taxes	$ 510,045	$ 842,827
Effective income tax rates	14.8 %	11.7 %

The effective tax rate for the year ended December 31, 2020 was 14.8% and differs from the U.S. statutory tax rate of 21% primarily due to worldwide earnings from various countries taxed at different rates and a portion of U.S. income being exempt from U.S. taxation as a result of the income qualifying for the foreign-derived intangible income deduction. As of December 31, 2020, the balance of our valuation allowance against deferred tax assets was $12.8 million and does not result in, or limit the Company's ability to utilize these tax assets in the future. We expect the effective tax rate in 2021 to be approximately 14-18%.

The tax expense changed from $98.2 million, with an effective tax rate of 11.7% for the year ended December 31, 2019 to a $75.7 million with an 14.8% effective rate for the year ended December 31, 2020. This increase in the effective tax rate is primarily due to enacted tax rate changes in European jurisdictions.

Effects of inflation

We incur costs in the United States and each of the non-U.S. countries in which we have a manufacturing facility. In general, our results of operations, cash flows and financial condition are affected by the effects of inflation on our costs incurred in each of these countries.

Currency translation and transactions

We translate the assets and liabilities of our non-U.S. subsidiaries into U.S. dollars for consolidation and reporting purposes in accordance with the Financial Accounting Standards Board (“FASB”) Accounting Standards Codification (“ASC”) 830, Foreign Currency Matters. Foreign currency translation adjustments are generally recorded as part of stockholders’ equity and identified as part of accumulated other comprehensive loss on the Consolidated Balance Sheets until such time as their operations are sold or substantially or completely liquidated.

We account for our Russian, Swiss, Luxembourg, United Kingdom (the “U.K.”) and Mexican subsidiaries using the U.S. dollar as the functional currency, as sales and purchases are predominantly U.S. dollar-denominated. Our remaining subsidiaries use their local currency as their functional currency.

We also record foreign currency transaction gains and losses from non-permanent intercompany balances as part of cost of sales and other (income) expense, net.

Significant changes in currency exchange rates impacting us are described under "—Effects of changes in currency exchange rates" and "—Results of operations" in this section.

Liquidity and capital resources

Our sources of funds have consisted principally of cash flow from operations and debt, including our credit facilities (subject to continued compliance with the financial covenants and representations). Our uses of those funds (other than for operations) have consisted principally of dividends, capital expenditures, scheduled debt repayments, optional debt repayments, share repurchases and other obligations. Disruptions in the U.S. and international financial markets could adversely affect our liquidity and the cost and availability of financing to us in the future.

We believe that we have adequate liquidity to meet our needs. As of December 31, 2020, we had liquidity of $391.8 million, consisting of $246.4 million of availability under our 2018 Revolving Facility (subject to continued compliance with the financial covenants and representations) and cash and cash equivalents of $145.4 million. We had long-term debt of $1,420.0 million and short-term debt of $0.1 million as of December 31, 2020. As of December 31, 2019, we had liquidity of $327.8 million, consisting of $246.9 million available under our 2018 Revolving Facility and cash and cash equivalents of $80.9 million. We had long-term debt of $1,812.7 million and short-term debt of $0.1 million as of December 31, 2019.

As of December 31, 2020 and 2019, $114.6 million and $41.4 million, respectively, of our cash and cash equivalents were located outside of the U.S. We repatriate funds from our foreign subsidiaries through dividends. All of our subsidiaries face the customary statutory limitation that distributed dividends do not exceed the amount of retained and current earnings. In addition, for our subsidiary in South Africa, the South Africa Central Bank imposes that certain solvency and liquidity ratios remain above defined levels after the dividend distribution, which historically has not materially affected our ability to repatriate cash from this jurisdiction. The cash and cash equivalents balances in South Africa were $1.6 million and $0.8 million as of December 31, 2020 and December 31, 2019, respectively. Upon repatriation to the United States, the foreign source portion of dividends we receive from our foreign subsidiaries is no longer subject to U.S. federal income tax as a result of the Tax Act.

Cash flow and plans to manage liquidity. Our cash flow typically fluctuates significantly between quarters due to various factors. These factors include customer order patterns, fluctuations in working capital requirements, timing of tax payments, timing of capital expenditures, acquisitions, divestitures and other factors. We had positive cash flow from operating activities during 2020, 2019 and 2018. Although the global economic environment experienced significant swings in these periods, our working capital management and cost-control initiatives allowed us to remain operating cash-flow positive in both times of declining and improving operating results. Cash from operations is expected to remain at positive sustained levels due to the predictable earnings generated by our long-term take-or-pay contracts with our customers.

As of December 31, 2020, we had total availability under 2018 Revolving Facility of $246.4 million after giving effect to $3.6 million of letters of credit. As of December 31, 2019, we had $3.1 million of letters of credit, for a total availability of $246.9 million under the 2018 Revolving Facility.

On February 12, 2018, we entered into the 2018 Credit Agreement, which provides for the 2018 Revolving Credit Facility and the 2018 Term Loan Facility. On February 12, 2018, the Issuer borrowed $1,500 million under the 2018 Term Loan Facility. The funds received were used to pay off our outstanding debt, including borrowings under our previous credit agreement and the previously outstanding senior notes and accrued interest relating to those borrowings and the senior notes, declare and pay a dividend of $1,112.0 million to Brookfield, pay fees and expenses incurred in connection therewith and for other general corporate purposes.

On April 19, 2018, we declared a dividend in the form of a promissory note in favor of Brookfield. The $750 million promissory note was conditioned upon (i) the Senior Secured First Lien Net Leverage Ratio (as defined in the 2018 Credit Agreement), as calculated based on our final financial results for the first quarter of 2018, being equal to or less than 1.75 to 1.00, (ii) no Default or Event of Default (each as defined in the 2018 Credit Agreement) having occurred and continuing or that would result from the promissory note and (iii) the satisfaction of the conditions described in (i) and (ii) above occurring within 60 days from the dividend record date. Upon publication of our first quarterly report on Form 10-Q, these conditions were met and, as a result, the promissory note became payable.

The promissory note had a maturity of eight years from the date of issuance and bore interest at a rate equal to the Adjusted LIBO Rate (as defined in the promissory note) plus an applicable margin equal to 4.50% per annum, with an additional 2.00% per annum starting from the third anniversary from the date of issuance. We were permitted to make voluntary

prepayments at any time without premium or penalty. All obligations under the promissory note were unsecured and guaranteed by all of our existing and future domestic wholly-owned subsidiaries that guarantee, or are borrowers under, the Senior Secured Credit Facilities. No funds were lent or otherwise contributed to us by Brookfield in connection with the promissory note. As a result, we received no consideration in connection with its issuance. As described below, the promissory note was repaid, in full, on June 15, 2018.

On April 19, 2018, we declared a $160 million cash dividend payable to Brookfield, the sole pre-IPO stockholder. Payment of this dividend was conditional upon (i) the Senior Secured First Lien Net Leverage Ratio (as defined in the 2018 Credit Agreement), as calculated based on our final financial results for the first quarter of 2018, being equal to or less than 1.75 to 1.00, (ii) no Default or Event of Default (as defined in the 2018 Credit Agreement) having occurred and continuing or that would result from the payment of the dividend and (iii) the payment occurring within 60 days from the dividend record date. The conditions of this dividend were met upon filing of our first quarter report on Form 10-Q and the dividend was paid on May 8, 2018.

On June 15, 2018, GrafTech entered into the First Amendment to its 2018 Credit Agreement (the "First Amendment"). The First Amendment amends the 2018 Credit Agreement to provide for an additional $750 million in aggregate principal amount of incremental term loans (the "Incremental Term Loans") to the Issuer. The Incremental Term Loans increase the aggregate principal amount of term loans incurred by the Issuer under the 2018 Credit Agreement from $1,500 million to $2,250 million. The Incremental Term Loans have the same terms as those applicable to the existing term loans under the 2018 Credit Agreement, including interest rate, payment and prepayment terms, representations and warranties and covenants. The Incremental Term Loans mature on February 12, 2025, the same date as the existing term loans. We paid an upfront fee of 1.00% of the aggregate principal amount of the Incremental Term Loans on the effective date of the First Amendment. The proceeds of the Incremental Term Loans were used to repay, in full, the $750 million in principal outstanding under the promissory note.

On August 13, 2018, the Company repurchased 11,688,311 of our common stock directly from Brookfield. These shares were retired upon repurchase. The price per share paid by the Company was equal to the price at which the underwriters purchased the shares from Brookfield in Brookfield's August 2018 public secondary offering of 23,000,000 shares of our common stock, net of underwriting commissions and discounts. We funded the share repurchase from cash on hand.

On July 30, 2019, our Board of Directors authorized a program to repurchase up to $100 million of our outstanding common stock. We may purchase shares from time to time on the open market, including under Rule 10b5-1 and/or Rule 10b-18 plans. The amount and timing of repurchases are subject to a variety of factors including liquidity, stock price, applicable legal requirements, other business objectives and market conditions. As of December 31, 2019, we had repurchased 1,004,685 shares of common stock totaling $10.9 million under this program. The Company had $89.1 million remaining under this program as of December 31, 2019, and $59.0 million remaining as of December 31, 2020.

On December 5, 2019, the Company announced two separate transactions. The first was a Rule 144 secondary block trade in which Brookfield sold 11,175,927 shares of GTI common stock at a price of $13.125 per share to a broker-dealer who placed the shares with institutional and other investors. Separately, the Company entered into a share repurchase agreement with Brookfield to repurchase $250 million of stock from Brookfield at the arm's-length price of $13.125 set by the competitive bidding process of the secondary block trade. As a result, we repurchased 19,047,619 shares of common stock, reducing total shares outstanding by approximately 7%.

On December 22, 2020, GrafTech Finance issued $500 million aggregate principal amount of the 2020 Senior Notes at an issue price of 100% of the principal amount thereof in a private offering to qualified institutional buyers in accordance with Rule 144A under the Securities Act of 1933 (the "Securities Act") and to non-U.S. persons outside the United States under Regulation S under the Securities Act. The 2020 Senior Notes were issued pursuant to an indenture, dated as of December 22, 2020 (the "Indenture"), among GrafTech Finance, as issuer, the Company, as a guarantor, the other subsidiaries of the Company named therein as guarantors and U.S. Bank National Association, as trustee and notes collateral agent. The proceeds of the 2020 Senior Notes were used to pay down a portion of our 2018 Term Loans.

We repaid an additional $400 million on our 2018 Term Loan Facility in 2020 and $350 million in 2019. Subsequent to December 31, 2020, we repaid an additional $150.0 million of 2018 Term Loans Facility. We are now prioritizing balance sheet flexibility and debt repayment. We anticipate using a majority of the cash flow that we generate to repay debt, but we will continue to examine opportunities to repurchase our common stock.

On February 17, 2021, the Company entered into a second amendment ("Second Amendment") to the 2018 Credit Agreement to, among other things, (a) decrease the Applicable Rate (as defined in the Credit Agreement) with respect to any Initial Term Loan (as defined in the Credit Agreement) by 0.50% for each pricing level, (b) decrease the interest rate floor for all Initial Term Loans to 0.50%, (c) add certain technical provisions with respect to the impact of European Union bail-in

banking legislation on liabilities of certain non-U.S. financial institutions, and (d) add certain technical provisions in connection with future replacement of the LIBO Rate (as defined in the Credit Agreement). As a result of the Second Amendment and the combined effect of the reduction in the interest rate margin and the reduction in the interest rate floor, the interest rate on the Initial Term Loan has been reduced by 1.0% per year.

Prior to April 2020, we had paid a quarterly cash dividend of $0.085 per share, or an aggregate of $0.34 per share on an annualized basis. Additionally, on December 31, 2018, we paid a special dividend of $0.70 per share totaling $203.4 million. In April 2020, as a result of the deteriorating economic environment, our Board of Directors reduced our dividend rate to $0.01 per share, or $0.04 per share on an annualized basis. We expect our Board of Directors to revisit the dividend level when economic conditions improve. There can be no assurance that we will pay dividends in the future in these amounts or at all. Our Board of Directors may change the timing and amount of any future dividend payments or eliminate the payment of future dividends in its sole discretion, without any prior notice to our stockholders. Our ability to pay dividends will depend upon many factors, including our financial position and liquidity, results of operations, legal requirements, restrictions that may be imposed by the terms of our current and future credit facilities and other debt obligations and other factors deemed relevant by our Board of Directors.

Potential uses of our liquidity include dividends, share repurchases, capital expenditures, acquisitions, scheduled debt repayments, optional debt repayments and other general purposes. An improving economy, while resulting in improved results of operations, could increase our cash requirements to purchase inventories, make capital expenditures and fund payables and other obligations until increased accounts receivable are converted into cash. A downturn, including the current downturn caused by the COVID-19 pandemic, could significantly and negatively impact our results of operations and cash flows, which, coupled with increased borrowings, could negatively impact our credit ratings, our ability to comply with debt covenants, our ability to secure additional financing and the cost of such financing, if available.

In order to seek to minimize our credit risks, we may reduce our sales of, or refuse to sell (except for prepayment, cash on delivery or under letters of credit or parent guarantees), our products to some customers and potential customers. Our unrecovered trade receivables worldwide have not been material during the last two years individually or in the aggregate.

We manage our capital expenditures by taking into account quality, plant reliability, safety, environmental and regulatory requirements, prudent or essential maintenance requirements, global economic conditions, available capital resources, liquidity, long-term business strategy and return on invested capital for the relevant expenditures, cost of capital and return on invested capital of the Company as a whole among other factors. Capital expenditures totaled $36.1 million in 2020. We anticipate capital expenditures between $55 and $65 million in 2021.

In the event that operating cash flows fail to provide sufficient liquidity to meet our business needs, including capital expenditures, any such shortfall would need to be made up by increased borrowings under our 2018 Revolving Credit Facility, to the extent available.

Related Party Transactions

We have engaged in transactions with affiliates or related parties during 2019 and 2020, and we expect to continue to do so in the future. These transactions include ongoing obligations under the Tax Receivable Agreement, stockholders rights agreement and registration rights agreement, each with Brookfield. In November 2019, we amended the stockholders rights agreement with Brookfield regarding compensation for the Brookfield designated directors. In December 2019, in conjunction with a secondary block trade by Brookfield pursuant to Rule 144 under the Securities Act, we repurchased approximately $250 million of common stock directly from Brookfield at the arm’s-length price determined by the competitive bidding process in the secondary block trade. This resulted in 19,047,619 shares of common stock repurchased at a price of $13.125 per share, reducing total shares outstanding by approximately 7%.

Cash flows

The following table summarizes our cash flow activities:

	For the Year Ended December 31,	
	2020	2019
	(Dollars in millions)	
Cash flow provided by (used in):		
Operating activities	$ 563.6	$ 805.3
Investing activities	(35.7)	(63.9)
Financing activities	(463.7)	(709.6)
Net change in cash and cash equivalents	64,267	31,801

Operating activities

Cash flow provided by operating activities represents cash receipts and cash disbursements related to all of our activities other than investing and financing activities. Operating cash flow is derived by adjusting net income for:

- Non-cash items such as depreciation and amortization, impairment, post-retirement obligations, and severance and pension plan changes;
- Gains and losses attributed to investing and financing activities such as gains and losses on the sale of assets and unrealized currency transaction gains and losses; and
- Changes in operating assets and liabilities, which reflect timing differences between the receipt and payment of cash associated with transactions and when they are recognized in results of operations.

The net impact of the changes in working capital (operating assets and liabilities), which are discussed in more detail below, include the impact of changes in: receivables, inventories, prepaid expenses, accounts payable, accrued liabilities, accrued taxes, interest payable and payments of other current liabilities.

In the year ended December 31, 2020, changes in working capital resulted in a net source of funds of $86.4 million which was impacted by:

- net cash inflows in accounts receivable of $63.6 million from the decrease in accounts receivable due to lower sales;
- source of funds from decreases in inventory of $44.6 million from our efforts to reduce inventory due to the lower demand environment;
- use of funds of $12.4 million resulting from a decrease in income taxes payable driven primarily by the timing of income tax payments in 2020 and lower tax liabilities as a result of lower profitability; and
- use of funds of $12.8 million from decreases in accounts payable and other accruals primarily driven by decreased purchases of raw materials resulting from lower levels of production and timing of payments.

Other uses of cash in the year ended December 31, 2020 included cash paid for interest of $87.0 million, $74.0 million of cash paid for taxes and contributions to pension and other benefit plans of $6.6 million.

In the year ended December 31, 2019, changes in working capital resulted in a net use of funds of $47.7 million, which was impacted by:

- use of funds from increases in inventory of $21.5 million due to the increased quantities on hand;
- source of funds of $3.9 million from decreased prepaid and other current assets primarily resulting from the lower value of imported goods impacting value-added taxes in certain foreign jurisdictions;
- use of funds of $18.2 million resulting from a decrease in income taxes payable driven primarily by the timing of income tax payments in 2019; and
- use of funds of $11.6 million from decreases in accounts payable and other accruals primarily driven by decreased purchases of raw materials and timing of payments.

Other uses of cash in the year ended December 31, 2019 included cash paid for interest of $121.1 million, $99.3 million of cash paid for taxes and contributions to pension and other benefit plans of $3.2 million.

Investing activities

Net cash used in investing activities was $35.7 million in the year ended December 31, 2020 comprised of capital expenditures of $36.1 million.

Net cash used in investing activities was $63.9 million in the year ended December 31, 2019 and included capital expenditures of $64.1 million.

Financing activities

Net cash outflow from financing activities was $463.7 million during the year ended December 31, 2020, which was driven by $896.2 million of repayments of long-term debt, $30.1 million of repurchases of our common stock, $30.9 million of dividend payments and $6.3 million of debt issuance costs. Partially offsetting these financing outflows was $500.0 million of proceeds from the issuance of our 2020 Senior Notes.

Net cash outflow from financing activities was $709.6 million during the year ended December 31, 2019, which was driven by $350.1 million of repayments of long-term debt, $260.9 million of repurchases of our common stock and $98.6 million of dividend payments.

Financing transactions

On February 12, 2018, we entered into the 2018 Credit Agreement, among GTI, the Issuer, Swissco, Lux Holdco (together with the Issuer and Swissco, the "Co-Borrowers"), the lenders and issuing banks party thereto and JPMorgan Chase Bank, N.A. (the "Administrative Agent"), which provides for (i) the 2018 Term Loan Facility and (ii) the 2018 Revolving Credit Facility, which may be used from time to time for revolving credit borrowings denominated in dollars or Euro, the issuance of one or more letters of credit denominated in dollars, Euro, Pounds Sterling or Swiss Francs and one or more swing line loans denominated in dollars. The Issuer is the sole borrower under the 2018 Term Loan Facility, while the Issuer, Swissco and Lux Holdco are Co-Borrowers under the 2018 Revolving Credit Facility. On February 12, 2018, the Issuer borrowed the term loans under the 2018 Term Loan Facility (the "2018 Term Loans"). On June 15, 2018, we entered the First Amendment to the 2018 Credit Agreement. The First Amendment amended the 2018 Credit Agreement to provide for the Incremental Term Loans to the Issuer. The amount outstanding under the Senior Secured Credit Facilities as of December 31, 2020 and 2019 was comprised solely of term loan balances of $944 million and $1,564 million, respectively.

The 2018 Term Loans and the Incremental Term Loans mature on February 12, 2025. The maturity date for the 2018 Revolving Credit Facility is February 12, 2023.

The proceeds of the 2018 Term Loans were used to (i) repay in full all outstanding indebtedness of the Co-Borrowers under our previous credit agreement and terminate all commitments thereunder, (ii) redeem in full the previously outstanding 2012 senior notes at a redemption price of 101.594% of the principal amount thereof plus accrued and unpaid interest to the date of redemption, (iii) pay fees and expenses incurred in connection with (i) and (ii) above and the Senior Secured Credit Facilities and related expenses, and (iv) declare and pay a dividend to Brookfield, with any remainder to be used for general corporate purposes. In connection with the repayment of our previous credit agreement and redemption of our previously outstanding 2012 senior notes, all guarantees of obligations under the previous credit agreement and the 2012 senior notes and related indenture were terminated, all mortgages and other security interests securing obligations under the previous credit agreement were released and the indenture were terminated.

Borrowings under the 2018 Term Loan Facility bear interest, at the Issuer's option, at a rate equal to either (i) the Adjusted LIBO Rate (as defined in the 2018 Credit Agreement), plus an applicable margin initially equal to 3.50% per annum or (ii) the ABR Rate (as defined in the 2018 Credit Agreement), plus an applicable margin initially equal to 2.50% per annum, in each case with one step down of 25 basis points based on achievement of certain public ratings of the 2018 Term Loans. The 2018 Term Loan Facility had an interest rate of 4.50% as of December 31, 2020 and 5.30% as of December 31, 2019.

Borrowings under the 2018 Revolving Credit Facility bear interest, at the applicable Co-Borrower's option, at a rate equal to either (i) the Adjusted LIBO Rate, plus an applicable margin initially equal to 3.75% per annum or (ii) the ABR Rate, plus an applicable margin initially equal to 2.75% per annum, in each case with two 25 basis point step downs based on achievement of certain senior secured first lien net leverage ratios. In addition, the Co-Borrowers will be required to pay a quarterly commitment fee on the unused commitments under the 2018 Revolving Credit Facility in an amount equal to 0.25% per annum.

For borrowings under both the 2018 Term Loan Facility and the 2018 Revolving Credit Facility, if the Administrative Agent determines that adequate and reasonable means do not exist for ascertaining the Adjusted LIBO Rate or the LIBO Rate and such circumstances are unlikely to be temporary or the relevant authority has made a public statement identifying a date after which the LIBO Rate shall no longer be used for determining interest rates for loans, then the Administrative Agent and the Co-Borrowers shall endeavor to establish an alternate rate of interest, which shall be effective so long as the majority in interest of the lenders for each Class (as defined in the 2018 Credit Agreement) of loans under the 2018 Credit Agreement do not notify the Administrative Agent otherwise. Until such an alternate rate of interest is determined, (a) any request for a borrowing denominated in dollars based on the Adjusted LIBO Rate will be deemed to be a request for a borrowing at the ABR Rate plus the applicable margin for an ABR Rate borrowing of such loan while any request for a borrowing denominated in any other currency will be ineffective and (b) any outstanding borrowings based on the Adjusted LIBO Rate denominated in dollars will be converted to a borrowing at the ABR Rate plus the applicable margin for an ABR Rate borrowing of such loan while any outstanding borrowings denominated in any other currency will be repaid.

All obligations under the 2018 Credit Agreement are guaranteed by the Issuer and each domestic subsidiary of GTI, subject to certain customary exceptions, and all obligations under the 2018 Credit Agreement of each foreign subsidiary of GTI that is a Controlled Foreign Corporation (within the meaning of Section 956 of the Code) are guaranteed by the Credit Agreement Guarantors.

All obligations under the 2018 Credit Agreement are secured, subject to certain exceptions and Excluded Assets (as defined in the 2018 Credit Agreement), by: (i) a pledge of all of the equity securities of the Issuer and each domestic Credit Agreement Guarantor (other than GTI) and of each other direct, wholly-owned domestic subsidiary of GTI and any Credit Agreement Guarantor, (ii) a pledge on no more than 65% of the equity interests of each subsidiary that is a Controlled Foreign Corporation (within the meaning of Section 956 of the Code), and (iii) security interests in, and mortgages on, personal property and material real property of the Issuer and each domestic Credit Agreement Guarantor, subject to permitted liens and certain exceptions specified in the 2018 Credit Agreement. The obligations of each foreign subsidiary of GTI that is a Controlled Foreign Corporation under the 2018 Revolving Credit Facility are secured by (i) a pledge of all of the equity securities of each Credit Agreement Guarantor that is a Controlled Foreign Corporation and of each direct, wholly-owned subsidiary of any Credit Agreement Guarantor that is a Controlled Foreign Corporation, and (ii) security interests in certain receivables and personal property of each Credit Agreement Guarantor that is a Controlled Foreign Corporation, subject to permitted liens and certain exceptions specified in the 2018 Credit Agreement.

The 2018 Term Loans amortize at a rate equal to 5% per annum of the original principal amount of the 2018 Term Loans payable in equal quarterly installments, with the remainder due at maturity. The Co-Borrowers are permitted to make voluntary prepayments at any time without premium or penalty. The Issuer is required to make prepayments under the 2018 Term Loans (without payment of a premium) with (i) net cash proceeds from non-ordinary course asset sales (subject to customary reinvestment rights and other customary exceptions and exclusions), and (ii) commencing with the Company's fiscal year ended December 31, 2019, 75% of Excess Cash Flow (as defined in the 2018 Credit Agreement), subject to step-downs to 50% and 0% of Excess Cash Flow based on achievement of a senior secured first lien net leverage ratio greater than 1.25 to 1.00 but less than or equal to 1.75 to 1.00 and less than or equal to 1.25 to 1.00, respectively. Scheduled quarterly amortization payments of the 2018 Term Loans during any calendar year reduce, on a dollar-for-dollar basis, the amount of the required Excess Cash Flow prepayment for such calendar year, and the aggregate amount of Excess Cash Flow prepayments for any calendar year reduce subsequent quarterly amortization payments of the 2018 Term Loans as directed by the Issuer.

The 2018 Credit Agreement contains customary representations and warranties and customary affirmative and negative covenants applicable to GTI and restricted subsidiaries, including, among other things, restrictions on indebtedness, liens, investments, fundamental changes, dispositions, and dividends and other distributions. The 2018 Credit Agreement contains a financial covenant that requires GTI to maintain a senior secured first lien net leverage ratio not greater than 4.00:1.00 when the aggregate principal amount of borrowings under the 2018 Revolving Credit Facility and outstanding letters of credit issued under the 2018 Revolving Credit Facility (except for undrawn letters of credit in an aggregate amount equal to or less than $35 million), taken together, exceed 35% of the total amount of commitments under the 2018 Revolving Credit Facility. The 2018 Credit Agreement also contains customary events of default.

First Amendment to 2018 Credit Agreement

On June 15, 2018, we entered into the First Amendment, which provided for an additional $750 million in aggregate principal amount of Incremental Term Loans to the Issuer. The Incremental Term Loans increased the aggregate principal amount of term loans incurred by the Issuer under the 2018 Credit Agreement from $1,500 million to $2,250 million. The Incremental Term Loans have the same terms as those applicable to the 2018 Term Loans, including maturity date, interest rate, payment and prepayment terms, representations and warranties and covenants. We paid an upfront fee of 1.00% of the aggregate principal amount of the Incremental Term Loans on the effective date of the First Amendment.

The proceeds of the Incremental Term Loans were used to repay, in full, the $750 million of principal outstanding of previously issued debt.

2020 Senior Notes

On December 22, 2020, GrafTech Finance issued $500 million aggregate principal amount of the 2020 Senior Notes at an issue price of 100% of the principal amount thereof in a private offering to qualified institutional buyers in accordance with Rule 144A under the Securities Act and to non-U.S. persons outside the United States under Regulation S under the Securities Act.

The 2020 Senior Notes were issued pursuant to the indenture among GrafTech Finance, as issuer, the Company, as a guarantor, the other subsidiaries of the Company named therein as guarantors and U.S. Bank National Association, as trustee and notes collateral agent.

The 2020 Senior Notes are guaranteed on a senior secured basis by the Company and all of its existing and future direct and indirect U.S. subsidiaries that guarantee, or borrow under, the credit facilities under its 2018 Credit Agreement . The 2020 Senior Notes are secured on a pari passu basis by the collateral securing the term loans under the 2018 Credit Agreement. GrafTech Finance, the Company and the other guarantors granted a security interest in such collateral, consisting of substantially all of their respective assets, as security for the obligations of GrafTech Finance, the Company and the other guarantors under the 2020 Senior Notes and the Indenture pursuant to a collateral agreement, dated as of December 22, 2020 (the "Collateral Agreement"), among GrafTech Finance, the Company, the other subsidiaries of the Company named therein as grantors and U.S. Bank National Association, as collateral agent.

The 2020 Senior Notes bear interest at the rate of 4.625% per annum, which accrues from December 22, 2020 and is payable in arrears on June 15 and December 15 of each year, commencing on June 15, 2021. The 2020 Senior Notes will mature on December 15, 2028, unless earlier redeemed or repurchased, and are subject to the terms and conditions set forth in the Indenture.

GrafTech Finance may redeem some or all of the 2020 Senior Notes at the redemption prices and on the terms specified in the Indenture. If the Company or GrafTech Finance experiences specific kinds of changes in control or the Company or any of its restricted subsidiaries sells certain of its assets, then GrafTech Finance must offer to repurchase the 2020 Senior Notes on the terms set forth in the Indenture.

The Indenture contains certain covenants that, among other things, limit the Company's ability, and the ability of certain of its subsidiaries, to incur or guarantee additional indebtedness or issue preferred stock, pay distributions on, redeem or repurchase capital stock or redeem or repurchase subordinated debt, incur or suffer to exist liens securing indebtedness, make certain investments, engage in certain transactions with affiliates, consummate certain assets sales and effect a consolidation or merger, or sell, transfer, lease or otherwise dispose of all or substantially all assets. The Indenture contains events of default customary for agreements of its type (with customary grace periods, as applicable) and provides that, upon the occurrence of an event of default arising from certain events of bankruptcy or insolvency with respect to the Company or GrafTech Finance, all outstanding 2020 Senior Notes will become due and payable immediately without further action or notice. If any other type of event of default occurs and is continuing, then the trustee or the holders of at least 30% in principal amount of the then outstanding 2020 Senior Notes may declare all of the Senior Notes to be due and payable immediately.

The entirety of the 2020 Senior Notes proceeds was used to pay down a portion of our 2018 Term Loans.

Term Loan Repricing

On February 17, 2021 (the "Effective Date"), the Company entered into a second amendment (the "Second Amendment") to its 2018 Credit Agreement to, among other things, (a) decrease the Applicable Rate (as defined in the Credit Agreement) with respect to any Initial Term Loan (as defined in the Credit Agreement) by 0.50% for each pricing level, (b) decrease the interest rate floor for all Initial Term Loans to 0.50%, (c) add certain technical provisions with respect to the impact of European Union bail-in banking legislation on liabilities of certain non-U.S. financial institutions, and (d) add certain technical provisions in connection with future replacement of the LIBO Rate (as defined in the Credit Agreement). As a result of the Second Amendment and the combined effect of the reduction in the interest rate margin and the reduction in the interest rate floor, the interest rate on the Initial Term Loan has been reduced by 1.0% per year.

In connection with the Second Amendment, on February 12, 2021, GrafTech Finance repaid approximately $150 million aggregate principal amount of its Initial Term Loans with cash on hand.

Fixed-rate obligations

As of December 31, 2020, we had $500 million of fixed-rate debt consisting of our 2020 Senior Notes and $944 million of debt based on variable interest rates. However, during the third quarter of 2019, we entered into four interest rate swap contracts. The contracts are "pay fixed, receive variable" with notional amounts of $500 million maturing in two years and another $500 million maturing in five years. It is expected that these swaps will fix the cash flows associated with the forecasted interest payments on this notional amount of debt to an effective fixed interest rate of 5.1%, which could be lowered to 4.85% depending on credit ratings.

Long-Term Contractual, Commercial and Other Obligations and Commitments. The following tables summarize our long-term contractual obligations and other commercial commitments as of December 31, 2020:

	Payments Due by Year Ending December 31,				
	Total	**2021**	**2022-2023**	**2024-2025**	**2026+**
	(Dollars in Thousands)				
Contractual and Other Obligations					
Long-term Debt (a)	$ 1,444,323	$ 154	$ 307	$ 943,862	$ 500,000
Interest on Long-term Debt (b)	380,111	71,398	139,952	99,386	69,375
Leases (c)	7,846	4,124	2,401	1,255	66
Total contractual obligations	1,832,280	75,676	142,660	1,044,503	569,441
Postretirement, pension and related benefits (d)	121,211	11,838	23,454	24,710	61,209
Committed purchase obligations (e)	1,588	1,588	—	—	—
Related party Tax Receivable Agreement (f)	40,850	21,752	8,179	8,132	2,787
Other long-term obligations	12,330	1,810	1,590	705	8,225
Uncertain income tax provisions	125	47	42	36	—
Total contractual and other obligations (g)	$ 2,008,384	$ 112,711	$ 175,925	$ 1,078,086	$ 641,662
Other Commercial Commitments					
Guarantees (h)	2,437	2,437	—	—	—
Total other commercial commitments	$ 2,437	$ 2,437	$ —	$ —	$ —

(a) Represents our total debt from our 2018 Credit Facility with an outstanding balance of $944 million,which matures on February 12, 2025 and from our 2020 Senior Notes with an outstanding balance of $500 million due in 2028 (see "Financing transactions" in this section for full details of these obligations).

(b) Represents estimated interest payments required on our 2018 Term Loan Facility using a monthly LIBOR curve through February 2025, net of interest rate swap impacts and estimated interest payments on the 2020 Senior Notes through December 15, 2028.

(c) Represents our undiscounted non-cancelable operating lease future payments as of December 31, 2020.

(d) Represents estimated postretirement, pension and related benefits obligations based on actuarial calculations.

(e) Represents committed purchases of raw materials.

(f) Represents Brookfield's right to receive future payments from us for 85% of the amount of cash savings, if any, in U.S. federal income tax and Swiss tax that we and our subsidiaries realize as a result of the utilization of certain tax assets attributable to periods prior to our IPO, including certain federal NOLs, previously taxed income under Section 959 of the Code, foreign tax credits, and certain NOLs in Swissco. In addition, we will pay interest on the payments we will make to Brookfield with respect to the amount of these cash savings from the due date (without extensions) of our tax return where we realize these savings to the payment date at a rate equal to LIBOR plus 1.00% per annum. The term of the Tax Receivable Agreement commenced on April 23, 2018 and will continue until there is no potential for any future tax benefit payments.

(g) In addition, letters of credit of $3.6 million were issued under the Revolving Facility as of December 31, 2020.

(h) Represents surety bonds, which are renewed annually, and other bank guarantees. If rates were unfavorable, we would use letters of credit under the Revolving Facility.

Off-Balance sheet arrangements and commitments. We have not undertaken or been a party to any material off-balance-sheet financing arrangements or other commitments (including non-exchange traded contracts), other than:

- The notional amount of foreign exchange and commodity contracts;
- Letters of credit outstanding under the Revolving Facility of $3.6 million as of December 31, 2020 and $3.1 million as of December 31, 2019; and

- Surety bonds and guarantees with other banks totaling $2.4 million.

Costs Relating to Protection of the Environment

We have been and are subject to increasingly stringent environmental protection laws and regulations. In addition, we have an on-going commitment to rigorous internal environmental protection standards. Environmental considerations are part of all significant capital expenditure decisions. The following table sets forth certain information regarding environmental expenses and capital expenditures.

	For the Year Ended December 31,		
	2020	2019	2018
	(Dollars in thousands)		
Expenses relating to environmental protection	$ 11,075	$ 11,204	$ 12,355
Capital expenditures related to environmental protection	9,018	7,251	4,080

Critical accounting policies

Critical accounting policies are those that require difficult, subjective or complex judgments by management, often as a result of the need to make estimates about the effect of matters that are inherently uncertain and may change in subsequent periods. We use and rely on estimates in determining the economic useful lives of our assets, obligations under our employee benefit plans, provisions for doubtful accounts, provisions for restructuring charges and contingencies, tax valuation allowances, evaluation of goodwill, other intangible assets, pension and OPEB and various other recorded or disclosed amounts, including inventory valuations. Estimates require us to use our judgment. While we believe that our estimates for these matters are reasonable, if the actual amount is significantly different than the estimated amount, our assets, liabilities or results of operations may be overstated or understated. The following accounting policies are deemed to be critical.

Business combinations and goodwill. The application of the purchase method of accounting for business combinations requires the use of significant estimates and assumptions in the determination of the fair value of assets acquired and liabilities assumed in order to properly allocate purchase price consideration between goodwill and assets that are depreciated and amortized. Our estimates of the fair values of assets and liabilities acquired are based on assumptions believed to be reasonable and, when appropriate, include assistance from independent third-party appraisal firms.

As a result of our acquisition by Brookfield, we have a significant amount of goodwill. Goodwill is tested for impairment annually or more frequently if an event or circumstance indicates that an impairment loss may have been incurred. Application of the goodwill impairment test requires judgment, including the identification of reporting units, assignment of assets and liabilities to reporting units, assignment of goodwill to reporting units and determination of the fair value of each reporting unit. We estimate the fair value of each reporting unit using a discounted cash flow methodology. This requires us to use significant judgment including estimation of future cash flows, which is based upon relevant market data, internal forecasts, estimation of the long-term growth for our business, the useful life over which cash flows will occur and determination of the weighted average cost of capital for purposes of establishing a discount rate.

Refer to Note 1, "Business and Summary of Significant Accounting Policies," to the Consolidated Financial Statements for information regarding our goodwill impairment testing.

Employee benefit plans. We sponsor various retirement and pension plans, including defined benefit and defined contribution plans and postretirement benefit plans that cover most employees worldwide. Excluding the defined contribution plans, accounting for these plans requires assumptions as to the discount rate, expected return on plan assets, expected salary increases and health care cost trend rate. See Note 11, "Retirement Plans and Postretirement Benefits," to the Consolidated Financial Statements for further details.

Impairments of long-lived assets. We may record impairment losses on long-lived assets used in operations when events and circumstances indicate that the assets might be impaired and the future undiscounted cash flows estimated to be generated by those assets are less than the carrying amount of those assets. Assets to be disposed are reported at the lower of the carrying amount or fair value less estimated costs to sell. Estimates of the future cash flows are subject to significant uncertainties and assumptions. If the actual value is significantly less than the estimated fair value, our assets may be overstated. Future events and circumstances, some of which are described below, may result in an impairment charge:

- new technological developments that provide significantly enhanced benefits over our current technology;
- significant negative economic or industry trends;
- changes in our business strategy that alter the expected usage of the related assets; and

- future economic results that are below our expectations used in the current assessments.

Accounting for income taxes. When we prepare the Consolidated Financial Statements for the year ended December 31, 2020, we are required to estimate our income taxes in each of the jurisdictions in which we operate. This process requires us to make the following assessments:

- estimate our actual current tax liability in each jurisdiction;
- estimate our temporary differences resulting from differing treatment of items for tax and accounting purposes (which result in deferred tax assets and liabilities that we include within the Consolidated Balance Sheets; and
- assess the likelihood that our deferred tax assets will be recovered from future taxable income and, if we believe that recovery is not more likely than not, a valuation allowance is established.

If our estimates are incorrect, our deferred tax assets or liabilities may be overstated or understated.

As of December 31, 2020, we had a valuation allowance of $12.8 million against certain deferred tax assets. Our losses in certain tax jurisdictions in recent periods represented sufficient negative evidence to require a full valuation allowance. Until we determine that we will generate sufficient jurisdictional taxable income to realize our net operating losses and deferred tax assets, we continue to maintain a valuation allowance.

Related-party Tax Receivable Agreement. On April 23, 2018, the Company entered into a Tax Receivable Agreement that provides Brookfield, as the sole pre-IPO stockholder, the right to receive future payments from us for 85% of the amount of cash savings, if any, in U.S. federal income tax and Swiss tax that we and our subsidiaries realize as a result of the utilization of certain tax assets attributable to periods prior to our IPO, including certain federal NOLs, previously taxed income under Section 959 of the Code, foreign tax credits, and certain NOLs (collectively, the "Pre-IPO Tax Assets") in Swissco. In addition, we will pay interest on the payments we will make to Brookfield with respect to the amount of these cash savings from the due date (without extensions) of our tax return where we realize these savings to the payment date at a rate equal to LIBOR plus 1.00% per annum. The term of the Tax Receivable Agreement commenced on April 23, 2018 and will continue until there is no potential for any future tax benefit payments.

The calculation of the Tax Receivable Agreement liability requires significant judgment with regards to the assumptions underlying the forecast of future taxable income, in total and by jurisdiction, as well as their timing.

Revenue recognition. Revenue is recognized when a customer obtains control of promised goods, in an amount that reflects the consideration which we expect to receive in exchange for those goods.

To determine revenue recognition for arrangements that we determine are within the scope of ASC 606, the following five steps are performed: (i) identify the contract(s) with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) we satisfy a performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration we are entitled to in exchange for the goods or services we transfer to the customer. At contract inception, once the contract is determined to be within the scope of ASC 606, we assess the goods or services promised within each contract and determine those that are performance obligations, and assess whether each promised good or service is distinct. We then recognize as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) the performance obligation is satisfied.

From 2018 to the present, our revenue streams primarily consisted of long-term take-or-pay supply contracts and short-term purchase orders (deliveries within the year) directly with steel manufacturers. The promises of delivery of graphite electrodes represent the distinct performance obligations to which the contract consideration is allocated, based upon the electrode stand-alone selling prices for the class of customers at the time the agreements are executed. The performance obligations are considered to be satisfied at a point in time when control of the electrodes has been transferred to the customer. The Company has elected to treat the transportation of the electrodes from our premises to the customer's facilities as a fulfillment activity, and outbound freight cost is accrued when the graphite electrode performance obligation is satisfied. Any variable consideration is recognized up to its unconstrained amount (i.e., up to the amount for which it is probable that a significant reversal of the variable revenue will not happen).

Recently adopted accounting standards

In January 2017, the FASB issued ASU No. 2017-04, *Intangibles-Goodwill and Other* (Topic 350). ASU No. 2017-04 was issued to simplify the accounting for goodwill impairment. ASU No. 2017-04 removes the second step of the goodwill impairment test, which requires that a hypothetical purchase price allocation be performed to determine the amount of impairment, if any. Under ASU No. 2017-04, a goodwill impairment charge will be based on the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill. ASU No. 2017-04 became effective

on a prospective basis for the Company on January 1, 2020. The Company adopted ASU No. 2017-04 on January 1, 2020, with no impact to our financial position, results of operations or cash flows.

In June 2016, the FASB issued ASU No. 2016-13*, Financial Instruments-Credit Losses* (Topic 326)*,* which introduces the Current Expected Credit Losses ("CECL") accounting model. CECL requires earlier recognition of credit losses, while also providing additional transparency about credit risk. CECL utilizes a lifetime expected credit loss measurement objective for the recognition of credit losses at the time the financial asset is originated or acquired. The expected credit losses are adjusted each period for changes in expected lifetime credit losses. ASU No. 2016-13 was effective for the Company on January 1, 2020. The adoption of ASU No. 2016-13 resulted in a cumulative-effect adjustment of $2.0 million included as an adjustment to our accounts receivable reserve and to retained earnings on January 1, 2020.

Accounting standards not yet adopted

In March 2020, the FASB issued ASU No. 2020-04, *Facilitation of the Effects of Reference Rate Reform on Financial Reporting* (Topic 848). This pronouncement contains optional expedients and exceptions for applying GAAP to contracts, hedging relationships and other transactions affected by reference rate reform. ASU 2020-04 is elective and applies to all entities, subject to meeting certain criteria, that have contracts, hedging relationships and other transactions that reference the LIBOR or another reference rate expected to be discontinued because of reference rate reform. ASU 2020-04 can be elected for both interim and annual periods from March 12, 2020 through December 31, 2022. We plan to adopt ASU 2020-04 as of January 1, 2023. The adoption of ASU 2020-04 is not expected to have a material impact on our financial position, results of operations or cash flows.

In December 2019, the FASB issued ASU No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*. ASU 2019-12 is intended to improve consistent application of Topic 740 and simplify the accounting for income taxes. This pronouncement removes certain exceptions to the general principles in Topic 740 and clarifies and amends existing guidance. ASU 2019-12 is effective for annual and interim reporting periods beginning after December 12, 2020, with early adoption permitted. The Company is currently evaluating the effects of this on our financial position, results of operations and cash flows.

Item 7A. Quantitative and qualitative disclosures about market risk

We are exposed to market risks, primarily from changes in interest rates, currency exchange rates, energy commodity prices and commercial energy rates. From time to time, we enter into transactions that have been authorized according to documented policies and procedures in order to manage these risks. These transactions relate primarily to financial instruments described below. Since the counterparties to these financial instruments are large commercial banks and similar financial institutions, we do not believe that we are exposed to material counterparty credit risk. We do not use financial instruments for trading purposes.

Our exposure to changes in interest rates results primarily from floating rate long-term debt tied to LIBOR or Euro LIBOR.

Our exposure to changes in currency exchange rates results primarily from:

- sales made by our subsidiaries in currencies other than local currencies;
- raw material purchases made by our foreign subsidiaries in currencies other than local currencies; and
- investments in and intercompany loans to our foreign subsidiaries and our share of the earnings of those subsidiaries, to the extent denominated in currencies other than the U.S. dollar.

Our exposure to changes in energy commodity prices and commercial energy rates results primarily from the purchase or sale of refined oil products and the purchase of natural gas and electricity for use in our manufacturing operations.

Interest rate risk management. We periodically enter into agreements with financial institutions that are intended to limit our exposure to additional interest expense due to increases in variable interest rates. These instruments effectively cap our interest rate exposure. During the third quarter of 2019, we entered into interest rate swaps resulting in a net unrealized pre-tax loss of $11.9 million as of December 31, 2020 and a net unrealized pre-tax gain of $2.9 million as of December 31, 2019.

Currency rate management. We enter into foreign currency derivatives from time to time to attempt to manage exposure to changes in currency exchange rates. These foreign currency derivatives, which include, but are not limited to, forward exchange contracts and purchased currency options, attempt to hedge global currency exposures. Forward exchange contracts are agreements to exchange different currencies at a specified future date and at a specified rate. Purchased currency options are instruments which give the holder the right, but not the obligation, to exchange different currencies at a specified

rate at a specified date or over a range of specified dates. Forward exchange contracts and purchased currency options are carried at market value.

The outstanding foreign currency derivatives represented a net unrealized loss of $0.2 million as of December 31, 2020, and a net unrealized gain of $0.2 million as of December 31, 2019.

Energy commodity management. We have entered into commodity derivative contracts to effectively fix some or all of our exposure to refined oil products. The outstanding commodity derivative contracts represented net unrealized losses of $2.2 million and $3.7 million as of December 31, 2020 and December 31, 2019, respectively.

Sensitivity analysis. We use sensitivity analysis to quantify potential impacts that market rate changes may have on the underlying exposures as well as on the fair values of our derivatives. The sensitivity analysis for the derivatives represents the hypothetical changes in value of the hedge position and does not reflect the related gain or loss on the forecasted underlying transaction.

A hypothetical increase in interest rates of 100 basis points (1%) would have increased our interest expense by $3.7 million, net of the impact of our interest rate swap, for the year ended December 31, 2020. The same 100 basis points increase would have resulted in an increase of $11.1 million in fair value of our interest rate swap portfolio.

As of December 31, 2020, a 10% appreciation or depreciation in the value of the U.S. dollar against foreign currencies from the prevailing market rates would result in a corresponding decrease of $6.0 million or a corresponding increase of $6.0 million, respectively, in the fair value of the foreign currency hedge portfolio.

A 10% increase or decrease in the value of the underlying commodity prices that we hedge would result in a corresponding increase or decrease of $6.1 million in the fair value of the commodity hedge portfolio as of December 31, 2020. Because of the high correlation between the hedging instrument and the underlying exposure, fluctuations in the value of the instruments are generally offset by reciprocal changes in the value of the underlying exposure.

For further information related to the financial instruments described above, see Note 1 "Business and Summary of Accounting Policies" and Note 8 "Fair Value Measurement and Derivative Instruments" to the Consolidated Financial Statements in Item 8.

Item 8. Financial Statements and Supplementary Data

(Unless otherwise noted, all dollars are presented in thousands)

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See the Table of Contents located at the beginning of this Report for more detailed page references to information contained in this Item.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the shareholders and the Board of Directors of GrafTech International Ltd.:

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of GrafTech International Ltd. and its subsidiaries (the "Company") as of December 31, 2020 and 2019, the related consolidated statements of operations and comprehensive income (loss), stockholders' equity (deficit), and cash flows for each of the three years in the period ended December 31, 2020, and the related notes (collectively referred to as the “financial statements”). We also have audited the Company’s internal control over financial reporting as of December 31, 2020, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2020, in conformity with accounting principles generally accepted in the United States of America. Also, in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2020, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by COSO.

Basis for Opinions

The Company’s management is responsible for these financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management’s Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on these financial statements and an opinion on the Company’s internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the financial statements included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures to respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

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

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

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current-period audit of the financial statements that was communicated or required to be communicated to the audit committee and that (1) relates to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Related Party Tax Receivable Agreement - Refer to Notes 1 and 12 to the financial statements

Critical Audit Matter Description

On April 23, 2018, the Company entered into a tax receivable agreement (the "TRA") that provides the sole pre-IPO stockholder, the right to receive future payments from the Company for 85% of the amount of cash savings, if any, in U.S. federal income tax and Swiss Federal and Cantonal tax that the Company and its subsidiaries realize as a result of the utilization of certain deferred tax assets attributable to periods prior to the IPO. The Company's TRA liability was $40.9 million as of December 31, 2020. The determination of the TRA liability required management to make significant estimates and assumptions related to forecasted revenues and taxable income in the appropriate taxing jurisdiction, which are the primary drivers of utilization of the deferred tax assets.

Given the significant estimates and assumptions related to forecasted revenues and taxable income in the appropriate jurisdictions, auditing the TRA liability required a high degree of auditor judgement and an increased extent of effort, including the need to involve our income tax specialists.

How the Critical Audit Matter Was Addressed in the Audit

Our audit procedures related to forecasted revenues and taxable income included the following, among others:

- Tested the effectiveness of controls over the calculation and recording of the TRA liability, including those over the forecasts of revenues and taxable income.
- With the assistance of our income tax specialists, we evaluated whether the sources of management's estimated taxable income were of the appropriate character and sufficient to utilize the deferred tax assets under the relevant tax law and tested the mathematical accuracy of the calculation used to determine the TRA liability.
- We evaluated management's ability to accurately estimate revenues and taxable income by comparing actual results to management's historical estimates and evaluating whether there have been any changes that would affect management's ability to continue accurately estimating revenues and taxable income.
- We tested the reasonableness of management's estimates of revenues and taxable income by jurisdiction by comparing management's forecast to:
    - Historical revenues, cost of sales, and income
    - Schedule of future revenues resulting from contracts with certain customers
    - Internal communications to management and the Board of Directors
    - Industry reports for the Company and the steel industry
- We evaluated whether the estimates of future revenues and taxable income were consistent with evidence obtained in other areas of the audit.

/s/ DELOITTE & TOUCHE LLP

Cleveland, Ohio

February 23, 2021

We have served as the Company's auditor since 2015.

GRAFTECH INTERNATIONAL LTD. AND SUBSIDIARIES

CONSOLIDATED BALANCE SHEETS

(Dollars in thousands, except share data)

	As of December 31,	
	2020	2019
ASSETS		
Current assets:		
Cash and cash equivalents	$ 145,442	$ 80,935
Accounts and notes receivable, net of allowance for doubtful accounts of $8,243 as of December 31, 2020 and $5,474 as of December 31, 2019	182,647	247,051
Inventories	265,964	313,648
Prepaid expenses and other current assets	35,114	40,946
Total current assets	629,167	682,580
Property, plant and equipment	784,902	733,417
Less: accumulated depreciation	278,685	220,397
Net property, plant and equipment	506,217	513,020
Deferred income taxes	32,551	55,217
Goodwill	171,117	171,117
Other assets	93,660	104,230
Total assets	$ 1,432,712	$ 1,526,164
LIABILITIES AND STOCKHOLDERS' EQUITY (DEFICIT)		
Current liabilities:		
Accounts payable	$ 70,989	$ 78,697
Short-term debt	131	141
Accrued income and other taxes	48,720	65,176
Other accrued liabilities	56,501	48,335
Related party payable - tax receivable agreement	21,752	27,857
Total current liabilities	198,093	220,206
Long-term debt	1,420,000	1,812,682
Other long-term obligations	81,478	72,562
Deferred income taxes	43,428	49,773
Related party payable - tax receivable agreement	19,098	62,014
Commitments and contingencies – Note 12		
Stockholders' (deficit) equity:		
Preferred stock, par value $0.01, 300,000,000 shares authorized, none issued	—	—
Common stock, par value $0.01, 3,000,000,000 shares authorized, 267,188,547 and 270,485,308 shares issued and outstanding as of December 31, 2020 and December 31, 2019, respectively	2,672	2,705
Additional paid – in capital	758,354	765,419
Accumulated other comprehensive (loss) income	(19,641)	(7,361)
Accumulated deficit	(1,070,770)	(1,451,836)
Total stockholders' (deficit) equity	(329,385)	(691,073)
Total liabilities and stockholders' equity	$ 1,432,712	$ 1,526,164

See accompanying Notes to the Consolidated Financial Statements

GRAFTECH INTERNATIONAL LTD. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE INCOME (LOSS)

(Dollars in thousands, except per share data)

	For the Year Ended December 31,		
	2020	2019	2018
STATEMENTS OF OPERATIONS			
Net sales	$ 1,224,361	$ 1,790,793	$ 1,895,910
Cost of sales	563,864	750,390	705,698
Gross profit	660,497	1,040,403	1,190,212
Research and development	3,975	2,684	2,129
Selling and administrative expenses	67,913	63,674	62,032
Operating income	588,609	974,045	1,126,051
Other expense	3,330	5,203	3,361
Related party tax receivable agreement (benefit) expense	(21,090)	3,393	86,478
Interest expense	98,074	127,331	135,061
Interest income	(1,750)	(4,709)	(1,657)
Income from continuing operations before provision for income taxes	510,045	842,827	902,808
Provision for income taxes	75,671	98,225	48,920
Net income from continuing operations	434,374	744,602	853,888
Income from discontinued operations, net of tax	—	—	331
Net income	$ 434,374	$ 744,602	$ 854,219
Basic income per share:			
Net income per share	$ 1.62	$ 2.58	$ 2.87
Net income from continuing operations per share	1.62	2.58	2.87
Weighted average shares outstanding	267,916,483	289,057,356	297,748,327
Diluted income per share:			
Net income per share	1.62	2.58	2.87
Diluted net income from continuing operations per share	1.62	2.58	2.87
Weighted average diluted shares outstanding	267,930,644	289,074,601	297,753,770
STATEMENTS OF COMPREHENSIVE INCOME (LOSS)			
Net income	$ 434,374	$ 744,602	$ 854,219
Other comprehensive (loss) income:			
Foreign currency translation adjustments, net of tax of $(162), $(67), and $(288), respectively	6,568	(6,371)	(18,391)
Commodities and interest rate derivatives, net of tax of $5,399, $(1,546), and $802, respectively	(18,848)	4,810	(7,698)
Other comprehensive (loss) income, net of tax:	(12,280)	(1,561)	(26,089)
Comprehensive income	$ 422,094	$ 743,041	$ 828,130

See accompanying Notes to the Consolidated Financial Statements

GRAFTECH INTERNATIONAL LTD. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF CASH FLOWS

(Dollars in thousands)

	For the Year Ended December 31,		
	2020	**2019**	**2018**
Cash flow from operating activities:			
Net income	$ 434,374	$ 744,602	$ 854,219
Adjustments to reconcile net income to cash provided by operations:			
Depreciation and amortization	62,963	61,819	66,413
Related party Tax Receivable Agreement (benefit) expense	(21,090)	3,393	86,478
Deferred income tax provision	20,241	17,503	(37,078)
Loss on extinguishment of debt	8,329	—	23,827
Non-cash interest expense	6,192	6,344	5,320
Other charges, net	10,526	21,831	15,761
Net change in working capital*	86,438	(47,687)	(177,754)
Change in related party Tax Receivable Agreement	(27,857)	—	—
Change in long-term assets and liabilities	(16,470)	(2,489)	(583)
Net cash provided by operating activities	563,646	805,316	836,603
Cash flow from investing activities:			
Capital expenditures	(36,075)	(64,103)	(68,221)
Proceeds from the sale of fixed assets	379	219	926
Net cash used in investing activities	(35,696)	(63,884)	(67,295)
Cash flow from financing activities:			
Short-term debt (reductions) borrowings, net	(146)	—	(12,607)
Credit Facility reductions	—	—	(45,692)
Refinancing fees and debt issuance costs	(6,278)	—	(27,326)
Proceeds from the issuance of long-term debt, net of original issue discount	500,000	—	2,235,000
Repayment of 2012 Senior Notes	—	—	(304,782)
Repurchase of common stock - related party	—	(250,000)	(225,000)
Repurchase of common stock - non-related party	(30,099)	(10,868)	—
Payment for taxes related to net share settlement of equity awards	(71)	—	—
Principal payments on long-term debt	(896,214)	(350,140)	(56,372)
Dividends paid to non-related-party	(8,603)	(20,613)	(55,616)
Dividends paid to related-party	(22,272)	(78,010)	(1,488,649)
Related-party promissory note repayment	—	—	(750,000)
Net cash used in financing activities	(463,683)	(709,631)	(731,044)
Net change in cash and cash equivalents	64,267	31,801	38,264
Effect of exchange rate changes on cash and cash equivalents	240	(746)	(1,749)
Cash and cash equivalents at beginning of period	80,935	49,880	13,365
Cash and cash equivalents at end of period	$ 145,442	$ 80,935	$ 49,880

See accompanying Notes to the Consolidated Financial Statements

GRAFTECH INTERNATIONAL LTD. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF CASH FLOWS (Continued)

(Dollars in thousands)

	For the Year Ended December 31,		
	2020	**2019**	**2018**
Supplemental disclosures of cash flow information:			
Net cash paid during the periods for:			
Interest	$ 86,962	$ 121,075	$ 108,006
Income taxes	73,971	99,278	21,444
Non-cash financing activities:			
*Dividend payable - Promissory Note***	—	—	750,000
* Net change in working capital due to the following components:			
Accounts and notes receivable, net	$ 63,557	$ (404)	$ (139,180)
Inventories	44,633	(21,549)	(126,355)
Prepaid expenses and other current assets	3,028	3,929	7,116
Income taxes payable	(12,420)	(18,174)	67,054
Accounts payable and accruals	(12,790)	(11,551)	15,724
Interest payable	430	62	(2,113)
Decrease (increase) in working capital	$ 86,438	$ (47,687)	$ (177,754)

***During the second quarter of 2018, we declared a $750 million dividend in the form of a Promissory Note that was a non-cash transaction. See Note 5 "Debt and Liquidity" for details.*

See accompanying Notes to the Consolidated Financial Statements

GRAFTECH INTERNATIONAL LTD. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY (DEFICIT)

(Dollars in thousands, except share data)

	Issued Shares of Common Stock	Common Stock	Additional Paid-in Capital	Accumulated Other Comprehensive Income (Loss)	Retained Earnings (Accumulated Deficit)	Total Stockholders' Equity (Deficit)
Balance as of December 31, 2017	302,225,923	$ 3,022	$ 851,315	$ 20,289	$ (261,411)	$ 613,215
Net income	—	—	—	—	854,219	854,219
Other comprehensive income (loss):						
Commodity derivatives income (loss), net of tax of $715	—	—	—	(6,866)	—	(6,866)
Commodity and foreign currency derivatives reclassification adjustments, net of tax of $87	—	—	—	(832)	—	(832)
Foreign currency translation adjustments, net of tax of $(288)	—	—	—	(18,391)	—	(18,391)
Total other comprehensive income	—	—	—	(26,089)	—	(26,089)
Common stock repurchased and retired (from related party)	(11,688,311)	(117)	(32,844)	—	(192,039)	(225,000)
Stock-based compensation	—	—	1,151	—	—	1,151
Dividends paid to related party stockholder ($5.14 per share)	—	—	—	—	(1,488,649)	(1,488,649)
Dividends paid to non-related party stockholders ($0.9345 per share)	—	—	—	—	(55,616)	(55,616)
Related-party promissory note repayment	—	—	—	—	(750,000)	(750,000)
Balance as of December 31, 2018	290,537,612	$ 2,905	$ 819,622	$ (5,800)	$ (1,893,496)	(1,076,769)
Net income	—	—	—	—	744,602	744,602
Other comprehensive income (loss):						
Commodity and interest rate derivatives income (loss), net of tax of $(3,418)	—	—	—	11,830	—	11,830
Commodity derivatives reclassification adjustments, net of tax of $1,872	—	—	—	(7,020)	—	(7,020)
Foreign currency translation adjustments, net of tax of $(67)	—	—	—	(6,371)	—	(6,371)
Total other comprehensive loss	—	—	—	(1,561)	—	(1,561)
Common stock repurchased and retired (from related party)	(19,047,619)	(190)	(53,524)	—	(196,286)	(250,000)
Common stock repurchased and retired (from non-related party)	(1,004,685)	(10)	(2,825)	—	(8,033)	(10,868)
Stock based compensation	—	—	2,146	—	—	2,146
Dividends paid to related party stockholder ($0.34 per share)	—	—	—	—	(78,010)	(78,010)
Dividends paid to non-related party stockholders ($0.34 per share)	—	—	—	—	(20,613)	(20,613)
Balance as of December 31, 2019	270,485,308	2,705	765,419	(7,361)	$ (1,451,836)	$ (691,073)
Net income	—	—	—	—	434,374	434,374
Other comprehensive income (loss):						
Commodity and interest rate derivatives income (loss), net of tax of $4,250	—	—	—	(15,594)	—	(15,594)
Commodity derivatives reclassification adjustments, net of tax of $879	—	—	—	(3,254)	—	(3,254)
Foreign currency translation adjustments, net of tax of $(162)	—	—	—	6,568	—	6,568
Total other comprehensive loss	—	—	—	(12,280)	—	(12,280)
Common stock repurchased and retired (from non-related party)	(3,328,574)	(33)	(9,700)		(20,366)	(30,099)
Stock based compensation	42,411	—	2,665	—	—	2,665
Dividends paid to related party stockholder ($0.115 per share)	—	—	—	—	(22,272)	(22,272)
Dividends paid to non-related party stockholders ($0.115 per share)	—	—	—	—	(8,603)	(8,603)
Common stock withheld for taxes on equity award settlement	(10,598)	—	(30)	—	(41)	(71)
Adoption of ASC 326					(2,026)	(2,026)
Balance as of December 31, 2020	267,188,547	$ 2,672	$ 758,354	$ (19,641)	$ (1,070,770)	$ (329,385)

See accompanying Notes to the Consolidated Financial Statements

(1) Business and Summary of Significant Accounting Policies

Discussion of Business and Structure

GrafTech International Ltd. (the "Company") is a leading manufacturer of high-quality graphite electrode products essential to the production of electric arc furnace ("EAF") steel and other ferrous and non-ferrous metals. References herein to "GTI," "we," "our," or "us" refer collectively to GrafTech International Ltd. and its subsidiaries. On August 15, 2015, GTI became an indirect wholly owned subsidiary of Brookfield Asset Management Inc. ("Brookfield") through a tender offer to our former stockholders and subsequent merger transaction. Brookfield has since distributed portions of its GrafTech common stock to the owners in the Brookfield consortium and sold portions of GrafTech common stock, resulting in the reduction in Brookfield's ownership of outstanding shares of GrafTech common stock to 55.3% as of December 31, 2020. See Note 14 "Stockholders equity" and Note 17 "Subsequent events" for more information.

The Company's only reportable segment, Industrial Materials, is comprised of our two major product categories: graphite electrodes and needle coke products. Needle coke is the key raw material to producing graphite electrodes. The Company's vision is to provide the highest quality graphite electrodes at the lowest cost while providing the best customer service all while striving to be the lowest cost producer.

Summary of Significant Accounting Policies

The Consolidated Financial Statements include the financial statements of GrafTech International Ltd. and its wholly owned subsidiaries. All intercompany transactions have been eliminated in consolidation.

Cash Equivalents

We consider all highly liquid financial instruments with original maturities of three months or less to be cash equivalents. Cash equivalents consist of certificates of deposit, money market funds and commercial paper.

Revenue Recognition

Revenue is recognized when a customer obtains control of promised goods. The amount of revenue recognized reflects the consideration to which the Company expects to be entitled to receive in exchange for these goods.

To achieve this core principle, the following five steps are performed: (i) identify the contract(s) with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) we satisfy a performance obligation.

The Company sells the majority of its products directly to steel manufacturers located in various jurisdictions. The Company's contracts consist of longer-term take-or-pay sales contracts of graphite electrodes with terms of up to five years and short-term purchase orders (deliveries within one year). Collectability is assessed based on the customer's ability and intention to pay, reviewing a variety of factors including the customer's historical payment experience and published credit and financial information. Additionally, for multi-year contracts, we may require the customer to post a bank guarantee, guarantee of a parent, a letter of credit or a significant pre-payment.

The promises of delivery of graphite electrodes represent the distinct performance obligations of our contracts. A small portion of our sales consist of deliveries of by-products of the manufacturing processes, such as graphite powders, naphta and gasoil.

Given their nature, the Company's performance obligations are satisfied at a point in time when control of the products has been transferred to the customer. In most cases, control transfer is deemed to happen at the delivery point of the products defined under the incoterms, usually at time of loading the truck or the vessel. The Company has elected to treat the transportation activity as a fulfilment activity instead of as a distinct performance obligation, and outbound freight cost is accrued when the product delivery promises are satisfied.

The transaction price is determined based on the consideration to which the Company will be entitled in exchange for transferring goods to the customer. Taxes assessed by a governmental authority that are both imposed on and concurrent with a specific revenue-producing transaction and collected by the Company from a customer are excluded from the transaction price.

Variable consideration is included in the transaction price if, in the Company's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. The estimated variable consideration is reflected through revenue reversal accruals that are based on the Company's experience as well as anticipated performance. Historically, these reversals have been insignificant. Additionally, when termination fees are invoiced under certain provisions of the longer-term take-or-pay sales agreements, they are accounted for as an element of variable consideration that is constrained, i.e. not recognized, until collected.

Contracts that contain multiple distinct performance obligations require an allocation of the transaction price to each performance obligation based on a relative stand-alone selling price basis. The Company regularly reviews market conditions and internally approved pricing guidelines to determine stand-alone selling prices for the different types of its customer contracts. The stand-alone prices as known at contract inception are utilized as the basis to allocate the transaction price to the distinct performance obligations. The allocation of the transaction price to the performance obligations remains unchanged if stand-alone selling prices change after contract inception.

Changes to longer-term take-or-pay contracts are reviewed to assess whether there has been a change in volume, price or both and whether any additional volumes are at their stand-alone selling price to determine whether the contract modification should be accounted for as (1) part of the existing contract, (2) the termination of the existing contract and the creation of a new contract or (3) a separate contract. Under the most commonly negotiated terms, the accounting is such that it treats these modified contracts as the termination of the existing contract and the creation of a new contract.

Inventories

Inventories are stated at the lower of cost or market. Cost is principally determined using the "first-in first-out" ("FIFO") and average cost, which approximates FIFO, methods. Elements of cost in inventory include raw materials, direct labor and manufacturing overhead.

We allocate fixed production overheads to the costs of conversion based on normal capacity of the production facilities. We recognize abnormal amounts of idle facility expense, freight, handling costs, and wasted materials (spoilage) as current period charges.

Property, Plant and Equipment

Expenditures for property, plant and equipment are recorded at cost. Maintenance and repairs of property and equipment are expensed as incurred. Expenditures for replacements and betterments are capitalized and the replaced assets are retired. Gains and losses from the sale of property are included in cost of sales or other expense (income), net. We depreciate our assets using the straight-line method over the estimated useful lives of the assets. The ranges of estimated useful lives are as follows:

	Years
Buildings	25-40
Land improvements	20
Machinery and equipment	5-20
Furniture and fixtures	5-10

The carrying value of fixed assets is assessed when events and circumstances indicating impairment are present. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of the assets to future undiscounted net cash flows expected to be generated by the assets. If the assets are considered to be impaired, the impairment to be recognized is measured by the amount by which the carrying amount of the assets exceeds the fair value of the assets. Assets to be disposed of are reported at the lower of the carrying amount or fair value less costs to sell.

Depreciation expense was $51.5 million, $49.7 million and $53.5 million in 2020, 2019 and 2018, respectively. Capital expenditures within accounts payable totaled $8.9 million and $11.5 million as of December 31, 2020 and 2019, respectively.

Accounts Receivable

Trade accounts receivable primarily arise from sales of goods to customers and distributors in the normal course of business.

Allowance for Doubtful Accounts

We adopted the new credit losses standard in 2020 introducing the Current Expected Credit Losses ("CECL") accounting model, using a lifetime of expected credit losses measurement objective for the recognition of credit losses at the time the financial assets originates or acquired. Our expected losses are adjusted each period for changes in expected lifetime credit losses.

Prior to adoption of the CECL standard, the allowance for doubtful accounts was based on judgment to assess the likelihood of collection of receivables, including the current creditworthiness of each customer, related aging of the past due balances and the facts and circumstances surrounding any non-payment. We evaluated specific accounts when we became aware of a situation where a customer may not be able to meet its financial obligations. Receivables are charged off when amounts are determined to be uncollectible.

Deferred Debt Issuance Costs

We defer debt issuance costs upon the incurrence of debt and record them as a direct reduction against our debt. We had deferred debt issuance costs of $18.1 million and $20.2 million as of December 31, 2020 and 2019, respectively. We amortize such amounts over the life of the respective debt instrument using the effective interest method. The estimated life may be adjusted upon the occurrence of a triggering event. Amortization of debt issuance costs amounted to $9.2 million, $4.1 million and $3.5 million in 2020, 2019 and 2018, respectively. Debt issuance costs amortization is included in interest expense.

Derivative Financial Instruments

We do not use derivative financial instruments for trading purposes. They are used to manage well-defined commercial risks associated with commodity purchases, interest rates and currency exchange rate risks. On the date that a derivative contract for a hedging instrument is entered into, the Company designates the derivative as either (1) a hedge of the exposure to changes in the fair value of a recognized asset or liability or of an unrecognized firm commitment (a fair value hedge), (2) a hedge of the exposure of a forecasted transaction or of the variability in the cash flows of a recognized asset or liability (a cash flow hedge), (3) a hedge of a net investment in a foreign operation (a net investment hedge) or (4) a contract not designated as a hedging instrument.

For a fair value hedge, both the effective and ineffective portions of the change in the fair value of the derivative are recorded in earnings and reflected in the Consolidated Statement of Operations on the same line as the gain or loss on the hedged item attributable to the hedged risk. For a cash flow hedge, the effective portion of the change in the fair value of the derivative is recorded in accumulated other comprehensive loss in the Consolidated Balance Sheet. When the underlying hedged transaction is realized, the gain or loss included in accumulated other comprehensive loss is recorded in earnings and reflected in the Consolidated Statement of Operations on the same line as the gain or loss on the hedged item attributable to the hedged risk. For a net investment hedge, the effective portion of the change in the fair value of the derivative is recorded in cumulative translation adjustment, which is a component of accumulated other comprehensive loss in the Consolidated Balance Sheet and is de-recognized upon liquidation or sale of the entity.

We formally document our hedge relationships, including the identification of the hedging instruments and the related hedged items, as well as our risk management objectives and strategies for undertaking the hedge transaction. Derivatives are recorded at fair value in prepaid expenses and other current assets, other long-term assets, other current liabilities and other long-term obligations in the consolidated balance sheets. We also formally assess, both at inception and at least quarterly thereafter, whether a derivative used in a hedging transaction is highly effective in offsetting changes in either the fair value or the cash flows of the hedged item. When it is determined that a derivative ceases to be highly effective or that the hedged transaction is no longer probable of occurring, we discontinue hedge accounting.

Foreign Currency Derivatives

We enter into foreign currency derivatives from time to time to manage exposure to changes in currency exchange rates. These instruments, which include, but are not limited to, forward exchange contracts and purchased currency options, attempt to hedge global currency exposures, relating to non-dollar denominated debt and identifiable foreign currency receivables, payables and commitments held by our foreign and domestic subsidiaries. Forward exchange contracts are agreements to exchange different currencies at a specified future date and at a specified rate. Purchased foreign currency options are instruments which give the holder the right, but not the obligation, to exchange different currencies at a specified rate at a specified date or over a range of specified dates. The result is the creation of a range in which a best and worst price is defined, while minimizing option cost. Forward exchange contracts and purchased currency options are carried at fair value.

These contracts may be designated as cash flow or fair value hedges to the extent that they are effective and are accounted for as described in section above (“Derivative Financial Instruments”). For derivatives that are not designated as a hedge, any gain or loss is immediately recognized in cost of sales on the Consolidated Statements of Operations. Derivatives used in this manner relate to risks resulting from assets or liabilities denominated in a foreign currency.

Commodity Contracts

We have entered into derivative contracts for refined oil products. These contracts are entered into to protect against the risk that eventual cash flows related to these products will be adversely affected by future changes in prices. All commodity contracts are carried at fair value and are treated as cash flow hedges to the extent they are effective. Changes in their fair values are included in accumulated other comprehensive income (loss) in the Consolidated Balance Sheets until settlement. Realized gains and losses resulting from settlement are first recognized in accumulated other comprehensive income (loss) and are recorded in cost of sales on the Consolidated Statements of Operations when the underlying hedged item is realized.

Interest Rate Swap Contracts

We have entered into interest rate swap contracts that are "pay variable, receive fixed" with maturities of either two or five years. The Company’s risk management objective was to fix its cash flows associated with the risk in variability in the one-month U.S. LIBO Rate for a portion of our outstanding debt under the 2018 Term Loan. It is expected that these swaps will fix the cash flows associated with the forecasted interest payments on this notional amount of debt. All interest rate swaps are carried at their fair value and are treated as cash flow hedges. Changes in their fair value are in included in accumulated other comprehensive income (loss) on the Consolidated Balance Sheets until settlement. Realized gains and losses resulting from the settlement are recognized in interest expense in the period of settlement.

Income Taxes

We file a consolidated U.S. federal income tax return for GTI and its eligible domestic subsidiaries. Our non-U.S. subsidiaries file income tax returns in their respective local jurisdictions. We account for income taxes under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to temporary differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and tax benefit carry forwards. Deferred tax assets and liabilities at the end of each period are determined using enacted tax rates. A valuation allowance is established or maintained, when, based on currently available information and other factors, it is more likely than not that all or a portion of a deferred tax asset will not be realized.

Under the guidance on accounting for uncertainty in income taxes, we recognize the benefit from an uncertain tax position only if it is more likely than not that the tax position will be sustained on examination by taxing authorities, based on the technical merits of the position. The tax benefits recognized in the financial statements from such a position are measured based on the largest benefit that has a greater than fifty percent likelihood of being realized upon ultimate settlement. The guidance on accounting for uncertainty in income taxes also provides guidance on derecognition, classification, interest and penalties on income taxes, and accounting in interim periods.

The Company treats taxes due on future U.S. inclusions in taxable income related to Global Intangible Low Tax Income ("GILTI") as a current period expense when incurred (the “period cost method”). See Note 13 "Income Taxes" for more information.

Related Party Tax Receivable Agreement

On April 23, 2018, the Company entered into a tax receivable agreement (the "TRA") that provides Brookfield, as the sole pre-initial public offering ("IPO") stockholder, the right to receive future payments from us for 85% of the amount of cash savings, if any, in U.S. federal income tax and Swiss tax that we and our subsidiaries realize as a result of the utilization of

certain tax assets attributable to periods prior to our IPO, including certain federal net operating losses ("NOLs"), previously taxed income under Section 959 of the Internal Revenue Code of 1986, as amended from time to time (the "Code"), foreign tax credits, and certain NOLs in Swissco (collectively, the "Pre-IPO Tax Assets"). In addition, we will pay interest on the payments we will make to Brookfield with respect to the amount of these cash savings from the due date (without extensions) of our tax return where we realize these savings to the payment date at a rate equal to LIBOR plus 1.00% per annum. The term of the TRA commenced on April 23, 2018 and will continue until there is no potential for any future tax benefit payments.

Retirement Plans and Postretirement Benefits

We use actuarial methods and assumptions to account for our defined benefit pension plans and our postretirement benefits. We immediately recognize the change in the fair value of plan assets and net actuarial gains and losses annually in the fourth quarter of each year with a mark-to-market adjustment ("MTM Adjustment") and whenever a plan is remeasured (e.g. due to a significant curtailment, settlement, etc.). Pension and postretirement benefits expense includes the MTM adjustment, actuarially computed cost of benefits earned during the current service period, the interest cost on accrued obligations, the expected return on plan assets based on fair market values, and adjustments due to plan settlements and curtailments. Contributions to the qualified U.S. retirement plan are made in accordance with the requirements of the Employee Retirement Income Security Act of 1974.

Postretirement benefits and benefits under the non-qualified retirement plan have been accrued, but not funded. The estimated cost of future postretirement life insurance benefits is determined by the Company with assistance from independent actuarial firms using the “projected unit credit” actuarial cost method. Such costs are recognized as employees render the service necessary to earn the postretirement benefits. We record our balance sheet position based on the funded status of the plan.

Additional information with respect to benefits plans is set forth in Note 11, “Retirement Plans and Postretirement Benefits.”

Environmental, Health and Safety Matters

Our operations are governed by laws addressing protection of the environment and worker safety and health. These laws provide for civil and criminal penalties and fines, as well as injunctive and remedial relief, for noncompliance and require remediation at sites where hazardous substances have been released into the environment.

We have been in the past, and may become in the future, the subject of formal or informal enforcement actions or proceedings regarding noncompliance with these laws or the remediation of company-related substances released into the environment. Historically, such matters have been resolved by negotiation with regulatory authorities resulting in commitments to compliance, abatement or remediation programs and in some cases payment of penalties. Historically, neither the commitments undertaken nor the penalties imposed on us have been material.

Environmental considerations are part of all significant capital expenditure decisions. Environmental remediation, compliance and management expenses were approximately $11.1 million, $11.6 million and $12.4 million in 2020, 2019 and 2018, respectively. A charge to income is recorded when it is probable that a liability has been incurred and the cost can be reasonably estimated. When payments are fixed or determinable, the liability is discounted using a rate at which the payments could be effectively settled. The accrued liability relating to environmental remediation was $4.9 million as of December 31, 2020 and 2019.

Our environmental liabilities do not take into consideration possible recoveries of insurance proceeds. Because of the uncertainties associated with environmental remediation activities at sites where we may be potentially liable, future expenses to remediate sites could be considerably higher than the accrued liability.

Foreign Currency Translation and Remeasurement

We translate the financial statements of foreign subsidiaries, whose local currency is their functional currency, to U.S. dollars using period-end exchange rates for assets and liabilities and weighted average exchange rates for each period for revenues, expenses, gains and losses. Differences arising from exchange rate changes are included in accumulated other comprehensive loss on the Consolidated Balance Sheets until such time as the operations of such non-U.S. subsidiaries are sold or substantially or completely liquidated.

For our Mexican, Swiss, United Kingdom and Russian subsidiaries, whose functional currency is the U.S. dollar, we remeasure non-monetary balance sheet accounts and the related income statement accounts at historical exchange rates. Resulting gains and losses arising from the fluctuations in currency for monetary accounts are recognized in other (income)

expense, net, in the Consolidated Statements of Operations. Gains and losses arising from fluctuations in currency exchange rates on transactions denominated in currencies other than the functional currency are recognized in earnings as incurred.

We have non-dollar denominated intercompany loans between some of our foreign subsidiaries. These loans are subject to remeasurement gains and losses due to changes in currency exchange rates. Certain of these loans had been deemed to be essentially permanent prior to settlement and, as a result, remeasurement gains and losses on these loans were recorded as a component of accumulated other comprehensive income (loss) in the stockholders' equity section of the Consolidated Balance Sheets. The remaining loans are deemed to be temporary and, as a result, remeasurement gains and losses on these loans are recorded as currency (gains) losses in other (income) expense, net, on the Consolidated Statements of Operations.

Goodwill and Other Intangible Assets

Goodwill is the excess of the acquisition cost of businesses over the fair value of the identifiable net assets acquired. We do not recognize deferred income taxes for the difference between the assigned value and the tax basis related to nondeductible goodwill. Goodwill is not amortized; however, impairment testing is performed annually or more frequently if circumstances indicate that impairment may have occurred. We perform the annual goodwill impairment test at December 31.

The annual goodwill impairment testing may begin with a qualitative assessment of potential impairment indicators in order to determine whether it is necessary to perform the quantitative goodwill impairment test.

In 2020, ASU No. 2017-14 simplified the accounting for goodwill impairment removing the second step of the good will impairment test. Prior to adopting the new guidance, the impairment test for goodwill used a two-step approach, which was performed at the reporting unit level. Step one compares the fair value of the reporting unit to its carrying value. The fair value for each reporting unit with goodwill is determined in accordance with accounting guidance on determining fair value, which requires consideration of the income, market, and cost approaches as applicable. If the carrying value exceeded the fair value, there is potential impairment and step two must be performed. Step two compared the carrying value of the reporting unit's goodwill to its implied fair value (i.e., fair value of the reporting unit less the fair value of the unit's assets and liabilities, including identifiable intangible assets). If the implied fair value of goodwill is less than the carrying amount of goodwill, an impairment is recognized.

Other amortizable intangible assets, which consist primarily of trademarks and trade names, customer-related intangibles and technological know-how, are amortized over their estimated useful lives using the straight line or sum-of-the-years digits method. The estimated useful lives for each major category of amortizable intangible assets are:

	Years
Trade name	5-20
Technology and know-how	5-14
Customer related intangible	5-15

Additional information about goodwill and other intangibles is set forth in Note 6, "Goodwill and Other Intangible Assets."

Major Maintenance and Repair Costs

We perform scheduled major maintenance of the storage and processing units at our Seadrift plant (referred to as "overhaul"). Time periods between overhauls vary by unit. We also perform significant maintenance and repair shutdown of the plant (referred to as "turnaround") every other year.

Costs of overhauls and turnarounds include plant personnel, contract services, materials, and rental equipment. We defer these costs when incurred and use the straight-line method to amortize them over the period of time estimated to lapse until the next scheduled overhaul of the applicable storage or processing unit. Under this policy, $10.2 million was deferred in 2020 and $0.8 million of costs were deferred in 2019. Amortization of deferred maintenance costs totaled $6.0 million, $5.1 million and $3.1 million in 2020, 2019 and 2018, respectively.

Earnings per share

The calculation of basic earnings per share is based on the number of common shares outstanding after giving effect to the stock split effected on April 12, 2018 and common stock repurchases. Diluted earnings per share recognizes the dilution that would occur if stock options or restricted shares were exercised or converted into common shares. See Note 15, "Earnings Per Share".

Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles ("GAAP") requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent liabilities at the date of the Consolidated Financial Statements and the reported amounts of revenue and expenses. Significant estimates and assumptions are used for, but are not limited to inventory valuation, pension and other post-retirement benefits, allowance for doubtful accounts, contingent liabilities, accruals and valuation allowances, asset impairment, and environmental-related accruals. Actual results could differ from our estimates.

Subsequent Events

We evaluate events that occur after the balance sheet date but before financial statements are issued to determine if a material event requires our amending the financial statements or disclosing the event. See Note 17 "Subsequent Events" for further details.

Recent Accounting Standards

Recently Adopted Accounting Standards

In January 2017, the Financial Accounting Standards Board ("FASB") issued ASU No. 2017-04, *Intangibles-Goodwill and Other* (Topic 350). This guidance was issued to simplify the accounting for goodwill impairment. The guidance removes the second step of the goodwill impairment test, which requires that a hypothetical purchase price allocation be performed to determine the amount of impairment, if any. Under this new guidance, a goodwill impairment charge will be based on the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill. This ASU No. 2017-04 is effective beginning January 1, 2020. The Company adopted ASU No. 2017-04 on January 1, 2020, with no impact to our financial position, results of operations or cash flows.

In June 2016, the FASB issued ASU No. 2016-13*, Financial Instruments–Credit Losses* (Topic 326)*,* which introduces the Current Expected Credit Losses ("CECL") accounting model. CECL requires earlier recognition of credit losses, while also providing additional transparency about credit risk. CECL utilizes a lifetime expected credit loss measurement objective for the recognition of credit losses at the time the financial asset is originated or acquired. The expected credit losses are adjusted each period for changes in expected lifetime credit losses. ASU No. 2016-13 was effective for the Company on January 1, 2020. The adoption of ASU No. 2016-13 resulted in a cumulative-effect adjustment of $2.0 million included as an adjustment to our accounts receivable reserve and to retained earnings on January 1, 2020.

Accounting Standards Not Yet Adopted

In March 2020, the FASB issued ASU No. 2020-04, *Facilitation of the Effects of Reference Rate Reform on Financial Reporting* (Topic 848). This pronouncement contains optional expedients and exceptions for applying GAAP to contracts, hedging relationships and other transactions affected by reference rate reform. ASU 2020-04 is elective and applies to all entities, subject to meeting certain criteria, that have contracts, hedging relationships and other transactions that reference the London Interbank Offered Rate ("LIBOR") or another reference rate expected to be discontinued because of reference rate reform. ASU 2020-04 can be elected for both interim and annual periods from March 12, 2020 through December 31, 2022. We plan to adopt ASU 2020-04 as of January 1, 2023. The adoption of ASU 2020-04 is not expected to have a material impact on our financial position, results of operations or cash flows.

In December 2019, the FASB issued ASU No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*. ASU 2019-12 is intended to improve consistent application of Topic 740 and simplify the accounting for income taxes. This pronouncement removes certain exceptions to the general principles in Topic 740 and clarifies and amends existing guidance. ASU 2019-12 is effective for annual and interim reporting periods beginning after December 12, 2020, with early adoption permitted. The Company is currently evaluating the effects of this on our financial position, results of operations or cash flows.

(2) Revenue from Contracts with Customers

Disaggregation of Revenue

The following table provides information about disaggregated revenue by type of product and contract:

	For the Year Ended December 31,		
	2020	2019	2018
	(Dollars in thousands)		
Graphite Electrodes - Long-term agreements	$ 1,069,772	$ 1,437,354	$ 1,341,557
Graphite Electrodes - Short-term agreements and spot sales	123,845	260,979	395,928
By-products and other	30,744	92,460	158,425
Total Revenues	$ 1,224,361	$ 1,790,793	$ 1,895,910

Effective the first quarter of 2019, the Graphite Electrodes revenue categories include only graphite electrodes manufactured by GrafTech. The revenue category “By-products and Other” now includes re-sales of low-grade electrodes purchased from third-party suppliers, which represent a minimal contribution to our profitability. For comparability purposes, the prior period has been recast to conform to this presentation.

Contract Balances

Substantially all the Company's receivables relate to contracts with customers. Accounts receivables are recorded when the right to consideration becomes unconditional. Payment terms on invoices range from 30 to 120 days depending on the customary business practices of the jurisdictions in which we do business.

Certain short-term and longer-term sales contracts require up-front payments prior to the Company’s fulfillment of any performance obligation. These contract liabilities are recorded as current or long-term deferred revenue, depending on the lag between the pre-payment and the expected delivery of the related products. Deferred revenue or contract assets originate from contracts where the allocation of the transaction price to the performance obligations based on their relative stand-alone selling prices results in the timing of revenue recognition being different from the timing of the invoicing. In this case, deferred revenue is amortized into revenue based on the transaction price allocated to the remaining performance obligations and contract assets are realized through the contract invoicing.

Contract assets as of December 31, 2020 were $2.7 million, of which $1.5 million and $1.2 million are included in "Prepaid expenses and other assets" and "Other long-term assets," respectively, on the Condensed Consolidated Balance Sheets. There were no contract assets as of December 31, 2019.

Current deferred revenue is included in "Other accrued liabilities" and long-term deferred revenue is included in "Other long-term obligations" on the Condensed Consolidated Balance Sheets.

The following table provides information about deferred revenue from contracts with customers (in thousands):

	Current deferred revenue	Long-Term deferred revenue
	(Dollars in thousands)	
Balance as of December 31, 2018	$ 5,380	$ 7,716
Increases due to cash received	7,961	—
Revenue recognized	(4,678)	—
Revision of estimates	—	(694)
Reclassification between long-term and current	3,042	(3,042)
Foreign currency impact	71	(122)
Balance as of December 31, 2019	11,776	3,858
Increases due to cash received	10,110	—
Revenue recognized	(6,270)	—
Reclassification between long-term and current	(1,804)	1,804
Foreign currency impact	(756)	—
Balance as of December 31, 2020	$ 13,056	$ 5,662

Transaction Price Allocated to the Remaining Performance Obligations

The following table presents estimated revenues expected to be recognized in the future related to performance obligations that are unsatisfied (or partially unsatisfied) at the end of reporting period. The estimated revenues do not include contracts with original duration of one year or less. During the challenging market conditions in 2020, we were able to work with our customers to develop mutually beneficial solutions to their challenges, including volume commitments. We have negotiated long-term sales agreement ("LTA") modifications with many of these customers. We also worked to preserve our rights under the LTAs in a few arbitrations that arose from some non-performance and other disputes during the year. As a result of recent contract modifications, as well as on-going discussions with many of our customers, the remaining revenue associated with our LTAs is expected to be approximately as follows:

	2021	2022	2023 through 2024
		(Dollars in millions)	
Estimated LTA revenue	$925-$1,025	$910-$1,010	$350-$450[(1)]

(1) Includes expected termination fees from a few customers that have failed to meet certain obligations under their LTAs.

The majority of the LTAs are defined as pre-determined fixed annual volume contracts while a small portion are defined with a specified volume range. For the year 2021 and beyond, the contractual revenue amounts above are based upon the minimum volume for those contracts with specified ranges. The actual revenue realized from these contracted volumes may vary in timing and total due to the credit risk associated with certain customers facing financial challenges and non-performance on contracts, as well as customer demand related to contracted volume ranges.

In addition to the expected remaining revenue to be recognized with the LTAs, the Company recorded $1,069.8 million, $1,437.4 million and $1,341.6 million of revenue pursuant to these contracts in the year ended December 31, 2020, 2019 and 2018, respectively.

(3) Stock-Based and Other Management Compensation

Our Omnibus Equity Incentive Plan permits the granting of options, and other stock-based awards (including restricted stock units and deferred share units). As of December 31, 2020, the aggregate number of shares authorized under the plans since their initial adoption was 15,000,000. Shares issued upon vesting of awards or exercise of options are new share issuances. Upon the vesting or payment of stock awards, an employee may elect receipt of the full share amount and either pay the resulting taxes or sell shares in the open market to cover the tax obligation.

The number of stock-based awards granted by our Board of Directors for the years ended 2020, 2019 and 2018 were as follows:

	2020	2019	2018
Award type:			
Stock options	308,875	229,250	979,790
Deferred share units	58,207	31,829	42,243
Restricted stock units	334,062	260,640	6,740

Accounting for Stock-Based Compensation

Stock-based compensation expense was $2.7 million, $2.1 million and $1.2 million in 2020, 2019 and 2018, respectively. A majority of the expense, $2.3 million in 2020, $1.9 million in 2019 and $1.0 million in 2018, was recorded as selling and administrative expenses in the Consolidated Statement of Operations, with the remaining expenses incurred as cost of sales.

As of December 31, 2020, unrecognized compensation cost related to non-vested stock options, deferred share units and restricted stock units represents $7.9 million, which will be recognized over a weighted average period of 3.4 years. As of December 31, 2019, unrecognized compensation cost related to non-vested stock options, deferred share units and restricted stock units represents $7.6 million, which will be recognized over a weighted average period of 3.8 years.

Deferred Share Units and Restricted Stock Units. Compensation expense for deferred share units and restricted stock unit awards is based on the closing price of our common stock on the date of grant, less forfeitures or cancellations of awards throughout the vesting period, which generally range between one and five years. The weighted average grant date fair value of deferred share units and restricted stock units was approximately $8.84 per share during 2020.

Deferred share units and restricted stock unit awards activity under the Omnibus Equity Incentive Plan for 2020 was as follows:

	Number of Shares	Weighted-Average Grant Date Fair Value
Outstanding unvested as of December 31, 2019	282,716	$ 12.83
Granted	392,269	8.84
Cancelled	(45,760)	12.24
Vested	(104,737)	10.30
Outstanding unvested as of December 31, 2020	524,488	$ 10.41

During 2020, we granted 392,269 shares of deferred share units and restricted stock units to certain directors, officers and employees at prices ranging from $6.48 to $10.66. Of the total deferred share units granted, 58,207 were granted to our independent directors in lieu of cash retainers and vested immediately upon grant. The remaining deferred share units and restricted stock units vest over a period of one to five years.

Stock Options. Compensation expense for stock options is based on the estimated fair value of the option on the date of the grant. We calculate the estimated fair value of the option using the Black-Scholes option-pricing model. During 2020, we granted 308,875 options to certain of our officers and employees. The weighted average fair value of the options granted in 2020 was $3.11. During 2019, we granted 229,250 options to certain of our officers and employees. The weighted-average fair value of the options granted in 2019 was $5.13. During 2018, we granted 979,790 options to certain of our officers and employees. The weighted-average fair value of the options granted in 2018 was $6.08. The weighted average assumptions used in our Black-Scholes option pricing model for options granted in 2020 and 2019 were as follows:

	For the Year Ended December 31,2020	For the Year Ended December 31,2019	For the Year Ended December 31,2018
Dividend yield	0.44% - 3.77%	2.39% - 3.05%	1.70% - 2.27%
Expected volatility	50 %	50 %	45 %
Risk-free interest rate	0.37% - 1.22%	1.79% - 2.63%	2.84% - 2.98%
Expected term in years	6.5 years	6.5 years	6.5 years

Dividend Yield. Our dividend yield estimate is based on our expected dividends and the stock price on the grant date.

Expected Volatility. For 2020, we estimated the volatility of our common stock at the date of grant based on the historical volatility of the company's stock. The volatility factor we use is based on our historical closing prices since our stock has been publicly traded. For the years 2019 and 2018, we estimated the volatility of our common stock at the date of grant based on the historical volatility of comparable companies over the most recent period commensurate with the expected life of the award.

Risk-Free Interest Rate. We base the risk-free interest rate on the implied yield currently available on U.S. Treasury zero-coupon issues with an equivalent remaining term equal to the expected life of the award.

Expected Term In Years. The expected life of awards granted represents the time period that the awards are expected to be outstanding. We determined the expected term of the grants using the "simplified" method as described by the SEC, since we do not have a history of stock option awards to provide a reliable basis for estimating such term.

The stock options vest over a five year period, with one-fifth of the award vesting on the anniversary date of the grant in each of the next five years. Options outstanding at December 31, 2020, have a weighted average remaining contractual life of 7.9 years, a weighted average remaining vesting period of 2.9 years, and an aggregate intrinsic value of $0.5 million. There were no options exercised during 2020, 2019 or 2018.

Stock options outstanding and exercisable under our plans at December 31, 2020 are:

	Options Outstanding			Options Exercisable	
Range of Exercise Prices	Number Outstanding	Weighted Average Remaining Contractual Life in Years	Weighted Average Exercise Prices	Number Exercisable	Weighted Average Exercise Prices
$7.28 - $20.00	1,248,935	7.9	$13.66	342,574	$ 15.38

Stock option awards activity under the Omnibus Equity Incentive Plan for 2020 was as follows:

	Number of Shares	Weighted-Average Exercise Price
Outstanding unvested as of December 31, 2019	931,658	$ 15.06
Granted	308,875	8.99
Vested	(190,212)	15.13
Forfeited	(143,960)	14.82
Outstanding unvested as of December 31, 2020	906,361	$ 13.01

As of December 31, 2020, we had 303,583 options expected to vest in the next year. There were 342,574 options exercisable as of December 31, 2020.

Incentive Compensation Plans

We have a global incentive program for our worldwide salaried and hourly employees, the Incentive Compensation Program (the "ICP"), which includes a stockholder-approved executive incentive compensation plan. The ICP is based primarily on adjusted earnings before income taxes, depreciation and amortization. The balance of our accrued liability for ICP was $8.9 million at December 31, 2020 and $6.9 million as of December 31, 2019.

(4) Segment Reporting

Our Industrial Materials segment manufactures high-quality graphite electrodes essential to the production of EAF steel and other ferrous and non-ferrous metals. Petroleum needle coke, a crystalline form of carbon derived from decant oil, is a key raw material used in the production of graphite electrodes. We utilize substantially all the needle coke that we produce internally to manufacture our graphite electrodes and as a result approximately 97% of our revenues from external customers are derived from the sale of graphite electrodes. In 2020, no customer accounted for more than 10% of our net sales.

The following tables summarize information as to our operations in different geographic areas:

	2020	2019	2018
		(Dollars in thousands)	
Net sales:			
United States	$ 260,867	$ 403,916	$ 429,599
Americas (excluding the United States)	187,779	348,670	367,561
Asia Pacific	127,415	172,439	131,578
Europe, Middle East, Africa	648,300	865,768	967,172
Total	$ 1,224,361	$ 1,790,793	$ 1,895,910

	At December 31,	
	2020	2019
	(Dollars in thousands)	
Long-lived assets (a):		
United States	$ 169,208	$ 174,307
Mexico	132,867	141,621
Brazil	4,309	5,694
France	92,805	88,514
Spain	106,467	102,577
Other countries	561	307
Total	$ 506,217	$ 513,020

(a) Long-lived assets represent fixed assets, net of accumulated depreciation.

(5) Debt and Liquidity

The following table presents our long-term debt:

	As of December 31, 2020	As of December 31, 2019
	(Dollars in thousands)	
2018 Credit Facility (2018 Term Loan and 2018 Revolving Facility)	$ 943,708	$ 1,843,750
2020 Senior Notes	$ 500,000	—
Other Debt	615	705
Unamortized debt discount and issuance costs	(24,192)	(31,632)
Total Debt	1,420,131	1,812,823
Less: Short-term Debt	(131)	(141)
Long-term Debt	$ 1,420,000	$ 1,812,682

2018 Credit Agreement

On February 12, 2018, the Company entered into a credit agreement (the "2018 Credit Agreement") among the Company, GrafTech Finance Inc. ("GrafTech Finance"), GrafTech Switzerland SA ("Swissco"), GrafTech Luxembourg II S.à.r.l.("Luxembourg Holdco" and, together with GrafTech Finance and Swissco, the "Co-Borrowers"), the lenders and issuing banks party thereto and JPMorgan Chase Bank, N.A. as administrative agent (the "Administrative Agent") and as collateral agent, which provides for (i) a $1,500 million senior secured term facility (the "2018 Term Loan Facility") and (ii) a $250 million senior secured revolving credit facility (the "2018 Revolving Credit Facility" and, together with the 2018 Term Loan Facility, the "Senior Secured Credit Facilities"), which may be used from time to time for revolving credit borrowings denominated in dollars or Euro, the issuance of one or more letters of credit denominated in dollars, Euro, Pounds Sterling or Swiss Francs and one or more swing line loans denominated in dollars. GrafTech Finance is the sole borrower under the 2018 Term Loan Facility while GrafTech Finance, Swissco and Lux Holdco are Co-Borrowers under the 2018 Revolving Credit Facility. On February 12, 2018, GrafTech Finance borrowed $1,500 million under the 2018 Term Loan Facility (the "2018 Term Loans"). The 2018 Term Loans mature on February 12, 2025. The maturity date for the 2018 Revolving Credit Facility is February 12, 2023.

The proceeds of the 2018 Term Loans were used to (i) repay in full all outstanding indebtedness of the Co-Borrowers under our previous credit agreement and terminate all commitments thereunder, (ii) redeem in full our previously held 2012 Senior Notes at a redemption price of 101.594% of the principal amount thereof plus accrued and unpaid interest to the date of redemption, (iii) pay fees and expenses incurred in connection with (i) and (ii) above and the Senior Secured Credit Facilities and related expenses, and (iv) declare and pay a dividend to the sole pre-IPO stockholder, with any remainder to be used for general corporate purposes. See Note 7 "Interest Expense" for a breakdown of expenses associated with these repayments. In connection with the repayment of our previous credit agreement and redemption of our previously held 2012 Senior Notes, all guarantees of obligations under the previous credit agreement, the 2012 Senior Notes and related indenture were terminated, all mortgages and other security interests securing obligations under the previous credit agreement were released and the indenture were terminated.

Borrowings under the 2018 Term Loan Facility bear interest, at GrafTech Finance's option, at a rate equal to either (i) the Adjusted LIBO Rate (as defined in the 2018 Credit Agreement), plus an applicable margin initially equal to 3.50% per annum or (ii) the ABR Rate (as defined in the 2018 Credit Agreement), plus an applicable margin initially equal to 2.50% per annum, in each case with one step down of 25 basis points based on achievement of certain public ratings of the 2018 Term Loans.

Borrowings under the 2018 Revolving Credit Facility bear interest, at the applicable Co-Borrower's option, at a rate equal to either (i) the Adjusted LIBO Rate, plus an applicable margin initially equal to 3.75% per annum or (ii) the ABR Rate, plus an applicable margin initially equal to 2.75% per annum, in each case with two 25 basis point step downs based on achievement of certain senior secured first lien net leverage ratios. In addition, the Co-Borrowers will be required to pay a quarterly commitment fee on the unused commitments under the 2018 Revolving Credit Facility in an amount equal to 0.25% per annum.

For borrowings under both the 2018 Term Loan Facility and the 2018 Revolving Credit Facility, if the Administrative Agent determines that adequate and reasonable means do not exist for ascertaining the Adjusted LIBO Rate or the LIBO Rate and such circumstances are unlikely to be temporary or the relevant authority has made a public statement identifying a date after which the LIBO Rate shall no longer be used for determining interest rates for loans, then the Administrative Agent and the Co-Borrowers shall endeavor to establish an alternate rate of interest, which shall be effective so long as the majority in interest of the lenders for each Class (as defined in the 2018 Credit Agreement) of loans under the 2018 Credit Agreement do not notify the Administrative Agent otherwise. Until such an alternate rate of interest is determined, (a) any request for a borrowing denominated in dollars based on the Adjusted LIBO Rate will be deemed to be a request for a borrowing at the ABR Rate plus the applicable margin for an ABR Rate borrowing of such loan while any request for a borrowing denominated in any other currency will be ineffective and (b) any outstanding borrowings based on the Adjusted LIBO Rate denominated in dollars will be converted to a borrowing at the ABR Rate plus the applicable margin for an ABR Rate borrowing of such loan while any outstanding borrowings denominated in any other currency will be repaid.

All obligations under the 2018 Credit Agreement are guaranteed by GrafTech Finance and each domestic subsidiary of GrafTech, subject to certain customary exceptions, and all obligations under the 2018 Credit Agreement of each foreign subsidiary of GrafTech that is a Controlled Foreign Corporation (within the meaning of Section 956 of the Code) are guaranteed by GrafTech Luxembourg I S.à.r.l., a Luxembourg société à responsabilité limitée and an indirect wholly owned subsidiary of GrafTech ("Luxembourg Parent"), Luxembourg Holdco and Swissco (collectively, the "Guarantors").

All obligations under the 2018 Credit Agreement are secured, subject to certain exceptions and Excluded Assets (as defined in the 2018 Credit Agreement), by: (i) a pledge of all of the equity securities of GrafTech Finance and each domestic Guarantor (other than GrafTech) and of each other direct, wholly owned domestic subsidiary of GrafTech and any Guarantor, (ii) a pledge on no more than 65% of the equity interests of each subsidiary that is a Controlled Foreign Corporation (within the meaning of Section 956 of the Code), and (iii) security interests in, and mortgages on, personal property and material real property of GrafTech Finance and each domestic Guarantor, subject to permitted liens and certain exceptions specified in the 2018 Credit Agreement. The obligations of each foreign subsidiary of GrafTech that is a Controlled Foreign Corporation under the Revolving Credit Facility are secured by (i) a pledge of all of the equity securities of each Guarantor that is a Controlled Foreign Corporation and of each direct, wholly owned subsidiary of any Guarantor that is a Controlled Foreign Corporation, and (ii) security interests in certain receivables and personal property of each Guarantor that is a Controlled Foreign Corporation, subject to permitted liens and certain exceptions specified in the 2018 Credit Agreement.

The 2018 Term Loans amortize at a rate equal to 5% per annum of the original principal amount of the 2018 Term Loans payable in equal quarterly installments, with the remainder due at maturity. The Co-Borrowers are permitted to make voluntary prepayments at any time without premium or penalty, except in the case of prepayments made in connection with certain repricing transactions with respect to the 2018 Term Loans effected within twelve months of the closing date of the 2018 Credit Agreement, to which a 1.00% prepayment premium applies. GrafTech Finance is required to make prepayments under the 2018 Term Loans (without payment of a premium) with (i) net cash proceeds from non-ordinary course asset sales (subject to customary reinvestment rights and other customary exceptions and exclusions), and (ii) commencing with the Company's fiscal year ending December 31, 2019, 75% of Excess Cash Flow (as defined in the 2018 Credit Agreement), subject to step-downs to 50% and 0% of Excess Cash Flow based on achievement of a senior secured first lien net leverage ratio greater than 1.25 to 1.00 but less than or equal to 1.75 to 1.00 and less than or equal to 1.25 to 1.00, respectively. Scheduled quarterly amortization payments of the 2018 Term Loans during any calendar year reduce, on a dollar-for-dollar basis, the amount of the required Excess Cash Flow prepayment for such calendar year, and the aggregate amount of Excess Cash Flow prepayments for any calendar year reduce subsequent quarterly amortization payments of the 2018 Term Loans as directed by GrafTech Finance.

The 2018 Credit Agreement contains customary representations and warranties and customary affirmative and negative covenants applicable to GrafTech and restricted subsidiaries, including, among other things, restrictions on indebtedness, liens, investments, fundamental changes, dispositions, and dividends and other distributions. The 2018 Credit Agreement contains a financial covenant that requires GrafTech to maintain a senior secured first lien net leverage ratio not greater than 4.00:1.00 when the aggregate principal amount of borrowings under the 2018 Revolving Credit Facility and outstanding letters of credit issued under the 2018 Revolving Credit Facility (except for undrawn letters of credit in an aggregate amount equal to or less than $35 million), taken together, exceed 35% of the total amount of commitments under the 2018 Revolving Credit Facility. The 2018 Credit Agreement also contains customary events of default.

First Amendment to 2018 Credit Agreement

On June 15, 2018, the Company entered into a first amendment (the "First Amendment") to its 2018 Credit Agreement. The First Amendment amended the 2018 Credit Agreement to provide for an additional $750 million in aggregate principal amount of incremental term loans (the "Incremental Term Loans") to GrafTech Finance. The Incremental Term Loans increased the aggregate principal amount of term loans incurred by GrafTech Finance under the 2018 Credit Agreement from $1,500 million to $2,250 million. The Incremental Term Loans have the same terms as those applicable to the 2018 Term Loans, including interest rate, payment and prepayment terms, representations and warranties and covenants. The Incremental Term Loans mature on February 12, 2025, the same date as the 2018 Term Loans. GrafTech paid an upfront fee of 1.00% of the aggregate principal amount of the Incremental Term Loans on the effective date of the First Amendment.

The proceeds of the Incremental Term Loans were used to repay, in full, the $750 million of principal outstanding on previously existing debt.

On February 13, 2019, we repaid $125 million on our 2018 Term Loan Facility. On December 20, 2019, we repaid $225 million on our 2018 Term Loan Facility. Through the year 2020, we made total repayments for $820 million on our 2018 Term Loan Facility, a significant portion of such repayments was funded by the cash obtained from the 2020 Senior Notes issued on December 22, 2020. Additionally, during 2020, we executed several transactions to repurchase a total of $80 million of principal of our 2018 Term Loan facility.

2020 Senior Notes

On December 22, 2020, GrafTech Finance issued $500 million aggregate principal amount of 4.625% Senior Secured Notes due 2028 (the "2020 Senior Notes") at an issue price of 100% of the principal amount thereof in a private offering to

qualified institutional buyers in accordance with Rule 144A under the Securities Act of 1933 (the "Securities Act") and to non-U.S. persons outside the United States under Regulation S under the Securities Act.

The 2020 Senior Notes were issued pursuant to an indenture, dated as of December 22, 2020 (the "Indenture"), among GrafTech Finance, as issuer, the Company, as a guarantor, the other subsidiaries of the Company named therein as guarantors and U.S. Bank National Association, as trustee and notes collateral agent.

The 2020 Senior Notes are guaranteed on a senior secured basis by the Company and all of its existing and future direct and indirect U.S. subsidiaries that guarantee, or borrow under, the credit facilities under its 2018 Credit Agreement. The 2020 Senior Notes will also be secured on a pari passu basis by the collateral securing the term loans under the 2018 Credit Agreement. GrafTech Finance, the Company and the other guarantors granted a security interest in such collateral, consisting of substantially all of their respective assets, as security for the obligations of GrafTech Finance, the Company and the other guarantors under the 2020 Senior Notes and the Indenture pursuant to a collateral agreement, dated as of December 22, 2020 (the "Collateral Agreement"), among GrafTech Finance, the Company, the other subsidiaries of the Company named therein as grantors and U.S. Bank National Association, as collateral agent.

The 2020 Senior Notes bear interest at the rate of 4.625% per annum, which accrues from December 22, 2020 and is payable in arrears on June 15 and December 15 of each year, commencing on June 15, 2021. The 2020 Senior Notes will mature on December 15, 2028, unless earlier redeemed or repurchased, and are subject to the terms and conditions set forth in the Indenture.

GrafTech Finance may redeem some or all of the 2020 Senior Notes at the redemption prices and on the terms specified in the Indenture. If the Company or GrafTech Finance experiences specific kinds of changes in control or the Company or any of its restricted subsidiaries sells certain of its assets, then GrafTech Finance must offer to repurchase the 2020 Senior Notes on the terms set forth in the Indenture.

The Indenture contains certain covenants that, among other things, limit the Company's ability, and the ability of certain of its subsidiaries, to incur or guarantee additional indebtedness or issue preferred stock, pay distributions on, redeem or repurchase capital stock or redeem or repurchase subordinated debt, incur or suffer to exist liens securing indebtedness, make certain investments, engage in certain transactions with affiliates, consummate certain assets sales and effect a consolidation or merger, or sell, transfer, lease or otherwise dispose of all or substantially all assets. The Indenture contains events of default customary for agreements of its type (with customary grace periods, as applicable) and provides that, upon the occurrence of an event of default arising from certain events of bankruptcy or insolvency with respect to the Company or GrafTech Finance, all outstanding 2020 Senior Notes will become due and payable immediately without further action or notice. If any other type of event of default occurs and is continuing, then the trustee or the holders of at least 30% in principal amount of the then outstanding 2020 Senior Notes may declare all of the Senior Notes to be due and payable immediately.

The entirety of the proceeds from the 2020 Senior Notes were used to partially repay our 2018 Term Loan Facility.

(6) Goodwill and Other Intangible Assets

We are required to review goodwill and indefinite-lived intangible assets annually for impairment. Goodwill impairment is tested at the reporting unit level on an annual basis and between annual tests if an event occurs or circumstances change that would more likely than not reduce the fair value of a reporting unit below its carrying value. For the years ended December 31, 2020 and 2019, an assessment for potential impairment was performed and an impairment adjustment was not required. There has been no change in the carrying value of goodwill for the years 2019 and 2020.

The following table summarizes acquired intangible assets with determinable useful lives by major category which are included in Other Assets on our Consolidated Balance Sheets:

	As of December 31, 2020			As of December 31, 2019		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
	(Dollars in thousands)					
Trade name	$ 22,500	$ (11,932)	$ 10,568	$ 22,500	$ (9,861)	$ 12,639
Technology and know-how	55,300	(34,091)	21,209	55,300	(29,112)	26,188
Customer related intangible	64,500	(23,848)	40,652	64,500	(19,473)	45,027
Total finite-lived intangible assets	$ 142,300	$ (69,871)	$ 72,429	$ 142,300	$ (58,446)	$ 83,854

Amortization expense of intangible assets was $11.4 million, $12.2 million and $12.9 million in 2020, 2019 and 2018, respectively. Estimated annual amortization expense for the next five years will approximate $10.7 million in 2021, $10.1 million in 2022, $9.2 million in 2023, $8.0 million in 2024 and $7.3 million in 2025.

(7) Interest Expense

The following table presents an analysis of interest expense:

	For the Year Ended December 31		
	2020	2019	2018
	(Dollars in thousands)		
Interest incurred on debt	$ 83,555	$ 121,010	$ 100,844
Related Party Promissory Note interest expense	—	—	5,090
2012 Senior Note redemption premium	—	—	4,782
Accretion of fair value adjustment on 2012 Senior Notes	—	—	19,414
Accretion of original issue discount on 2018 Term Loans	5,340	2,196	1,455
Amortization of debt issuance costs	9,179	4,125	3,476
Total interest expense	$ 98,074	$ 127,331	$ 135,061

Interest rates

The 2020 Senior Notes issued on December 22, 2020 carry a fixed interest rate of 4.625%. The 2018 Credit Agreement had an interest rate of 4.50% as of December 31, 2020, 5.30% as of December 31, 2019 and 6.02% as of December 31, 2018. The Old Revolving Facility and Old Term Loan Facility, both of which were repaid on February 12, 2018, had an interest rate of 4.56% and 4.58%, respectively, as of the date of the repayment. The 2012 Senior Notes issued on November 20, 2012, which were also repaid on February 12, 2018, had a fixed interest rate of 6.375% (See Note 5 "Debt and Liquidity").

In December 2020, the proceeds from the issuance of the $500 million 2020 Senior Notes were used to repay $500 million of principal on the 2018 Term Loan. The repayment of the 2018 Term Loan was accounted for as a partial debt extinguishment and triggered $3.2 million of accelerated accretion of the original issue discount and $5.2 million of accelerated amortization of the debt issuance costs. The 2020 Senior Notes were accounted for as new debt and the related debt issuance costs were deferred.

As a result of our February 12, 2018 refinancing, we paid a prepayment premium for the redemption of our 2012 Senior Notes totaling $4.8 million. The accretion of the August 15, 2015 fair value adjustment to our 2012 Senior Notes issued on November 20, 2012, totaling $19.4 million in 2018, included accelerated accretion of $18.7 million resulting from the prepayment. Amortization of debt issuance costs included $0.3 million of accelerated amortization related to the refinancing.

(8) Fair Value Measurements and Derivative Instruments

Fair Value Measurements

Depending on the inputs, we classify each fair value measurement as follows:

- Level 1 – based upon quoted prices for *identical* instruments in active markets,

- Level 2 – based upon quoted prices for *similar* instruments, prices for identical or similar instruments in markets that are not active, or model-derived valuations of all of whose significant inputs are observable, and
- Level 3 – based upon one or more significant unobservable inputs.

The following section describes key inputs and assumptions used in valuation methodologies of our assets and liabilities measured at fair value on a recurring basis:

Cash and cash equivalents, short-term notes and accounts receivable, accounts payable and other current payables – The carrying amount approximates fair value because of the short maturity of these instruments.

Debt – The fair value of our debt as of December 31, 2020 and December 31, 2019 was $1,453.1 million and $1,812.8 million, respectively. The fair values were determined using Level 3 inputs.

Foreign currency derivatives – Foreign currency derivatives are carried at market value using Level 2 inputs. We had an outstanding loss of $0.1 million as of December 31, 2020 and an outstanding gain of $0.2 million as of December 31, 2019.

Commodity derivative contracts – Commodity derivative contracts are carried at fair value. We determine the fair value using observable, quoted refined oil product prices that are determined by active markets and therefore classify the commodity derivative contracts as Level 2. We had outstanding unrealized gains of $0.6 million and outstanding unrealized losses of $2.8 million as of December 31, 2020 and outstanding unrealized gains of $0.5 million and outstanding unrealized losses of $4.1 million as of December 31, 2019.

Interest rate swap contracts – Interest rate swap contracts are carried at fair value. We determine the fair value using the income approach to value the derivatives, using observable Level 2 market expectations at the measurement date and standard valuation techniques to convert future amounts to a single discounted present amount reflecting current market expectations about those future amounts. We had no outstanding unrealized gains and outstanding unrealized losses of $11.9 million as of December 31, 2020. We had outstanding unrealized gains of $2.9 million and outstanding unrealized losses of $0.1 million as of December 31, 2019.

Additional fair value information related to our Pension funds' assets can be found in Note 11 "Retirement Plans and Postretirement Benefits".

Derivative Instruments

We use derivative instruments as part of our overall foreign currency and commodity risk management strategies to manage the risk of exchange rate movements that would reduce the value of our foreign cash flows and to minimize commodity price volatility. Foreign currency exchange rate movements create a degree of risk by affecting the value of sales made and costs incurred in currencies other than the U.S. dollar.

Certain of our derivative contracts contain provisions that require us to provide collateral. Since the counterparties to these financial instruments are large commercial banks and similar financial institutions, we do not believe that we are exposed to material counterparty credit risk. We do not anticipate nonperformance by any of the counter-parties to our instruments.

Foreign currency derivatives

We enter into foreign currency derivatives from time to time to attempt to manage exposure to changes in currency exchange rates. These foreign currency instruments, which include, but are not limited to, forward exchange contracts and purchased currency options, attempt to hedge global currency exposures such as foreign currency denominated debt, sales, receivables, payables, and purchases.

We had no foreign currency cash flow hedges outstanding as of December 31, 2020 and December 31, 2019 and therefore, no unrealized gains or losses reported under accumulated other comprehensive income (loss).

As of December 31, 2020, we had outstanding Mexican peso, South African rand, euro, Swiss franc and Japanese yen currency contracts, with aggregate notional amounts of $71.0 million. As of December 31, 2019, we had outstanding Mexican peso, South African rand, euro, Swiss franc and Japanese yen currency contracts, with aggregate notional amounts of $78.8 million. The foreign currency derivatives outstanding as of December 31, 2020 had maturity dates from January 2021 to March 2021, and were not designated as hedging instruments.

Commodity derivative contracts

We have entered into commodity derivative contracts for refined oil products. These contracts are entered into to protect against the risk that eventual cash flows related to these products will be adversely affected by future changes in prices.

In the fourth quarter of 2017, we began to enter into three- to five-year take-or-pay contracts with many of our customers and began to hedge the cash flows related to these contracts. As of December 31, 2020, we had outstanding commodity derivative contracts with a notional amount of $61.3 million and maturities from January 2021 to June 2022. As of December 31, 2019, we had outstanding commodity derivative contracts with a notional amount of $99.5 million with maturities from January 2020 to June 2022. Within Accumulated Other Comprehensive income (loss), we had a net unrealized pre-tax loss of $2.2 million and a net unrealized pre-tax loss of $3.7 million as of December 31, 2020 and 2019, respectively. The fair value of these contracts was determined using Level 2 inputs.

In connection with de-designated commodity derivative contracts, we recognized in cost of sales a $0.4 million unrealized loss in 2020 and a $0.4 million unrealized gain in 2019 as a result of the variation in fair value from the de-designation date. This resulted from a small portion of our commodity derivative contracts that ceased to qualify for hedge accounting.

Interest rate swap contracts

During the third quarter of 2019, the Company entered into interest rate swap contracts. The contracts are "pay fixed, receive variable" with notional amounts of $500 million maturing in two years and another $500 million maturing in five years. The Company's risk management objective was to fix its cash flows associated with the risk in variability in the one-month US LIBO Rate for a portion of our outstanding 2018 Term Loan. It is expected that these swaps will fix the cash flows associated with the forecasted interest payments on this notional amount of debt to an effective fixed interest rate of 5.1%, which could be lowered to 4.85% depending on credit ratings. In December 2020, in connection with the $500 million principal repayment of the 2018 Term Loan, we de-designated one interest rate swap contract of $250 million notional maturing in the third quarter of 2021.

Within accumulated other comprehensive income, we recorded a net unrealized pre-tax loss of $11.9 million and a net unrealized pre-tax gain of $2.9 million as of December 31, 2020 and 2019, respectively. The fair value of these contracts was determined using Level 2 inputs.

The change in the fair value of the de-designated interest rate swap contract from the de-designation date to December 31, 2020, was recorded in interest expense and was immaterial.

Net Investment Hedges

We use certain intercompany debt to hedge a portion of our net investment in our foreign operations against currency exposure (net investment hedge). In the second quarter of 2020, we discontinued our net investment hedge following a reduction in the investment that materially decreased the currency exposure. As of December 31, 2019, intercompany debt denominated in foreign currency and designated as a non-derivative net investment hedging instrument was $5.5 million. Within our currency translation adjustment portion of other comprehensive income (loss), we recorded $1.2 million in pre-tax gains in 2020, and no gain or loss in 2019, resulting from these net investment hedges.

The fair value of all derivatives is recorded as assets or liabilities on a gross basis in our Consolidated Balance Sheets. At December 31, 2020 and 2019, the fair value of our derivatives and their respective balance sheet locations are presented in the following table:

	Asset Derivatives		Liability Derivatives	
	Location	Fair Value	Location	Fair Value
As of December 31, 2020	*(Dollars in thousands)*			
Derivatives designated as cash flow hedges:				
Commodity derivative contracts	Prepaid and other current assets	$ 518	Other accrued liabilities	$ 888
	Other long-term assets	63	Other long-term obligations	1,898
Interest rate swap contracts	Prepaid and other current assets	—	Other accrued liabilities	4,080
	Other long-term assets	—	Other long-term obligations	6,903
Total fair value		$ 581		$ 13,769
As of December 31, 2019				
Commodity derivative contracts	Prepaid and other current assets	$ 104	Other accrued liabilities	$ 1,872
	Other long-term assets	369	Other long-term obligations	2,255
Interest rate swap contracts	Prepaid and other current assets	$ 253	Other accrued liabilities	$ —
	Other long-term assets	$ 2,684	Other long-term obligations	$ 72
Total fair value		$ 3,410		$ 4,199

	Asset Derivatives		Liability Derivatives	
	Location	Fair Value	Location	Fair Value
As of December 31, 2020	*(Dollars in Thousands)*			
Derivatives not designated as hedges:				
Foreign currency derivatives	Prepaid and other current assets	$ 6	Other accrued liabilities	$ 111
Interest rate swap contracts	Prepaid and other current assets	—	Other accrued liabilities	952
Total fair value		$ 6		$ 1,063
As of December 31, 2019				
Derivatives not designated as hedges:				
Foreign currency derivatives	Prepaid and other current assets	$ 239	Other accrued liabilities	$ 81
Commodity derivative contracts	Prepaid and other current assets	376	Other accrued liabilities	—
Total fair value		$ 615		$ 81

As a result of the settlement of commodity derivative contracts, as of December 31, 2020 and December 31, 2019, net realized pre-tax loss of $7.4 million and net realized pre-tax gain of $3.5 million, respectively, were reported in accumulated other comprehensive income (loss) and will be released to earnings within the next 12 months.

The location and amount of realized (gains) losses on derivatives are recognized in the Statements of Operations when the hedged item impacts earnings and are as follows for the years ended December 31, 2020, 2019 and 2018:

		Amount of (Gain)/Loss Recognized		
	Location of Realized (Gain)/Loss Recognized in the Consolidated Statement of Operations	**2020**	**2019**	**2018**
Derivatives designated as cash flow hedges:		*(Dollars in thousands)*		
Commodity derivative contracts	Cost of sales	$ (4,134)	$ (8,892)	$ (919)
Interest rate swaps	Interest expense (income)	4,390	(1,050)	—

		Amount of (Gain)/Loss Recognized		
	Location of Realized (Gain)/Loss Recognized in the Consolidated Statement of Operations	**2020**	**2019**	**2018**
Derivatives not designated as hedges:		*(Dollars in thousands)*		
Foreign currency derivatives	Cost of sales, Other expense/ (income)	$ (2,671)	$ (506)	$ (522)
Commodity derivative contracts	Cost of sales	(530)	(223)	—

(9) Supplementary Balance Sheet Detail

The following tables present supplementary balance sheet details:

	As of December 31, 2020	As of December 31, 2019
	(Dollars in thousands)	
Inventories *:		
Raw materials and supplies	$ 101,098	$ 129,879
Work in process	110,331	131,435
Finished goods	54,535	52,334
	$ 265,964	$ 313,648
Prepaid expenses and other current assets:		
Prepaid expenses	$ 9,242	$ 9,986
Value added tax and other indirect taxes receivable	10,666	13,890
Spare parts inventory	11,825	12,738
Other current assets	3,381	4,332
	$ 35,114	$ 40,946
Property, plant and equipment:		
Land and improvements	$ 50,285	$ 46,548
Buildings	80,041	71,784
Machinery and equipment and other	621,478	567,715
Construction in progress	33,098	47,370
	$ 784,902	$ 733,417
Other accrued liabilities:		
Payrolls (including incentive programs)	$ 13,159	$ 11,801
Employee benefits	7,128	7,416
Deferred revenue	13,056	11,776
Other	23,158	17,342
	$ 56,501	$ 48,335
Other long term obligations:		
Postretirement benefits	$ 15,669	$ 16,528
Pension and related benefits	37,847	37,431
Other	27,962	18,603
	$ 81,478	$ 72,562

*During the fourth quarter of 2020, we elected to change the presentation of needle coke within our Seadrift manufacturing facility to present such inventory as a raw material. Prior to this change, such needle coke was presented, as either work in process or finished goods. We applied this change in accounting policy retrospectively for all periods presented, thereby increasing raw materials by $25.1 million, decreasing work in process by $5.8 million, and decreasing finished goods by $19.3 million as of December 31, 2019. The change had no impact on total inventories or any other financial statement disclosures. We believe that the new presentation enhances comparability and consistency of inventory disclosure as it accounts for needle coke inventory as raw material across all of our facilities and whether sourced internally from Seadrift or from third-party suppliers. We currently use all Seadrift produced needle coke internally.

The following table presents an analysis of the allowance for doubtful accounts:

	2020	2019	2018
Balance at beginning of year	$ 5,474	$ 1,129	$ 1,097
ASC 326 adoption impact	2,026	—	—
Additions	1,458	4,636	122
Deductions	(715)	(291)	(90)
Balance at end of year	$ 8,243	$ 5,474	$ 1,129

(10) Leases

We lease certain transportation and mobile manufacturing equipment such as railcars and forklifts, as well as real estate.

The Company adopted ASC 842 on January 1, 2019, which requires that all leases, financing and operating, be included on the balance sheet. The Company adopted ASC 842 using the modified retrospective approach under which prior periods' financial statements are not restated and a cumulative-effect adjustment to retained earnings at the beginning of the period of adoption is recorded, if applicable. The Company elected to adopt the transition package of practical expedients for lease identification, classification, initial direct costs and hindsight. At the adoption of ASC 842 on January 1, 2019, the Company recognized right-of-use ("RoU") assets and corresponding operating lease liabilities of $7.5 million with no cumulative-effect adjustment to retained earnings.

We determine if an arrangement is a lease at lease inception. When an arrangement contains a lease, we then determine if it meets any of the criteria for a financing lease. Leases with a term of 12 months or less are not recorded on the balance sheet.

RoU assets represent our right to use an underlying asset for the lease term and lease liabilities represent our obligation to make lease payments arising from the lease. RoU assets and lease liabilities are recognized at the lease commencement date based on the present value of the lease payments over the lease term.

In order to compute the lease liability, when the rate implicit in the lease is not readily determinable, we discount the lease payments using our estimated incremental borrowing rate for secured fixed rate debt over the same term, derived from information available at the lease commencement date. Our lease term includes the option to extend the lease when it is reasonably certain that we will exercise that option.

The Company has elected to account for the lease and non-lease components as a single lease component, except for leases of warehouse space where they will be accounted for separately. Leases may include variable lease and variable non-lease components costs which are accounted for as variable lease expense in the income statement.

Components of lease expense are as follows:

	For the Year Ended December 31,	
	2020	2019
	(Dollars in thousands)	
Operating lease cost	6,138	4,816
Short-term lease cost	159	14
Variable lease cost	429	227
Total lease cost	$ 6,726	$ 5,057

Supplemental cash-flow and other information related to leases is as follows:

	For the Year Ended December 31,	
	2020	2019
	(Dollars in thousands)	
RoU assets obtained in exchange for new operating lease liabilities (non-cash)	5,262	4,995
Operating (use of cash) from operating leases	(6,177)	(4,724)

Supplemental balance sheet information related to leases is as follows:

		As of December 31,	
		2020	2019
		(Dollars in thousands)	
	Location		
Operating RoU Assets	Other assets	$ 7,164	$ 7,994
Current operating lease liabilities	Other accrued liabilities	4,102	4,475
Non-current operating lease liabilities	Other long-term obligations	3,195	3,598
Total operating lease liabilities		$ 7,297	$ 8,073
Weighted average remaining lease term (in years)		2.7	2.3
Weighted average discount rate - operating leases		5.82 %	5.61 %

As of December 31, 2020, lease commitments under non-cancelable operating leases extending for one year or more will require the following future payments:

	(Dollars in thousands)
2021	4,124
2022	1,377
2023	1,024
2024	872
2025 and thereafter	449
Total lease payments	$ 7,846
Less: Imputed interest	(549)
Present value of lease payments	$ 7,297

As of December 31, 2020, we have not entered into any additional operating lease commitments that have yet to commence.

(11) Retirement Plans and Postretirement Benefits

Retirement Plans

On February 26, 1991, we formed our own retirement plan covering substantially all our U.S. employees. Under our plan, covered employees earned benefit payments based primarily on their service credits and wages subsequent to February 26, 1991.

Prior to that date, substantially all our U.S. employees were participants in the U.S. retirement plan of Union Carbide Corporation (“Union Carbide”). While service credit was frozen, covered employees continued to earn benefits under the Union Carbide plan based on their final average wages through February 26, 1991, adjusted for salary increases (not to exceed six percent per annum) through January 26, 1995, the date Union Carbide ceased to own a minimum 50% of the equity of GTI. The Union Carbide plan is responsible for paying retirement and death benefits earned as of February 26, 1991.

Effective January 1, 2002, we established a defined contribution plan for U.S. employees. Certain employees had the option to remain in our defined benefit plan for an additional period of up to five years. Employees not covered by this option had their benefits under our defined benefit plan frozen as of December 31, 2001, and began participating in the defined contribution plan.

Effective March 31, 2003, we curtailed our qualified benefit plan and the benefits were frozen as of that date for the U.S. employees who had the option to remain in our defined benefit plan. We also closed our non-qualified U.S. defined benefit plan for the participating salaried workforce. The employees began participating in the defined contribution plan as of April 1, 2003.

Pension coverage for employees of foreign subsidiaries is provided, to the extent deemed appropriate, through separate plans. Obligations under such plans are systematically provided for by depositing funds with trustees, under insurance policies or by book reserves.

The components of our consolidated net pension costs are set forth in the following table:

	For the Year Ended December 31,					
	2020		2019		2018	
	U.S.	Foreign	U.S.	Foreign	U.S.	Foreign
	(Dollars in thousands)					
Service cost	$ 1,322	$ 1,183	$ 1,297	$ 624	$ 1,315	$ 674
Interest cost	3,949	174	5,070	275	4,709	253
Expected return on assets	(4,730)	(401)	(5,026)	(424)	(5,679)	(330)
Mark- to- market loss	613	2,596	205	3,302	2,473	503
Pension costs	$ 1,154	$ 3,552	$ 1,546	$ 3,777	$ 2,818	$ 1,100

The mark-to-market loss in 2020 was the result of the unfavorable change in the discount rate, new employee obligations and unfavorable foreign currency translation, partially offset by better than expected return on plan assets, particularly for the U.S. plans. The mark-to-market loss in 2019 was the result of the unfavorable change in the discount rate, partially offset by better than expected return on plan assets, particularly for the U.S. plans. The mark-to-market loss in 2018 was the result of less than expected return on plan assets, partially offset by a favorable change to the discount rate.

The reconciliation of the beginning and ending balances of our pension plans' benefit obligations, fair value of assets, and funded status at December 31, 2020 and 2019 are:

	As of December 31, 2020		As of December 31, 2019	
	U.S.	Foreign	U.S.	Foreign
	(Dollars in thousands)			
Changes in Benefit Obligation:				
Net benefit obligation at beginning of period	$ 135,810	$ 28,903	$ 126,985	$ 22,332
Service cost	1,322	1,183	1,297	624
Interest cost	3,949	174	5,070	275
Participant contributions	—	470	—	417
Foreign currency exchange changes	—	2,869	—	379
Actuarial (gain) loss	9,583	2,683	12,868	3,319
Benefits paid*	(10,410)	2,434	(10,410)	1,557
Net benefit obligation at end of period	$ 140,254	$ 38,716	$ 135,810	$ 28,903
Changes in Plan Assets:				
Fair value of plan assets at beginning of period	$ 107,832	$ 18,980	$ 99,845	$ 15,354
Actual return on plan assets	13,700	488	17,689	441
Foreign currency exchange rate changes	—	1,893	—	377
Employer contributions	4,446	817	708	834
Participant contributions	—	470	—	417
Benefits paid*	(10,410)	2,434	(10,410)	1,557
Fair value of plan assets at end of period	$ 115,568	$ 25,082	$ 107,832	$ 18,980
Funded status (underfunded):	$ (24,686)	$ (13,634)	$ (27,978)	$ (9,923)
Amounts recognized in the statement of financial position:				
Non-current assets	$ —	$ 13	$ —	$ 37
Current liabilities	(423)	(50)	(427)	(43)
Non-current liabilities	(24,263)	(13,597)	(27,551)	(9,917)
Net amount recognized	$ (24,686)	$ (13,634)	$ (27,978)	$ (9,923)

- For certain international jurisdictions, the amount reported under "Benefits paid" include obligations and assets that have been transferred into our plans in connection with personnel hired during the year.

The accumulated benefit obligation for all defined benefit pension plans was $176.3 million and $162.6 million as of December 31, 2020 and 2019, respectively.

Plan Assets

The accounting guidance on fair value measurements specifies a hierarchy based on the observability of inputs used in valuation techniques (Level 1, 2 and 3). See Note 8, "Fair Value Measurements and Derivative Instruments", for a discussion of the fair value hierarchy.

The following describes the methods and significant assumptions used to estimate the fair value of the investments:

Cash and cash equivalents – Valued at cost. Cash equivalents are valued at net asset value as provided by the administrator of the fund.

Foreign government bonds – Valued by the trustees using various pricing services of financial institutions.

Equity securities – Valued at the closing price reported on the active market on which the security is traded.

Fixed insurance contract – Valued at the present value of the guaranteed payment streams.

Investment contracts – Valued at the total cost of annuity contracts purchased, adjusted for market differences from the date of purchase to year-end.

Collective trusts – Valued at the net asset value provided by the administrator of the fund (the practical expedient). The net asset value is primarily based on quoted market prices of the underlying securities for which quoted market prices of the underlying securities of the funds. Some of the underlying investments include securities for which quoted market prices are not available and are valued using data obtained by the trustee from the best available source or market value. This method may produce a fair value calculation that may not be indicative of net realizable value or reflective of future fair values. Furthermore, although we believe its valuation method is appropriate and consistent with other market participants, the use of different methodologies or assumptions to determine fair value of certain financial instruments could result in a different fair value measurement at the reporting date.

The fair value of other plan assets by category is summarized below (dollars in thousands):

	As of December 31, 2020			
	Level 1	Level 2	Level 3	Total
U.S. Plan Assets				
Cash and cash equivalents	$ 1,850	$ —	$ —	$ 1,850
International Plan Assets				
Foreign government bonds	—	995	—	995
Fixed insurance contracts	—	—	24,087	24,087
Total assets in the fair value hierarchy	$ —	$ 995	$ 24,087	$ 25,082
U.S. Plan - Investments measured at net asset value				$ 113,718
Total	$ 1,850	$ 995	$ 24,087	$ 140,650

	As of December 31, 2019			
	Level 1	Level 2	Level 3	Total
U.S. Plan Assets				
Cash and cash equivalents	$ 1,524	$ —	$ —	$ 1,524
International Plan Assets				
Foreign government bonds	$ —	$ 995	$ —	$ 995
Fixed insurance contracts	—	—	17,985	17,985
Total assets in the fair value hierarchy	$ —	$ 995	$ 17,985	$ 18,980
U.S. Plan - Investments measured at net asset value				$ 106,308
Total	$ 1,524	$ 995	$ 17,985	$ 126,812

The following table presents the changes for those financial instruments classified within Level 3 of the valuation hierarchy for international plan pension assets for the years ended December 31, 2019 and 2020 (dollars in thousands):

	Fixed Insurance Contracts
Balance at December 31, 2018	$ 14,396
Gain / contributions / currency impact	3,603
Distributions	(14)
Balance at December 31, 2019	17,985
Gain / contributions / currency impact	6,149
Distributions	(16)
Balance at December 31, 2020	$ 24,118

We annually re-evaluate assumptions and estimates used in projecting pension assets, liabilities and expenses. These assumptions and estimates may affect the carrying value of pension assets, liabilities and expenses in our Consolidated Financial Statements. Assumptions used to determine net pension costs and projected benefit obligations are:

Pension Benefit Obligations Key Assumptions	**As of December 31,**	
	2020	**2019**
Weighted average assumptions to determine benefit obligations:		
Discount rate	1.78 %	2.59 %
Rate of compensation increase	1.46 %	1.50 %

Pension Cost Key Assumptions		
Weighted average assumptions to determine net cost:		
Discount rate	2.59 %	3.71 %
Expected return on plan assets	4.14 %	4.92 %
Rate of compensation increase	1.50 %	1.74 %

We adjust our discount rate annually in relation to the rate at which the benefits could be effectively settled. Discount rates are set for each plan in reference to the yields available on AA-rated corporate bonds of appropriate currency and duration. The appropriate discount rate is derived by developing an AA-rated corporate bond yield curve in each currency. The discount rate for a given plan is the rate implied by the yield curve for the duration of that plan's liabilities. In certain countries, where little public information is available on which to base discount rate assumptions, the discount rate is based on government bond yields or other indices and approximate adjustments to allow for the differences in weighted durations for the specific plans and/or allowance for assumed credit spreads between government and AA rated corporate bonds.

The expected return on assets assumption represents our best estimate of the long-term return on plan assets and generally was estimated by computing a weighted average return of the underlying long-term expected returns on the different asset classes, based on the target asset allocations. The expected return on assets assumption is a long-term assumption that is expected to remain the same from one year to the next unless there is a significant change in the target asset allocation, the fees and expenses paid by the plan or market conditions.

The rate of compensation increase assumption is generally based on salary increases.

Plan Assets. The following table presents our retirement plan weighted average asset allocations at December 31, 2020, by asset category**:**

	Percentage of Plan Assets as of December 31, 2020	
	US	**Foreign**
Equity securities and return seeking assets	20 %	— %
Fixed income, debt securities, or cash	80 %	100 %
Total	100 %	100 %

Investment Policy and Strategy. The investment policy and strategy of the U.S. plan is to invest approximately 20% in equities and return seeking assets and approximately 80% in fixed income securities. Rebalancing is undertaken monthly. To the extent we maintain plans in other countries, target asset allocation is 100% fixed income investments. For each plan, the investment policy is set within both asset return and local statutory requirements.

Information for our pension plans with an accumulated benefit obligation in excess of plan assets at December 31, 2019 and 2020 follows:

	2020		**2019**	
	U.S.	**Foreign**	**U.S.**	**Foreign**
	(Dollars in thousands)			
Accumulated benefit obligation	$ 140,254	$ 35,316	$ 135,810	$ 26,829
Fair value of plan assets	115,568	24,118	107,832	17,985

Information for our pension plans with a projected benefit obligation in excess of plan assets at December 31, 2020 and 2019 follows:

	2020		2019	
	U.S.	Foreign	U.S.	Foreign
	(Dollars in thousands)			
Projected benefit obligation	$ 140,254	$ 37,734	$ 135,810	$ 27,944
Fair value of plan assets	115,568	24,118	107,832	17,985

Following is our projected future pension plan cash flow by year:

	U.S.	Foreign
	(Dollars in thousands)	
Expected contributions in 2021:		
Expected employer contributions	$ 2,363	$ 886
Expected employee contributions	—	—
Estimated future benefit payments reflecting expected future service for the years ending December 31:		
2021	9,254	1,102
2022	9,211	1,087
2023	9,149	1,229
2024	9,022	2,763
2025	8,976	1,330
2026-2030	42,021	13,164

Post-Employment Benefit Plans

We have legacy post-retirement medical coverage and life insurance benefits for eligible retired employees in the US and in certain foreign jurisdictions. Effective December 31, 2005, all US post-retirement medical coverage plans were frozen.

The post-employment benefit plans are un-funded and our periodic contributions correspond to the amount of benefits paid in the period. Our funding contributions were $1.3 million and $1.7 million in 2020 and 2019, respectively.

The estimated liability for post-employment benefit plans was $17.2 million and $18.1 million as of December 31, 2020 and December 31, 2019, respectively. The expense recognized in the Consolidated Statement of Operations for post-employment benefits was $0.7 million, $1.6 million and none for 2020, 2019 and 2018, respectively.

Savings Plan

Our employee savings plan provides eligible employees the opportunity for long-term savings and investment. The plan allows employees to contribute up to 5% of pay as a basic contribution and an additional 45% of pay as supplemental contribution. In 2020, 2019 and 2018, the Company's matching contributions to our savings plan were $2.2 million, $2.1 million and $1.3 million, respectively.

(12) Contingencies

Legal Proceedings

We are involved in various investigations, lawsuits, claims, demands, environmental compliance programs and other legal proceedings arising out of or incidental to the conduct of our business. While it is not possible to determine the ultimate disposition of each of these matters, we do not believe that their ultimate disposition will have a material adverse effect on our financial position, results of operations or cash flows.

Pending litigation in Brazil has been brought by employees seeking to recover additional amounts and interest thereon under certain wage increase provisions applicable in 1989 and 1990 under collective bargaining agreements to which employers in the Bahia region of Brazil were a party (including our subsidiary in Brazil). Companies in Brazil have settled claims arising out of these provisions and, in May 2015, the litigation was remanded by the Brazilian Supreme Court in favor of the employees union. After denying an interim appeal by the Bahia region employers on June 26, 2019, the Brazilian Supreme Court finally ruled in favor of the employees union on September 26, 2019. The employers union has determined not to seek annulment of such decision. Separately, on October 1, 2015, a related action was filed by current and former employees against our subsidiary in Brazil to recover amounts under such provisions, plus interest thereon, which amounts together with interest could be material to us. If the Brazilian Supreme Court proceeding above had been determined in favor of the employers union, it would also have resolved this proceeding in our favor. In the first quarter of 2017, the state court initially ruled in favor of the employees. We appealed this state court ruling, and the appellate court issued a decision in our favor on May 19, 2020. The employees have further appealed, and on December 16, 2020, the court upheld the decision in favor of GrafTech Brazil. On February 22, 2021, the employees filed a further appeal, and we intend to vigorously defend our position. As of December 31, 2020, we are unable to assess the potential loss associated with these proceedings as the claims do not currently specify the number of employees seeking damages or the amount of damages being sought.

Product Warranties

We generally sell products with a limited warranty. We accrue for known warranty claims if a loss is probable and can be reasonably estimated. We also accrue for estimated warranty claims incurred based on a historical claims charge analysis. Claims accrued but not yet paid and the related activity within the reserve for 2019 and 2020 are as follows:

	(Dollars in Thousands)
Balance as of December 31, 2018	$ 1,528
Product warranty charges/adjustments	1,033
Payments and settlements	(726)
Balance as of December 31, 2019	$ 1,835
Product warranty charges/adjustments	1,220
Payments and settlements	(1,058)
Balance as of December 31, 2020	$ 1,997

Related Party Tax Receivable Agreement

On April 23, 2018, the Company entered into the TRA that provides Brookfield, as the sole pre-IPO stockholder, the right to receive future payments from us for 85% of the amount of cash savings, if any, in U.S. federal income tax and Swiss tax that we and our subsidiaries realize as a result of the utilization of the pre-IPO Tax Assets. In addition, we will pay interest on the payments we will make to Brookfield with respect to the amount of these cash savings from the due date (without extensions) of our tax return where we realize these savings to the payment date at a rate equal to LIBOR plus 1.00% per annum. The term of the TRA commenced on April 23, 2018 and will continue until there is no potential for any future tax benefit payments.

There was no liability recognized on the date we entered into the TRA as there was a full valuation allowance recorded against our deferred tax assets. During the second quarter of 2018, it was determined that the conditions were appropriate for the Company to release a valuation allowance of certain tax assets as we exited our three year cumulative loss position. This release resulted in the recording of a $86.5 million liability related to the TRA on the Consolidated Statements of Operations as "Related Party Tax Receivable Agreement Expense."

As of December 31, 2019, the total TRA liability was $89.9 million, of which $27.9 million was classified as a current liability in "Related party payable-tax receivable agreement" on the balance sheet, and $62.0 million of the liability remained as a long-term liability in "Related party payable-tax receivable agreement" on the balance sheet. The 2019 current liability was settled in the first quarter of 2020.

In 2020, the TRA liability was reduced by $21.1 million as a result of revised U.S. income estimates affecting the future usage of our U.S. tax attributes. The reduction was recorded as a "Related Party Tax Receivable Agreement Benefit" on the Consolidated Statement of Operations. As of December 31, 2020, total TRA liability is $40.9 million, of which $21.8

million is classified as current liability "Related party payable - tax receivable agreement" on the balance sheet, as we expect this portion to be settled within twelve months, and $19.1 million of the liability remains as a long-term liability in "Related party payable - tax receivable agreement" on the balance sheet.

Long-term Incentive Plan

The long-term incentive plan ("LTIP") was adopted by the Company effective as of August 17, 2015, as amended and restated as of March 15, 2018. The purpose of the plan is to retain senior management personnel of the Company, to incentivize them to make decisions with a long-term view and to influence behavior in a way that is consistent with maximizing value for the pre-IPO stockholder of the Company in a prudent manner. Each participant is allocated a number of profit units, with a maximum of 30,000 profit units ("Profit Units") available under the plan. Awards of Profit Units generally vest in equal increments over a five-year period beginning on the first anniversary of the grant date and subject to continued employment with the Company through each vesting date. Any unvested Profit Units that have not been previously forfeited will accelerate and become fully vested upon a ‘‘Change in Control’’ (as defined below).

Profit Units will generally be settled in a lump sum payment within 30 days following a Change in Control based on the ‘‘Sales Proceeds’’ (as defined below) received by Brookfield Capital Partners IV, L.P. (or, together with its affiliates, Brookfield Capital IV) in connection with the Change in Control. The LTIP defines ‘‘Change in Control’’ as any transaction or series of transactions (including, without limitation, the consummation of a combination, share purchases, recapitalization, redemption, issuance of capital stock, consolidation, reorganization or otherwise) pursuant to which (a) a person not affiliated with Brookfield Capital IV acquires securities representing more than seventy percent (70%) of the combined voting power of the outstanding voting securities of the Company or the entity surviving or resulting from such transaction, (b) following a public offering of the Company’s stock, Brookfield Capital IV has ceased to have a beneficial ownership interest in at least 30% of the Company’s outstanding voting securities (effective on the first of such date), or (c) the Company sells all or substantially all of the assets of the Company and its subsidiaries on a consolidated basis. It is intended that the occurrence of a Change in Control in which Sales Proceeds exceed the Threshold Value would constitute a ‘‘substantial risk of forfeiture’’ within the meaning of Section 409A of the Code. The LTIP defines ‘‘Threshold Value’’ as, as of any date of determination, an amount equal to $855,000,000 (which represents the amount of the total invested capital of Brookfield Capital IV as of August 17, 2015), plus the dollar value of any cash or other consideration contributed to or invested in the Company by Brookfield Capital IV after August 17, 2015. The Threshold Value shall be determined by the Board of Directors in its sole discretion. The LTIP defines ‘‘Sales Proceeds’’ as, as of any date of determination, the sum of all proceeds actually received by the Brookfield Capital IV, net of all Sales Costs (as defined below), (i) as consideration (whether cash or equity) upon the Change in Control and (ii) as distributions, dividends, repurchases, redemptions or otherwise as a holder of such equity interests in the Company. Proceeds that are not paid upon or prior to or in connection with the Change in Control, including earn-outs, escrows and other contingent or deferred consideration shall become ‘‘Sale Proceeds’’ only as and when such proceeds are received by Brookfield Capital IV. ‘‘Sales Costs’’ means any costs or expenses (including legal or other advisor costs), fees (including investment banking fees), commissions or discounts payable directly by Brookfield Capital IV in connection with, arising out of or relating to a Change in Control, as determined by the Board of Directors in its sole discretion.

Given the successful completion of the IPO in the second quarter of 2018, it is reasonably possible that a Change in Control, as defined above, may ultimately happen and that the awarded Profit Units will be subsequently paid out to the participants. Depending on Brookfield’s sales proceeds, the potential liability triggered by a Change in Control is estimated to be in the range of $55 million to $70 million. As of December 31, 2020, the awards are 100% vested.

(13) Income Taxes

The following table summarizes the U.S. and non-U.S. components of income (loss) from continuing operations before Provision (benefit) for income taxes:

	For the Year Ended December 31,		
	2020	2019	2018
	(Dollars in thousands)		
U.S.	$ 51,672	$ 85,365	$ (68,032)
Non-U.S.	458,373	757,462	970,840
	$ 510,045	$ 842,827	$ 902,808

Income tax expense (benefit) consists of the following:

	For the Year Ended December 31,		
	2020	2019	2018
U.S. income taxes:			
Current	$ (7,660)	$ 16,589	$ 787
Deferred	27,822	5,690	(52,145)
	20,162	22,279	(51,358)
Non-U.S. income taxes:			
Current	63,092	64,134	85,252
Deferred	(7,583)	11,812	15,026
	55,509	75,946	100,278
Total income tax expense (benefit)	$ 75,671	$ 98,225	$ 48,920

Income tax expense in 2020 was $75.7 million on income before taxes of $510.0 million. In 2019, income tax expense was $98.2 million on income before taxes of $842.8 million, and in 2018, income tax expense was $48.9 million on income before taxes of $902.8 million. The change in tax expense from year to year is primarily due to changes in earnings and the shift in the jurisdictional mix of earnings and losses from year to year. The years 2018 and 2019 also included partial release of a valuation allowance recorded against the deferred tax asset related to certain foreign, US federal and state tax attributes.

Income tax expense (benefit) differed from the amount computed by applying the U.S. federal income tax rate of 21% for years ended December 31, 2020, 2019 and 2018 to income before (benefit) expense for taxes as set forth in the following table:

	For the Year Ended December 31,		
	2020	2019	2018
	(Dollars in thousands)		
Tax at statutory U.S. federal rate	$ 107,109	$ 176,994	$ 189,590
Impact of U.S. Tax Act - GILTI	45,539	65,531	93,739
Impact of Tax Receivable Agreement	(4,429)	713	18,160
Valuation allowance	(980)	(14,548)	(93,125)
State taxes, net of federal tax benefit	3,591	4,231	1,529
U.S. tax impact of foreign earnings (net of foreign tax credits)	2,113	2,181	792
Establishment/resolution of uncertain tax positions	(78)	(1,293)	(345)
Adjustment for foreign income taxed at different rates	(38,464)	(76,922)	(95,822)
Foreign tax credits	(37,280)	(56,171)	(65,046)
Other	(1,450)	(2,491)	(552)
Provision (benefit) for income taxes	$ 75,671	$ 98,225	$ 48,920

The tax effects of temporary differences that give rise to significant components of the deferred tax assets and deferred tax liabilities at December 31, 2020 and December 31, 2019 are set forth in the following table:

	As of December 31,	
	2020	2019
	(Dollars in thousands)	
Deferred tax assets:		
Postretirement and other employee benefits	$ 18,202	$ 18,256
Foreign tax credit and other carryforwards	37,101	55,103
Capitalized research and experimental costs	3,897	5,566
Environmental reserves	1,111	1,110
Inventory adjustments	7,381	14,863
Long-term contract option amortization	1,031	1,080
Provision for rationalization charges	96	232
Mark- to- market Hedges	3,552	768
Other	3,646	1,104
Total gross deferred tax assets	76,017	98,082
Less: valuation allowance	(12,773)	(13,736)
Total deferred tax assets	63,244	84,346
Deferred tax liabilities:		
Fixed assets	$ 54,485	$ 56,659
Inventory	8,573	12,778
Goodwill and acquired intangibles	7,552	6,996
Other	3,254	2,468
Total deferred tax liabilities	73,864	78,901
Net deferred tax (liability) asset	$ (10,620)	$ 5,445

Net non-current deferred tax assets are separately stated as deferred income taxes in the amount of $84.3 million as of December 31, 2019 and $63.2 million as of December 31, 2020. Net non-current deferred tax liabilities are separately stated as deferred income taxes in the amount of $78.9 million at December 31, 2019 and $73.9 million at December 31, 2020.

At each reporting period, we assess the need for valuation allowances against deferred tax assets based on determinations of whether it is more likely than not that deferred tax benefits will be realized through the generation of future taxable income. Appropriate consideration is given to all available evidence, both positive and negative, in assessing the need for a valuation allowance. Examples of positive evidence would include a strong earnings history, an event or events that would increase our taxable income through a continued reduction of expenses, and tax planning strategies that would indicate an ability to realize deferred tax assets. Examples of negative evidence would include cumulative losses in recent years and history of tax attributes expiring unused. In circumstances where the significant positive evidence does not outweigh the negative evidence in our assessment, we have established and maintained valuation allowances on those net deferred tax assets. However, the recognition of the valuation allowance does not result in or limit the Company's ability to utilize these tax assets in the future.

Valuation allowance activity for the years ended December 31, 2018, 2019 and 2020 is as follows:

		(Dollars in thousands)
Balance as of December 31, 2018	$	58,446
Credited to income		(14,548)
Changes attributable to write-off of underlying assets		(30,138)
Translation adjustment		(24)
Balance as of December 31, 2019	$	13,736
Credited to income		(980)
Translation adjustment		17
Balance as of December 31, 2020	$	12,773

During 2018, we determined that sufficient positive evidence existed that allowed us to conclude that a full valuation allowance was no longer required to be recorded against the deferred tax assets related to the U.S. tax attributes. This positive evidence was primarily supplied by the company exiting a cumulative loss period in the U.S. as well as sufficient U.S. current and forecasted taxable income that would utilize the U.S. tax attributes. As a result, a partial release (to reflect only the economic benefit of the attributes) of the valuation allowance against federal net operating losses and state losses was recorded in 2018 while a full release of the valuation allowance against the federal foreign tax credit carryforward, other federal deferred tax assets was also recorded. A valuation allowance of $35.8 million is included in the December 31, 2018 balance reflected above as there was not sufficient positive evidence that the deferred tax asset related to the U.S. federal net operating loss would generate more than its estimated economic benefit. This valuation allowance and the related deferred tax asset were subsequently released to the income statement in 2019. In 2020, the reduction in the valuation allowance resulted primarily from expirations of NOLs upon which a valuation allowance was previously recorded.

As of December 31, 2020, we have a total foreign tax credit carryforward of $17.9 million. As indicated above, a valuation allowance is no longer recorded against this foreign tax credit carryforward. These tax credit carryforwards begin to expire in 2025. In addition, we have state net operating losses carryforwards of $255.7 million (net of federal benefit), which can be carried forward from 5 to 20 years. These state net operating losses carryforwards result in a deferred tax asset of $15.0 million as of December 31, 2020. We also have U.S. state tax credits of $0.1 million as of December 31, 2020. Our foreign loss carryforwards on a gross basis are $9.1 million and may be carried forward indefinitely.

As of December 31, 2020, we had unrecognized tax benefits of $0.1 million, which, if recognized, would have a favorable impact on our effective tax rate. We have elected to report interest and penalties related to uncertain tax positions as income tax expense. Accrued interest and penalties were $0.9 million as of December 31, 2018 and no accrued interest and penalties as of December 31, 2019 (a decrease of $0.9 million). A reconciliation of the beginning and ending amount of unrecognized tax benefits is as follows:

		(Dollars in thousands)
Balance as of December 31, 2018	$	1,990
Settlements		(1,383)
Reductions for tax positions of prior years		(421)
Foreign currency impact		(2)
Balance as of December 31, 2019	$	184
Lapse of statutes of limitations		(75)
Foreign currency impact		16
Balance as of December 31, 2020	$	125

It is reasonably possible that a reduction of unrecognized tax benefits of up to $0.1 million may occur within 12 months due to settlements and the expiration of statutes of limitation.

We file income tax returns in the U.S. federal jurisdiction, and various state and foreign jurisdictions. All U.S. federal tax years prior to 2016 are generally closed by statute or have been audited and settled with the applicable domestic tax authorities. Other jurisdictions are still open to examination beginning after 2014.

As of December 31, 2020, the Company has accumulated undistributed earnings generated by our foreign subsidiaries of approximately $1.2 billion. Because $1.0 billion of such earnings have previously been subject to taxation by way of the transition tax on foreign earnings required by the Tax Act, as well as the current and previous years' GILTI inclusion, any additional taxes due with respect to such earnings or the excess of the amount for financial reporting over the tax basis of our foreign investments would generally be limited to foreign withholding and state taxes. We intend, however, to indefinitely reinvest these earnings and expect future U.S. cash generation to be sufficient to meet future U.S. cash needs.

(14) Stockholders' Equity

The following information should be read in conjunction with the Consolidated Statement of Stockholders' Equity.

Stock Split

On April 12, 2018, the Company effected a 3,022,259.23 to one stock split of the Company's then outstanding common stock. We have retroactively applied this split to all share presentations, as well as "Net income per share" and "Income from continuing operations per share" calculations for the periods presented.

Conditional Dividend to Pre-IPO Stockholder

On April 19, 2018, we declared a $160 million cash dividend payable to Brookfield, the sole pre-IPO stockholder. Payment of this dividend was conditional upon (i) the Senior Secured First Lien Net Leverage Ratio (as defined in the 2018 Credit Agreement), as calculated based on our final financial results for the first quarter of 2018, being equal to or less than 1.75 to 1.00, (ii) no Default or Event of Default (as defined in the 2018 Credit Agreement) having occurred and continuing or that would result from the payment of the dividend and (iii) the payment occurring within 60 days from the dividend record date. The conditions of this dividend were met upon filing of our first quarter report on Form 10-Q and the dividend was paid on May 8, 2018.

Brookfield Promissory Note

On April 19, 2018, we declared a dividend in the form of the Brookfield Promissory Note to the sole pre-IPO stockholder. This note was repaid on June 15, 2018 with proceeds from our Incremental Term Loans. See Note 5 "Debt and Liquidity".

Initial Public Offering

On April 23, 2018, we completed the IPO of 35,000,000 shares of our common stock at a price of $15 per share. This offering represented a sale of 11.6% of our sole pre-IPO stockholder's ownership in the Company.

On April 26, 2018, we closed the sale of an additional 3,097,525 shares of common stock at a price to the public of $15 per share from the pre-IPO stockholder, as a result of the partial exercise by the underwriters in our IPO of their overallotment option. After giving effect to the partial exercise of the overallotment option, the total number of shares of common stock sold by the pre-IPO stockholder was 38,097,525.

The Company did not receive any proceeds related to the offering. We incurred $5.1 million of legal, accounting, printing and other fees associated with this offering through December 31, 2019, which was recorded in "Selling and administrative" expenses in the Consolidated Statements of Operations.

Follow-on Offerings and Common Stock Repurchases

On August 13, 2018, Brookfield completed an underwritten public secondary offering (the "Offering") of 23,000,000 shares of our common stock at a price to the public of $20.00 per share. The Company did not receive any proceeds related to the Offering. Pursuant to a share repurchase agreement with Brookfield, we concurrently repurchased 11,688,311 shares directly from Brookfield. The price per share paid by us in the repurchase was equal to the price at which the underwriters purchased the shares from Brookfield in the Offering net of underwriting commissions and discounts. We funded the share repurchase from cash on hand. The terms and conditions of the share repurchase were reviewed and approved by the audit committee of our board of directors, which is comprised solely of independent directors. All repurchased shares were retired.

On July 30, 2019, our Board of Directors authorized a program to repurchase up to $100 million of our outstanding common stock. We may purchase shares from time to time on the open market, including under Rule 10b5-1 and/or Rule 10b-18 plans. The amount and timing of repurchases are subject to a variety of factors including liquidity, stock price,

applicable legal requirements, other business objectives and market conditions. As of December 31, 2020, we had repurchased 4,333,259 shares of common stock totaling $41.0 million under this program.

On December 5, 2019, GrafTech announced two separate transactions. The first was a Rule 144 secondary block trade in which Brookfield sold 11,175,927 shares of GrafTech common stock at a price of $13.125 per share to a broker-dealer who placed the shares with institutional and other investors. Separately, GrafTech entered into a share repurchase agreement with Brookfield to repurchase $250 million of stock from Brookfield at the arm's length price of $13.125 per share, set by the competitive bidding process of the secondary block trade. As a result, GrafTech repurchased 19,047,619 shares of common stock, reducing total shares outstanding at the time by approximately 7%.

Brookfield undertook several transactions during 2020 reducing their ownership to 55.3% as of December 31, 2020.

Dividends

The Board of Directors declared and paid a dividend of $0.0645 per share for the first quarter of 2018 totaling $19.5 million, which was paid on June 29, 2018 and represented a prorated quarterly dividend of $0.085 (or $0.34 per annum) per share of our common stock prorated from the date of our IPO, April 23, 2018 to June 30, 2018. Additionally, we paid a special dividend to stockholders of $0.70 per share on December 31, 2018. Since that time, the Company paid regular quarterly dividends of $0.085 through the first quarter of 2020. Effective the second quarter of 2020, the regular quarterly dividend was reduced to $0.01 per share.

Accumulated other comprehensive income (loss)

The balance in our Accumulated other comprehensive (loss) income is set forth in the following table:

	As of December 31, 2020	As of December 31, 2019
	(Dollars in thousands)	
Foreign currency translation adjustments, net of tax	$ (2,725)	$ (9,293)
Commodities, foreign currency and interest rate derivatives, net of tax	(16,916)	1,932
Total accumulated comprehensive (loss) income	$ (19,641)	$ (7,361)

(15) Earnings per Share

The following table shows the information used in the calculation of our basic and diluted earnings per share calculation as of December 31, 2020, 2019 and 2018. See Note 14 "Stockholders' Equity" for details on our April 12, 2018 stock split and our common stock repurchases in 2020 and 2019.

	For the Year Ended December 31,		
	2020	2019	2018
Weighted average common shares outstanding for basic calculation	267,916,483	289,057,356	297,748,327
Add: Effect of equity awards	14,161	17,245	5,443
Weighted average common shares outstanding for diluted calculation	267,930,644	289,074,601	297,753,770

Basic earnings per common share are calculated by dividing net income (loss) by the weighted average number of common shares outstanding, which includes 73,320, 32,981 and 5,592 shares of participating securities in 2020, 2019 and 2018, respectively. Diluted earnings per share are calculated by dividing net income (loss) by the sum of the weighted average number of common shares outstanding plus the additional common shares that would have been outstanding if potentially dilutive securities had been issued.

The weighted average common shares outstanding for the diluted earnings per share calculation excludes consideration of 1,667,325, 1,082,113 and 650,432 equivalent shares in 2020, 2019 and 2018, respectively, as these shares are anti-dilutive.

(16) Summary of quarterly financial data (Unaudited)

The following summarizes certain consolidated operating results by quarter for 2020 and 2019.

	2020				2019			
	March 31	June 30	September 30	December 31	March 31	June 30	September 30	December 31
	(Dollars in thousands, except per share amounts)							
As Reported:								
Net Sales	$ 318,646	$ 280,718	$ 286,987	$ 338,010	$ 474,994	$ 480,390	$ 420,797	$ 414,612
Gross profit	179,729	150,118	155,125	175,525	279,470	283,343	242,300	235,290
Research and development	712	710	650	1,903	637	713	611	723
Selling and administrative expenses	14,932	16,001	19,062	17,918	15,226	15,394	15,708	17,346
Other expense (income), net	(3,314)	311	694	5,639	467	863	(688)	4,561
Related party Tax Receivable Agreement (benefit) expense	(3,346)	—	—	(17,744)	—	—	—	3,393
Interest Expense	25,672	20,880	22,474	29,048	33,700	32,969	31,803	28,859
Interest Income	(1,141)	(348)	(93)	(168)	(414)	(731)	(1,765)	(1,799)
Net income	122,268	92,776	94,234	125,096	197,436	196,368	175,876	174,922
Net income per share	$ 0.45	$ 0.35	$ 0.35	$ 0.47	$ 0.68	$ 0.68	$ 0.61	$ 0.61

(17) Subsequent Events

Dividend declaration

On February 3, 2021, the Board of Directors declared a dividend of $0.01 per share of common stock to stockholders of record as of the close of business on February 26, 2021, to be paid on March 31, 2021.

Brookfield Offering and Ownership

On January 20, 2021, Brookfield completed the sale of 20,000,000 shares of our common stock, in an underwritten public offering at a price of $10.90 per share. Brookfield's ownership percentage stood at approximately 47.8% of our outstanding common stock following the transaction.

Term Loan Repricing

On February 17, 2021 (the "Effective Date"), the Company entered into a second amendment (the "Second Amendment") to its 2018 Credit Agreement to, among other things, (a) decrease the Applicable Rate (as defined in the Credit Agreement) with respect to any Initial Term Loan (as defined in the Credit Agreement) by 0.50% for each pricing level, (b) decrease the interest rate floor for all Initial Term Loans to 0.50%, (c) add certain technical provisions with respect to the impact of European Union bail-in banking legislation on liabilities of certain non-U.S. financial institutions, and (d) add certain technical provisions in connection with future replacement of the LIBO Rate (as defined in the Credit Agreement). As a result of the Second Amendment and the combined effect of the reduction in the interest rate margin and the reduction in the interest rate floor, the interest rate on the Initial Term Loan has been reduced by 1.0% per year.

In connection with the Second Amendment, on February 12, 2021, GrafTech Finance repaid approximately $150 million aggregate principal amount of its Initial Term Loans with cash on hand.

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

None.

Item 9A. Controls and Procedures

Disclosure Controls and Procedures

Management is responsible for establishing and maintaining adequate disclosure controls and procedures at the reasonable assurance level. Disclosure controls and procedures are designed to ensure that information required to be disclosed by a reporting company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by it in the reports that it files under the Exchange Act is accumulated and communicated to management, including the Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we have evaluated the effectiveness of the design and operation of our disclosure controls and procedures as of December 31, 2020. Based on that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that these controls and procedures are effective at the reasonable assurance level as of December 31, 2020.

Management's Report on Internal Control over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act as a process, designed by, or under the supervision of, the chief executive officer and chief financial officer and effected by the board of directors, management and other personnel of a company, 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, and includes those policies and procedures that:

- pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect transactions and dispositions of assets of the company;
- 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 the board of directors; and
- provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of assets of the company that could have a material effect on its financial statements.

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

Management has conducted an assessment of the effectiveness of our internal control over financial reporting as of December 31, 2020 using the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) in *Internal Control-Integrated Framework (2013)*. Based on that assessment, management concluded that our internal control over financial reporting was effective as of December 31, 2020. The effectiveness of the Company's internal control over financial reporting as of December 31, 2020 has been audited by Deloitte & Touche LLP, our independent registered public accounting firm, as stated in their report, which is presented elsewhere in this Annual Report on Form 10-K.

Changes in Internal Control over Financial Reporting

There has been no change in the Company's internal control over financial reporting during the Company's most recent fiscal quarter that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting.

Item 9B. Other Information

None.

PART III

Items 10 to 14 (inclusive).

Except as set forth in Part I, the information required by Items 10, 11, 12, 13 and 14 will appear in the definitive GrafTech International Ltd. Proxy Statement for the Annual Meeting of Stockholders to be held on or about May 13, 2021, which will be filed pursuant to Regulation 14A under the Securities Exchange Act of 1934 and is incorporated by reference in this Annual Report pursuant to General Instruction G(3) of Form 10-K (other than the portions thereof not deemed to be "filed" for the purpose of Section 18 of the Securities Exchange Act of 1934).

PART IV

Item 15. Exhibits and Financial Statement Schedules

The following documents are filed as part of this report.

(a) (1) Financial Statements
The financial statements are set forth under Item 8 of this Annual Report on Form 10-K.
(2) Financial Statement Schedules
None.
(3) Exhibits

The exhibits listed in the following table have been filed with, or incorporated by reference into, this Annual Report.

Exhibit Number	Description of Exhibit
2.1	Agreement and Plan of Merger dated as of May 17, 2015 among GrafTech International Ltd., BCP IV GrafTech Holdings LP and Athena Acquisition Subsidiary, Inc. (incorporated by reference to Exhibit 2.1 to GrafTech International Ltd.'s Current Report on Form 8-K filed May 18, 2015).
3.1	Amended and Restated Certificate of Incorporation of GrafTech International Ltd. (incorporated by reference to Exhibit 3.1 to GrafTech International Ltd.'s Quarterly Report on Form 10-Q filed May 1, 2019).
3.2	Amended and Restated By-Laws of GrafTech International Ltd. (incorporated by reference to Exhibit 3.2 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-223791) filed April 13, 2018).
4.1	Registration Rights Agreement by and between GrafTech International Ltd. and BCP GrafTech Holdings LP (incorporated by reference to Exhibit 4.1 to GrafTech International Ltd.'s Form 10-Q filed on August 3, 2018).
4.2	Stockholder Rights Agreement by and between GrafTech International Ltd. and BCP IV GrafTech Holdings LP (incorporated by reference to Exhibit 4.2 to GrafTech International Ltd.'s Form 10-Q filed on August 3, 2018).
4.3	Amendment No. 1 to Stockholder Rights Agreement, dated November 6, 2019 by and between GrafTech International Ltd. and BCP IV GrafTech Holdings LP (incorporated by reference to Exhibit 4.3 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 21, 2020).
4.4	Description of securities (Description of securities (incorporated by reference to Exhibit 4.4 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 21, 2020).
4.5	Indenture, dated as of December 22, 2020, among GrafTech Finance Inc., as issuer, GrafTech International Ltd., as a Indenture, dated as of December 22, 2020, among GrafTech Finance Inc., as issuer, GrafTech International Ltd., as a guarantor, the subsidiary guarantors party thereto, and U.S. Bank National Association, as trustee and collateral agent, relating to GrafTech Finance Inc.'s 4.625% Senior Secured Notes due 2028 (incorporated by reference to Exhibit 4.1 to GrafTech International Ltd.'s Current Report on Form 8-K filed December 23, 2020).
4.6	Form of 4.625% Senior Secured Notes due 2028 of GrafTech Finance Inc. (included in Exhibit 4.5) (incorporated by reference to Exhibit 4.2 to GrafTech International Ltd.'s Current Report on Form 8-K filed December 23, 2020).
10.1	Credit Agreement, dated February 12, 2018, among GrafTech International Ltd., GrafTech Finance Inc., GrafTech Switzerland SA and GrafTech Luxembourg II S.A.R.L., as co-borrowers, the lenders and issuing banks party thereto and JPMorgan Chase Bank, N.A., as Administrative Agent and Collateral Agent (incorporated by reference to Exhibit 10.1 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).

10.2	First Amendment to the Credit Agreement, dated June 15, 2018, among GrafTech International Ltd., GrafTech Finance Inc., GrafTech Switzerland SA, GrafTech Luxembourg II S.À.R.L. as co-borrowers, the lenders and issuing banks party thereto and JPMorgan Chase Bank, N.A., as Administrative Agent and Collateral Agent (incorporated by reference to Exhibit 10.1 to GrafTech International Ltd.'s Quarterly Report on Form 10-Q filed on August 3, 2018).
10.3	Guarantee Agreement, dated February 12, 2018, among GrafTech International Ltd., GrafTech Finance Inc., the other subsidiaries of GrafTech International Ltd. from time to time party thereto and JPMorgan Chase Bank, N.A., as Administrative Agent (incorporated by reference to Exhibit 10.2 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.4	Collateral Agreement, dated as of February 12, 2018, among GrafTech International Ltd., GrafTech Finance Inc., the other grantors party thereto and JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.3 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.5	European Guarantee and Luxembourg Security Agreement, dated as of February 12, 2018, by GrafTech Luxembourg I S.À.R.L., GrafTech Luxembourg II S.À.R.L., GrafTech Switzerland SA and JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.4 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.6	Pledge Agreement, dated as of February 12, 2018, by GrafTech Switzerland SA in favor of JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.5 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.7	Pledge Agreement, dated as of February 12, 2018, by GrafTech Luxembourg I S. À.R.L in favor of JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.6 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.8	Pledge Agreement, dated as of February 12, 2018, by GrafTech Luxembourg II S.À.R.L in favor of JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.7 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.9	Patent Security Agreement, dated as of February 12, 2018, among GrafTech International Holdings Inc., as Grantor, and JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.8 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.10	Trademark Security Agreement, dated as of February 12, 2018, among GrafTech International Holdings Inc., as Grantor, and JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.9 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.11	Copyright Security Agreement, dated as of February 12, 2018, among GrafTech International Holdings, Inc., as Grantor, and JPMorgan Chase Bank, N.A., as Collateral Agent (incorporated by reference to Exhibit 10.10 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.12	Share Pledge Agreement, dated February 12, 2018, between GrafTech Luxembourg I S.À.R.L., as Pledgor, and JPMorgan Chase Bank, N.A., as Collateral Agent, in the presence of GrafTech Luxembourg II S.À.R.L. (incorporated by reference to Exhibit 10.11 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.13	Share Pledge Agreement, dated as of February 12, 2018, between GrafTech International Holdings Inc., as Pledgor, and JPMorgan Chase Bank, N.A., as Collateral Agent, in the presence of GrafTech Luxembourg I S.À.R.L. (incorporated by reference to Exhibit 10.12 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.14	Swiss Security Agreement, dated as of February 12, 2018, by GrafTech Switzerland SA and JPMorgan Chase Bank, N.A., as the Assignee and Collateral Agent (incorporated by reference to Exhibit 10.13 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.15	Form of Tax Receivable Agreement between GrafTech International Ltd. and Brookfield Capital Partners IV GP, Ltd. (incorporated by reference to Exhibit 10.14 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.16+	Form of Indemnification Agreement with Directors and Executive Officers (incorporated by reference to Exhibit 10.15 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-223791) filed March 26, 2018).
10.17+	GrafTech International Holdings Inc. Compensation Deferral Program as amended and restated (January 1, 2005) (incorporated by reference to Exhibit 10.10 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 27, 2009).
10.21+	Employment Agreement, effective March 1, 2018, between GrafTech International Holdings Inc. and David J. Rintoul (incorporated by reference to Exhibit 10.20 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).

10.22+	GrafTech International Ltd. Incentive Compensation Plan (incorporated by reference to Exhibit 10.21 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.24+	GrafTech International Ltd. Long Term Incentive Plan, amended and restated as of March 15, 2018 (incorporated by reference to Exhibit 10.23 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-223791) filed March 20, 2018).
10.25+	GrafTech International Ltd. Omnibus Equity Incentive Plan (incorporated by reference to Exhibit 10.24 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-223791) filed April 4, 2018).
10.26+	Form of Stock Option Agreement for the GrafTech International Ltd. Omnibus Equity Incentive Plan (incorporated by reference to Exhibit 10.25 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-223791) filed April 4, 2018).
10.27+	Form of Stock Option Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan for David Rintoul (incorporated by reference to Exhibit 10.26 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-223791) filed April 4, 2018).
10.28+	Form of Deferred Share Unit Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan for Non-Employee Directors (incorporated by reference to Exhibit 10.27 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-223791) filed April 4, 2018).
10.29+	Form of Deferred Share Unit Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan for David Rintoul (incorporated by reference to Exhibit 10.28 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-223791) filed April 4, 2018).
10.30+	GrafTech International Ltd. Director Deferred Fee Plan (incorporated by reference to Exhibit 10.30 to GrafTech International Ltd.'s Registration Statement on Form S-1 (Registration No. 333-226609) filed August 6, 2018).
10.31	Share Repurchase Agreement, dated as of August 7, 2018, by and between GrafTech International Ltd. and BCP IV GrafTech Holdings LP (incorporated by reference to Exhibit 10.31 to GrafTech International Ltd.'s Registration Statement on Form S-1/A (Registration No. 333-226609) filed August 8, 2018).
10.32+	Amendment to Deferred Share Unit Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan for David Rintoul (incorporated by reference to Exhibit 10.32 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 22, 2019).
10.33+	Amended and Restated GrafTech International Ltd. Director Deferred Fee Plan, amended as of November 1, 2018 (incorporated by reference to Exhibit 10.33 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 22, 2019).
10.34+	Form of Deferred Share Unit Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan for Non-Employee Directors (adopted November 1, 2018) (incorporated by reference to Exhibit 10.34 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 22, 2019).
10.35+	Summary of Modifications to Employment Agreement, effective March 1, 2018, between GrafTech International Holdings Inc. and David J. Rintoul (incorporated by reference to Exhibit 10.35 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 22, 2019).
10.36+	Form of Restricted Stock Unit Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan (incorporated by reference to Exhibit 10.1 to GrafTech International Ltd.'s Quarterly Report on Form 10-Q filed May 1, 2019).
10.37+	Form of Stock Option Grant Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan (incorporated by reference to Exhibit 10.2 to GrafTech International Ltd.'s Quarterly Report on Form 10-Q filed May 1, 2019).
10.38	Share Repurchase Agreement, dated December 3, 2019 by and between GrafTech International Ltd. and BCP IV GrafTech Holdings LP. (incorporated by reference to Exhibit 10.1 to GrafTech International Ltd.'s Current Report on Form 8-K filed December 9, 2019).
10.39+	Form of Restricted Stock Unit Form of Restricted Stock Unit Agreement under the GrafTech International Ltd. Omnibus Equity Incentive Plan (incorporated by reference to Exhibit 10.39 to GrafTech International Ltd.'s Annual Report on Form 10-K filed February 21, 2020).
10.40	Separation Agreement, Waiver and Release as of January 10, 2020 between GrafTech International Holdings Inc. and Brian M. Boutte (incorporated by reference to Exhibit 10.2 to GrafTech International Ltd.'s Quarterly Report on Form 10-Q filed May 6, 2020).
10.41	Collateral Agreement, dated as of December 22, 2020, among GrafTech Finance Inc., GrafTech International Ltd., the other subsidiary grantors party thereto, and U.S. Bank National Association, as collateral agent (incorporated by reference to Exhibit 10.1 to GrafTech International Ltd.'s Current Report on Form 8-K filed December 23, 2020).
21.1*	List of subsidiaries of GrafTech International Ltd.
23.1*	Consent of Deloitte & Touche LLP, Independent Registered Public Accounting Firm.

31.1*	Certification pursuant to Rule 13a-14(a) under the Exchange Act by David J. Rintoul, President and Chief Executive Officer (Principal Executive Officer).
31.2*	Certification pursuant to Rule 13a-14(a) under the Exchange Act by Quinn J. Coburn, Vice President and Chief Financial Officer (Principal Financial Officer).
32.1*	Certification pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 by David J. Rintoul, President and Chief Executive Officer (Principal Executive Officer).
32.2*	Certification pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 by Quinn J. Coburn, Vice President and Chief Financial Officer (Principal Financial Officer).
101	The following financial information from GrafTech International Ltd.'s Annual Report on Form 10-K for the year ended December 31, 2020 formatted in Inline XBRL (Extensible Business Reporting Language) includes: (i) the Consolidated Balance Sheets, (ii) the Consolidated Statements of Operations and Comprehensive Income (Loss), (iii) the Consolidated Statements of Cash Flows, (v) the Consolidated Statements of Stockholders' Equity (Deficit), and (vi) Notes to the Consolidated Financial Statements.
104	Cover Page Interactive Data file (formatted as Inline XBRL and contained in Exhibit 101)

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* Filed herewith

\+ Indicates management contract or compensatory plan or arrangement

Item 16. Form 10-K Summary

Not applicable

SIGNATURES

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

GRAFTECH INTERNATIONAL LTD.

February 23, 2021

By: /s/ David J. Rintoul
David J. Rintoul

Title: President and Chief Executive Officer

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

Signatures	Title	Date
/s/ David J. Rintoul David J. Rintoul	President, Chief Executive Officer and Director (Principal Executive Officer)	February 23, 2021
/s/ Quinn J. Coburn Quinn J. Coburn	Chief Financial Officer, Vice President Finance and Treasurer (Principal Financial and Accounting Officer)	February 23, 2021
/s/ Denis A. Turcotte Denis A. Turcotte	Chairman and Director	February 23, 2021
/s/ Brian L. Acton Brian L. Acton	Director	February 23, 2021
/s/ Catherine L. Clegg Catherine L. Clegg	Director	February 23, 2021
/s/ Michel J. Dumas Michel J. Dumas	Director	February 23, 2021
/s/ Leslie D. Dunn Leslie D. Dunn	Director	February 23, 2021
/s/ Jeffrey C. Dutton Jeffrey C. Dutton	Director	February 23, 2021
/s/ David Gregory David Gregory	Director	February 23, 2021
/s/ Anthony R. Taccone Anthony R. Taccone	Director	February 23, 2021

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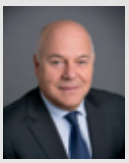
CORPORATE AND INVESTOR

RELATIONS

Board of Directors

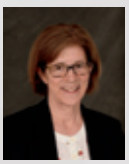


Denis A. Turcotte

Chairman, GrafTech International Ltd.
Managing Partner and Chief Operating Officer - Private Equity Group, Brookfield Asset Management Inc.

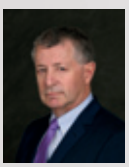
Brian L. Acton

President, Pac Basin Resources LLC, Sierra Minerals LLC and Px Carbon LLC



Catherine L. Clegg

Former Vice President, Workforce Strategy, Global Human Resources, General Motors Company



Michel J. Dumas

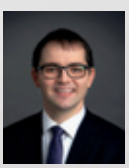
Former Executive Vice President, Finance, and Chief Financial Officer, Tembec Inc.

Leslie D. Dunn

Former Senior Vice President of Business Development and General Counsel, Cole National Corporation

Jeffrey C. Dutton

Managing Director, Business Operations - Private Equity Group, Brookfield Asset Management Inc.



David Gregory

Managing Partner, Investments - Private Equity Group, Brookfield Asset Management Inc.

David J. Rintoul

President and Chief Executive Officer, GrafTech International Ltd.

Anthony R. Taccone

Founding Partner, First River LLC

Investor Relations

Wendy Watson
Vice President, Investor Relations and Corporate Communications
216.676.2000 | investor.relations@graftech.com

Stock Exchange Listing

Our common stock is listed on the NYSE under the symbol EAF.

Transfer Agent

Computershare
PO BOX 505000
Louisville, Kentucky 40233
800.736.3001 | +1.781.575.3100
computershare.com/investor

Annual Meeting

May 13, 2021
8:00 AM Eastern Time
www.meetingcenter.io/258657458
Password: EAF2021

Stockholder Contact and Form 10-K

Stockholders, prospective investors and other interested parties are welcome to call or write us with questions. A copy of the annual report filed with the SEC on Form 10-K for the year ended December 31, 2020 is available, without charge, upon written request to Wendy Watson, Vice President, Investor Relations and Corporate Communications, at the Company's Corporate Headquarters.

Independent Registered Public Accounting Firm

Deloitte & Touche LLP

Forward-Looking Statements

Statements in this Annual Report regarding the Company that are not historical facts are "forward-looking statements" that involve risks and uncertainties. Certain of the risks and uncertainties to which the Company is subject are described in the "Forward Looking Statements" and "Risk Factors" sections of the enclosed Form 10-K and the Company's other applicable filings with the Securities and Exchange Commission. See pages 4-6 and 19-34 of the enclosed Form 10-K.

GrafTech International Ltd.
982 Keynote Circle
Brooklyn Heights, Ohio 44131

www.graftech.com