The availability and cost of graphite electrodes have come to dominate discussions in the North American steel and nonferrous markets, as an industry-wide scarcity has pushed up prices and left mill buyers scratching their heads. In this special edition, AMM takes an in-depth look at the issues driving the tightness, which could prop up fourth-quarter steel prices—despite falling raw-material costs—and elevate electric-arc furnace producers’ costs through next year.
Mill fear over graphite electrode scarcity grows

A global shortage of graphite electrodes has been raising domestic steelmaking costs all year, and the situation is worsening, prompting growing fears of a severe shortfall, according to raw material buyers at US steel mills.

While some mills have annual supply contracts in place, others that purchase on a quarterly or spot-market basis are reporting that prices have increased from $1 per pound to as high as $16 per pound on certain sizes.

“The rising costs are a real concern. A bigger concern is the limited supply of electrodes and the potential for disruptions with some producers. One Midwest steel producer just made a big buy at $14 to $15 (per pound),” said a Midwest mill buyer who is being quoted electrode prices as much as $16 per pound higher than last year.

The runaway price increase for graphite electrodes is raising the cost of steel production, according to the Midwest buyer. For each ton of steel produced, the electrode cost has soared from $10 to $20 per ton to $60 to $80 per ton. “Outside of scrap, not a single other increase has been to the degree of this one, including alloys, which have increased,” said the Midwest buyer.

Mill buyers throughout the country have confirmed that electrodes are in short supply, with some indicating prices have risen from $1 per pound to $5 per pound.

Mills that have annual supply agreements in place are monitoring the situation closely, but they are more insulated from the dynamics. A Southwest mill buyer said he rejected offers to pay $15 per pound at one facility and is seeking other alternatives due to the high prices being quoted.

One southern mill buyer suspects that China—a dominant supplier—has hiked the price for electrodes in retaliation for the United States weighing Section 232 safeguards. “Nobody expected this to occur. Maybe it is a negotiating or conspiracy theory. China is essentially holding us hostage and saying, ‘Let’s see how long you can melt without electrodes,’” said the southern buyer.

The shortage is not the result of malice and is the culmination of numerous factors, according to a graphite electrode insider. Those factors include closures of facilities during the last downturn in electric-arc furnace (EAF) production,
consolidation among suppliers and pressures on needle coke supply—all coming in the face of renewed strength in the domestic industry.

“The supply issue has been brewing for a long time. About four years ago, electrode demand started falling off, and there was huge oversupply ... which led to a correction that took 150,000 to 200,000 tons out of the market,” the insider told AMM, adding that this was a “tremendous amount of capacity” to be cut.

An example of consolidation is Brooklyn Heights, Ohio-headquartered Graftech International, which closed operations in Brazil and Russia and later idled its St. Mary’s, Pa., plant. Superior Graphite, meanwhile, shuttered its Russellville, Ark., facility, telling suppliers in a letter that “the continued importing of low-cost electrode and specialty graphite products; the continued depressed rates of steel production; and low capacity utilization have created an environment such that we cannot effectively compete in these markets with these conditions.”

Other graphite electrode producers closed facilities as well, and the huge supply-side correction became obvious when the US steel industry started to rebound following the presidential election. With no one anticipating that raw steel production would improve as it has in 2017, it was impossible to see this shortage coming, sources said.

Graphite electrode producers have increased spot-market prices but have yet to reap the benefits in their overall earnings. They are still honoring deals cut for 2017 delivery, made when the market was soft and material was selling for $1 per pound, the insider noted.

After the consolidation of many graphite electrode operations, the steel industry leaned heavily on China, particularly for smaller-diameter sizes. Now this supply chain has broken down because the Chinese are cracking down on production for environmental reasons, and customers are scrambling to rebuild alliances with their previous suppliers. “Relying on China has turned out to be a bad idea,” the insider said.

In addition to a shortage in electrodes themselves, a primary ingredient is being pursued by a rival—and fast-growing—industry. Needle coke is being sold to lithium battery producers, who use it to make natural graphite that appears to be performing better than synthetic graphite.

Needle coke prices have also surged due to suppliers of the material taking downtime early in 2017, sources said.

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LISA GORDON

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**Steel and raw material pricing since the electrode shortage**

(in cents per pound)

<table>
<thead>
<tr>
<th>Material</th>
<th>June 2, 2017</th>
<th>September 22, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold-rolled coil</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td>No. 1 busheling</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Hot-rolled coil</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Shredded steel scrap</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Steel rebar</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Ferrosilicon 75% Si in-warehouse Pittsburgh</td>
<td>0.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Ferrochrome high carbon 6-8% C basis 60-65% Cr max 2% Si</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Silicomanganese 65% min. Mn 16% min.</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Steel and ferroalloy prices have been fairly steady since the start of the graphite electrode shortage earlier this year, but some market participants have said that the real pain for producers will be felt next year, when annual contracts reset at higher levels.
Electrode prices simply normalizing: GrafTech

Recent graphite electrode price increases represent a rebound from record lows in the first half of this year—more of a normalization than a surge to unprecedented heights, according to GrafTech vice president of financial planning and strategy Michael E. Carr.

“We were more than due for our time to recover,” he told AMM. “I’ve worked for (GrafTech) for 31 years, and (prices) were at their lowest in the first half of this year.”

Electrode prices slumped early this year due to excess supply. “Now it’s gotten tight again,” Carr said, declining to disclose GrafTech’s current or past electrode prices.

According to GrafTech’s latest earnings filing with the US Securities and Exchange Commission (SEC) dated August 2, its weighted average selling price for graphite electrodes fell 7.4% year on year in the first half of 2017 despite increased sales volumes.

“This increased volume is the result of an improvement in customer demand driven by growth in the EAF (electric-arc furnace) market,” the Parma, Ohio-based electrode producer said in the filing. GrafTech also noted first-half 2016 and 2017 inventory adjustments of $14.6 million and $1.5 million, respectively, “due to decreased pricing in our graphite electrode product line.”

GrafTech’s base prices for 8- to 16-inch, 18- to 24-inch and 26- to 30-inch graphite electrodes stood at $1.44, $1.35 and $1.49 per pound, respectively, in September 2016, when it last issued a price increase, which applied to all new orders placed before December 31, 2016, and scheduled for delivery before December 31, 2017.

But graphite electrode prices recently spiked to a range of $4 to $10 per pound from around $1 per pound in May, GES Graphite president Keith Kearney told AMM via email.

As such, US mini-mills could see the electrode portion of their steelmaking costs increase to $25 to $30 per short ton ($1.25 to $1.50 per hundredweight) from less than $5 per ton (25 cents per cwt), Piyush Sood, vice president of equity research at New York-based Morgan Stanley, wrote in an October 2 research note, adding that some global mills could see this cost increase to as much as $75 per ton ($3.75 per cwt).

The jump in electrode prices in recent months has been caused by a supply shortage that resulted from the closure of facilities during the last downturn in EAF production, consolidation among suppliers and pressure on needle coke supply, at the same time of renewed strength in the domestic steel industry.

Some US steel producers—including wire rod mills and stainless mills—have cited higher graphite electrode costs as a factor behind recent price hikes.

ELECTRODE MARKET FOCUS

GrafTech recently sold its two remaining specialty graphite facilities in Parma, Ohio, and Clarksburg, W.Va., to focus solely on producing and machining graphite electrodes, according to Carr.

“We have a (partially) idled facility in St. Marys, (Pa). ... We could restart that facility ... (but) needle coke is tight and it depends on the availability of needle coke. To restart the facility, it depends on the economics,” he said when asked if the sale of the two facilities would allow GrafTech to increase production of electrodes.

The St. Marys facility still operates a machine shop that processes electrodes, but it does currently produce electrodes, “so it is not 100% idled,” Carr clarified.

The two facilities were sold in one transaction to a consortium of buyers on September 30, he said.

That consortium included GES Graphite, which purchased GrafTech’s Parma machine shop; and Americarb, which bought the Clarksburg specialty graphite production plant, GES Graphite president Keith Kearney told AMM via email.

Others in the consortium included Capital Recovery Group, Big Shoulders Capital and Rabin Worldwide, GES Graphite manager Baker Kearney added.

“I can confirm that we (Americarb chairman Lee Reineke and myself) now own the Clarksburg facility and plan to continue operations at this facility as normal to produce specialty graphite materials,” Matt Reineke, chief executive officer and president of Americarb and president of Advanced
Higher aluminium prices on the London Metal Exchange should “more than offset” an expected 4-cent-per-pound cost inflation related to carbon prices, Morgan Stanley Research said in an October 2 note. Aluminium smelters use carbon anodes in the production of raw aluminium, making the industry attentive to carbon price movement.

The movement in carbon pricing appears to be related to both Chinese supply-side reform as well as Hurricane Harvey, which impacted US graphite electrode producer Parma, Ohio-based GrafTech by cutting its needle coke supply and forcing the company to declare force majeure.

The LME’s three-month aluminium contract has been hovering near a more than five-year high of $2,191 per tonne (99.4 cents per pound) reached on September 20, up more than 22 cents per pound since the beginning of the year. The contract closed the official session at $2,147 per tonne (97.4 cents per pound) on October 5.

As part of China’s supply-side reforms, the country’s aluminium output dropped in July and August, although output for the first eight months of the year rose 6.1% to 22.17 million tonnes.

Morgan Stanley believes that electrode pricing could become a drag on global scrap sales, with China exporting 27,000 tonnes of graphite electrodes in July, up 8% sequentially and 100% year on year.

“We think some global electrode buyers are trying to lock in supplies on expected shortages (even at higher prices), especially ahead of Chinese winter closures anticipated later this year,” it said.

Graphite electrode costs have also been cited as the reason for an increase in US steel wire rod prices.

And GrafTech will soon be the only producer of graphite electrodes in the US following a proposed settlement between Japan’s Showa Denko KK and the US Justice Department. The Japanese producer, in order to proceed with its purchase of SGL Carbon SE’s graphite electrodes business, is required to divest the US portion of that business.

Originally published on October 4, 2017.

KIRK MALTAIS

High aluminium prices to offset carbon costs

Aluminium smelting costs have increased as a result of higher spot carbon pricing, but it’s unlikely that higher graphite electrode prices will hurt the aluminium business going into next year.

Graphite Materials, said via email.

The Parma and Clarksburg facilities were the “last pieces” that GrafTech needed to shed from its former engineered solutions business segment, according to Carr, noting that the company has been divesting assets from that division since 2015 when it was acquired by Brookfield Asset Management.

GrafTech’s only reportable segment is its industrial materials division, which is comprised of two main product categories: graphite electrodes and needle coke products, according to the company’s latest SEC filing.

Electrodes are the prongs mainly used to melt scrap in EAFs, but are also used to refine steel in ladle furnaces and in other smelting processes, according to GrafTech’s website. Needle coke is the key raw material to producing graphite electrodes, the company’s SEC filed noted.

“We’re the only backward integrated manufacturer … we have a competitive advantage in (the electrode market),” Carr said. “Brookfield purchased GrafTech to focus on it.”

And GrafTech will soon be the only producer of graphite electrodes in the US following a proposed settlement between Japan’s Showa Denko KK and the US Justice Department. The Japanese producer, in order to proceed with its purchase of SGL Carbon SE’s graphite electrodes business, is required to divest the US portion of that business.

Originally published on October 4, 2017.

GRACE LAVIGNE
Billet-scrap spread widens on electrode dearth

In September, Turkey’s price premium for imported billet over imported scrap reached its highest level in more than five years, according to data from AMM sister publication Metal Bulletin.

This was driven by a shortage of graphite electrodes, used in electric-arc furnaces (EAFs), which triggered a shift by mills away from sourcing scrap toward billet.

Metal Bulletin’s price assessment for billet imported into Turkey hit a peak of $530 to $535 per tonne cfr on September 21 before falling to $495 to $510 per tonne cfr on September 28.

This put the premium over imported No. 1 and No. 2 heavy melt scrap (75/25) at $222.50 per tonne on September 22—the widest gap recorded by Metal Bulletin since June 2012, when steep gains in billet prices pushed the gap to $260 per tonne.

Metal Bulletin’s assessment for Turkish imports of No. 1 and No. 2 heavy melt scrap (75/25) was $290 to $304 per tonne cfr on September 29, reducing the gap between imported billet and scrap to $205.50 per tonne.

However, this was still sharply up on the $110.50 to $178 per tonne premium for billet over scrap in the year to the end of July 2017, when the premium to scrap began ramping up.

“(The) last time we saw (the premium) nearing the $200-per-tonne mark was in June 2013, and the peak was followed by a steep fall in prices,” according to Metal Bulletin Research (MBR) metals analyst Shruti Salwan.

A source in India agreed there was likely to be a correction.

“The billet price is going to fall fast—$220 per tonne (was) a very big (premium) and (this) week is a holiday in China,” he said.

However, he was less certain about the medium-term direction for the billet/scrap price gap, and said this would depend on whether China re-enters the billet market as a buyer or seller when activity resumes after the National Day holiday.

A Middle-Eastern source told Metal Bulletin that European scrap participants will play a key role in determining the price difference between imported billet and imported scrap in Turkey.

“The (gap) will close up when the big European (scrap) sellers re-enter the market,” he said.

High prices for scrap in the European domestic market have supported higher export offer prices, so over the past week Turkey has imported three lower-priced scrap cargoes from Canada.

MARKET SHIFT

As Turkey has become a major producer of long steel, melting scrap in EAFs, it has been particularly hard hit by the recent sharp rise in the price of graphite electrodes used in these furnaces.

Graphite electrode prices are now at $22,000-$40,000 per tonne, up sharply from around $2,000 per tonne in 2016, according to delegates at the International Rebar Exporters & Producers Association (Irepas) conference last week in Athens, Greece.

This has been driven by a reduction in electrode supplies from China, after a government crackdown on pollution led to the closure of some electrode plants, sources at the conference said.

“With these electrode prices, finished (steel) product prices are not going to go down,” one Turkish source told Metal Bulletin. “People will be producing from either scrap (using) electrodes or having to buy expensive billet, so production costs are still going to be high.”

The higher graphite electrode costs provide a powerful incentive for Turkish mills to consider producing long steel products directly from purchased billet rather than producing billet through the EAF route using scrap, with an increase in inquiries heard from Turkish steelmakers for Europe-origin billet.

“After the end of January, Turkish mills won’t have (electrodes) in stock anymore, so Turkey should import billet over buying scrap,” another Indian source said. “All scrap prices will be under pressure. Raw materials prices will be going down, and finished (steel) prices will be going up.”


REGINALD AJUONUMA
EAF output costs up $48/T: Spain’s Celsa

European costs for rebar and billet produced via electric-arc furnaces (EAFs) have risen by about €40 ($48) per tonne, according to Celsa Steel commercial director José Angel Rey.

“This increase is as a result of rising cost (of) graphite electrodes, ferroalloys and refractory bricks,” Rey told delegates, speaking on September 26, at the Steel Orbis 2017 Conference and 77th International Rebar Exporters & Producers Association (Irepas) meeting in Athens, Greece.

“There has been a (temporary) decoupling of billet and long product prices from scrap, due to the disruption caused by the (increasing cost of) electrodes and the lack of availability,” he said.

AMM sister publication Metal Bulletin’s weekly price assessment for domestic rebar rose €10 to €20 per tonne to €545 to €580 ($653 to $695) per tonne delivered in northern Europe on September 20, while the weekly price assessment for shredded ferrous scrap fell $26 to $29 per tonne to $302 to $304 per tonne fob Rotterdam on September 22.

Prices of ferrovanadium, which is used to add hardening qualities to steel products, have also increased, raising the production costs for steel rebar and billet, Rey said.

Metal Bulletin’s average monthly price assessment for ferrovanadium in western Europe was $44.99 to $47.81 per kilogram, duty paid free delivery; that price has risen for three consecutive months from June’s average of $25.82 to $26.41 per kg since environmental inspections took place in China.

A revision of China’s rebar standards means that Chinese vanadium producers are expected to forgo their annual supply agreements with European buyers from 2018, prioritizing domestic sales to Chinese rebar producers instead, market participants told Metal Bulletin on September 6.

Refractory brick prices also have risen sharply in recent weeks, amid reduced availability of raw materials such as magnesium oxide, bauxite and alumina, one southern European refractory products producer told Metal Bulletin on September 25.

Despite rising costs for EAF-based steel production, switching to imported billet made through the blast furnace-basic oxygen furnace (BF-BOF) production route might not fully mitigate rising graphite electrode costs, according to Michael Setterdahl, non-executive advisory board member at international metals group Liberty House.

“We should remember that graphite electrodes are also used in the ladle furnace (LF) metallurgy stage of BF production, albeit less than in EAF production,” he said.

Global steel long products consumption is expected to strengthen to 801 million tonnes in 2017, up from 794 million tonnes in 2016, Rey said. Of the total, rebar consumption is forecast to reach 360 million tonnes in 2017 and wire rod consumption 204 million tonnes.

Originally published on September 26, 2017.

VIRAL SHAH
Higher-grade scrap tags to rise on electrodes

Prices for higher grades of ferrous scrap metal are likely to diverge from other grades in the coming months as steelmakers reliant on electric-arc furnace (EAF) production look to conserve graphite electrodes.

“We are likely to see growing price differentials between high- and low-grade scrap from November or December as steelmakers look to use higher-quality ferrous scrap in their EAFs to better conserve electrodes,” Sundeep Rao, director at Oman’s Sharq Sohar Steel Group, told AMM sister publication Metal Bulletin on September 26 on the sidelines of the Steel Orbis 2017 Conference and 77th International Rebar Exporters & Producers Association (Irepas) meeting in Athens, Greece.

The cost of graphite electrodes used in EAFs has soared in recent months due to a reduction in supplies from China, after a government crackdown on pollution led to the closure of some electrode plants.

Delegates at the meeting said that graphite electrode prices were now between $22,000 and $40,000 per tonne, up from around $2,000 per tonne in 2016.

Production of graphite electrodes in China has fallen by roughly 300,000 tonnes per year, Michael Setterdahl, non-executive advisory board member at international metals group Liberty House, told Irepas delegates.

And the high graphite electrode prices could last until the middle of 2019, according to Murat Cebecioglu, export manager at Turkish long steelmaker Icdas.

Metal Bulletin’s weekly Turkish ferrous shredded scrap import price fell by $26 to $29 per tonne week on week to $329 to $331 per tonne cfr on September 22, while Metal Bulletin’s daily scrap index for Northern Europe-origin No. 1 and No. 2 heavy melt (80/20) dropped to $310.53 per tonne cfr on September 25.

“The recent buildup in scrap supplies has put pressure on pricing in the short term, but demand is still solid,” said Jens Björkman, head of ferrous sales at metal recycler Stena Metall.

NEEDLE COKE
Rao said the sharp increase in electrode prices this year should be attributed to higher demand for needle coke—a premium-grade, high-value petroleum coke required to produce graphite electrodes.

Lithium-ion batteries used in electric vehicles (EVs) also use needle coke, FD Baysal, president of US trading company Seba International, told delegates, noting that China has announced aggressive quotas for EV production.

“There are only five or six needle coke producers globally and, right now, they can do what they want with the price (due to the higher demand),” Rao said.

Originally published on September 26, 2017.

VIRAL SHAH
Keystone lifts rod $40/T on electrode costs

Keystone Steel & Wire raised prices for all wire rod products by $40 per ton ($2 per hundredweight), effective with shipments from October 2, the company said in a September 15 letter to customers.

“While market conditions remain steady, the impact of rising costs is having a significant impact on our business,” according to the Peora, Ill.-based mill.

“The main driver in this cost is the global shortage of graphite electrodes used in the steelmaking process,” the company wrote, in perhaps the first official price increase to reference higher electrode costs. “Your Keystone sales representative will be discussing this with you during the next few days.”

Recently, rod market sources reported rumors of an electrode-related hike, citing conversations with mill representatives.

A source at a rival producer had also heard that another major producer, not his company, was “looking into” a similar electrode-based increase. “Electrodes are being treated like gold these days,” he told AMM on September 15, summing up market sentiment.

Originally published on September 18, 2017.

NAT RUDARAKANCHANA

Outokumpu institutes global electrode upcharge

Outokumpu introduced a graphite electrode upcharge for all stainless steel products, effective September 26.

The initial electrode upcharge will be €30 per tonne and will cover all new contracts and spot orders in Europe, Africa, Australia, Asia and the Middle East, according to the Finnish stainless steelmaker. The upcharge will be updated monthly, Outokumpu said.

“The tight supply situation within the graphite electrodes market has led to limited global availability of graphite electrodes and sharp increases in their prices,” Outokumpu said on September 26. “This has in turn led to a significant increase in the production costs of stainless steel.”

Prices for higher grades of ferrous scrap metal are likely to diverge from other grades in the coming months as steelmakers reliant on electric-arc furnaces (EAF) look to conserve graphite electrodes.

Originally published on September 27, 2017.

GRACE LAVIGNE
Electrode shortage leads Turks to billet imports

Steelmakers in Turkey showed increased interest in booking billet from Europe while looking to mitigate the spike in costs and scarcity of graphite electrodes, sources told AMM sister publication Metal Bulletin.

Costs for graphite electrodes have soared in recent months due to a lack of availability from China—after environmental inspections there, operations at several producers have been suspended. This has forced European steelmakers such as ArcelorMittal and Celsa to raise their prices for long products.

“Electrodes cost $30,000 to $35,000 per tonne cfr Turkey, from what I heard. And it was $2,000 per tonne cfr five to six months ago,” one Turkish source told Metal Bulletin.

Turkish electric-arc furnace (EAF) mills, having to contend with ballooning electrode costs, have been turning toward buying and transforming steel billet into finished steel products over recent weeks.

With local Turkish billet markets strong and prices for the material high, one European billet producer told Metal Bulletin that he sold 5,000 tonnes of billet to Turkish buyers this past.

Turkish billet imports have been rising this year, with shipments to Turkey of 10,000 tonnes from Italy and 25,000 tonnes from Belarus and other eastern European markets in June, according to Shruti Salwan, metals analyst at Metal Bulletin Research.

Offer prices for imports of billet to Turkey increased over the past week, with Metal Bulletin’s weekly price assessment moving to $520 to $530 per tonne cfr from $510 to $520 per tonne on August 24, when the previous assessment was published.

Offers for Commonwealth of Independent States-origin billet were made to Turkey in the range of $530 to $550 per tonne cfr this past week, while European Union-origin material reportedly moved up to €460 ($551) per tonne cfr as of September 8.

CONSERVING ELECTRODES

Turkish mills could reduce their scrap buying in favor of billet to curb their use of electrodes, some sources said.

“What’s likely to happen because of electrode shortages is mills not being able to use scrap, so they’ll use billet. It is interesting to see what will happen to scrap prices,” one European producer source said.

Refurbishing used electrodes could become “more of a focus” for steelmakers, the producer source said.

“Electrodes that would have been thrown away a months ago (could) be used,” he added.

Current billet prices are “unworkable,” the Turkish source said, so mills in the country still prefer to buy scrap.

Any increased use of billet may only be a short-term solution to the scarcity of electrodes, according to other sources.

“While the recent surge in Turkish billet imports could potentially pacify the impact of surging raw material cost at EAFs to a certain extent, if the rally persists, some of the producers will have to curb their production rates in the coming months,” Salwan said.

Another European producer even told Metal Bulletin he is considering reducing billet output to conserve electrodes.

“Otherwise, it is a possible scenario that we could stop (billet) production in February,” he said.

Nadia Popova, Moscow, contributed to this report. Originally published on September 8, 2017.

LEE ALLEN