April 2019

Metal Market Magazine

Jürgen Pilarsky on the growth of Cronimet

Changing patterns of trade in scrap

Battery raw material markets

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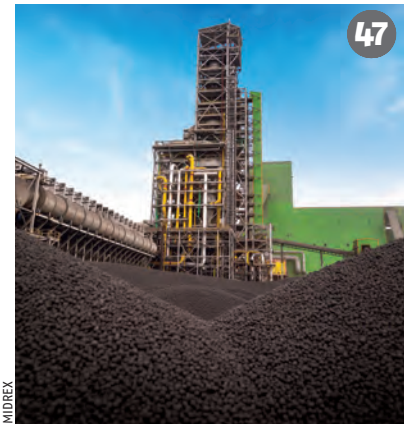

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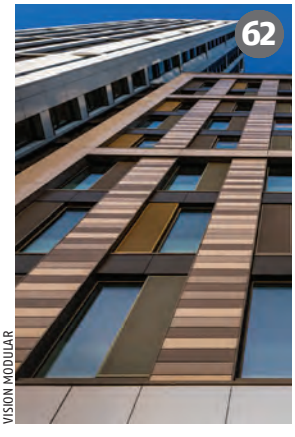

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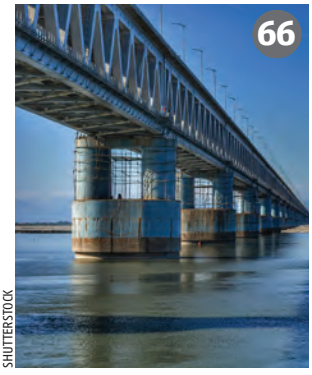

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Comment

Recycling reviewed

In a world in which demand for raw materials grows ever larger, alongside a global need to reduce carbon emissions, the importance of recycling is greater than ever.

For most metals, the fundamental questions of how, where and when they can be recycled have long been answered. With appropriate sorting, cleaning and cutting, many grades of steel, non-ferrous metals and their alloys are processed ready to restart life in new products, after melting, casting, forming and fabrication steps in the same way as primary metals. Energy consumption – and thus in many cases carbon emissions – at the upstream end of production is generally significantly lower for secondary than for primary metal production.

Large companies operating globally have developed to purchase, process and deliver scrap for industry. Our cover profile interview with Cronimet's Jürgen Pilarsky outlines the nearly 40-year growth of a family-owned international business that has stainless steel recycling at its core, but which has a host of other recycling, raw material and technology activities in its portfolio as a consequence of the entrepreneurial approach it takes to embrace new commercial opportunities.

While the basic physical principles of metal recycling are well known, the markets and technologies for the businesses applying them are anything but static. A separate in-depth interview with the CEO of subsidiary Cronimet Envirotec demonstrates an innovative approach to processing industrial sludges and metal powders.

On both a national and global scale, changes in environmental and trade regulations impinge on international scrap business. China's drive to make the purity of its scrap imports higher to reduce – and in the long term potentially eliminate – the proportion of foreign waste imported in shipments of scrap is concerning scrap exporters to the nation. A review of US non-ferrous scrap business outlines its recyclers' outlook.

Also influenced by new Southeast Asian steelmaking capacity, the pattern of international ferrous scrap shipments is seeing consequential changes, with Vietnam in particular emerging as a new destination for scrap. Fastmarkets' Asian steel experts consider the implications for regional scrap price benchmarks.

Elsewhere in Asia, India will hold nationwide elections soon. Our Kolkata-based contributor considers potential impacts.

All of the above is complemented by a look at the latest DRI plants, a market spotlight on trends in battery raw materials, a technology spotlight on business intelligence and an end-user spotlight on modular construction.

Find us online at www.metalbulletin.com and www.amm.com

'While the basic physical principles of metal recycling are well known, the markets and technologies for the businesses applying them are anything but static'

Metal Market Magazine

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Fastmarkets

News review: non-ferrous

Pumpkin Hollow on track for Q4 production

The Pumpkin Hollow mining project in the United States remains on target to start production in the fourth quarter, with the utilities and ventilation infrastructure complete "down the entire length of the main production shaft," Nevada Copper said in a production update on March 14.

Based in a state with a long tradition of mining, and located a couple of hours' drive southeast of Reno, Nevada, Pumpkin Hollow has ready access to affordable power and a skilled workforce of mine workers.

NEVADA COPPER

Pumpkin Hollow copper production in Nevada, US, is targeted for Q4 2019

Exchange CEOs see blockchain role grow

The advent of blockchain and other digital ledger technologies cannot be ignored, and they will play a much greater role in the financial markets in the next five years, according to the heads of several of the world's commodities exchanges.

For example, Matthew Chamberlain, chief executive officer of the London Metal Exchange, told Fastmarkets that the blockchain route for the LME would probably be pursued through partnerships, rather than via a central attempt to digitize data.

Antofagasta profits fall amid record Cu output

Copper miner Antofagasta reported a 14% year-on-year drop in profits in 2018 despite it being a record year for output.

The company, which mines in Chile but is listed in London, generated revenue of $4.73 billion in 2018, flat compared with the previous year.

A 6.3% decrease in realized copper prices and higher costs led profits to drop to $2.23 billion, it said.

KME takes full control of Tréfimétaux in €2 million deal

Italian semi-finished copper-products conglomerate KME will take full control of Tréfimétaux in a €2 million ($2.25 million) deal, continuing on what is now a two-year series of acquisitions.

The deal will see KME increase its stakeholding in the French copper tube and rod manufacturer, which has a turnover of €220 million, from 49% to 100%, giving it management control.

The deal is subject to conditions, which the companies did not detail, KME's parent company Intek Group said in an announcement on the Boursa Italiana on March 12.

NIF in deal to buy Glencore zinc conc, sell metal

Glencore Canada Corp is to supply Noranda Income Fund with all of its zinc concentrate requirements and purchase all of the fund's zinc metal for a four-year period ending April 30, 2022.

Noranda Income Fund said that until April 30, 2019, it will buy the zinc concentrate and sell the zinc metal based on fixed market terms for both concentrate and metal. After that, terms will be agreed annually, in line with prevailing market conditions and after discussions with the trustees' independent consultants.

The market terms of the agreement have not been disclosed. The agreement was unanimously approved by the independent trustees of Noranda Operating Trust, after consultation with their independent industry consultants.

Rusal's profit up in 2018 despite US sanctions

UC Rusal's net profit rose by 39% year-on-year in 2018 despite the aluminium producer operating under trading sanctions imposed by the United States for the majority of the year, Rusal said in its earnings report on March 7.

Rusal recorded a net profit of $1.689 billion last year, compared with $1.222 billion in 2017. The company's revenue increased by 3.1% to $10.28 billion from $9.969 billion in the same comparison.

Rusal said the increase was partly due to growth in the London Metal Exchange aluminium price, which increased by 7.2% in 2018. But profits were offset by a 7.2% decrease in primary aluminium and alloy sales volumes and higher raw material costs.

ANTOFAGASTA

Antofagasta's Los Pelambres copper reserve is one of the largest in the world

Chinese government looks to sell Fanya's APT stock

The Chinese government is in talks with local companies, including Minmetals, to sell the

ammonium paratungstate (APT) stocks that it holds in Fanya Metal Exchange warehouses, sources told Fastmarkets last week at an industry conference in London.

Some 29,651 tonnes of APT are still held by the collapsed Fanya – equivalent to almost three months' output in China. No agreement had been reached, but sources told Fastmarkets that a joint purchase, including the price of such joint purchase, among three large companies had already been discussed.

Aasheim appointed new Hydro chief executive

Hilde Merete Aasheim has been appointed new president and chief executive officer of aluminium producer Norsk Hydro, effective May 8.

She will succeed Svein Richard Brandtzæg, who is stepping down after ten years as CEO.

Brandtzæg, who became CEO of Hydro in March 2009, has worked at Hydro for 33 years and will remain with the company until the end of 2019.

Aasheim is currently executive vice president and head of Hydro's primary metal business area, a position that she has held since 2008. Prior to joining Hydro, she chaired the International Aluminium Institute and the Federation of Norwegian Industries.

Increased Asian nickel demand to coincide with advent of new Russian mine

Nickel demand is set to outstrip supply as soon as 2023, Amur Minerals chief executive officer Robin Young told Fastmarkets in an interview on February 27.

The junior mining company owns the Russia-based Kun-Manie project, the world's largest Asia-adjacent unexploited nickel deposit, home to an estimated 1.2 million tonnes of mineable nickel ore.

PT Freeport's export quota from Indonesia has been lowered

GTI resumes Ti powder output after fire

Global Titanium Inc (GTI) has resumed titanium powder output following an early-January fire that disabled its powder crushing equipment, bringing it back into the market at a time of rising prices in the United States due to a material shortage in Europe.

The shortage in Europe, which was sparked by the temporary withdrawal of one of the region's biggest suppliers earlier this month, has driven buyers there who do not typically purchase material from the US to seek material from this market.

Soave grows auto portfolio with New Center buy

Soave Enterprises has acquired New Center Stamping for an undisclosed amount, adding manufacturing capabilities to its automotive portfolio, the company announced on March 18.

Detroit, Michigan-based New Center stamping supplies medium- to large-size metal stamping components and welded assemblies to Detroit. Its 20-acre, 240,000-square-foot facility is equipped with heavy tonnage cranes, 35 presses, complex assembly weld cells, robotic roller hemmers and modern process automation, according to Soave.

"Soave Enterprises' longstanding and diverse experience in the automotive industry enhances New Center Stamping's capability to address opportunities in the next generation of automotive supply," Ed Schwartz, president of Soave Industrial Group, said in a statement.

IWG in deal to be bought by Atlas Holdings

Camden, New York-based International Wire Group Holdings Inc (IWG) has entered into a definitive merger agreement to be acquired by Atlas Holdings LLC, it said in a release on March 8.

Under the terms of the agreement, Atlas will acquire all IWG common stock for $10.70 per share in cash. The move was unanimously approved by the company's board of directors, which recommended that stockholders vote in favor of the deal.

The transaction is expected to close early in the second quarter of 2019 and is not subject to a financing condition, IWG said.

Freeport's Indonesian copper concs export quota drops

Copper miner PT Freeport's export quota issued by the Indonesian government has been lowered by 84% year-on-year, officials from the country's Ministry of Energy and Mineral Resources said on March 8. Under its new export license, Freeport can export 198,282 wet tonnes of copper concentrates this year, compared with 1.25 million tonnes last year.

The volume drop was mainly attributed to a significant fall in production at the world's second largest copper mine, Grasberg, which is expected to start from the first half of 2019 when operations transition from open pit to underground mining, the company said in its annual report

DRC miners eye blockchain for ethical sourcing

Miners in the Democratic Republic of Congo (DRC) are starting to look at blockchain as a way to provide supply chain traceability in compliance with customer and regulatory requirements, according to the chief operating officer of Cobalt Blockchain (COBC).

Lance Hooper said the Canadian resource company, which has an exploration and development business including assets in the DRC, is extending its own blockchain pilot project in the country and is in talks with a couple of large mining companies to trial its technology.

A similar move is planned with artisanal mining in the DRC, which accounts for about 10% of the world's cobalt supply. However, artisanal mining is often associated with issues such as child labor and conflict zones, leading to ethical sourcing concerns from original equipment manufacturers (OEM) such as consumer electronics and technology firm Apple and automakers Volkswagen and BMW.

News review: steel

Big uptick in iron ore hedging after Vale dam breach

The Singapore Exchange (SGX) has seen a "tremendous uptick" in iron ore futures trading activity due to supply concerns following the breach at one of Vale's tailings dams earlier this year.

"There is suddenly a big squeeze on high-quality iron ore," the exchange's head of derivatives, Michael Syn, said in response to a question from Fastmarkets at an SGX press briefing at the 44th Annual International Futures Industry Conference in Boca Raton, in the US state of Florida on March 12.

"The only way you could have addressed this if you're a steel mill is through hedging," he noted.

Aurizon repairs Queensland coal rail infrastructure by week's end

Australian rail freight operator Aurizon expected repair works on its rail infrastructure and overhead lines that suffered damage from a train derailment at the Dalrymple Bay Coal Terminal (DBCT) to be completed by March 15.

"At approximately 3.50pm, Sunday March 10, an empty Pacific National train derailed as it exited Dalrymple Bay Coal Terminal. No one was injured in the incident and it is being investigated," an Aurizon spokesperson said.

The incident resulted in significant damage to the overhead lines and the suspension of train access to the terminal, which is located at the Port of Hay Point in Queensland state, he added.

Irepas remains positive on long steel market strength

The International Rebar Producers & Exporters Association (Irepas) delivered a broadly positive short-range outlook for the long steel markets in March, even though prices continue to struggle on lackluster demand, largely because of concerns about protectionist trade measures.

"The global long steel products market is currently in a positive mood amid good demand worldwide," Irepas said in its outlook report on March 8. "Had there not been protectionist actions such as additional tariffs, quotas and safeguard measures, the global business scenario would be much better," it noted.

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Brazilian vehicle production was up in February

Leeco Steel to expand near Atlanta

Leeco Steel plans to open a distribution center – its ninth in the United States – in May outside of Atlanta, Georgia, the company announced on March 11.

The 49,000-square-foot facility, located in Pendergrass, Georgia – northeast of Atlanta – will allow the steel plate distributor to better serve customers in Georgia, North Carolina, South Carolina and Florida, the company said.

The facility will have two 40-ton cranes and two drive-through bays, according to the company.

Brazilian auto output up 20% in February on solid local demand

Vehicle production in Brazil increased in February, with late Carnival holidays in 2019 helping to keep figures high during the month, although exports were still under pressure, local automotive association Anfavea said on March 11.

Brazilian automakers produced 257,233 light vehicles, trucks and buses in February, up 20.5% from 213,498 units a year earlier. Volumes also grew 29.9% from 198,095 units in January.

According to Anfavea, February's output was the highest since October last year.

Furnace installation under way at Burns Harbor

ArcelorMittal USA's installation of two walking beam furnaces at the 80-inch hot strip mill at its Burns Harbor, Indiana, facility is "well under way," the company said in a release.

The $140-million investment project is part of ArcelorMittal's Action 2020 improvement plan. The project was approved in the second quarter of 2018 and preparations of the work site began immediately, the company said.

Furnace foundations are progressing inside the hot strip mill, while furnace foundation installation and new building grade walls are under way outside of the plant.

The Luxembourg-based steelmaker ordered the two top- and bottom-fired walking beam furnaces from Andritz AG to replace existing pusher furnaces at the Northwest Indiana mill.

The new furnaces will each be able to produce 500 tons per hour of steel and will allow the company to offer higher-quality substrate to downstream facilities and customers, ArcelorMittal said.

Tenaris granted US Section 232 exclusion for round billet

The US Commerce Department has given steel pipe and tube maker Tenaris an exemption from Section 232 tariffs for some of the round steel billet it imports from its sister companies.

Commerce granted Tenaris the exemption for rounds from Romania, Mexico and Italy that the company uses to make products such as seamless oil country tubular goods (OCTG), according to documents from the department dated March 1.

The department found that the rounds for which Tenaris had sought exemptions were not made in sufficient quality or quantity in the US and that providing an exemption for them would not jeopardize national security.

Maksteel completes LexWest Steel buy

Maksteel USA has completed its acquisition of California's LexWest Steel in its push to expand to the western United States, parent company Union Partners said on March 7.

LexWest Steel is a full-line distributor of flat-rolled steel products and will be rebranded as part of Maksteel USA, a subsidiary of Canadian service center Maksteel.

Demolition, redevelopment under way at Weirton

Demolition at the idled Weirton steel plant in West Virginia is under way and set to be completed next year, with the site "being developed for

industrial uses," according to Robert Zuchlewski, chief operating officer of Frontier Group of Companies, which owns the facility.

"The oil and gas industry is very robust in this region," Zuchlewski told Fastmarkets AMM via email. "It is likely that midstream oil and gas operators will be interested in building plants at this location."

Frontier acquired the plant from ArcelorMittal in 2017. The 1,100-acre site, located on the Ohio-West Virginia border, includes the 250-acre Brown's Island in the Ohio River.

Primetals to upgrade Nucor Alabama plate mill

Nucor has picked Primetals Technologies to supply a project to upgrade the steelmaker's plate mill in Tuscaloosa, Alabama, Primetals announced on February 28.

The international equipment supplier said it would provide the United States' largest steelmaker with a new downcoiler that would allow Nucor to make heavier plate for the line pipe market. The downcoiler will be able to process low-carbon plate up to 1.25 inches thick and line pipe grades up to 1 inch thick.

USS may seek coke after emissions order

U.S. Steel Corp has been ordered to reduce its use of coke oven gas and daily sulfur dioxide emissions across all Mon Valley Works facilities in Pennsylvania, which one analyst said could drive it to buy more coke in North American and foreign markets.

The Allegheny County Health Department (ACHD), in Pittsburgh, ordered U.S. Steel to comply with federal sulfur dioxide standards at the Mon Valley Works facilities, the department said in a notice posted to its website on February 28.

TENARIS

Tenaris' rotary furnace at Bay City, Texas

Investment fund buys Eagle Steel Products

The former Eagle Steel Products will do business as Eagle Steel and Metal Products, following its acquisition by investment group Kestrel Co for an undisclosed amount.

Kestrel purchased the remaining assets of Eagle Steel Products, a steel and metal products warehousing and distribution facility in Louisville, Kentucky, from majority owner Shirley Ohta.

SDI buy of 75% United Steel Supply stake done

Steel Dynamics Inc (SDI) announced that it has completed its acquisition of a 75% equity stake in United Steel Supply LLC.

"This partnership provides an exciting opportunity to expand our painted Galvalume distribution network. We look forward to growing with United Steel Supply and to providing our high-quality flat-roll steel directly to this important market segment," SDI president and chief executive officer Mark D. Millett said in a statement on March 1.

The $134-million acquisition, announced on February 1, leaves SDI with the option to buy the remaining 25% of Austin, Texas-based United Steel Supply in the future.

ICDX halts PT Surveyor suspension

The Indonesia Commodities & Derivatives Exchange (ICDX) has ended the suspension of key smelter inspector PT Surveyor Indonesia in connection with the launch of its new physical tin contract, which is set to transfer tin exports to bonded warehouses for the first time in the exchange's history, ICDX chief executive officer Lamon Rutten said on March 4.

PT Surveyor was ordered to suspend operations in mid-October 2018, with the inspector responsible for around 70% of smelter inspections last year. Since then, only Indonesia's leading state-owned tin producer, PT Timah, has been able to export.

With Indonesian tin exports required to obtain clearance through independent analysis prior to trading on the ICDX, the move caused physical premiums to spike by more than 30%, while tin's three-month price on the London Metal Exchange pushed higher, recently trading near $22,000 per tonne and up by more than 17%.

Stelco to use AI platform in steel ops

Canadian flat-rolled steelmaker Stelco will utilize Canvass Analytics Inc's artificial intelligence (AI) platform to boost yield and productivity within its steelmaking operations, Canvass announced on March 5. Financial terms of the deal were not disclosed.

"By partnering with Canvass Analytics, we are systematically transforming our facilities into intelligent operations environments and augmenting a digitally oriented work force in order to take the efficiency of our operations to the next level," Stelco executive chairman Alan Kestenbaum said in a statement.

Commerce initiates threaded rod probes

The US Department of Commerce has initiated anti-dumping duty and countervailing duty investigations into carbon and alloy steel threaded rod imports from China, India, Taiwan and Thailand, according to a March 15 statement.

The investigations were petitioned by Vulcan Threaded Products of Pelham, Alabama, on February 21. They will also determine whether producers of carbon and alloy steel threaded rod in China and India are receiving unfair subsidies.

According to a Commerce fact sheet, alleged dumping margins are 57.36 to 59.45% for China, 32.26% for Taiwan, 25.43 to 28.34% for India, and 20.83% for Thailand.

Products covered by the investigation include carbon and alloy steel threaded rod, defined by Commerce as "certain threaded rod, bar, or studs, of carbon or alloy steel, having a solid, circular cross section of any diameter, in any straight length."

Steel's good times to roll into 2019: Klöckner

Klöckner expects continued profits in 2019 thanks to what it predicts will be lofty steel prices in the United States and Europe as well as a modest increase in demand compared with 2018. ▶

News review: steel

"Sales… are anticipated to rise sharply on the back of investment made in expansion and an expected higher overall steel price level than in the preceding year," the steel distributor said in comments released with fourth-quarter 2018 earnings data on March 12.

Klöckner benefited from "windfall gains" of €50 million ($56.5 million) in 2018 as a result of Section 232 tariffs and quotas driving US steel prices higher, Jefferies equity analyst Alan Spence wrote in a research note dated March 11. "But with spot [hot-rolled coil] prices 15% below the 2018 average, we don't expect this [windfall] to repeat," Spence said.

Although based in Germany, Klöckner records more of its sales – 39% – in the United States than in any other country, according to a presentation released with the earnings figures.

Eskom implements first March load shedding

South African state power utility Eskom implemented load shedding in March amid lingering power constraints, sparking predictions of ferro-chrome price spikes if the situation deteriorates.

Load shedding – controlled power outages – were last implemented in mid-February and were reported to have affected large industrial power users, including ferro-chrome smelters.

After releasing multiple warnings in recent weeks over the continuing threat of load shedding, Eskom announced on March 14 that it was implementing stage one of the protocol. The utility later upgraded to stage two, which allows for 2,000 MW to be shed from the national load, double that allowed at stage one.

The move came amid concerns that power constraints in both South Africa and Inner Mongolia may reduce ferro-chrome supply over the coming months and push up prices, as well as news that South Africa's power prices will rise by 23% over the next three years.

SHUTTERSTOCK

Load shedding in South Africa impacts ferro-chrome production

SDI to pick mill site in 4–6 weeks

Steel Dynamics Inc's (SDI) executive team recently visited Sinton, Texas, while they continue to explore possible locations for a new flat-rolled mill, the company's top executive said.

SDI aims to decide on a site within the next four to six weeks, company president and chief executive officer Mark Millett said in an email to Fastmarkets AMM on March 14.

"In Texas, unlike most states, the preponderance of incentives [essentially limited to tax abatements] are dictated at the local level," he said. "We visited the area to simply educate them about SDI ahead of their decision-making process."

Sinton is located about 30 miles northwest of Corpus Christi, Texas. SDI's executives visited on March 13.

Toyota sets $749 million for five-state expansion

Toyota Motor Corp plans to ramp up its investments in the United States to $13 billion by 2021, with an initial $749 million to be used to expand its facilities in five states – a move that might have been partly motivated by United States-Mexico-Canada agreement (USMCA) considerations.

"The new investments will include adding the Toyota RAV4 Hybrid, the best-selling [sports utility vehicle] in the US, and Lexus ES 300h hybrid vehicle production at its Georgetown, Kentucky, manufacturing plant; expanding engine capacity at its Huntsville, Alabama, facility; doubling hybrid transaxle capacity at its plant in Buffalo, West Virginia; and a building expansion for additional castings at Bodine Aluminum's Jackson, Tennessee, facility as well as additional castings at its Troy, Missouri, facility," Toyota said on March 14.

TOYOTA

Toyota is investing heavily to expand US facilities

This is up from the automaker's earlier commitment, announced in 2017, to spend $10 billion on its US operations by 2021.

The announcement caught the attention of US President Donald Trump: "Congratulations @Toyota! Big news for US Auto Workers! The USMCA is already fixing the broken Nafta deal," he tweeted. Indeed, some metal market participants believe that the anticipated ratification of USMCA played a role in the automaker's decision.

Companies find ways to navigate 232 trade

Revenue garnered from the United States' Section 232 tariffs – in place for almost a year – stood at $4.3 billion for steel and $1.4 billion for aluminium as of February 21, 2019, according to data from US Customs and Border Protection, which assesses and collects duties on imports.

While the blanket 25% steel tariffs imposed by President Donald Trump's administration has helped US steel mills reap record profits, restart idled capacity and expand new projects, it has also resulted in rising supply chain costs across various sectors.

US importers have been forced to pay additional taxes on roughly $23 billion in steel imports, according to the recently introduced Bicameral Congressional Trade Authority Act of 2019.

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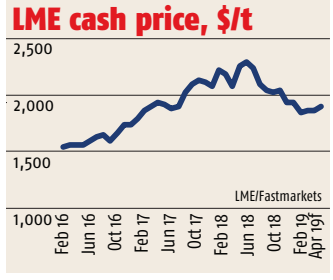
Market analysis

Aluminium

Time for the odd one out to play catch-up

Aluminium has been the laggard of the base metals complex this year, as it has been the only metal consistently trading below its December 2018 average, which was $1,925 per tonne. Aluminium's average LME three-month price for Q1 up until mid-March was $1,875 per tonne, with a range of $1,814-1,923 per tonne. But the sluggish performance warns that aluminium has some catching up to do, and that correction may be starting belatedly in the second half of March. And with aluminium unique in still carrying a net speculative short position into March, there is plenty of ammunition to fuel fund

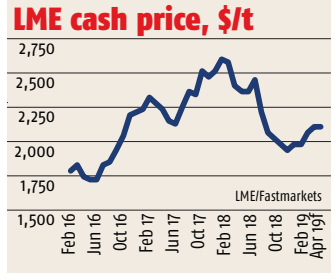


short-covering rallies. But we are not optimistic that a stronger tone can be sustained, given underlying bearish themes such as soft demand, elevated Chinese semis exports, the spectre of off-market stocks and concerns over recovering Russian supplies. Our Q2 average cash price forecast is $1,930 per tonne.

Lead

Vulnerable to renewed tightness

In lead, all eyes have been on exchange warehouses recently, with prices and spreads reacting accordingly. When 31,300 tonnes of LME warrants were cancelled in late-February, it sent a bullish signal to the market that stocks were likely to fall to even more critically low levels. Available LME stocks dropped to a low of 44,150 tonnes, about 2,700 tonnes short of January's decade lows. But by mid-March, however, the cancelled warrants had been re-warranted, which lifted available stocks to around 75,000 tonnes – still historically low. Prices eased to around $2,030 per tonne, from their seven-month high

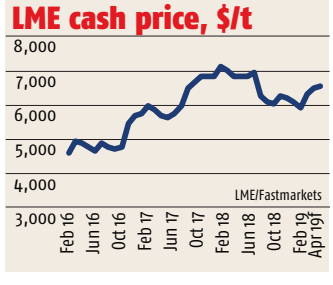


at $2,180 per tonne on February 28. The cash/threes contango also widened. In China, SHFE stocks have been climbing since November, but at 33,442 tonnes are still low given a 5 million tonne-per-year domestic market. Our Q2 cash price forecast is $2,125 per tonne, but the risks are to the upside.

Copper

Taking a breather into end-Q1, stronger again in Q2

Copper prices rallied strongly in February and have spent most of March consolidating those gains, which topped out around $6,550 per tonne. That represents a 14% gain from the lows of $5,725 per tonne in early January. Driving the most recent upswing was a spike in LME cancelled warrants, which, along with steady withdrawals, plunged available warrants to 14-year lows at just 24,000 tonnes. Deliveries and rewarranting in the LME system and increases in Chinese stocks have since relieved the tightness. But the squeeze has certainly focused attention on the vulnerability of this market in light of continuing supply disruptions and the approach of the

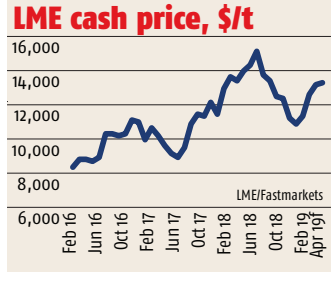


seasonally strong demand period. Indeed, improving demand dynamics in Q2 are key, especially in China as recent policy easing, including looser credit conditions, should have a positive impact in the coming months. Copper cash prices look set to exceed our Q1 price forecast of $6,230 per tonne and we are looking for $6,500 per tonne for Q2.

Nickel

Still bullish, but this year's deficit now looks smaller

Stock trends are one of the key indicators maintaining bullish sentiment towards nickel. At around 190,000 tonnes, LME stocks are at their lowest since June 2013. And taking cancellations into account, the available tonnage of warrants is below the 120,000-tonne level for the first time since November 2012. SHFE stocks are even lower, moving between 10,000 tonnes and 15,000 tonnes throughout Q1, compared with about 50,000 tonnes 12 months ago. At the current rate of outflow, global exchange stocks warn of a third consecutive annual supply deficit of more than 100,000 tonnes. We are bullish nickel, but not overly bullish. In fact, in the past month we have scaled



down the size of the deficit we are forecasting for 2019, to 63,000 tonnes, as Chinese NPI production has begun the year ominously much stronger than we previously expected. Further shrinkage in the underlying supply deficit would relieve pressure on exchange inventories and cap the upside to nickel prices. Our current Q2 forecast of $13,000 per tonne has begun to feel conservative.

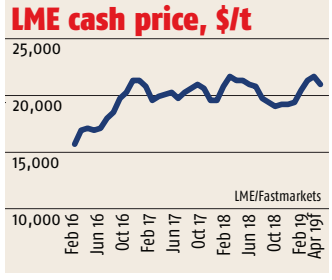
Fastmarkets MB

In this regular section, Fastmarkets MB's research team summarize their in-depth reports to highlight key factors driving the markets and their short-term price forecasts. The weekly service, Base Metals Market Tracker, provides independent analysis and forecasts for base metal markets and prices.

Tin

Focus may shift from supply to demand

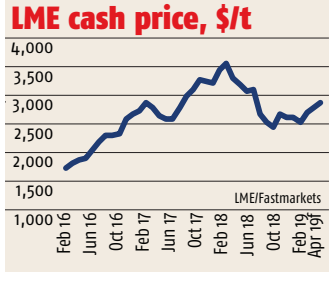
Tin has been all about Indonesia, the world largest supplier of refined tin and so often the swing factor for both sentiment and the fundamentals. The suspension of key smelter inspector PT Surveyor Indonesia by the ICDX in October prevented exports of metal from private smelters, in the process draining LME stocks, tightening spreads and raising prices, premiums and speculative positioning. But with that bottleneck now removed, after the lifting of PT Surveyor's suspension on March 4, those bullish trends should reverse. The correction has started slowly, with prices so far holding above $21,000 per tonne, no doubt as the market waits for material to show up. But when it does, prices could potentially fall fast. Should funds unwind this length in the same way they did in May/June 2018, tin prices could tumble by a similar 7%. That could take them back to around the $19,500 per tonne level. Our Q2 price forecast is $21,000 per tonne.



Zinc

Upside risks to price are emerging

Zinc prices extended their run-up to an eight-month high close of $2,900 per tonne in mid-March, as available LME stocks – already at low levels not seen this century – continue to fall. The key focus is on the smelting industry and how quickly it can transfer a concentrate market surplus to the refined market to relieve the acute tightness. In this regard, Chinese smelters in particular are the bottleneck. The latest data showed their output slowed to an annualized 5.11 million tonne-per-year pace in the first two months of 2019, from 5.74 million tpy in the year-earlier period and 5.68 million tpy in full-year 2018. The fact that Chinese smelters have been largely absent from the spot concentrate market suggest the anticipated rebound in refined production they are expected to drive, has not begun yet. We have increased our expectations for the full-year global deficit to 206,000 tonnes from about 150,000 tonnes previously. That puts our high-case price forecast scenario for Q2 in reach, which is $2,950 per tonne.



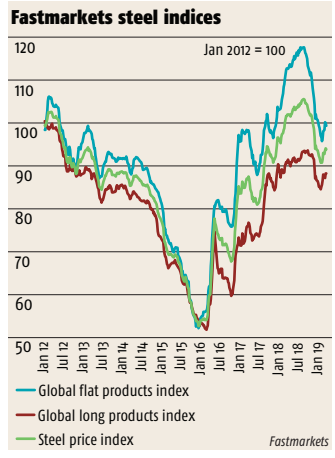
Analysis by **Andy Cole**, Fastmarkets MB

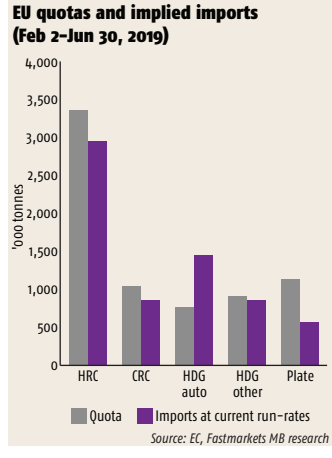
Steel

EU hot-dip galvanized import quotas are expected to be full before their reset in July

EU definitive safeguard measures have been in place since early February and only HDG is likely to reach quota limits before the reset in July. According to the European Commission (EC), between February 2 and March 12 HRC imports totaled 787,079 tonnes, or 23.4% of the quota. The daily run-rate suggests that February's volumes were around 551,000 tonnes, up by 4.9% year-on-year, but below last year's monthly average of 698,000 tonnes. As our chart shows, at current run-rates HRC, CRC and plate imports are not in danger of exceeding quotas and therefore being hit by 25% tariffs. Plate imports have been particularly slow, and we estimate that imports will fill less than half of the quota by July 1.

For HDG, the largest share of 'metallic coated sheets', however, the picture is different. The EC isolated automotive grades into a separate category, with China filling its allocation by March 8. 'Other countries' were left with just 677 tonnes below the cap, with more material awaiting allocation. Run-rates for South Korea suggest that the limit would be exceeded in both HDG sub-categories, as well as imports from India in the non-automotive grade segment. This could create a window of opportunity for European HDG producers to push for higher prices before the quotas are reset in July. But in the second half of the year HDG imports could rise sharply: the main exporters will have access to full annual quotas, making it possible to hike shipments, although this strategy risks having no allocation left for H1 of 2020.





North European HRC prices continued to drift down since the downtrend started in September 2018 and are on course to settle lower on a quarter-on-quarter basis. This would be the first Q1 fall since 2016 as safeguard quotas were unable to reduce competition from imports. Even in the HDG market, with tighter quotas, the only opportunity for European mills to hike their prices could be in the second quarter, but they might be prevented from ▶

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doing so by weak automotive demand.

In Germany, the largest producer in Europe, with the 42.8% share of the eurozone's automotive output last year, automotive production has been trending down since August last year as a result of an introduction of worldwide harmonized light vehicle test procedure (WLTP). In the first two months of 2019, German automotive production and exports both fell by 10.3% year-on-year. On a slightly more positive note, February's decline in production was just 1.5% after falls of around 20% in the previous three months, which could indicate that the fallout after the implementation of WLTP emissions tests is starting to fade. Oxford Economics forecasts that declines in German car output will continue through the first half of the year, but production will bounce back later in 2019. Negatively for demand in the EU as a whole, a sharp fall in car production is still expected in Italy this year, and smaller declines in France and the Czech Republic.

The automotive sector impacted performance of the European economy as a whole, with industrial production in the EU falling on a month-on-month basis in November and December last year; German industrial production declined by 0.8% in January. However, the momentum is expected to improve in the second half of the year, underpinned by solid consumer demand, leading to a pick-up in industrial activity in the region. In the flat steel market, a steady flow of imports will continue to weigh on local European prices, but a sharp downtrend should be avoided.

Analysis by **Marina Maliushkina**, Fastmarkets MB

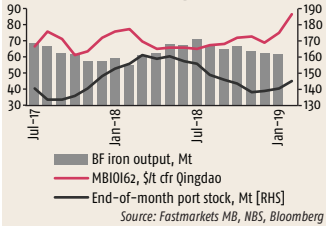
Steel raw materials

Outlook clouds for iron ore and coking coal prices in China despite supply-side disruptions

Blast furnace utilization rates across China's regions usually stay in a narrow range close to the average level, but the range tends to widen during winter cuts. Chinese steelmakers in some regions compensated for the loss of iron and steel production in other regions last year, and this year the scenario appears to have been repeated. Cuts happened mainly in North and West China. This year's so-called "winter season" in China was extended from October 1 to March 31, replicating plans last year earmarked from November 15 to March 15. Neither this nor last year's utilization rates came anywhere close to the 50% target announced by the government, averaging 80% in 2017-18 and 87% (until mid-March) in the 2018-19 winter cut periods. Although higher utilization reported this year may be to some extent attributed to capacity cuts, blast furnace iron output shows similar patterns. Members of the China Iron & Steel Association (Cisa) produced pig iron at an average rate of 1.70 million tonnes per day during October-February this winter season, higher than the 1.60 million tonnes daily average between mid-November 2017 and mid-March 2018.

Despite seasonally lower blast furnace iron production, we have seen iron ore prices increase during winter seasons, due to restocking activity. As our chart shows, Chinese steelmakers tend to stock up during winter cut periods, therefore supporting seaborne prices. The Fastmarkets MB daily MBIOI62 Index increased by $10.27 per tonne between November 15, 2017, and March 15, 2018. This winter season to-date the index rose by $17.28 per tonne from October 1, 2018, to $86.52 per tonne cfr Qingdao on Friday March 15. Price rises this year have been additionally fueled by iron ore production cuts after Vale's dam collapse with the supply disruptions affecting fines to a bigger extent than pellet, we at Fastmarkets MB research estimate.

Price tends to rise during winter cuts due to restocking



Source: Fastmarkets MB, NBS, Bloomberg

Iron ore prices inched down by $1.64 per tonne between mid-February and mid-March, and we expect the downturn to continue due to tight steel margins and high port stocks of iron ore available at competitive prices. Meanwhile in the coking coal market, we saw prices increase from $5 to $10 per tonne depending on the grades over the period, but the Chinese domestic market stability threatens the import price revival. The differential for China-origin premium hard coking coal (PHCC) over and above imported PHCC has been trending down lately, and history shows that as prices approach parity so seaborne prices subsequently tend to turn down, in order that imports can regain their competitiveness. In general, we understand that China's demand for coking coal, especially seaborne, is being directly affected by falling coke intensity at Chinese blast furnaces and indirectly by rising scrap consumption. And we expect demand for higher-grade iron ore will pick up in the second quarter, limiting coke requirements of Chinese steel mills.

Effectively the data suggests that when Chinese integrated producers choose to increase stocks of Brazil-origin iron ore, so the premium for PHCC over HCC coal increases. We believe that by storing higher iron-content ore from Brazil at ports and, by implication, consuming stock of lower iron-content ores, it follows that integrated mills' demand for coking coal, and especially the higher quality coal, increases so as to remove impurities from the lower quality ores. Naturally prices and premiums for PHCC rise as a result. We believe that as seasonal conditions change and higher-quality ore demand from steelmakers increase, so port stocks of Brazilian ore must fall. This we would argue is a negative risk for PHCC prices to China, given that premiums tend to fall when stocks from Brazil are in decline: when more Brazilian iron ore and less coke is being consumed.

Analysis by **Alona Yunda**, Fastmarkets MB

Jürgen Pilarsky

'People need to have the experience that they are allowed to be entrepreneurs'

In the space of just under 40 years, Cronimet has grown from running a single business from a scrap yard in Karlsruhe, Germany, to an international enterprise with annual sales of $3 billion. The group comprises two separate daughter companies – Cronimet Holding and Mining. CEO of Cronimet Holding and co-shareholder of Cronimet Mining Jürgen Pilarsky told Richard Barrett how the family-owned company has done it.

If the staff working at Cronimet's headquarters in Karlsruhe, Germany ever need a reminder of how the international family-owned business that employs them began, they can just look out of the windows of their offices to see the bustling original scrap yard where the business started nearly 40 years ago.

On the sparkling blue-sky day of *Metal Market Magazine*'s visit to meet Cronimet Holding CEO Jürgen Pilarsky, the sun glinted off multiple segregated piles of stainless steel scrap in the storage yards on the bulk-handling side of the headquarters building. On the opposite side, smaller bays hold stainless steel scrap destined for foundries rather than big steel mills, and a separate area holds different kinds of high-value titanium alloys.

A range of buildings house high-speed steel and tool steel scrap, ferro-alloys, pure metals as well as a range of technologies to analyse, sort and cut material, as well as to clean and shot blast it when necessary. The company's most exacting customers using vacuum furnaces need pieces of a particularly precise size and purity.

The long site stretches away into the distance, all bounded by a railway siding for freight wagons and a canal for barges on one side, and a parallel access road for trucks on the other.

Nowadays, from this hub of an international business that operates at over 70 locations worldwide, Cronimet's directors need to look beyond the horizon to the north and west to monitor progress at the holding company's subsidiaries in Western Europe and further still – across the Atlantic – to activities in the United States. To the east, the company has a significant, but separate, mining enterprise with a copper-molybdenum asset in Armenia and, to the Far East, a presence in Asia. In the southern hemisphere, the company has scrapyards in South Africa and further recycling operations in Brazil.

A family business

A timeline of the main highlights of Cronimet's expansion since its foundation in 1980 as Cronimet Ferroleg. (Ferro-alloys) by Jürgen's father, Günter Pilarsky, is peppered with well over a dozen milestones, but before running through them Jürgen outlined the present ownership structure of the business.

"My father founded the company in the last days of the 1980s, so we are looking back nearly 40 years – in 1.5 years we will have our 40th anniversary," he said with pride. Cronimet is a 100% family-owned business comprising two daughter companies. Cronimet Holding is primarily a stainless and special steel scrap processing and trading company, which were the activities in which the enterprise started its business and are activities that remain at its core. Cronimet's substantial separate company, Cronimet Mining AG, formed 15 years ago as Cronimet Mining GmbH in 2004.

"These are two separate companies and only the shareholder structure is rather similar," Jürgen Pilarsky stressed. "For Holding, my father is the main shareholder. I have a sister and a brother and we three hold the rest of the shares." In the mining company, Jürgen, his sister and his brother have an equal shareholding of one-third each.

Forty years of growth

Initial expansion began in Germany with the opening of a subsidiary in Düsseldorf, followed by further businesses in Germany. "Then, step by step, the business steadily increased – mainly through partnerships I

CRONIMET

would like to say," Pilarsky said. The net widened across Europe to include scrap yards in England, Sweden and the Netherlands, among others. Progressively, joint ventures formed and many of those subsequently became Cronimet subsidiaries.

"It has been 40 years that we have been growing, but it was nevertheless sometimes rather fast," Pilarsky recalled. Born in Karlsruhe in 1960, after graduating from university Jürgen Pilarsky studied social work at Bielefeld University of Applied Sciences and successfully completed his studies in 1988. He joined Cronimet in September 1989, initially working in the trading division.

Five years later, Cronimet made its first investment outside Europe, adding two small yards in South Africa, in Durban and Johannesburg, in 1994.

Just two years after that – in a step that was later to act as a springboard for Cronimet's entry into mining – the company started to co-operate with a ferro-molybdenum producer in Armenia called Pure Iron in 1996. The Armenian company was producing ferro-molybdenum from ore sourced from a domestic copper-moly mine, buying molybdenum concentrate and converting it into ferro-molybdenum.

"Armenia is rather isolated, so it takes a long time to get the material from Armenia to, say, Western Europe," Pilarsky noted. "So we pre-paid the first truckload – this is often the way that joint ventures start – and then the second, and more and more truckloads," he recalled. A similar approach has worked well for the scrap recycling side of the business, he explained. "That means that we often already have a relationship with other scrap yards before we enter into join ventures."

In Armenia, the long-term relationship with Pure Iron indeed led to the formation of a joint venture with the ferro-alloy producer. The foundation of Cronimet Mining came in 2004. "I always say that it was an opportunity that has unexpectedly arisen and that we have seized. It happened because the Armenian state decided to privatize the mine," Pilarsky said.

Cronimet's joint venture partner was worried that someone else from outside might buy the mine and that their offtake agreement for moly concentrate could be lost. "We have to participate. We have to buy the mine," was the conclusion of its management.

"This is how we as Cronimet, or as a family, began to discuss it: 'Do we enter into a mining business?'" Pilarsky said that his father was particularly keen on the idea, but that his children were more hesitant. "It was a huge step to enter into a mining business."

In the end, Cronimet participated in a tender process, which it won and entered into the mining business. "Today, we are also managing the mine by ourselves. This was a huge development, to develop this knowledge to be able then to manage a whole mine. It is a totally different business to manage a mine than to run a scrap processing business," Pilarsky stresses.

Timeframes and financing structures are, of course, substantially different – measured in days or weeks for scrap processing and trading, but in multiple years for mining. "It is decades or even more, and financing structures are totally different," Pilarsky underscored. "From today's perspective it was the right decision to make this a totally separate business because the mindset of the management had to be different," he added.

Just a year later, in 1997, Cronimet entered the US market, with the formation of Cronimet Corp. It now has 12 locations in the USA. Elsewhere in the Americas, the Holding company also has "two small and successful operations" in Brazil.

Mixed fortunes in China

Cronimet opened a representative office in Shanghai in 2005. The company still has business there, but Pilarsky is open that China has been a difficult market to work in. "It was bigger, but now it is coming back to the roots," he said of Cronimet's activities there. The company had a large yard in Shanghai where it processed scrap for the industry, but its size has been reduced substantially now.

Nickel pig iron is one chief cause. "We do still have relationships with customers there and we are supplying whenever the window opens to the stainless industry in China. But more and more the development of NPI and the inexpensive production of ferro-chrome in inner Mongolia means that there is more or less no imported scrap needed in China."

Pilarsky added that it is really difficult for west European companies to participate in China's domestic scrap processing industry, "So therefore we decided to scale down our operations there."

The sheer physical size of the country is also a challenge. "You cannot buy scrap in Beijing and take it to Shanghai [given the distance between them] – it makes no sense," Pilarsky explained. "There was no opportunity to upgrade this material to leverage this business," he added.

A European blend of steel scrap is understood by Cronimet's customers in that region, "But I have to say that this kind of blending is something that does not really exist in China," he explained.

The business mindset in China also differs from that in Europe at present. "Our customers have to be our partners. They have to rely on us. They have to know that everything works right with this blend in their furnace." He said that the company would do the same in China if there was a similar demand for, and understanding of, blends there as in Europe.

"China is of course an important market due to its size and economic power," he summarized. "The future will show how Cronimet can successfully participate in this market."

Growth continued

In 2009, Cronimet Mining acquired a chrome mine in South Africa, and, in 2013, the company entered into the business of processing industrial sludges. Cronimet has also entered into the business of certified destruction of aerospace engine parts in recent years.

The company made other investments to increase geographical spread, or to enlarge existing yards or enhance their sorting capabilities. While some of Cronimet's yards handle 2,000-3,000 tonnes per month of stainless scrap, others may supply four or five times as much.

There is a difference in scale between Cronimet's two top-level sister companies too. While about 3,500 people work at the mine in Armenia – and over 4,000 in total for Cronimet Mining – around 1,570 work for Cronimet Holding businesses.

Some of the company's yards do a little carbon steel scrap business too. "We talk about processing stainless steel scrap. But we do have, for example, a yard in Estonia where we also process carbon steel scrap – because of the size of the yard, the managing director there decided to enter into recycling or processing that, but it is not our core business," Pilarsky added.

Volatile and evolving markets

At 1.395 million tonnes, Cronimet Holding sales of stainless steel scrap in 2017 were only just short of 1.4 million tonnes, which is a threshold that Pilarsky expects the company will have exceeded a little for 2018.

The tonnage total for sales in 2017 was the highest achieved over the past 12 years and marks one end of a trend line that starts at a little over 1 million tonnes in 2005. While the long-term trend is unquestionably rising, its volatility is stark, showing peaks of over 1.3 million tonnes ▶

in 2006 and 2014, but a trough of below 900,000 tonnes in the depths of the global financial crisis in 2009.

How does Cronimet manage such long-term volatility in sales?

"I would say that in the past the bottleneck was the availability of scrap, because scrap is always cheaper than primary raw materials," said Pilarsky. "Therefore, in our history we have given to our customers a kind of formula where they have paid for iron, chrome and nickel content. Up to 2009, nickel paid 90%-plus LME prices. In 2005-2006 we were receiving over 100% of its price, because no nickel was available. In the end, it is about availability and demand as always in economics."

He reminded that the first peak in sales, in 2006, arose when nickel prices went up to $50,000 per tonne. "Everybody took out their last tonne of stainless steel scrap and sold it," he recalled. The opposite happened in 2009.

Scrap has traditionally been the cheapest raw material for stainless producers, but the international market has changed since NPI was introduced to the market in China and undermined demand for stainless scrap imports into the country because NPI nickel units were cheaper to produce. "That meant that scrap stayed outside of China, besides [domestic] scrap inside China itself, but there were no imports," Pilarsky added.

He noted that the latest step has been the start-up of Tsingshan Stainless Steel's production in Indonesia with material produced from liquid NPI and ferro-chrome directly to a stainless product, which changes the market outlook again. "This is a huge discussion we are faced with now," he added.

Pilarsky explained that a key response to the new market circumstances has been to remove as many price risks from Cronimet's business as possible. "That means that we are 100% hedged with nickel. So we are not speculating on nickel but, sure, chrome and iron we cannot hedge." Avoiding working with huge stocks is the other risk reduction tool used by the company: "Within 4-6 weeks we are turning our stocks over."

Difficult price negotiations

Cronimet Holding normally has four major flat stainless steel producing customers in Europe and three in the US, typically buying scrap on monthly contracts. "We need our customers and our customers need us," Pilarsky said. Additionally we have a handful of long stainless steel producing customers.

"We have monthly negotiations where we mainly discuss the level of discount from the LME price, just as has been organized in the past." Cronimet knows from past patterns of mill purchasing roughly what a given stainless mill's requirements are likely to be unless something unexpected happens at that mill.

But recent negotiations have become tougher. "Right now, it is really getting difficult because we are getting a lot of pressure from our customers. They said we have to supply them the commodity stainless scrap and it has to be, price-wise, comparable with [raw material costs for] the product coming out of Indonesia," he explained.

In other words, western world stainless steel producers are arguing that they have to compete with stainless steel production by Tsingshan Stainless in Indonesia, which is based on local low-cost chrome, nickel and iron units available there, and so are pressurizing their own raw material suppliers like Cronimet to reduce their prices.

"If we were to have a closed market in Europe and a closed market in the US and wherever, sure, for us then there is no need [for a high price for stainless steel scrap]. We do not need a price of $2,000 per tonne for stainless scrap, we would then be happy with $1,000 per tonne. We don't need a large price, we only need a small margin," he stressed.

He compares the stainless steel scrap business today with the position of carbon steel scrap processors 20 or 30 years ago: "This margin is more or less the same – it is a few dollars between buying and selling." While long-term output has continued to climb, Cronimet's net results are not growing like its processed volumes. "It is like everywhere in the world, every year you have to do more to get the same results," he said.

Impact on scrap processors

Pilarsky said that he understands mills' concerns, but that they in turn need to understand the dynamics of the upstream markets of the scrap processors supplying them.

"European steel mills fear the competition from Indonesia and I fully understand this fear, but this market for scrap in Europe is an open market. We have had this situation in 2009, and we are looking to the same situation now: where our suppliers are now becoming our competitors." He pointed out that if the prices paid by mills in Europe are too low, a lot of scrap then moves out of Europe.

He elaborated on the problem: "We are the last step before the steel mill. We have thousands of suppliers delivering to us, by truck mainly. What we are doing is processing this scrap so that it fits into the furnace and we blend it according to the needs of our customers. Suppliers who are close to the coastal areas are not only exporting stainless scrap… They are also getting each kind of non-ferrous metals, or even plastics and paper for recycling."

Pilarsky noted that those scrap suppliers, serving industries generating scrap as well as those needing to buy it, consequently have contacts, say, in China and India for their copper, aluminium and other non-ferrous metals, but also have customers for stainless scrap there. Quite simply, if the prices outside of Europe are much higher, then this scrap is leaving Europe. "This is difficult to explain to our industry in Europe. Right now, our customers think they are able to produce their products with this raw material scrap on the same price level as Indonesian-produced slab with liquid NPI and ferro-chrome. This actually creates a really difficult situation," he stressed.

The peak in Cronimet's tonnage sales in 2014 corresponded to another peak in nickel prices caused by Indonesia's decision to stop the export of nickel ore. "In the end, for us, we need these peak years to make money and we should take care that we don't lose money in the more difficult years," Pilarsky summarized.

The two daughter companies of the Cronimet Group generated a total of almost $3 billion in sales in 2017: $2.421 billion by Holding and $545 million by Mining. The operating profit of the Holding company in 2017 was just above $40 million and Pilarsky expects it to remain at the same level in 2018.

Diversification

Cronimet Holding has four business units: recycling, production, trade & sales and services.

In addition to processing stainless scrap, to which some of the company's locations are exclusively dedicated, at Karlsruhe Cronimet processes titanium and titanium alloys, high-speed steel and tool steel alloys, tungsten carbide, nickel-cobalt and cupronickel. "So in the end we are specialized in alloys," Pilarsky summarized. The company has also diversified by adding some additional businesses to its recycling business unit.

One of the more recent and most innovative additions to the Cronimet stable is its Envirotec business, with a processing

plant about 50 km from Leipzig. "The idea behind it was to have, for the future, a solution for sludges," said Pilarsky. "Manufacturing generates solid scrap and turnings – the traditional forms of scrap we have been processing – but we have not had a solution for sludges. So the idea was to service industrial accounts for these sludges. We are treating that and also alloyed sludges," he explained (*see separate article*).

Cronimet's Karlsruhe site is also home to an investment in advanced sorting technology. Laser-induced breakdown spectroscopy is a technique that has attracted the interest of the aluminium industry, among others, as a means to distinguish between different alloys.

Pilarsky acknowledged its application for the high volumes of, and relatively homogenous, scrap processed by the aluminium sector, but pointed out that its use to sort the widely varying shapes, forms and alloys in the scrap that Cronimet handles needs a different, bespoke solution. The company has partnered with the Fraunhofer-Institut für Lasertechnik Aachen to develop that.

"This is a learning curve and it will take another few years to take care of everything – at least, that is our experience," he said. Cronimet already has a pilot plant inside one of its Karlsruhe warehouses. "We are still in the implementation phase and everything works as planned, but we have to find out what the plant will be able to sort under industrial conditions," he explained. "We are convinced it will work well after a few more months of development.," he added. "It has required a lot of experience to develop the technology for our applications."

Trade and sales too

"We sometimes add to our recycling business, because of the relationships we have worldwide to suppliers and customers, by trading ferro-alloys or pure metals," Pilarsky explained, demonstrating again that the company is always looking to leverage its existing relationships to drive further business.

To give an example of the trading that Cronimet does, he highlighted a good relationship with PT Antam, the nickel producer in Indonesia. "Up to a few years ago, we marketed their material in Europe, but then – because of the huge demand in China – more or less all of their products went there." Cronimet still supports them by marketing their material when they sometimes have some spot business to do.

He also mentioned a tungsten ore producer in Mongolia, where Cronimet buys a truckload per month. "We have in the past supplied ferro-tungsten from China to customers in Europe. Customers to which Cronimet supplies ferro-molybdenum, from its own production, also require other materials like ferro-tungsten or ferro-titanium, so if you know someone who is producing it you can combine the business. This is a little bit of a side-business in this way."

CRONIMET

Stainless steel recycling is at the core of Cronimet's international business

Service with a smile

"Then we are offering our services," said Pilarsky, completing a whistle-stop tour of the range of Cronimet's business units.

Recycling superalloy scrap and nickel-based alloys for the aerospace sector is part of that business, offered by subsidiaries Metalloy Metalle-Legierungen in Germany, United Alloys & Metals in Los Angeles and Unico Alloys in Columbus, Ohio, for example. "Sure, we are purchasing turnings and have washing lines for them and sell them to the industry. Another option is converting contracts: we take the turnings and clean them, and return them to the client in a tolling process."

Pilarsky said this is something he would like the company to do more of in the future: "where we are adding service to the industry itself in general, wherever this kind of service can be provided."

Cronimet already has its own staff on some clients' sites. "For example, with one of our main customers in the United States, we not only supply the scrap, but we also have 2-3 people at their yard so we are supplying, as it were, free-delivered baskets. We do the logistics inside [the mill]."

At Karlsruhe and elsewhere, Cronimet has its own laboratories to analyze all types of alloy content – a capability of particular value to the aerospace sector, but also of particular relevance to the titanium and titanium alloys that the company processes.

Pilarsky said that the tungsten carbide scrap market is getting more and more difficult because only a handful of major producers of tooling use the material and they have buyback programs for used tools from their major customers at prices that are always above the price that Cronimet can offer. Cronimet still buys some spent tooling from smaller users, but the existing tungsten carbide scrap recycling business is declining.

All the same, Pilarsky is always keen to turn a challenge into an opportunity. "We do have this sorting know-how. So what could be an idea is to form a joint venture with one of the big tooling producers of the world, because we would say, 'Ok, you get your material back, but maybe you don't have this sorting and separating knowledge – this is something we could bring together'."

In its production unit – aside from its production of ferro-molybdenum at Pure Iron in Armenia, Cronimet has a partner in the Ukraine that produces ferro-titanium from scrap supplied by Cronimet – which then takes back its partner's output to market the ferro-alloy. Put simply, "It is toll production for ferro-titanium with a partner in Ukraine," Pilarsky explained.

Aeroengine part destruction

Yet another example of the company's diverse activities is a service whereby it receives scrap components from airline servicing and maintenance sites, which Cronimet destroys and recycles to ensure that the parts are not sold on to re-enter use in aircraft. The business receives turbine blades from aeroengines, individually tracked by serial number, and certifies that they have been destroyed by Cronimet.

As a trial, Cronimet purchased a complete redundant plane to understand the business potential of plane dismantling and recycling. While the fuselage and wings of a redundant plane at the end of its useful life can be recycled, primarily for their aluminium content, that is not Cronimet's core business. There is a spare parts market for many components that can legally be resold, such as passenger seats, "But this is more of a re-use business than a recyling business," Pilarsky observed, so the company has not ventured into that type of business.

Managing it all

Throughout his discussion with *Metal Market Magazine*, Pilarsky referred several times to progress that was made almost by accident, by the company entering into a little joint venture here, doing a little trading there, and then finding that the company simply had to have a mine in Armenia. But he swiftly rebuffed any notion that progress by accident in itself was an ▶

actual strategy. Rather, the approach has been to establish good relationships, encourage an entrepreneurial spirit in Cronimet staff, and then to spot and to seize opportunities wherever they arise. Evidence of that spirit is found in item number 1 on Cronimet's list of corporate values: "We think and act entrepreneurially."

So how does Pilarsky and the members of his senior management team direct such a large and diverse international business?

"We are centralized as we have to be. We have a holding company and the holding company is here in Karlsruhe, where we have financing, HR, and our central business departments. This is to offer these kinds of services to all of our subsidiaries. The holding structure is a service provider for our subsidiaries," he explained.

"So, the business itself has to be done in all of these subsidiaries. We are not telling them what they have to do tomorrow. They have to be entrepreneurs themselves," he succinctly summarized.

Cronimet is embracing digitalization as an aid to managing its widespread range of operations. "We are making our processes transparent to everybody in Cronimet. For me, this is the most important step that we have to do. We chose SAP about five years ago and we are rolling it out ourselves, so about 60% of our businesses are connected [to the platform]. This at the end should give us this 100% transparency for everybody," Pilarsky said.

"The next step will then be to collect all the big data and information, and to create a proper process out of it," he explained. "Further we want to connect it with our customers and our suppliers." One of Cronimet's major European stainless steel mill customers is introducing SAP for example. "This is the future – other industries are doing it already and it is not rocket science," Pilarsky said.

Power as a service

Cronimet's mining group comprises its mine in Armenia and the chrome mine in South Africa, but it has also spawned an energy business. When the company built up the mine in South Africa, which is off-grid in a remote location, it had to find a way to generate energy for it. The solution was a 2 MW photovoltaic solar array.

Using that experience, Cronimet has offered the technology to others needing to generate electricity in remote locations. "We got a contract with some people to supply such solar power technology and now we have a joint venture to supply mainly smaller power projects in South Africa for projects up to 6 or 7 MW, or smaller projects for tourism sites in the bush set up for activities like viewing wildlife," said Pilarsky.

"It is really a small business," he added. This is another example of Cronimet's owners showing all the signs of the serial entrepreneurship that has seen the company grow substantially over its nearly 40 years of existence. Every opportunity taken seems to lead to more.

"This one happened by accident because we needed energy. And what we need, all the other mining companies need too," said Pilarsky. "Our idea was that we would offer energy and that in return miners would pay us back by supplying their product. In other words, they would pay for energy with ore. It was a good idea, but when we introduced it to the industry, it was a difficult time." He added that miners generally preferred the established means of using diesel-fuelled electricity generators on site.

"Maybe it was the wrong idea or the wrong time – sometimes it's different – but this is only an example. I think it was a really good idea, which we started with our own pilot, and now we have a lot of other projects where we have shown that we are able to provide this service of photovoltaic solar farms, but, to be honest, at the beginning the idea was different."

Processing – the future

Cronimet's mining division also has a trading arm, which trades concentrate, and a processing business unit, which Pilarsky says is particularly interesting for the company's future development.

The latter division already has four projects, where metals from old historical tailings at closed mines and operations – or at operating mines such as Cronimet's own copper-molybdenum mine at Karajan in Armenia – are being sorted by using today's latest technology.

The project at Karajan is achieving in-pit sorting of ore to separate out material worth processing from that which is not, rather than sorting it out at the processing unit, where time and energy has already been spent to transport the material there.

Cronimet is also sorting out the metal content from 'iron mountains' created by steel companies in the US during the late 19th and early 20th centuries when they dumped waste materials from their operations in the Pittsburgh area. "Now we are reopening them and sorting out the metal content in them," said Pilarsky.

In another of the current projects, Cronimet claims that after five years of test work and technology development, it has achieved a recovery rate of over 70% through electromagnetic sorting of nickel ore and ferro-nickel from a low-grade stockpile.

Further projects are under way, at Alaska Copper in Zimbabwe, and for tungsten in South Korea, for example. Straightforward magnetic separation works to extract iron, but a multitude of other sorting technologies are being deployed to separate non-ferrous metals. "It is always related to experience," Pilarsky stressed. "Nothing works a second time again," he said, explaining that the sorting methods and technologies applied for any particular project need careful tailoring to the needs and materials of that site.

"We need the mining mindset for this," Pilarsky observed. "For the Iron Mountain project, for example, you really dig down holes to get an idea of whether it makes sense to open it." And just like the risks of primary mining, "You could invest a lot of money and then find it doesn't make sense. It is a long-term business."

Defining company culture

Pilarsky said that social, economic and ecological responsibilities are particularly important to Cronimet as a family-owned company. They are among the company's list of corporate values. The business also has a dozen leadership principles based on openness, learning, care and progress.

These values and leadership principles help to define the company's culture. "A company culture is always the whole experience a company made throughout its history, so if you want to change something and to have entrepreneurs, people need to have the experience that they are allowed to be entrepreneurs," he explained. "This needs time to develop," he stressed. "This is the view we like to have of our company." On leadership principles, you cannot say that you have just established them and then expect that they will work 100% from one day to the next, he elaborated.

So is that partly about giving people the room to make mistakes as long as they are not too big? "Maybe not a second time!" he responded with a smile. "Everything that works today has been tried out at least once," he emphasized.

"You have to try things out and it is important to try things out. And it's ok if you say it doesn't work – then we say 'forget it'. If it does not work the first time, then it's not really a mistake – at least we tried something out. Maybe this is another good example of entrepreneurship again," he said.

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Cronimet Envirotec – A case study in innovation

The expectations of the brightest young people entering the world of work are markedly different from what they might have been when today's major metal industry leaders entered the business.

The nearly 40-year-old international business Cronimet Holding realized that to attract and build an innovative management team to run one of its most recent acquisitions – a company now recycling industrial sludges and metal powders at a plant in Bitterfeld-Wolfen, 50 km from Leipzig – it would need to adopt a non-traditional approach to recruitment and provide a modern office environment.

The solution was to treat the subsidiary company as an "incubator" business and to open an office in a co-working space on the sixth floor of a skyscraper located beside the main university buildings in central Leipzig.

It was there that *Metal Market Magazine* met Cronimet Envirotec CEO Filipe Costa to discuss the subsidiary's strategy, progress and priorities, while surrounded by contemporary furnishings and wall murals, a variety of works of art and some small potted succulent plants. At just 36, Costa is the oldest member of the management team based there.

Discussion took place at a large black satin-finished table, which doubles as a table tennis table, while along the corridor a selection of small but well-equipped glass-fronted offices provide private workspaces, smaller meeting rooms with sofas and screens, and shared spaces for teams using common areas.

The trendy 'start-up vibe' that the whole working environment offers seems to have paid dividends for Cronimet Envirotec, although Costa stressed that, as a four-year-old business, the subsidiary company is well beyond that stage of its development now.

A strategic acquisition

Cronimet first took interest in an independent business called Destimet Green Services in 2013. Costa said that at the turn of that year into the beginning of 2014, Cronimet already knew about the vacuum distillation technology that the company was developing, but knew little about Destimet as a business.

After learning more, Cronimet took a minority share in the company, based on its interest in the technology and its applicability to the metals market. During 2013-15, Cronimet developed its understanding of the business model further and, by the beginning of 2015, decided to acquire a majority share of the company. Costa joined the business in January 2015.

His clear mandate was to develop a strategy focused on the metal market and to integrate the company with, and to broaden the capabilities of, Cronimet itself. "We decided to buy out the company 100% in August 2015," Costa recalled. "We then had the freedom to reshape the company and implement the strategy that we developed," he added.

More people were hired and production capabilities ramped up. "Our first step was to get the production staff up and running and then to get more production staff because we foresaw growing demand," Costa explained. This process was implemented throughout 2015.

At the beginning of 2016, the focus changed from growing the production team to expanding the whole team around their output to support the business. "We hired a sales director and started developing our sales team. I was getting to know the market, because I came from outside the metals market (*see box*). I started to get new customers and that was an interesting start right there," Costa recalled.

The new sales team also focused on getting to know their customers in order to penetrate their markets because the client base and material suppliers were not the same as the metals businesses that Cronimet already dealt with.

"We are always working with the producers of metal parts and really the places where the waste is produced. We didn't have traders in between us and them," Costa recalled. By the second half of 2016, it became a priority for the subsidiary to deepen its integration with the Cronimet group. That process included helping the group's traders to understand the value of industrial sludges, Costa recalled.

It also demanded rebranding the company to become Cronimet Envirotec. That project started in mid-2016 and was completed by the end of that year. "So in January 2017 we started with a new website

CRONIMET ENVIROTEC

The plant in Bitterfeld–Wolfen processes industrial sludges and metal powders

homepage, name and brand," said Costa. The holding company liked the logo and the website design, style and structure that Envirotec developed and has rolled that out to other parts of the group when needed. "It was a way that the company showed how we work together with ideas going both ways," Costa noted.

Digital and mobile

"We also realized that we were still working like a typical mid-size German company," Costa recalled. "It was not mobile, it was not cloud-based, it was not 'digital' at all," he added. Other companies that he and members of his team had worked for had a completely digitalized world. "So we decided to bring that to us at Envirotec."

Costa himself does most of his work on his iPad. "That is something we changed at the beginning of 2017 in order to be more mobile and agile and to have the information we need wherever we are," he stressed. "I have everything I need in here," he said, pointing to his tablet.

The company uses Google G Suite. "We report everything into the cloud, taking advantage of all of the security features they have built in," said Costa. "That is how we manage our data. We have a policy that we want to have everything readily available on our mobile devices. We work together on documents for example. It makes our life easier," he explained.

Envirotec's plant at Bitterfeld-Wolfen is in an industrial area of eastern Germany. "It is a very nice town, but it is difficult to attract young talent to that area," said Costa. So it was in 2016 that the company opened up its small co-working office space in Leipzig, with the idea of attracting Masters students to work with the business. "That gave us the opportunity to get to know them better and they got to know us. Many of the people that we now have as full-time hires with us started as students and came from their studies for Masters degrees," Costa explained. Cronimet Envirotec now has 28 people working for the business.

"There was not a culture clash [for the new recruits] when we started because they helped to create our culture and they lived it. The only thing that has changed [for them] is that they now have to be here!" he smiled.

Working time in Leipzig is flexible. Of necessity, the staff at the production plant work 24/5 on a three-shift basis. All staff have to follow standard operating procedures (SOPs) when required. The plant has three shifts of four workers, two people for logistics, a maintenance worker and a plant manager: "She brought another view to the company as an engineer," said Costa. Two more staff work full-time on logistics, invoicing and regulatory waste issues. "We are a certified waste handling company, so every single kilogram of material that goes through our hands has to be logged and documented," he stressed.

Over the past two years, the company focus has been to grow within the metals market, to get to know customers even more, and the technologies they use that produced the waste that Envirotec processes. "And at the same time to grow this team and to have the technological proof of concept, to run the plant continuously 24/5, and to implement all of the learning that we had from the previous years of operating the production system," Costa summarized.

Present focus

Envirotec is looking to innovate further and to focus on several key projects this year.

The biggest investment is to build a new storage facility and yard for incoming metal sludges and powders. It is a large, liquid-proof, three-sided covered concrete building, lined with an oil- and waterproof impermeable membrane. The raw material store is being built on a 2,500 square meter overall area and will be subdivided to hold different types of material.

"We are also changing some parts of our existing yard to use both capabilities together to make the process more efficient," said Costa. Work is scheduled for completion by June 30 this year.

"We hope at that time that we will be able to accept all of the material that we are being offered. At the moment, one of the challenges we have is that we do not have a big enough storage area to manage all of ▶

A chemist and business leader

Cronimet Envirotec's 36-year-old CEO Filipe Costa holds a PhD in chemistry, for which he wrote his thesis about the use of carbon dioxide as a chemical building block in work that he did in Germany. His research group was particularly interested in catalytic methodology and systems.

At the same time, he started to do a three-year modular MBA in Stellenbosch, South Africa, near Cape Town. It focused on leadership and ways to think differently on a strategic basis. He said that it demanded a considerable amount of self-analysis and that "It changes the way that you think and makes you more aware of the people around you that you work with."

He said that a period of operating in "two different worlds" when completing his PhD and working in Germany – in between flying to South Africa for MBA modules – was hard work but also a very stimulating time that broadened his horizons.

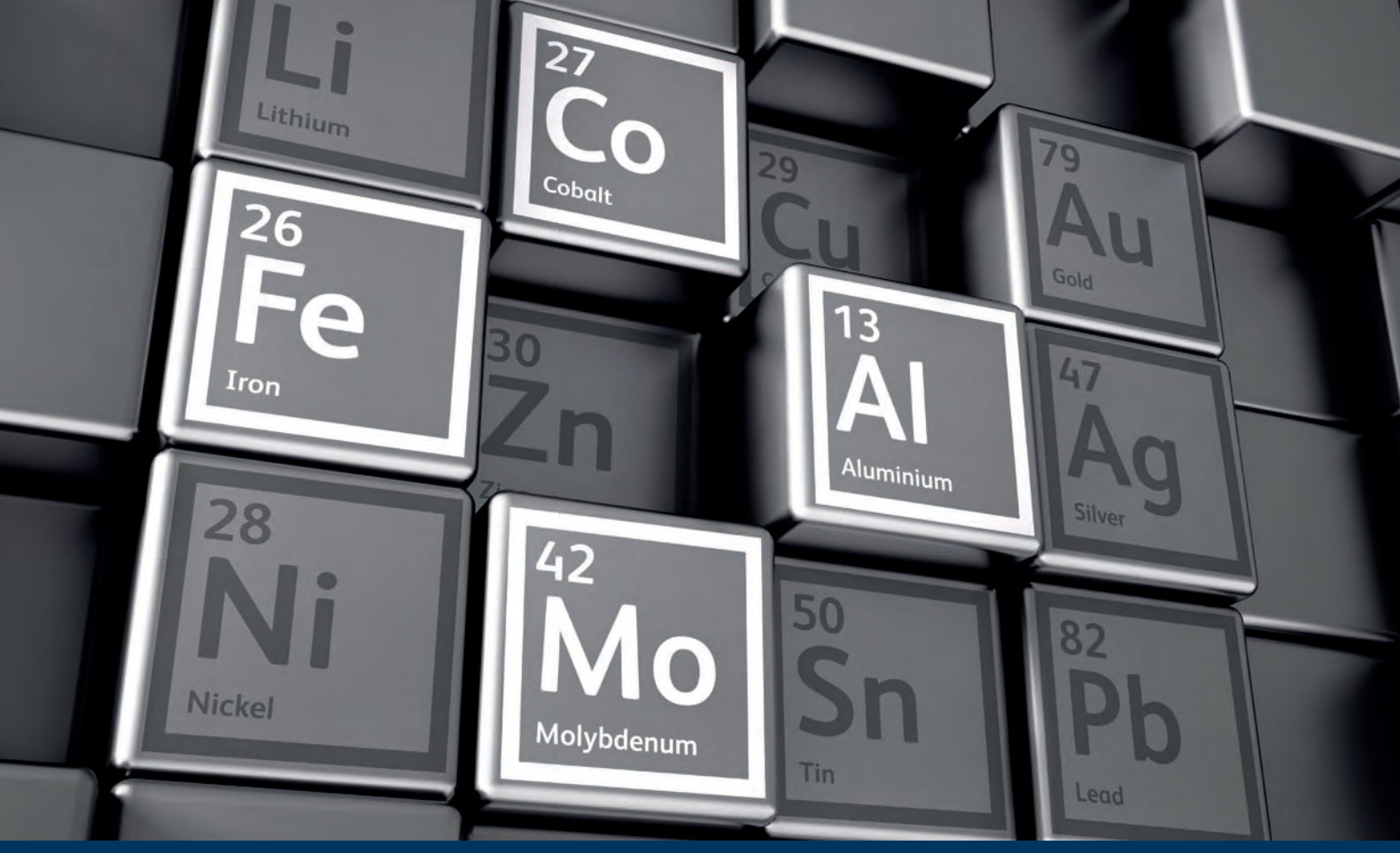
On completing his PhD, he joined a large chemical company and started work in a laboratory in "a typical corporate job." The MBA changed his outlook, with its business content and emphasis on entrepreneurial thinking.

While living in Berlin, he subsequently joined a group of entrepreneurs who founded a company for the pyrolysis of end-of-life vehicle tires. The process evaporated the rubber content of the tires to win an oil, and to recycle separate types of carbon black from different layers of the tire, leaving steel tire cord.

They built a proof-of-concept plant in Germany to run continuously and managed to develop a carbon black that was the first to be recovered from a tire for the manufacturing of new tires.

When a larger competitor bought out the company, Costa decided to expand his personal development at that point by accepting an offer to join Cronimet.

He said that they have a very collaborative approach to management and that the entrepreneurial approach encouraged by the Cronimet group is also nurtured within Envirotec: "That way the sense of responsibility and accountability grows," he explained.



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SETTING THE GLOBAL STANDARD

Vacuum distillation technology

Cronimet Envirotec has two similar production units at its site in Bitterfeld-Wolfen. Each has a 12 cubic meter dryer that can accommodate tonnes of material to be processed. Material is charged into them from the top from a holding bunker. Vacuum valves open to charge material into the dryer and close when all of the material to be processed has entered. The plant occupies a three-storey building.

The dryer is then heated. It contains a rotating shaft fitted with paddles to stir the material in a figure-of-eight movement. A thermal oil system heats the outside of the dryer and the shaft inside it to maximise heat exchange with the contents and thermal efficiency.

"As soon as the contents start to move from the liquid to the gas phase we filter out the dust from the gas, while metal content stays at the bottom of the dryer," Costa explained. "The gas stream goes through a quenching and condensation unit where we win back water and oil after cooling it down."

As the process runs at temperatures above 300°C, much care is taken when discharging the machine. Removing several tonnes of very hot metal powder with a high surface area could be hazardous but, to avoid a reaction with oxygen, the plant has a cooling bunker under a nitrogen atmosphere. The material enters the bunker at temperatures above 300°C but, after short and intensive cooling, the material emerges at 60°C.

"We are now building up a briquetting facility, into which discharged powders will enter directly in order to produce almond-shaped briquettes with binder content of less than 5%," noted Costa. He stressed that throughout the whole process, the metal that the company receives remains metallic, rather than emerging as an oxide. Consequently the foundry purchasers of the recycled metal do not need to have a reduction process, but can melt the metal directly.

the customer input that is coming in," he explained.

"Our overall 20,000 tonnes per year of processing capacity will be the same, but our efficiency will be higher," he said. At present, rented external storage facilities, certified to handle these kinds of materials, are used in addition to the company's own yard, but that presents more of a logistical challenge.

It will be far more convenient for the company to have a single buffer stock of materials to process on their own site. Capex for the new yard and a new briquetting facility is within the range of €2-3 million ($2.3-3.4 million).

Many materials processed

The types of material that Envirotec can process are many, various and growing in number. The speed of processing material depends in part on its physical consistency. "If it's wet, it goes a bit slower. If it's drier, it goes a bit quicker," Costa explained. Wetter sludges tend to have more oil content.

"We have 64 different material codes and growing. We started with four or five in 2015," he said. That does not represent 64 different customers or 64 different types of material, however. "On the nickel-containing material side, for example, we have each code representing a different percentage of nickel content," he explained

The appearance and overall composition of metal-containing sludges are similar – a grey-brown material that also contains a water and oil emulsion. "We are in a nickel-based metal market, high-speed steel and hard metal market," said Costa. "Those are the three markets that we are focused on, and also the subsidiary industries that supply these markets of course," he added.

Envirotec also has clients in heavy industry, where it works with catalyst recyclers and other companies that need to have oil and moisture removed from their catalysts, such as tungsten, vanadium or nickel catalysts used for industrial processes. These are usually in the form of pellets and become covered by a lot of oil and water in use. "They create challenges for the further downstream processes of our customers, and that is why they come to us for their treatment. We offer our services on a tolling basis," said Costa.

Tolling work represents about 25% of Envirotec's business at present. Within the other 75%, depending on the metal content and the value recycling can create further downstream, the company has customers that have to pay for the metal to be recovered because they have hazardous sludges that demand very strict treatment, with some constituents that need to be disposed of afterwards. Some materials are delivered for free, while others are purchased by Envirotec at a price based on the metal content.

"We work in a very complex market for sludges and powders. Customers have a choice. Some may choose to dispose of it somewhere else, burn it off or send it to landfill. Most of those options are downcycling or not recycling at all – just disposal of the material," Costa said.

"But disposal and landfilling in Germany costs more money than we do," he stressed. "We can be highly competitive to other options within the market. We do this by being as efficient as we can be. We are cutting down costs, have a process that is lean and does not create too much waste on site."

Plant capabilities

A focus for the original Destimet Green Services was to serve the industry for solar panel manufacturing. "Part of the production process generated a silicon cake mixture as a slurry or sludge. The idea was to use this product and dry it to get the silicon back," Costa explained. It also had the idea to be a recycler of mineral waste in order to treat contaminated soil removed from sites before building work could commence on them.

Neither of those activities is a focus for Envirotec now, but work with the oil industry, started on a small scale by Destimet to process mud from drill cuttings, continues. "When you are drilling for oil, you have to add a lubricant to the drilling head," Costa explained. "You inject oil and water when you're drilling offshore, so the mineral, oil and mud comes out when you are drilling." Envirotec has managed to grow that business. "We are still handling that and have been treating that material since 2013, and on a stable and growing basis since 2015."

The synthetic oil that this mud often contains is extremely expensive, Costa noted. "We are able to 100% recycle the oil and the customer gets their oil back," he summarized.

Treating drilling mud now accounts for 15-20% of Envirotec's business. Metals account for about 60%, and the balance is tolling and other work.

Further development

"For everything we have in large, we also have the same in small," Costa said, referring to a small pilot facility that the company has at its commercial plant to test out different new materials that could be processed, to carry out laboratory tests and to produce small-scale metal briquettes as samples. ▶

The fastest customer that Envirotec secured – operating in the automotive sector – took just two months. That speed came in part from the fact that the sludge to be processed came from a German customer operating under German regulations. "We have to have a disposal contract for such material and we are under a privilege rule in Germany because we are a certified waste management company able to take waste from other companies in the country [with less paperwork than if it came from elsewhere]."

The fact that the client already knew exactly what the content of the material was and had already carried out thorough sampling helped to expedite the contract. After laboratory testing at Cronimet at a 0.5 kg level, followed by scaling up to 100-200 kg at the pilot plant, it was determined quickly that all was well to proceed with commercial processing. "We received the first shipment of 20 tonnes of material coming in two months after we started," Costa recalled.

Envirotec has customers throughout Europe, including the Netherlands, France, Austria and Italy, as well as in Germany. Clients can call on the waste handling experts within Envirotec as well as within the Cronimet group itself. Costa acknowledges the help that Envirotec has received from Cronimet's quality management and regulatory issues department in particular. Obtaining the necessary regulatory approvals for the new yard at Bitterfeld is one of many areas in which group expertise has assisted progress, he noted.

CRONIMET ENVIROTEC

Throughout the whole process, the metal received remains metallic

Further capacity expansion

Costa also said that the commercial units operating at Bitterfeld (*see technology box*) are already of optimal size. Future increases in sludge and slurry processing capacity there would need extra units to be installed, but is there scope to build a similar plant elsewhere in the world, potentially at one of Cronimet's many other international sites?

"We need to evaluate and learn the markets and their drivers," Costa responded, noting that they are different in Europe from those in the US or Asia. "If the regulatory and market needs are there, then yes, we definitely see an opportunity in the future."

Up to now, Envirotec has been working closely with Cronimet's central laboratory in Karlsruhe, where it has been sending all of its samples for analysis. The volume of business now under way has justified Envirotec investing in its own analytical laboratory equipment to test samples at its own site, next to its existing pilot plant equipment, while continuing to draw on the central laboratory's experience.

Envirotec also hopes to have a full-scale plant for briquetting up and running by mid-year. "We have projected capacity for that of 30,000 tonnes per year of powders to allow for future expansion in briquetting," said Costa. That line could take powders sourced from elsewhere, in addition to those produced by Envirotec's own vacuum distillation process.

Costa is looking forward to the inauguration of the new yard and storage facility later in the year as well as getting to know the powder market to feed Envirotec's new briquetting facility. He explained that powders for processing by Envirotec into briquettes could arise wherever metal is treated without water and oil for surface optimization, such as in shotblasting. "This is something completely new for us, which we are still learning about," he said.

Market drivers

Given the range of materials that Envirotec can process, the number of potential customers is large. Costa said that while Envirotec has to be competitive on pricing, "and our growth shows that we are," the company also focuses on recycling and keeping metals within that loop. "We want to stop the loss of resources," he added.

He said that the company's customers do not focus solely on price: "We have seen from C-suite levels in companies that they want to see their companies being more sustainable and efficient." They are consequently looking for more sustainable options and means of recycling waste.

"That provides an opportunity for us," he stressed. "If you work with a company like us, we have 100% transparency and are quite nimble. We offer our customers different solutions. They come to us when they want to dispose of some material and we take care of everything – from sending them specialized ASP 800 galvanized steel containers, which are fully certified to handle and transport dangerous waste, to arranging transport and offering them a full service," Costa explained.

By that means, the company integrates itself into the customers' processes. "That was one of the priorities we have had in recent years, so having the right management team to manage such complexity is also one of our priorities," he added.

"Another priority is to manage our growth," said Costa. "We are now a four-year-old company. We are a young and innovative company, which is learning and whose business is getting more complex by the day. We try to manage that – to manage that complexity into where we want to be and to integrate that more into Cronimet because, wherever we have complexity on our side, we might get help from somebody in the Cronimet group."

He concluded that being part of a large family-owned business with a top-level management that has embraced innovation at Envirotec, and across the whole group, is a big advantage.

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Uncertainty looms over non-ferrous scrap trade

The pattern of international trade in non-ferrous metal scrap is changing – not least due to changes in China's import policies. Myra Pinkham reviews the changes to date and considers potential future impacts

SHUTTERSTOCK

Some grades of aluminium scrap have been easier to trade than others

Despite much uncertainty in the US non-ferrous scrap market – a lot of which is due to a lack of clarity about new Chinese import restrictions that are slated to take effect in July, coupled with lackluster domestic demand – there is some cautious optimism that 2019 as a whole will be similar to 2018. Last year in itself turned out to be a better year than some had expected.

"While demand for non-ferrous scrap is subdued, processors can move their material as long as they can stomach the price," C.T. Hardison, director of non-ferrous at Padnos Co., says. This, however, varies by commodity, with copper and brass scrap being fairly solid and consistent, while stainless scrap, on the back of rising nickel prices, is slowly moving up. The market for aluminium is less well defined. While secondary smelter demand has been consistent, albeit at very low prices, some grades have been easier to move than others.

Overall, non-ferrous scrap – particularly the copper and aluminium scrap that accounts for most of the market – has been selling at very wide discounts to primary metal, which tends to indicate that the US market is well supplied. "So, while we have seen better non-ferrous metal exchange prices (both on the London Metal Exchange and on Comex), the scrap industry hasn't been able to reap the same benefit," Joseph Pickard, chief economist and director of commodities for the Institute of Scrap Recycling Industries (ISRI), points out.

John Mothersole, director of research for IHS Markit's pricing and purchasing service, explains that this is largely due to China's National Sword Initiative, which is an effort by China to limit imports of a wide range of materials that it defines as waste – not just metal scrap.

There is concern in the marketplace that China is now trying to position itself to stop imports of important materials, including non-ferrous metal scrap, altogether. "For years Chinese buyers have knowingly been purchasing material from the rest of the world that contained a lot of waste, but now they believe that they can do better generating their own scrap," Randy Goodman, executive vice president at Greenland (America) Inc., explains.

Goodman maintains that it was those restrictions, not the Chinese retaliatory tariffs upon US aluminium and copper scrap, that has been affecting those markets, particularly the aluminum scrap market. He explains that while China has placed a tariff on aluminum scrap that affects zorba, there is an exception with any scrap that is re-exported as ingot not being subject to the tariff. "So, while it has had an effect, it hasn't been a stifling effect."

That does not mean that the US non-ferrous scrap market will not be impacted by the US-China trade negotiations that were continuing at the time of writing. Michael Diehl, director of copper at Alpert & Alpert Iron & Metal Inc., says that China's National Sword initiative is redefining what is recyclable. "Some lower grade scrap items won't necessarily have a home if we don't have the manpower to pull it apart and extract it in order to get the desired value of it."

Even though the Chinese import restrictions have been described as being onerous – especially by those who are quick to point out that ▶

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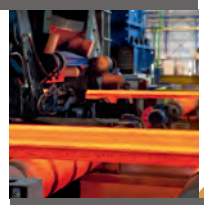

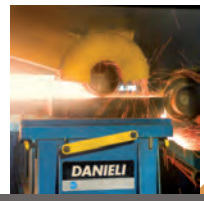

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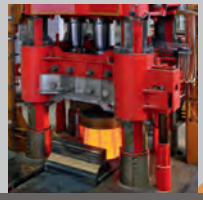

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China has never hesitated to manage trade – Mothersole says that it could also be argued that a reasonable case could be made for these restrictions on environmental grounds, since China does not want to remain as a destination for low-quality imported scrap products.

These developments have further incentivized companies to invest in more sorting and separation equipment and to improve their sorting processes to produce a more consistent, higher quality product, Pickard notes. "We will continue to see that trend going forward." Such investments have reportedly been further supported by the recent US tax reform legislation.

But even though high-quality scrap is not all that hard to sell, Rose Mock, president of Allied Scrap Processors, notes that processors still find it difficult to get a timely appointment with consumers because they tend to have a lot of scrap on hand.

This comes as there are some concerns about how strong domestic demand will remain, Mothersole says, especially given that the scrap market tends to be very sensitive to even very small changes in demand. While new orders for both copper- and aluminium-consuming industries have worsened over the past six months globally, the US has been the last major region to see deterioration.

Metal-specific trends

The impact is not equal upon non-ferrous scrap commodities. Goodman says that the copper scrap market is currently doing well, although it is running into a period where it could get a little less certain, while the aluminium scrap market has been tougher. While domestic demand has been satisfactory, ISRI's Pickard says there has been more than enough supply to meet that demand.

Even though the domestic copper scrap market has generally been described as rather tight, Diehl says that it has not been so tight that consumers are not satisfied: "They are getting what they want to fill their needs at relatively cheap prices."

Nickel has been fundamentally tight. Because of that, Pickard says that its prices have outperformed some other non-ferrous metals so far this year. This, he says, has increased the availability of stainless steel scrap at a time when there is just a limited number of US consumers. At the same time, however, overseas demand – particularly from India, Canada and Vietnam, has been up.

SHUTTERSTOCK

US exports of copper and copper alloy scrap into China fell by 60.1% last year

For copper scrap, Mothersole says that there has been somewhat of a "dance" when it comes to the demand drivers, given that it mainly goes into wire used by the construction and machinery sectors. He notes that last year US tax cuts were supportive of equipment investment, but this year some of that investment could cool off.

Meanwhile, the US construction sector, while still growing, has not been as strong as some anticipated. According to the latest data from the Census Bureau, US construction spending was only up by 1.3% month-on-month and 0.3% year-on-year in January.

For aluminium scrap, Pickard says that there appears to be plenty of aluminium scrap inventories on the ground. There has, however, been two distinct divisions when it comes to domestic aluminium scrap demand. Stephen Moss, vice president of Stanton A. Moss Inc., points out that while there continues to be high demand for high-purity grades, other secondary grades are suffering from weak demand. He says this is because of a combination of falling secondary metal prices and the recent easing of domestic auto production and sales. According to Hardison, mixed automotive clips have been particularly difficult to move, largely due to their chemistry.

Automotive influence

While US automotive sales are still at historically high levels, bolstered by continued strong demand for light trucks, Stephanie Brinley, IHS Markit's principal automotive analyst, says they are expected to contract to about 16.8 million vehicles this year from 17.3 million vehicles in 2018. Even though growth in the light truck share of total sales is seen as being positive for aluminium, and therefore aluminum scrap demand, Moss says that given trends in automotive usage and demographics, including the emergence of self-driving cars, he is concerned that over the long term the automotive industry could continue to contract.

A recent Center for Automotive Research report states that, cumulatively, the Section 232 tariffs on steel and aluminium, the Section 301 tariffs against China, and the potential Section 232 on imports of cars and auto parts could result in a 1.3 million unit decline in US light vehicle sales.

Pickard says that the aluminium scrap market has also been impacted by the rise in domestic supply of used beverage cans (UBCs), with some major buyers stepping out of that market. As a result, the UBC price had fallen to about 56-57 cents/lb at the beginning of March, down from about 76-77 cents/lb a year earlier, but moving back up slightly to 61-63 cents/lb mid-month due to seasonally slower flows.

Pickard also notes that there has been concern about what the impact will be now that US sanctions against aluminium from Rusal have been lifted. "That has been a bearish signal for the aluminium market and part of the reason why primary aluminum prices have not been doing as well as other non-ferrous metals," he says. Goodman says that he believes that it was because of the sanctions that aluminium had a softer than expected landing last year, "But now that those sanctions have been removed, all bets are off. If the US market fills up with Russian ingot that will displace aluminium scrap, forcing it into the export market."

Asia's dominance

But, as for so many metal markets, it is China that has the biggest ▶

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impact. Just taking account of the restrictions that went into effect in March last year, Pickard notes that US exports of copper and copper alloy scrap into China fell by 60.1% last year, contributing to an overall 9.1% year-on-year decline in US red metal scrap exports, even though US companies had been able to increase their copper exports to certain other countries.

While other countries did pick up some of the slack, Hardison says that many of those countries' purchases were somewhat sporadic, coming in and out of the market – and overall they have been unable to consume all of the scrap that China used to buy. Not all of those countries are actually consuming the scrap that they have been buying, Goodman points out, noting that, for example, Malaysia processes the majority of the scrap it buys to ship furnace–ready material to China or elsewhere.

Pickard says that last year the biggest increase of US copper scrap exports was to Malaysia, rising dramatically from a very small base of 5,553 tonnes in 2017 to 118,877 tonnes last year. He says that India, which, unlike Malaysia, has been increasing its brass mill infrastructure and has been increasing its purchases of a wide variety of metal and non-metallic scrap products, purchased 48,428 tonnes of US copper scrap in 2018, nearly double the 24,869 tonnes that it purchased during the previous year. Goodman says that while some consumers in India are currently running at over 100% capacity utilization, they have been cautious about adding more capacity until they can be sure that their current demand is sustainable.

Pickard notes that US copper scrap exports increased by 164% to Japan and 127% to South Korea last year.

The overall picture has been different for US aluminium scrap exports, Pickard says. While they were down 39.2% year-on-year to China, overall US aluminium scrap exports were up by 12.4% in 2018, helped by a 228.2% gain to Malaysia, a 174.4% rise to India, a 33.0% increase to South Korea and 27.2% more exports to Mexico. He, however, says that some companies have queried whether the Commerce Department may have miscategorized some of these exports: "They have questioned whether some mixed shipments or alloy shipments had been counted under aluminum scrap codes in which they didn't belong."

There is some uncertainty about what will happen to US non-ferrous scrap exports in future, given that China is changing regulations again, effective July 1, with a new round of import restrictions upon not just aluminium and copper scrap, but ferrous scrap as well, which will limit imports on some yet-to-be-specified products in order to allow only 99% contamination-free products to be imported. "But we won't know who will be allowed to ship metal scrap into China, and what grades of scrap, until the last minute," Goodman says. Because of the uncertainty, he says some people plan to pause their shipments starting in May or June. That is being further complicated with the number of import licenses up for renewal.

Pickard says that one reason why it is still unclear exactly what commodities will be included in July's expanded restrictions is that China's harmonized tariff schedule (HTS) codes do not fully align with US HTS export codes. He also says that the initial expectation was that China was not just going to limit imports of mixed shipments and scrap imports with high levels of contamination, but also scrap commodities that need a lot of processing before a consumer can melt it. "But it is less certain today if that will be the case as far as the July 1 restrictions," he says, or if that will be part of yet another step up in restrictions expected to go into effect in 2020.

Scrap import ban?

For the past few years there had been some concern that China would ban all scrap imports. "I always thought that they wouldn't do that as it would be shooting themselves in the foot as they still need raw materials. But they might," Goodman says. "The question is if they would rather melt cathodes than No. 2 copper. They might if they could get cathodes cheap enough, but they won't be able to generate enough copper scrap domestically for a while."

'Given that there are still outlets for anything that is recyclable, scrap is still trading, but everyone is taking a more conservative approach'

It is, however, possible that such a ban is already in the pipeline. Pickard points out that China has indicated in certain statements, although not in writing, that they want to eliminate all scrap and waste imports into China by 2020: "We are not sure what that means either."

Given this uncertainty, everyone in the non-ferrous scrap supply chain has been very cautious, Diehl notes. "Given that there are still outlets for anything that is recyclable, scrap is still trading, but everyone is taking a more conservative approach."

Hardison agrees, observing that peddlers and dealers have not been moving as much material, waiting for the market to pick up. Processors, concerned about their inventories, have been careful to just buy what they can sell. Consumers have also been limiting the amounts they have been buying. "I would like to see more equilibrium of supply and demand," he says. "That would make everyone healthier."

Meanwhile there is a lot of vetting going on around the world as to who is buying what, who is getting into the market, who is getting out and what the future export restrictions will be, Goodman points out.

Recognizing how important it is to develop additional homes for scrap given the current market dynamics, Pickard says that ISRI is planning a trade mission to Southeast Asia later this year to help its member companies to build the necessary bridges to open up some of the developing markets to US scrap.

"For both non-ferrous scrap processors and merchants it has been a relatively tough year-and-a-half," Mothersole observes, "But I don't expect that to continue." That includes scrap discounts, which are now much wider than historic averages. "I don't believe they will persist indefinitely. Something will happen." He says that either not as much scrap will be collected or greater use will be found for that scrap, or, more likely, it will displace some primary metal.

"There isn't any cockeyed optimism about the non-ferrous scrap market in 2019," Goodman says. "It will more be a steadying of the ship, but everyone will be happy if it is similar year to what we saw in 2018."

New dynamics in Asia's ferrous scrap markets

Asia's ferrous scrap markets are likely to encounter more wide-ranging price changes from 2019 amid governmental policy changes and with economies in the region continuing to develop rapidly against a backdrop of international trade tensions, reports Paul Lim

In the global drive toward clean steelmaking, the Chinese government has introduced policies that may result in electric-arc furnaces (EAFs) making up a bigger proportion of domestic steel production in China than they do at present.

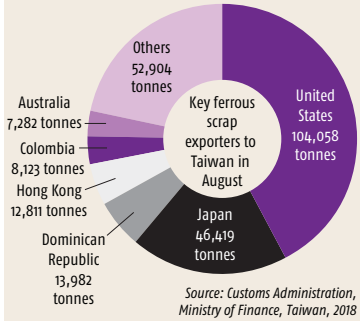
In addition, the continued development of the Chinese and Indian economies will mean that the availability of ferrous scrap will rise further thanks to growing volumes of steel products reaching the end of their life. This will undoubtedly drive the use of ferrous scrap in steel production when steelmakers try to find the cheapest raw materials.

China has started to ban ferrous scrap imports in several phases from this year, while maintaining a high export tax to discourage the export of steelmaking raw materials. This will isolate it from the international ferrous scrap market, setting the stage for Vietnam to become the most relevant terminal market – and for its price to become the benchmark in Asia.

The United States' unilateral 25% tariff on steel and aluminium imports from China and heightened US-Sino trade tensions also disrupted trade flows in ferrous scrap in 2018. Steep currency depreciations caused by these trade tensions showed that international markets can suddenly become delinked – as was the case in Asian markets in the third quarter of 2018 when international sellers tried to offload their cargoes there because of higher prices.

This led to a clear divergence between ferrous scrap prices in Asia and beyond. For example, a 40% drop in the value of the Turkish lira in 2018 resulted in supply that was typically bound for Turkey being offered to Asia when the arbitrage window sprang open. This included material from the US East Coast and from Europe that significantly undercut offers for Asia-origin scrap.

Taiwan remains a key regional benchmark for containerized scrap



Source: Customs Administration, Ministry of Finance, Taiwan, 2018

Such a volatile trading environment resulted in a stronger need among recyclers and scrapyards for tools to hedge risks to maintain their profit margins. A few market participants have proposed the listing of derivatives for containerized scrap on regional exchanges for physical and financial market participants to hedge their trades.

Global scrap availability

Global ferrous scrap availability will hit the 1-billion-tonne mark by 2030, largely driven by greater volumes from China, according to the World Steel Association (Worldsteel). This will be an increase of about 33% from the 750 million tonnes available globally this year, of which the global steel and foundry casting industries will recycle an estimated 630 million tonnes.

Asia is the largest ferrous scrap market in terms of trade volumes, with growth in consumption expected to continue beyond 2050.

Policy changes in China

Growth in scrap availability is likely to be strongest in China because of the large quantities of virgin steel that the country has produced over the past 25 years. Worldsteel forecasts a 50% increase to 300 million tonnes by 2030 from about 200 million tonnes at present.

This may accelerate the shift in balance of Chinese steel production from the blast furnace to the EAF route. Production in EAFs accounts for only about 6% of Chinese steel production at present, well below the global average of about 26%. In advanced economies such as the United States, Europe and Japan, EAFs typically account for a higher proportion of steel production.

The availability of ferrous scrap is usually higher in such advanced economies, which have a higher steel intensity - the amount of steel used per unit of gross domestic product - due to the abundance of high-rise buildings, automobiles and white and yellow goods.

With Chinese steel demand growing in line with the country's economic goals and technologically ▶

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advanced housing, while automotive manufacturing and infrastructure becomes more commonplace, the use of obsolete steel as a raw material is set to increase while the country continues its quest to produce more high-quality steel.

Tougher rules

The increasingly stringent environmental regulations imposed by the Chinese government will play a part in encouraging the use of ferrous scrap for steelmaking. Carbon emissions will become more expensive and the production of steel by using scrap will look increasingly attractive, further boosting demand.

China launched a nationwide carbon-trading market at the end of 2017, tracking emissions and registering companies to trade carbon credits. Full-fledged carbon trading is expected to start in 2020, according to some reports. A carbon-trading market allows buyers and sellers to trade carbon limits among one another and imposes a monetary burden on polluters while providing cost savings to greener companies.

Physical environmental controls on emissions have also become more pronounced, with major steelmaking hubs such as Tangshan city in Hebei province and other regions in the north ordered to lower steel production rates during the winter to control emission levels.

An increase in the proportion of ferrous scrap used integrated steelmaking reduces the quantity of pollutants produced during the steelmaking process, making it an attractive option for steel mills.

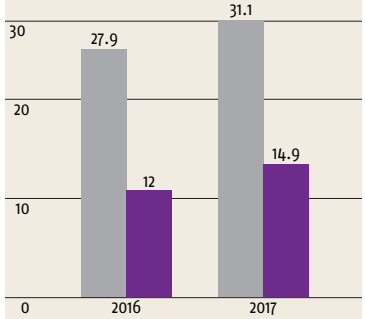
Import ban

A plan by China to ban ferrous scrap imports from the end of this year sets up a range of possibilities for the future of Asian steel market dynamics. The country has banned the import of 32 types of solid waste with the goal of cutting pollution, China's Ministry of Ecology & Environment said. The ban includes compressed automotive scrap and ship scrap, the imports of which were banned from December 31.

This could lead to a shortage of prime-grade ferrous scrap material in China when the share of EAF-based steelmaking picks up, especially when much of its current scrap supply is obsolete-grade scrap. Bans on other scrap grades are also likely from the end of 2019, including stainless steel scrap.

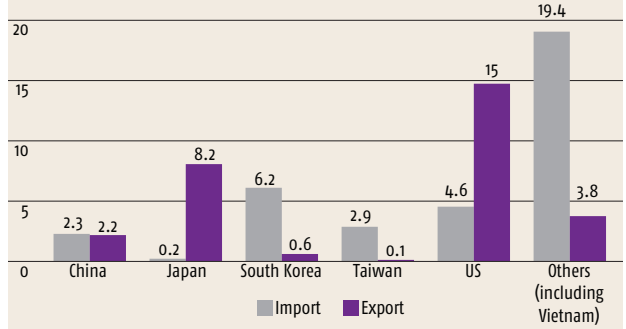
The ban, coupled with high taxes on exports of ferrous scrap, could make the Chinese ferrous scrap market very self-contained – with limited inflows and outflows – leading to major scrap-consuming markets such as Vietnam becoming regional price benchmarks, sources said.

Asia scrap import and export volumes (million tonnes)



Source: Fastmarkets MB

Asia scrap and export volumes breakdown by key countries (million tonnes)



Source: Fastmarkets MB

Vietnam's rising importance

The reduction in China's international ferrous scrap trade will lead to Vietnam scrap import prices being the next most relevant benchmark in Asia, especially because import volumes there should continue to rise in 2019. Demand for scrap in Vietnam will remain firm due to the rapid growth of steelmaking capacity in the country, supported by its fast-growing economy.

Vietnam's steel demand has almost doubled since 2013 – the country consumed nearly 22 million tonnes of steel in 2017 (10.49 million tonnes of long steel and 11.41 million tonnes of flat steel products) compared with 11.9 million tonnes in 2013 (about 50:50 flat versus long steel products), according to Vietnam Steel Association data.

Vietnamese steel production also has increased, according to South East Asia Iron & Steel Institute data. Crude steel output rose by 46.9% to 11.47 million tonnes in 2017 from 7.81 million tonnes in 2016, and finished steel production increased by 30.6% to 11.3 million tonnes from 8.66 million tonnes in the same comparison.

Vietnam's growing self-sufficiency in steel is reflected in dropping import volumes. Imports fell by 13.9% to 15.02 million in 2017, down from 17.45 million tonnes in 2016, while exports grew by 24% to 4.69 million tonnes in 2017, up from 3.78 million tonnes in 2016.

Ferrous scrap import volumes have shot up accordingly to feed Vietnam's growing appetite for steel products, according to statistics from the country's customs agency. Vietnam imported 2.09 million tonnes of ferrous scrap in the first five months of 2018, which was a 21.5% year-on-year increase from the 1.72 million tonnes it took in over the same period in 2017. Over the whole of 2017, the country imported 4.74 million tonnes of the steelmaking raw material, up by 21.5% from 3.9 million tonnes in 2016.

Japan is Vietnam's key supplier of ferrous scrap. It typically sends more than 90,000 tonnes per month to major Vietnamese ports – especially those in the south – in the form of bulk cargoes. Other sources include Australia, Europe, Hong Kong, Chile and the US, but scrap buyers in Vietnam have traditionally imported more material from Japan than any other country.

Forthcoming Asian benchmark

Key participants in the regional scrap and long steel markets actively look at cfr Vietnam and Taiwan scrap prices to determine the latest price movements.

Fastmarkets MB launched a cfr Vietnam ferrous scrap import ▶

price assessment on August 3, 2018, in response to interest from market participants seeking a benchmark to price physical contracts for bulk scrap cargoes imported into Asia. This will soon be followed by a containerized ferrous scrap price.

A Vietnam scrap price is workable as a basis for a physical contract not just for Vietnam itself, but also for neighboring countries in Asia such as Indonesia, whose prices track the Vietnam scrap price trend. Its importance is growing quickly; it should complement Fastmarkets MB's benchmark cfr Taiwan import price assessment, which tracks US-origin containerized scrap sold into the East Asian territory.

While end users import other ferrous scrap grades such as plate and structural or shredded, heavy melting scrap prices remain the key price indicator, with other grades tracking them through different levels of dollar premiums. Vietnamese steel mills also selectively import the higher-quality scrap grades, depending on their needs.

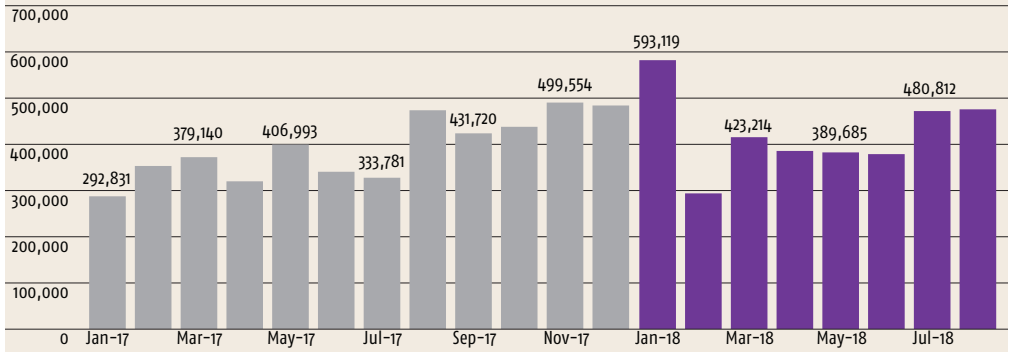
Fastmarkets MB continues to monitor the fluid Asia scrap markets and trade flows, especially amid increasingly stringent inspections of ferrous scrap by Vietnam's customs authorities to reduce the inflow of environmentally harmful waste materials. This has prompted buyers to seek higher quality scrap such as shredded material, which may alter trade flows further in the medium term and create more opportunities for ferrous scrap price assessments.

India's importance too

India is also likely to increase its use of ferrous scrap as a steelmaking raw material – the country's steel ministry has been working consistently toward this goal.

New Delhi has approved a new scrap policy that will be implemented in 2020. The policy encourages vehicle owners to scrap vehicles that are more than 20 years old through incentives such as waivers on duties and new-vehicle discounts. And after the establishment of Cero, the country's first auto-shredding and vehicle-recycling company, a second auto-recycling plant is being planned, according to reports.

Vietnam scrap import volumes 2017-18 (tonnes)



Source: General Department of Vietnam Customs

The country is also increasing scrap-based steemaking capacity. According to reports, steel secretary Aruna Sharma expects 30-40 million tonnes of steel to be produced from scrap by 2030, up from 10 million tonnes per year at present.

Indian demand for ferrous scrap may reach 33 million tonnes per year by 2031 if the country boosts its steel production in accordance with the National Steel Plan for India, according to Fastmarkets MB's research team. Scrap usage exceeded 11 million tonnes in 2017, data showed. The increase in domestic demand for scrap could eventually outstrip supply, causing import volumes to climb.

Ferrous scrap derivatives

Asia's ferrous scrap import prices are prime contenders for derivatives contracts for traders and scrapyards to hedge their price risks. Market participants are calling for a derivatives contract based on Fastmarkets MB's cfr Vietnam or cfr Taiwan containerized scrap price assessment to be listed on regional exchanges for use as a hedging mechanism.

These requests are on top of discussions by market participants to use the Fastmarkets MB cfr Vietnam bulk scrap import price in physical contracts for term and spot cargoes sold into Vietnam and other countries in Southeast Asia.

The ferrous scrap markets are suitable for benchmarking and exchange-listing because of constant, regular trade flows, where the presence of key markets such as Vietnam, Taiwan, Japan and South Korea set the benchmark prices for the region to follow.

The uniformity of ferrous scrap grades such as heavy melt No.1 and No. 2 (80:20) also makes this steelmaking raw material more "commoditizable" than its downstream products, which have a wide range of specifications in terms of chemical composition and physical size.

The ferrous scrap market is also more developed in the use of term contracts, with steel mills looking to ensure that their meltshops have a steady supply of raw materials by entering into short- and long-term contracts with traders and scrapyards or purchasing spot cargoes and using published price indices to mitigate fluctuations in spot price.

This segment of the ferrous market is also becoming more accepting of futures trading. For instance, scrapyards are increasingly looking to hedge their price risks via exchange-listed derivatives to lock in their margins and reduce the chances of losses when prices take an unfavorable turn.

Lastly, scrapyards and shippers need to export their cargoes to maintain cash flows and reduce inventory levels. This is in contrast to major integrated steel mills, which can choose to keep their cargoes for their domestic markets when the margins there are comparatively higher, or to export large quantities when prices peak abroad.

Further information about Fastmarkets scrap prices is available at: Hello.mb@fastmarkets.com; www.fastmarkets.com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The latest DRI plants

The long-term gradual expansion of the global fleet of DRI plants under way includes two large plants in Algeria and a third plant being built for Cleveland-Cliffs in Toledo, Ohio, in the United States. All three plants are supplied by Midrex Technologies

According to data compiled by Midrex Technologies, DRI production in 2017 totalled 87.1 million tonnes. At 5 million tonnes per year, the combined production capacity of the two Algerian units – one completed at the end of 2018 and another due to start up later this year – consequently represents a significant increase in global capacity for producing the steelmaking raw material.

Another new plant for hot-briquetted iron (HBI) production, which Midrex is building for Cleveland-Cliffs in the US, adds to the global tally.

Tosyali Algerie

With its Midrex Megamod® furnace, the 2.5 million tpy plant built for Tosyali Algerie, part of Turkey's Tosyali Holding, in Bethioua, Algeria is the largest unit built by the plantmaker to date. It commenced production of cold DRI in late-November 2018. Iron ore pellet to feed the DRI plant is transported via a 10-km-long conveyor from the port at Arzew, Oran Province.

Hot DRI production commenced in early 2019. The plant is equipped to produce hot or cold DRI, with a mechanical conveyor used to transport hot DRI from the shaft furnace to an adjacent melt-shop, typically at 600°C, thus improving energy efficiency.

Tosyali Algerie started production of steel rebar in Algeria in 2013 by using scrap as feedstock. It subsequently added 500,000 tpy of wire rod production capacity, which started up in 2015. Output ▶

MIDREX

The 2.5 million tpy plant at Tosyali Algerie commenced hot DRI production in early 2019

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from the new DRI plant is destined to supply a substantial increase in billet production to feed high-quality rebar production capacity exceeding 3 million tpy.

Algerian Qatari Steel

A unit of a similar design, and the same capacity, as Tosyali Algerie's plant is under construction for Algerian Qatari Steel (AQS) in Jijel province. It is due to start up in the second half of 2019. SMS group's Paul Wurth is a consortium partner with Midrex for both the AQS and Tosyali Algerie projects.

AQS has a 750,000 tpy rebar mill, installed in October 2017. Its 2 million tpy capacity meltshop is due to produce billet to feed an additional 750,000 tpy rebar mill and a 500,000 tpy wire rod mill.

The Tosyali and AQS investments will see a big reduction in the imports of billet to Algeria.

Cleveland-Cliffs

While smaller, with its capacity of 1.6-million tpy for HBI production, the plant being built for Cleveland-Cliffs in Toledo, Ohio, will be the first plant equipped with Midrex ACT™ – adjustable carbon technology.

Carbon is usually added to DRI in the shaft furnace by introducing natural gas in a process that lowers the furnace temperature in an endothermic reaction. But in ACT, a carbon-monoxide-rich gas is mixed with natural gas before injection into the shaft furnace. The use of carbon monoxide to increase DRI carbon content is an exothermic reaction, so the carbon content in the DRI produced can be increased while the product's temperature is maintained.

ACT allows the carbon content to be adjusted in a range from 1.5 to 4%. Midrex says that the process works for hot or cold DRI production, or for HBI, and that 90-92% of the carbon forms as iron carbide for a higher quality product. ACT will be installed at the new DRI plant at the Cliffs' project, but Midrex notes that it can be used in existing plants too.

MIDREX

Global DRI output is forecast to exceed 100 million tonnes in 2020

Cliffs' plant is due to start production in mid-2020, when it will substantially boost North America's capacity for DRI production. Midrex's data show that North American DRI output was 4.60 million tonnes in 2017, up by 44% on output of 3.20 million tonnes in 2016, and 77% higher than 2015 output of 2.60 million tonnes.

The Toledo plant is strategically placed to serve US steel producers in the Great Lakes region. As Cliffs' chairman, president and CEO Lourenco Goncalves told *Metal Market Magazine* in February 2018, "High-end steel consumers, such as automakers, are looking for partners that they can bet will still be around in the next 10, 20 years. And they will appreciate the stronger balance sheets of the EAFs and (their wherewithal) to become as important to them as the good integrated mills are right now."

He added that to satisfy sectors needing high-quality steel, EAF-based steelmakers will need virgin iron units in general. "And what Cliffs can provide is a lot more than just virgin iron units. We can supply customized feedstock," he said. Cleveland-Cliffs already supplies integrated steelmakers in the region with customized pellets for their blast furnaces. The new HBI plant will enable the company to supply EAF-based steelmakers with high-quality iron units too.

The United States has the advantage of low natural gas prices and, at present, strong steel and metallics markets. Cliffs' new plant will increase the number of DRI plants operating in the US to three – Voestalpine's Texas MIDREX® Plant and Nucor's Louisiana HYL plant being the other two existing producers.

Global outlook

Global steel production is set to rise inexorably. It notably doubled from nearly 850 million tonnes in 2000 to not far short of 1,700 million tonnes in 2017. Some analysts forecast that annual production will climb further by more than 50 million tonnes by 2020 to top 1,750 million tonnes.

The proportion of world steel production coming via the EAF route dropped from about a third in 2000 to just a quarter in 2015, during the period in which China's integrated steelmaking capacity grew dramatically, but Midrex statistics predict a recovery in that percentage to 34.1% in 2020.

Global production of DRI from captive plants – those built to provide dedicated raw material supply at steelworks – more than doubled from 34.2 million tonnes to 71.0 million tonnes in 2017. Merchant DRI/HBI production grew from 9.6 to 16.1 million tonnes over the same period.

Midrex figures predict that total global DRI output will exceed 100 million tonnes in 2020, with 80% coming from captive units and the balance from the merchant market. Nearly all of it will make its way into steel production via EAFs, with less than 10% entering steel production via the BF/BOF route.

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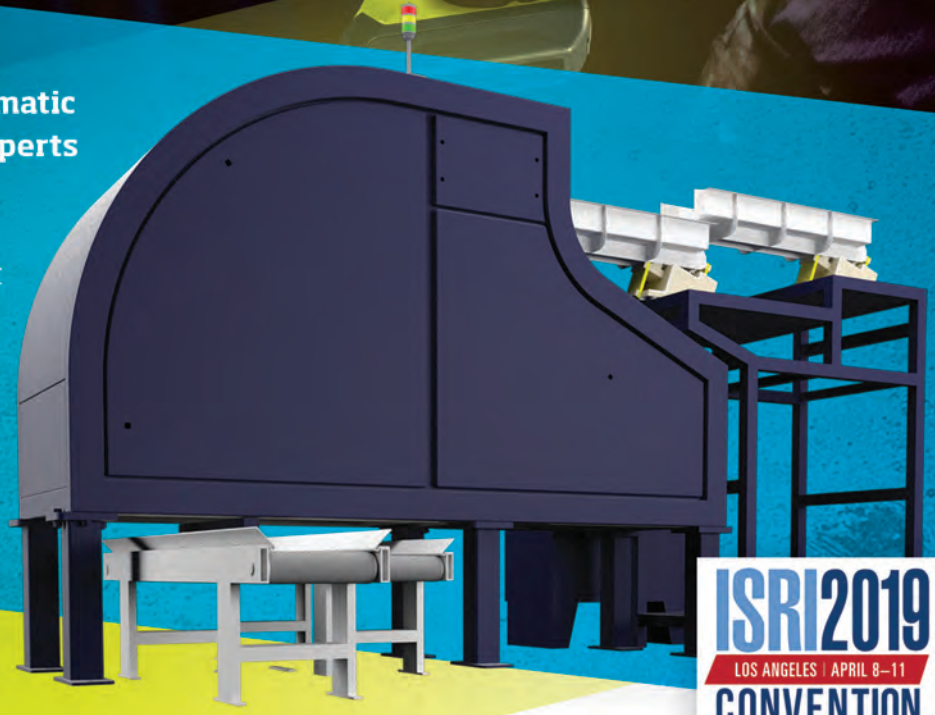

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A big year for India

Since important parts of India's steel and metal sectors are state-owned, their members and private enterprises will keep a close eye on the results of elections in May for the likely effects of future governmental policies. Kunal Bose reviews the performance of the current government and ponders the outlook for the country's economy, trade and industrial climate

SHUTTERSTOCK

Despite its growing urbanization, just a third of India's population lives in cities

In the world's largest dance of democracy – to be held in India from April 11 in seven phases ending on May 19 – nearly 900 million people are eligible to choose the next government. On May 23, the world will know whether Narendra Modi, who heads an alliance of parties with a Hindu-nationalist agenda, will become prime minister for a second term or a combination of liberal secular parties will wrest power from the incumbent National Democratic Alliance (NDA).

The logistical challenge of hosting general elections every five years in India, where the number of voters exceeds the combined population of the US and the European Union, is enormous. No wonder that the former US secretary of state Hillary Clinton said while visiting Chennai last year: "India is widely viewed as the global gold standard for running elections."

Elections are an occasion when different sections of voters, often depending on their economic interests, will review the achievements of the NDA government over the past five years against the host of promises made before ascending to power with a thumping majority back in 2014. Political analysts point out that Modi's five-year economic record will also come in for comparison with his predecessor Dr Manmohan Singh's work during his second term, spanning 2009-14.

Political scientist Nityapriya Ghosh is sceptical: "The Election Commission announced the poll dates on March 10. But a few months ahead of the announcement, political parties went into election mode, stitching alliances to avoid splitting of votes and holding massive rallies across the country. As has become the practise here, ahead of the model code of conduct coming into effect, Modi launched any number of infrastructure and rural development projects to curry favour with unsuspecting voters. We have seen it in the past that post-election many of the projects were never discussed again."

India being a vibrant democracy, ahead of elections, which are generally held peacefully under the oversight of an independent Election Commission, any number of business analysts and journalists from all over the world travel to the country to take stock of ground reality.

One such visitor is Martin Wolf, chief economics commentator at the *Financial Times*. He wrote: "What happens to India is going to affect everybody on the planet. What then, are its economic prospects? Has Narendra Modi, its prime minister, made a big difference?" In providing an answer, Wolf pointed out that Modi has largely functioned within the policy that replaced the "license raj" system for a market driven economy in the wake of the 1991 foreign exchange crisis. Even then, the economy is constrained by significant public ownership of business, allowing unwelcome interference by ministers and bureaucrats.

Ownership issues

Notwithstanding the emergence of some highly efficient private sector banks with global footprints in recent years, the government still has about 70% ownership of the Indian banking sector. This has influenced the sanction of loans, reflected in the fact that the 21 public sector banks in the country have over 85% share of the banking sector's bad loans. In order to cut costs and bring efficiency in the industry, the government has started the process of ▶

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More recently, the country's central Reserve Bank left instructions with bank chief executives that every sanction of a big loan must be preceded by "honest" due diligence and scrutiny of antecedents of promoters seeking loans – a step that should see the weeding out of accounts of routinely defaulting companies.

Outspoken industrialists, such as Anil Agarwal of Vedanta, are disappointed that the "continuing big scale public ownership of steel, aluminium, copper and mines assets is standing in the way of getting the most out of these. Let the government ownership of public sector undertakings (PSUs) be brought down to a level to allow their professional running without official interferences."

Disinvestment in driblets done so far and forcing cash-rich PSUs to buy official holdings in weaker units in the same industry are designed to shore up government revenues. The management of the state-owned Steel Authority of India, National Aluminium Company and miner NMDC continue to remain firmly under the government in spite of marginal disinvestments in phases.

Modi won a majority in 2014 elections on the promise of providing a radical alternative to the past regime's steady-as-she-goes approach. But, as Wolf noted, the Modi government has basically stuck to the policy prevalent since 1991, "bringing in useful improvements in some areas, yet being quite conservative in others, notably on privatization, market liberalization and promotion of competition." Participating in a discussion recently, Ruchir Sharma, head (emerging markets), Morgan Stanley Investment Management, said: "Privatization has become almost a dead issue in India. Everyone tends to be an incremental reformer when they come to power."

Economic and fiscal policy

A recent World Bank report noted that the more notable achievements of the Modi administration are an inflation-targeting framework – inflation is contained to around 4%. In 2012 it hit a high of 12%. Other achievements have been restricting fiscal deficit, improvements in the business environment – India has climbed 65 places in the World Bank's ranking of the ease of doing business since 2014 – attempts to resolve the growing menace of non-performing assets by introducing a new and effective insolvency and bankruptcy framework, and the introduction of a nationwide goods and services tax.

SHUTTERSTOCK

Prime minister Narendra Modi has been instrumental in courting foreign investment in India by companies engaged in making cars, electronics and metals

At the same time, the government has been criticized for its abrupt cancellation of high-denomination bank notes in November 2016 – overriding objections of the central bank – and for introduction of Goods and Services Tax (GST) in July 2017 without adequate preparation, which roiled small- and medium-size enterprises. Despite both moves impacting the economy for a period, India continues to record GDP growth of over 7%.

During the 2014 election campaign, Bharatiya Janata Party, a loose affiliate of Rashtriya Swayamsevak Sangh, patron of the Hindu nationalist movement, said that if voted to power it would end India's "jobless growth" and create at least 10 million new jobs. But recent data showing that 2017-18 unemployment, at 6.1%, was the highest in 45 years caused much governmental embarrassment.

The recent rebasing of GDP data, by changing the base year, to show the present regime in a good light has attracted a backlash from over 100 economists and social scientists from leading international universities who, in a petition, claimed: "any statistics that cast an iota of doubt on the achievement of the government seem to get revised or suppressed on the basis of some questionable methodology."

Financiers note that if India is to receive foreign direct investment according to its potential then the reliability of national statistical data is essential.

Foreign investment

The release of draft new rules intended to protect domestic e-commerce firms from competition from foreign retailers disappointed some foreign investors, but overall Modi has been very successful in attracting foreign investment in India.

For example, he has personally courted big foreign groups engaged in making automobiles, electronics products and in metals. For the first time in two decades, in 2018 India achieved a bigger total of inbound deals than China: $38 billion of inbound deals for India, compared with China's $32 billion.

"If you ask me how India managed to upstage China, I will say basically it is because of political stability, stable long-term economic fundamentals, an insolvency and bankruptcy code, 2016 – which makes no distinction between global and domestic creditors or between classes of financial investors when insolvency resolution happens within a given time – and promotion of sunrise sectors," said a spokesperson for the Confederation of Indian Industry (CII).

India has achieved much success in the automobile industry. Toyota, Suzuki, Hyundai, Mercedes, BMW and Ford have been in India in strength for a long time. All of them are periodically expanding their production base in India to step up domestic and export sales, and some luxury car brands, such as Bugatti and Aston Martin, have arrived more recently, drawn to India by the rapidly growing number of billionaires. According to the Hurun Global Rich List 2018, India has 170 billionaires in dollar terms.

India's emergence as a global hub of automotive components is encouraging for producers of, and manufacturers in steel, aluminium and copper.

Rural India

The government made a promise in January 2016 to double the income of farmers by 2022, but rural unrest has continued to grow. Farmers are not getting remunerative prices for their crops, except for major portions of ▶

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rice and wheat for which the government is a big procurer. For sugarcane, many crushing factories are said to postpone payments as long as they can since their balance sheets are in the red.

A poor marketing network across the country, which puts farmers at the mercy of middlemen, ensures that in a season of good harvest wholesale prices of most agricultural commodities allow recovery of less than half of their production cost. Perpetually high indebtedness of the farming community results.

The metals industry, which wants to pry open the nearly virgin rural market seeks a rapid improvement in the rural economy, says a member of the Indian Steel Association. "The per capita consumption of steel in rural India is about 12 kg, against around 175 kg in urban centres, making the national average close to 70 kg. Whatever promotional work the industry may do to encourage rural steel use, success will only come its way if the prosperity level of people living and working in the countryside improves.

The use of non-ferrous metals, such as aluminium and copper, outside the urban centres is negligible, primarily because of the low income of the rural masses. "We are reasonably confident that the next government will accord high priority to enrichment of farm economy," said the CII official.

The automobile industry, which is a major user of hot and cold-rolled steel coil, experienced a fall in sales of passenger vehicles and two-wheelers in February. According to the Federation of Automobile Dealers Associations, the setback in two-wheeler sales in particular has got much to do with rural distress.

Since India is an emerging economy, it is inevitable that in the process of economic development, agriculture and allied sectors will see a declining share of GDP. But this in no way is a deflection from the "significance of the sector for employment, livelihood, food security and rural demand for metals and products thereof," said Om Prakash Dhanuka, former president of Indian Sugar Mills Association. Even while the level of urbanization is inching its way towards one third, over 68% of Indians still live in rural areas, he highlighted.

For almost everything, from farm equipment to two-wheelers to metals and metal products, rural India remains "a market of high promise awaiting disposable income in the hands of masses there," said Dhanuka. Create the right conditions for farmers to get good prices for their crops, especially during bumper harvests, to see a miracle happening to market demand, economists keep on telling the government. Companies such as Tata Steel, JSW Steel and Hindalco, and a wide range of metal converters downstream, are ready with a range of products for the countryside awaiting their affordability for farmers, artisans and traders to improve.

SHUTTERSTOCK

Nearly 900 million people are eligible to vote in India's elections

Boosting steelmaking capacity

India has thrust upon itself a big challenge of building new steel capacity of around 150 million tonnes per year to make a total of 300 million tpy by 2030-31. The country's steel policy enacted in 2017 says that capacity enhancement will be needed to meet domestic demand of 255 million tpy by 2030-31. If the targets are achieved, then the steel use in the country per capita now, at about 70 kg in 2018, will rise to 158 kg by 2030-31. That will still fall short of the present world per capita use of 208 kg. Last year saw India overtake Japan to become the world's second largest steelmaker with production rising 4.9% to 106.5 million tonnes.

Binoy Kumar became India's steel secretary in September 2018. The steel policy was rolled out in May 2017. He was quick to realise that if the policy capacity and production targets are to be achieved, then challenges in the upstream section of the supply chain will have to be met. It supplies 437 million tonnes of iron ore from local mines, provides ore fines to make pellets, and lifted sponge iron capacity to 114 million tonnes, in which the share of gas-based direct-reduced iron will be 30%. Gradual improvements have been made in the supply of local coking coal by way of periodic auctions of coal blocks among steelmakers and the installation of modern washeries.

Kumar has kick-started inter-ministerial dialogue to ensure that the "multimodal transport infrastructure" is sufficiently strengthened for 2030-31 level of ingress of raw materials and egress of finished steel products.

Steel minister Chaudhary Birender Singh never misses an opportunity to say that "India is well on its way to hit the 2030-31 capacity and production targets." What obviously gives him confidence is the ambitious capacity expansion programmes of groups such as JSW Steel and Tata Steel, which recently sold most of its business in southeast Asia to China's state owned HBIS Group to focus on the fast-growing home market.

ArcelorMittal has almost arrived in India, as it the chosen preferred bidder for the 10 million tpy Essar Steel. All the winners of insolvent Indian steel companies have major expansion programmes planned for their new acquisitions. As things are progressing, the BF-BOF route will have a 65% share of 2030-31 capacity, and EAF and induction furnaces a combined 35%.

Aluminium too

Anticipating a high local demand growth to be sustained over many years, Hindalco and Vedanta invested heavily in building greenfield smelters and simultaneously modernizing their existing plants to lift the industry capacity from 1.711 million tonnes in 2010-11 to 4.129 million tonnes in 2017-18. The government-owned National Aluminium Company is now to build a 500,000 tonne per year smelter at Angul in Orissa, where it has a 460,000 tpy unit. India's per capita use of the white metal is a low 2.6 kg, but the demand is growing at an annual rate of over 10%.

Unfortunately, high levels of imports, particularly of scrap, restricted the industry's share of 2017-18 domestic aluminium demand for 3.627 million tonnes to 45%. Under compulsion, Indian primary producers are exporting as much as half of their production. Scrap imports rose from 470,000 tonnes in 2010-11 to 1.121 million tonnes in 2017-18, claiming a share of 57% of total imports that included primary aluminium (18%) and downstream products (25%). According to industry officials, a very low customs duty of 2.5% led to "unnerving rapid rises" in scrap imports.

There is some hope that once the new government presents the budget for 2019-20 in June, it will put 7.5% import duty on scrap, as it already obtains for primary metal and aluminium products. The reason why the government is taking its time to revisit the import duty structure is because the nearly 3,500 secondary producers, largely of medium and small size, spread across the country are sustaining a campaign that says that making imported scrap expensive will badly hurt their business of melting scrap to make aluminium products. In the present unfavorable picture for unemployment, the government will be worried about aluminium downstream plant closures and job losses.

Sharing is caring?

Most of the major benefits of business intelligence are gained through data analytics. That is true for process and supply-chain optimization, for predictive maintenance, for key performance indicators (KPIs) and risk management. For there to be analytics, there has to be data – and a great deal of it. For there to be benchmarking and collaboration, there has to be data sharing, or at least pooling.

"In manufacturing the three most prevalent KPIs throughout the supply chain are on-time delivery, quantity, and quality," said Bill Wertz, director of advanced analytics at Worthington Industries. "Individual entities in each supply chain will typically have additional internal measures, but all are in an effort to ensure the ability to meet the higher level KPIs."

Sharing of data, whether collaboratively with suppliers and vendors, or more broadly across the sector, means a leap of faith that few yet seem willing to make. "Mostly business intelligence is still done by word of mouth," said long-time industry analyst Aldo Mazzaferro. "What do the mills give to the service centers? Lead-time information, whether that is accurate or not. What do they get back? Information flow sometimes seems more like a poker game."

After many years as lead metals analyst with Macquarie, Mazzaferro now runs his own research firm and publishes a newsletter providing insight to hedge funds. "Large investors assume that mills are hedging their currency risks, and trading futures or using systems for commodity risk management," he said. "They do notice when things get out of line, but

Many companies already gain much value by capturing and analyzing their own business data, but the full benefits of Big Data will require much wider sharing of information along the supply chain. Gregory Morris finds that initial reticence to do so in the steel and metals sectors can be overcome

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otherwise it is not a major consideration."

The power of data

While there is a clear interest in gaining insight through sharing data, there is also hesitation to provide insight to competitors. "Mills know that the service centers they may be sharing data with are also talking to their other suppliers. There is not any obvious place for mills to go for centralized data," Mazzaferro added.

That is not to say that vast amounts of available data do not exist. The energy sector provides a ready example of another capital-intensive heavy industry that has made extensive use of public data (*see box*).

While metals producers have yet to plumb public data to the same extent, some downstream companies are putting some effort into coaxing their suppliers into collaborating on business intelligence.

"We have an ERP system," said Stephen Armstrong, president and CEO of O'Neal Steel. "We have used the Oracle E-1, which was originally PeopleSoft, since about 2005 or 2006 and have considered it very successful for data management. So now we have all this information to make better decisions on important business questions such as what makes a customer profitable? What makes a line profitable? We have more than 10 years of data so can take the business intelligence to a very high level."

Armstrong started at O'Neal 12 years ago specifically to build business analytics. "The problem was never adoption; it was trying to manage requests. We addressed that by pushing the requests back out: we enabled people to do their own queries."

From those basic beginnings, and building through the long experience with ERP, O'Neal is in the final stages of selecting a new system. Not surprisingly, one of the primary criteria is data analytics. "The time has come to stop just looking at what has happened and to use the data to help predict what is likely to happen," said Armstrong.

"Business intelligence underlies it all. We have focused our teams on using data proactively."

There are aspirations of extending that upstream, but working with mills collaboratively by sharing data is still a new idea. "To be honest we have not tried too much yet," said Armstrong, "but in the last six months we have been having those conversations with our suppliers. Things are starting to happen. They clearly don't want to share everything, so we are starting from the position of 'what do we need?' and then determine how to scrub the data to provide that and still ensure confidentiality."

Armstrong is also frank in noting that mills are not the only sources of data. "There are many places to connect. There are commercial data centers. We just have to determine what data are relevant to our markets and to our customers." It is not a question of if, only a question of when: "Everyone sees this as the future," said Armstrong

At this stage it is not possible to determine if that sort of thing will be a loss or gain for mills. If their customers find other sources of business intelligence, steelmakers could be left in the dark.

In its initial discussions with mills on business intelligence, O'Neal has met with varied responses. "We have not run into any brick walls. No one has said, 'no way!' At least everyone is intrigued," said Armstrong. "Clearly some mills are farther along than are others. Some are more inclined to share than are others."

Drilling for data in oil and gas

At every trade association conference, analyst presentation, and investor day, oil and gas producers from the global majors to the smallest family-owned independent show the performance of their wells as benchmarked against industry standards. They show the 'type curve', which is the initial production and decline rate for their wells not just against national or even regional averages, but against competitors' wells in the same area.

From that benchmarking, producers can make highly informed decisions about where to drill, which bores to complete and connect, and then which to keep in production once flowing. Those KPIs are available not just for the majors, but for the smallest operators.

Like metals, oil and gas is a capital-intensive and intensely competitive industry. And just like metals, there is no central organization that aggregates and scrubs all the data. The difference is that energy companies have made a point of combing public data for business intelligence.

While the analogy is instructive, it is not an exact parallel. Oil and gas companies have the advantage of decades of tax and royalty filings to state and federal authorities. If the same records do not exist per se for metals, there are still federal, state and port records for imports, exports, taxes, tariffs, as well as other public documents and filings.

"Independent oil companies don't share well data out of beneficence," said Greg Haas, director of integrated energy at Stratas Advisors in Houston. "They have to pay taxes and royalties to the federal and state governments, as well as severance taxes in many states. The state oil and gas authorities have very strict rules on how to measure and report well performance. All the data that are shared in the industry come from those tax and royalty filings."

Similar useful data might be found for the metals sector. "A company or data provider might have to dig deep into the records, but more than likely the public data on metals, or any industrial segment, could be aggregated for benchmarking and decision making. The process is highly developed in oil and gas, and something similar is probably likely in other industries," Haas suggested.

He also noted that Houston was home to important computer hardware and software companies that grew with oil and gas through the same era. The techniques that led to the shale bonanza were pioneered about 1980, and became widespread by 2000. Compaq Computer was founded in 1982 and acquired by Hewlett-Packard in 2002.

So the rise of big data and big wells came about the same time. "The shale boom started this millennium," said Haas, "just about the time cloud-based big data became possible. Certainly oil and gas has been at this a couple of decades. You need big numbers to crunch, and big computing power to crunch them."

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Several sources suggest that it will take material gains by one or another metal maker to jolt the rest into action. In some ways O'Neal is the type of service center that would make a good partner for the first forays into joint business intelligence. It is a full-line operation – carbon steel, stainless, even aluminium – with some value-added operations, but not a heavy processing shop.

"Today our business is still controlled by order entry," Armstrong lamented. "That is true for us and for other service centers. Visibility is limited on what is coming down the pipe. Clearly there is an opportunity to improve visibility to the market for our mill suppliers. They would like to know if it is efficient or profitable to run at a different speed, or run longer or shorter."

Overall, Armstrong is sanguine: "There is absolutely a potential outcome for collaboration from our inventory to their manufacturing. That is opportunity. That is the future. That is where we need to be."

Growing willingness

Software vendors rave about analytics and artificial intelligence based on data lakes or data mining. Yet, as often reported, mills seem reticent to grant access to their data. Wertz, at Worthington, would like to see mills "more open, collaborative, and creative in working with other members in the supply chain to find ways to use data and analytics to help themselves and their partners to operate more safely, consistently and efficiently."

He sees hopeful signs. "Over the past several years we have seen a greater willingness to share information up and down the supply chain as we are all looking for ways to increase efficiencies and become better suppliers to our customers," Wertz noted. "As more entities in the supply chain begin to capture more information, I believe the ability and willingness to share and collaborate will continue to grow, especially as new technologies are developed that allows for more targeted capture and data sharing. What's going to be important is the ability to share while maintaining security and control over proprietary information."

There are numerous opportunities to explore in all areas [of business intelligence], Wertz asserted. "In the supply chain, being able to feed changing demand/sales data or quality data upstream and downstream to drive faster, more real-time changes in production schedules can help minimize inventory and scheduling disruptions and improve quality performance."

Competitive pressures

It is a little ironic that an impediment to sharing KPIs and other business intelligence within the metals sector is the pressure of competition. It is that same pressure that seems to be driving the service centers to seek collaboration with their suppliers.

"Certain distributors are going for margin, while others are going for volume; they can't do both," said Philip Gibbs, vice president and metals equity research analyst at Key Banc Capital Markets. "It is a very fragmented market and to gain share they have to increase their capabilities."

One leading service center, for example, focuses on high value and has made capital investments to that end to drive results. "They are not keeping pace in volume, but with unit margins well above industry average, they can be more choosy," Gibbs noted.

Others are more beholden to the OEMs in heavy equipment and transportation and are running on thinner margins. Some service centers are more value-added than others but, with a heavy dependence on automotive business, have less diversification.

That differentiation of focus by the service centers influences how they approach business intelligence and their level of interest in collaboration with mills and other suppliers on key performance indicators.

'Clearly some mills are farther along than are others. Some are more inclined to share than are others'

A range of business-intelligence systems is available for mills and service centers to support their chosen strategic focus. "There are some interesting things out there, but the industry is behind the curve. There are inventory mapping systems, for example, but those are limited by what both sides are willing to share. Without sharing data, it becomes a constant battle between buyer and seller: 'You need to buy, your inventory is low. No it's not.'" said Gibbs.

Proxy for data sharing

Given the availability of ERP and sales customer relationship management (SCRM) software, it would seem simple for the system to be the honest broker driven by data. But it needs the data. Gibbs has noticed that some mills and distributors have begun using derivatives, making hedging a proxy for data sharing. "It is easy to see the liquidity building on the markets, in hot-roll coil, in scrap, ore, and busheling." There are now the financial tools to synthesize a proxy supply chain.

"People are already using cash-flow tools at least as a first-level conversation," said Gibbs. "But they are scared. They don't know how to proceed until someone shows them. If distributors can show a cash-flow approach, then that is the technological change. I don't see a lot of other tech change with sharing of data. I see more risk-management strategies being implemented."

The snag is that it often involves limiting downside risk at the cost of some upside potential. "People in this industry like to be directional. They don't really care which, but if they are positive, then they will be long inventory. If they feel negative then they are going to reduce risk. They prefer one or the other, but these days the sentiment is mostly 'I just don't know.'"

Turbulent trends

William Adams reviews market dynamics for battery raw materials and considers the outlook

Battery raw material prices have for the most part been under pressure, albeit for different reasons, with spot lithium prices in China and international cobalt prices reacting sharply to the supply responses that are underway, while nickel prices were hit by the general economic slowdown that has emerged from the drawn out US-China trade dispute.

Spot lithium carbonate prices, ex-works China, peaked at 175,000 yuan ($26,315) per tonne in November 2017, but have since fallen to 76,000 yuan ($11,325) per tonne – a drop of approximately 57%.

Fastmarkets' MB standard-grade free-market cobalt prices, on an in warehouse basis, peaked at $43.70 per pound (lb) in April 2018, and have since fallen 68% to $13.90 per lb. Prices are now back in the range before the 2016 demand shock got under way.

LME nickel prices bottomed out in early 2016 at $7,550 per tonne. They climbed to $15,845 per tonne in June 2018, before dropping back to $10,525 per tonne in early January this year, but they have since rebounded to a high of $13,765 per tonne.

Unlike spot lithium and cobalt prices, which have seen prices fall due to increased supply, nickel prices pulled back more as a result of concerns over the economic outlook for the global economy. But, while the price of nickel metal has rebounded 30% from the start-of-year lows, nickel sulfate prices, ex-works China, have only recovered 3% over the same period. Prices for nickel sulfate containing between 21% and 22.5% nickel were quoted in mid-March at 24,750 yuan per tonne, compared with a low of 23,950 yuan per tonne in mid-December last year.

The speed and extent of the supply response has been significant for both lithium and cobalt. As these are still relatively small markets, the ramp-up of five new lithium projects and two large cobalt projects, all in the space of just over a year, have not surprisingly created supply surpluses. In addition, the size of these start-ups have dampened the outlook for the next few years as the market will now have to wait for demand to grow to absorb the new supply. Not only has this affected battery raw material prices, but it has also impacted the share prices of lithium and cobalt producers and junior miners who have mining projects under development. This weak price environment will further impact miners' ability to bring new production capacity on stream.

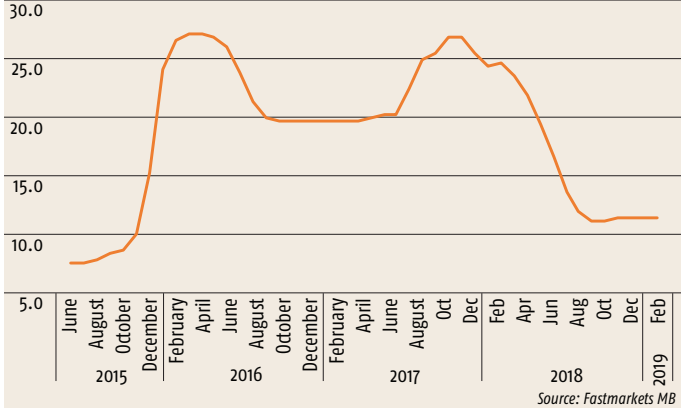
The recent supply increases look massive on paper – for example, an additional 100,000 tonnes of lithium carbonate equivalent (LCE) capacity will be in place in 2019. Considering that lithium production was around 300,000 tonnes in 2018, that means a 33% increase in one year just from new entrants, while there will also be incremental increases from existing producers. However, in reality, the ramp-up of new production tends to bring start-up issues that affect grade and production volumes and new material needs to be qualified by downstream users, all of which means the actual amount of new material reaching the market will be less than the headline figure.

For 2019, Fastmarkets expects processed lithium supply to rise by 78,000 tonnes, but it may end up being lower than that as low prices may prompt some producers to halt production, or delay the ramp-up of new production. Indeed, one hard rock mine (North American Lithium) has already halted production due to low prices; the start-up of a new project (Nemaska) set to come on stream later this year may be delayed; and brine operations in Argentina and Chile have been affected by heavy rainfall since the start of the year. In addition, we now see that SQM expects its sales to be less than its production, which means it will stockpile material. All of this means actual supply to the market will not be as much as it could have been. In addition, if prices fall further then that is likely to squeeze margins more and lead to production restraint at higher cost Chinese processors.

Cobalt has had a similar experience. The cobalt market was around 103,000 tonnes in 2017, but the ramp up of Glencore's Katanga mine in the Democratic Republic of Congo (DRC), and increasing production at existing mines, meant that production increased by some 15% in 2018. It was set to increase by a further 14% this year, as Katanga continued to ramp up output and Eurasian Resources Group's (ERG) Roan Tailings Reclamation (RTR) project started production too. Such large one-off increases in supply are bound to throw any market into an imbalanced state so, like lithium, the cobalt market will now need to wait for demand to catch up with supply again.

Also like lithium, the sharp drop in cobalt prices has led to negative supply responses in cobalt, with some artisanal producers in the DRC cutting production as margins were squeezed. Glencore cut expat workers at its Mutanda mine, which, along with Katanga, is one of the world's two largest cobalt mines. The cut in expat workers is expected to lead to lower cobalt output. In addition, higher taxes in the DRC and the tax on concentrate

Battery grade lithium carbonate ex-works, $/kg

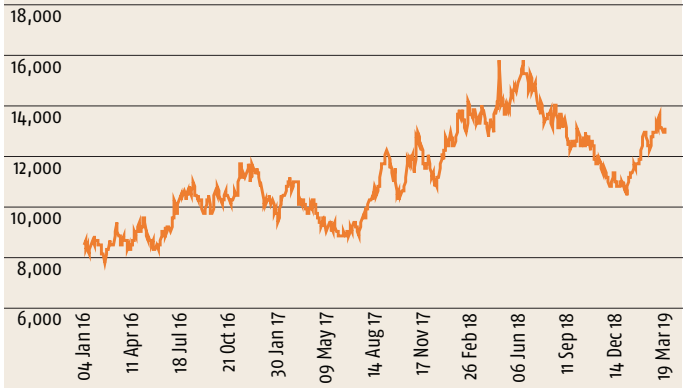


Source: Fastmarkets MB

Fastmarkets MB long-term cobalt prices 1997 to present

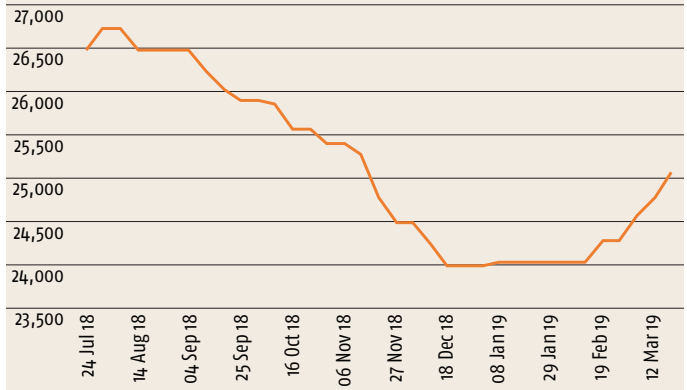
Source: Fastmarkets MB

Nickel 3-month LME official prices, $/tonne



Source: Fastmarkets MB, LME

Fastmarkets MB nickel sulfate, yuan/tonne



Source: Fastmarkets MB

imports in Zambia have led to the closing of ERG's Boss mine in the DRC and the Chambishi smelter in Zambia. The bringing into production of new mines and the development of mining projects are also expected to be delayed while prices are low.

Nickel sulfate

The outlook for nickel sulfate is generally bullish. While more nickel sulfate production capacity is being built, nickel metal prices are not high enough to incentivize the development of new nickel sulfide mines, which is the most common route to producing nickel metal, from which nickel sulfate is made.

At present stocks of nickel metal are high, so those can be used to make nickel sulfate, by dissolving the nickel in sulfuric acid. Nickel metal and nickel sulfate can also be produced by using high-grade nickel laterite ores that can be processed via high-pressure acid leaching (HPAL), or just acid leaching in the case of some ores. But again, higher nickel prices would be needed to encourage producers to build new mines and refineries.

At present the growth in nickel units comes from converting low-grade nickel laterite ores into nickel pig iron (NPI) which can feed the stainless steel market, but at present is not believed to be an economically viable way to produce nickel sulfate – although work is under way to see if this can be done. For now, and out to around 2022, it is believed that there will be enough of the right type of nickel units to feed the needs of the lithium-ion battery industry, but unless breakthroughs in technology are made by then, nickel sulfate may become in short supply.

Supply-chain dynamics

In summary, the supply side of the battery raw materials supply-demand equation is well supplied over the next three to four years, but there is little room for complacency as demand is already growing rapidly and that will only accelerate over the next two to three decades.

The surge in new lithium and cobalt production in 2018 and the corresponding price falls have, to some extent, masked the strong growth in electric vehicle (EV) sales. Global plug-in vehicle sales reached 2.1 million units in 2018, an increase of 64% compared with 2017, according to EV-Volumes.com. It is worth noting that this rapid growth in EV sales is happening before EVs have become mainstream, which Fastmarkets does not expected them to do until around 2023. Fastmarkets expects EV sales to grow at a compound average growth rate (CAGR) of 35%, which will mean large annual increases in demand for battery raw materials.

In addition to EVs, demand for energy storage systems is also forecast to see rapid growth. Any supply chain that is growing fast and relies on new mine supply to feed it is in an increasingly difficult space, as finding, permitting and financing new projects takes considerable time. It is reckoned that to bring a new greenfield mine on stream takes around seven years, but as environmental pressures grow and water supply becomes more of an issue in many mining areas, it is likely that lead-times will increase.

By 2025, we expect lithium demand from EVs to be rising at an annual rate of 180,000 tpy and total lithium demand to be rising at a rate of 220,000 tpy. To put that into context, Pilbara Minerals is expecting capacity of 100,000 tpy once Stage 2 is commissioned, so by 2025 the market will be needing the equivalent of two large new mines a year. Consequently the upstream lithium supply chain probably has no time to dawdle, as seven years is not a long time in the context of bringing new mines into production.

Given the need for a lot more production capacity in the years and decades ahead, the last thing the market needs is for price dips to lead to cuts in producers' capital expenditure. Lithium, being an old but small market, has traditionally been left to its own devices and, as such, only a handful of traditional producers has been involved. That has changed in the past decade – initially driven by extra demand from the consumer electronics market, but more rapidly more recently by the pace of the EV demand that has emerged.

The sudden pick-up in interest has caught the financial markets unprepared – many banks have not been active in early-stage financing, with most of the junior miners having to rely on private placings, offtake agreements and, more recently, joint ventures.

Given lower lithium and cobalt prices and oversupply, there is a danger that junior miners without adequate financing in place will now suffer delays in bringing on their production. This could make for even tighter supply in the mid-2020s. Fastmarkets, however, expects that financing will be forthcoming, not so much from banks, but from the downstream supply chain and OEMs. Banks may get more involved once lithium and cobalt prices are quoted on an exchange, as that could help them offset their risk. The LME has just launched a new cobalt contract that will be cash-settled against the Fastmarkets MB cobalt standard-grade free-market price assessment and the exchange is planning to introduce a lithium contract at some stage.

The OEMs have invested billions in new battery and EV factories, so the last thing they will need is a shortage of raw materials. As such, Fastmarkets expects a lot more activity in M&A, joint ventures, partnerships and offtake agreements, which should help avoid some of the delays that a boom-bust cycle would have otherwise caused.

The author is head of base metals and battery materials research for Fastmarkets

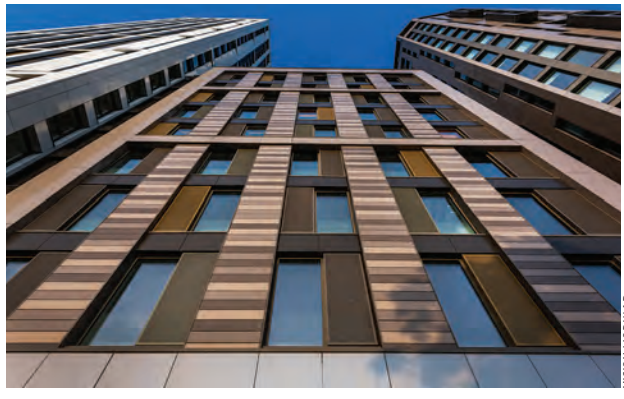
Prefabrication offsite keeps projects lean

Modular and hybrid modular methods of construction are expanding owing to the construction time and cost benefits they offer. Seema Chaudhary outlines key market forces and examples of their application

Architects, fabricators and contractors often strive to work together closely on construction projects and together contend with many potential challenges. Among these are over-running budgets, unseen site constraints, service integration, subcontractor delays and unexpected design omissions. During an era when low cost, resource efficiency and tight schedules are a priority, such challenges in the construction industry and advances in building technology have encouraged the use of offsite prefabrication and modular construction.

Prefabricated construction encompasses modular building – also sometimes known as volumetric construction – with preassembly offsite to a lesser or greater degree prior to modules arriving on site. Prefabrication also includes 3D structural units, usually made from steel frames, light-gauge steel sections, precast concrete and/or timber.

Modules can come complete, fitted with services and internal fixtures and fittings in the factory and stacked in place by cranes. Other modular prefabricated units include 2D panels, such as walls, frames, doors, ceilings and windows. The posts and beams to which they are fitted and fastened are usually made from hot-rolled steel sections. Hybrid systems may use both volumetric and 2D panel systems and incorporate other pre-cast and/or primary structural frames.



VISION MODULAR

Alex Carrick, chief economist at ConstructConnect, a company based in both the United States and Canada, said that the use of modularization is growing.

ConstructConnect, a wholly owned subsidiary of Roper Technologies, provides preconstruction for the non-residential market in the US and Canada, connecting the entire construction industry including general contractors, subcontractors, building product manufacturers, designers, architects and project owners. "ConstructConnect is the one place where people connect and confidently evaluate, choose, and prepare projects before they build," said the company.

Carrick said that a key factor that is beginning to drive offsite construction is the shortage of onsite labour. He noted that modularization is at present being led by companies in the Middle East, Europe and China, which are introducing new technologies in construction.

VISION MODULAR

VISION MODULAR

Apex House in the UK provides student accommodation with its 679 modules and 29 storeys

In the Unites States, said Carrick, because the construction workforce has traditionally been sourced locally, "when you start doing offsite work this changes the nature of the industry." Such change is resisted by some people in the industry. "That said the labour shortage in the US will be a big part of future change," said Carrick. He also noted that automated processes will reduce the need for traditional labour, but will also draw on alternative sources of labour and skills.

Carrick observed that projects use a variety of hybrid systems. He cited the Humber River Hospital in Toronto as a sustainable model. It utilized PCL companies' prefabrication services for the design, engineering and assembly of modular building solutions with more than 260 tons of structural steel framing installed, according to PCL. Through the utilization of virtual construction technology and offsite manufacturing techniques PCL prefabricated and installed 360 patient washrooms and 14 telecommunications/data rooms, and in so doing reduced the schedule time.

"Fabrication of the modules in PCL's in-house manufacturing facility generated less waste, created fewer site disturbances, and decreased the overall embodied energy of the project," noted the company. "Embodied energy is the sum of all energy needed to produce a product, as if that energy were incorporated or 'embodied' into the product itself. Reducing embodied energy therefore reduces a building's carbon footprint, which is the sum of all greenhouse gases emitted during the full life cycle of a product," it added.

Modular applications

Successful modular buildings in the UK include student accommodation by Vision Modular Systems, a UK-based company that manufactures 3D structural modules for the construction industry. The Apex House in Wembley, London, is built to have aesthetic as well as practical appeal. Vision Modular System modules are manufactured with integrated structural steel framing and solid concrete floors. The modules are said to deliver a major reduction in on-site program, a guaranteed consistent high-quality of finish, a safer method of construction and the certainty of program and cost.

The company won various categories in the annual Offsite Construction Awards 2019 run by Radar Communications in ExCel London. The other award winners showcased a number of examples of prefabrication and factory-based methods that have consistently strived for "a sustainable, streamlined and cost-effective way to deliver a better-built environment." Award winners such as Ilke Homes, Kier Construction, Mid Group, Innovaré Systems, Voestalpine Metsec, Barratt Homes, Premier Modular and Caledonian Modular, also in the UK, have all been part of innovative offsite building projects.

The advantage of building with prefabricated components and modules are many. According to the US National Institute of Building Sciences Off-Site Construction Council (OSCC) based in Washington D.C., "More than 87% of construction managers, general contractors, engineers, trade contractors, architects, owners and developers used some form of prefabrication in the past 12 months."

OSCC found also that more companies were using elements fabricated off-site for commercial, industrial, healthcare, education, multi-family, hospitality, single-family and data center construction. Respondents in a survey conducted by OSCC reported added benefits of reduced project schedules, better product quality and cost effectiveness. But the survey also highlighted that additional education is needed to influence decision-makers and developers who have the potential to use off-site construction.

Offsite framing techniques are particularly advantageous for the speed they lend to construction. Specialist cold-roll steel specialist Voestalpine Metsec, in the UK, uses lightweight steel for its Metframe pre-panelized system. It can be utilized to provide a load-bearing structure of up to 15 storeys high. Metframe can support lightweight steel joist floors or concrete floors. Fabrication of individual steel pieces takes place offsite in a safe, controlled environment. Digital design and fabrication systems deliver products that are precision engineered with minimum waste and thus cost-saving benefits.

Off-site framing projects can be made 20% to 30% faster than traditional construction methods, according to Voestalpine. This means that tight deadlines can be met more readily. The Metframe system is said regularly to take less than two weeks per floor to construct. "This allows other trades to enter the site and carry out their role," notes its supplier. Work in the factory can begin in unison with the project schedule. "Stringent factory-quality control, better working conditions and automation mean offsite-fabricated elements are made to a higher quality than the site-fabricated equivalent," states Voestalpine.

ArcelorMittal's holistic Steligence® system

ArcelorMittal is using its own Steligence® system to build its flagship headquarters in Kirchberg, Luxembourg, scheduled for completion in the autumn of 2021. It advocates better dialogue between various architectural and engineering disciplines as well as the use of modularized steel components in building projects wherever possible. A key feature of the holistic design will be the prefabrication element and the ability to take down and re-use steel.

In a White Paper published by ArcelorMittal, the company compared costs of Steligence with a baseline scenario utilising an objective peer-review methodology. ArcelorMittal's Paper explained: "To demonstrate the utility of the methodology, it was used to assess different construction scenarios for an eight-storey office building considered typical of those constructed in Europe: a 'baseline' scenario most representative of current construction systems and an optimized Steligence using best-in-class steel products." It was found that overall Steligence is 7% less expensive than the baseline due to faster building construction. Infrastructure costs are reduced because of lighter foundations and an innovative structural system.

The White Paper collected and analysed data on office building configurations, performance characteristics and technical solutions, and evaluated trends for future buildings in the 2018-2020 timeframe. The structure used for the flooring was ArcelorMittal's Cofraplus® 60 ZM floor decks, which are trapezoidal steel sheets with embossed ribs to ensure a composite action with concrete used in floor construction. It is said to permit significant weight, time and cost savings.

ArcelorMittal's flagship headquarters in Kirchberg, Luxembourg, is scheduled for completion in the autumn of 2021

The infrastructure for the Steligence system is made from the steelmaker's Angelina® long-span framing, which can span 13 meters in length. The longer uninterrupted span between columns should result in much better flexibility of interior floor layout, according to the White Paper.

Steligence also allows buildings to be deconstructed and the steel components to be re-used at the end of the building's service. "Most of the environmental impacts are caused by the manufacturing of materials, and the largest end-of-life savings are due to the recycling of steel and aluminium," the paper noted. Because the scenario uses steel sheets instead of concrete hollow slabs, each floor can be erected twice as fast, resulting in 24% cost savings for that part of the construction, notes the company.

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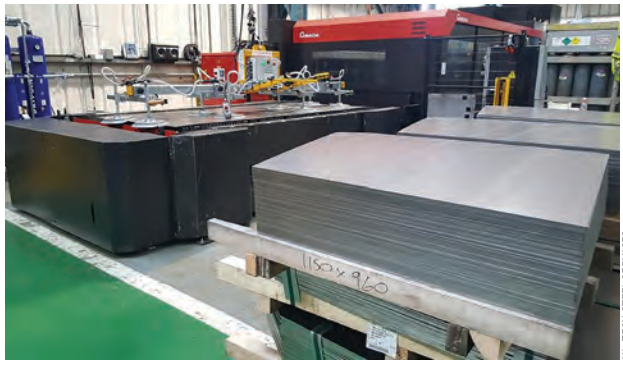
Hi-Tech Steel increases turnover by embracing Industry 4.0

UK-based steel stockholder and processor Hi-Tech Steel Services (HTSS) has introduced a digital approach to steel processing and in so doing has increased its turnover in 2018 by £3 million ($3.93 million), or 12%.

HTSS approached the business support programme LCR 4.0 team at Liverpool John Moores University (LJMU) after seeing a hike in requests for laser-cut materials and flat sheet metal products. This culminated in the development of a commissioning strategy to fully integrate new laser cutting equipment into the factory quicker than previously possible.

All the new equipment is autonomous, which HTSS says frees employees' time to be spent on other business areas. The collection of performance data from the digital machinery also provides insights for making business improvements.

In addition, HTSS said that it has hired four highly trained operatives to offer 'bespoke' CAD design services to ensure the metal is cut and processed exactly as required.



HI-TECH STEEL SERVICES

HTSS incorporates the latest digital technologies into new laser cutting equipment

"Digital transformation is making waves through every industry, so it was no surprise to us that our customers were looking for more advanced solutions than we had traditionally offered," Andy Flatt, general manager at Hi-Tech Steel Services, said.

The Liverpool City Region Local Enterprise Partnership (LEP) was instrumental in connecting HTSS with LCR 4.0 partner LJMU, which provided specialist academic expertise and resources. The UK's LCR 4.0 (Liverpool City Region Four Point Zero) is a business support programme for manufacturers looking for help in integrating their businesses with the digital industry 4.0 revolution.

"We knew the technology we needed to introduce, and we knew that there was a significant growth opportunity for us to expand our offer. But we what didn't know was how to implement it without disruption, so it was great that the LCR 4.0 team at LJMU was there to help," Flatt added.

HTSS works across the UK and Europe in the automotive, construction and ventilation sectors. LCR 4.0 is receiving up to £4.4 million funding from the England European Regional Development Fund as part of the EU's European Structural and Investment Funds Growth Programme 2014-2015.

"The results of going through our own digital transformation are already tremendous," Flatt said, "We have increased turnover by £3 million this year and expanded our customer base significantly. We have also entered new tiers within our supply chain which will encourage further growth well into the future."

Inmarsat, Knight Piésold team offer real-time tailings dam monitoring

Inmarsat, which specializes in global satellite communications, is teaming with Knight Piésold UK, geotechnical tailings management and engineering consultancy, to offer real-time tailings dam monitoring for global miners.

Inmarsat is using a range of industry-standard sensors via edge connectivity – such as long-range wide-area networks (LoRaWAN). Data is transferred over Inmarsat's L-band satellite network to a single cloud dashboard. The solution is highly versatile and has 'sensor-agnostic' capabilities, working with both existing sensors and new devices.

At present, mine tailing audits are conducted at intervals, with consultants travelling long distances to collect and audit data. Inmarsat's internet of things (IoT) solution means this auditing practise can now be supplemented with a remote, customizable, 'daily management cycle.' This gives engineers on-site access to real-time decision-making.

The synergy between the new technology and conventional monitoring methods will enable a new approach to the way that tailing dams are audited and managed, providing improved decision-making, higher safety standards and support for regulatory compliance.

Mining companies and national regulators can now gain a comprehensive summary regardless of where the mine is located, with granular metrics such as pond elevation, piezometric pressure, inclinometer readings and weather conditions displayed in one place.

INMARSAT

Satellite technology will complement conventional methods for monitoring tailings dams

"Instrumentation data is often collected on-site and mining companies are largely reliant on human activity for the collection, storage and analysis of the data. Our collaboration with Inmarsat provides our clients access to the latest and best available technology for real-time data collection and analysis," Richard Elmer, regional manager for Knight Piésold UK, said.

"We have been working with Knight Piésold's UK practice since 2017 to develop an approach to tailings dam monitoring that supports smarter, safer and more regulated mining practices. Following successful trials we are pleased to be able to bring what we believe to be a truly disruptive solution to market," Paul Gudonis, president of Inmarsat Enterprise, said.

Tata Steel's SD rebar provides strength for India's Bogibeel bridge

Tata Steel has supplied 15,000 tonnes of higher strength and flexibility rebar – 75% of the total rebar used – in the construction of India's Bogibeel river bridge. The bridge is 4.94 km long and has been built over the Brahmaputra River in Assam. It has fully-welded steel-concrete composite girders.

India's largest 'rail-cum-road' bridge was opened by prime minister Narendra Modi. The Tata Tiscon brand launched the latest super ductile (SD) rebar used, especially designed for zones prone to seismic activity. To avoid steel wastage, Tata Steel customized the length of the rebar.

The product is made with higher control over carbon, sulfur, phosphorus and other alloying elements as well as post-rolling treatment. The higher ductility ensures that the concrete surrounding the rebar does not peel off and thus that the rebar is not exposed. The higher elongation property of the SD rebar means it has an enhanced ability to withstand load and deformation, which would provide more time to leave the structure in the event of an earthquake.

"It is a matter of pride for us to be part of this structure that bridges the distance and enables a better tomorrow for the North-east. This is a manifestation of the spirit of innovation in Tata Steel and we will continue to develop products to support such megastructures," Kulvin Suri, chief of corporate communications at Tata Steel, said.

Tata's Tiscon steel was also used in the Bandra-Worli Sea Link, an eight-lane bridge over Mahim Bay, Mumbai. It was designed as the first cable-stayed bridge built over open seas in India. Tata Steel's durable LRPC strands feature in the bridge, along with Tiscon reinforced bar.

SHUTTERSTOCK

Bogibeel bridge in Assam incorporates Tata's latest super ductile rebar

Naval Group and Centrale Nantes pilot first large 3D hollow propeller

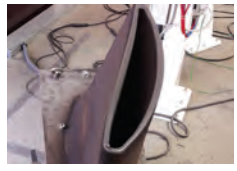
France's Naval Group and engineering school Centrale Nantes have designed large stainless steel propeller blades for ships by using metal additive manufacturing in order to improve vessel propulsion.

Wire-arc additive manufacturing (WAAM), which uses electric arc as a heat source and wire as a feedstock, enables the printing of larger products with the potential for more complex parts.

The propeller was made as part of the European Commission-funded H2020 project RAMSSES (the realization and demonstration of advanced material solutions for sustainable and efficient ships) to improve the operational capabilities of ships and reduce their environmental impact.

The propellers were printed in less than 100 hours, measure six meters in length and would not have been possible to make with traditional manufacturing methods. They weigh 300 kilograms, providing a weight advantage of over 40% by comparison with that achievable via conventional processes, says Naval Group.

Naval Group designs and manufactures defense systems. Sirenna, a Centrale Nantes spin-off and subsidiary of Naval Group, is piloting the design to improve energy efficiency and reduce the environmental footprint linked to the propulsion, Naval Group explains. This has been a challenge for large container ships. The product also features a significant reduction in radiated noise and vibrations.



NAVAL GROUP

3D printing hollow propellers in shipbuilding

Thyssenkrupp rolls out MAX in France

Thyssenkrupp Elevator will maintain 585 elevators and 1,545 automatic doors in France by using its MAX predictive maintenance service, which will collect real-time data through sensors for analysis by using artificial intelligence.

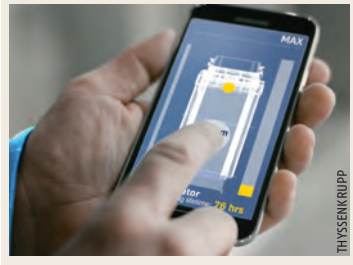
The solution is already connected to 125,000 elevators in the United States, Germany, South Korea and Brazil. Now the IoT application is to be launched for the first time in France with EDF.

MAX will first be piloted at the Paris-headquarters of EDF, offering the energy supplier greater transparency and building efficiency with 17 elevators to be installed with the service.

The installation of MAX will then follow over the energy supplier's other facilities in France.

Thyssenkrupp is aiming to transform the delivery of services to the elevator industry after teaming with Microsoft's Azure platform in 2015 with MAX. The real-time, cloud-based predictive solution for the smooth running of elevators, cuts down-time by 50%, according to Thyssenkrupp.

"Maintenance with MAX means predicting elevator break downs before they happen. In a MAX-Connected city elevators will run more consistently..." Peter Walker, CEO of Thyssenkrupp Elevator, said.



THYSSENKRUPP

Thyssenkrupp Elevator is monitoring equipment to provide predictive maintenance

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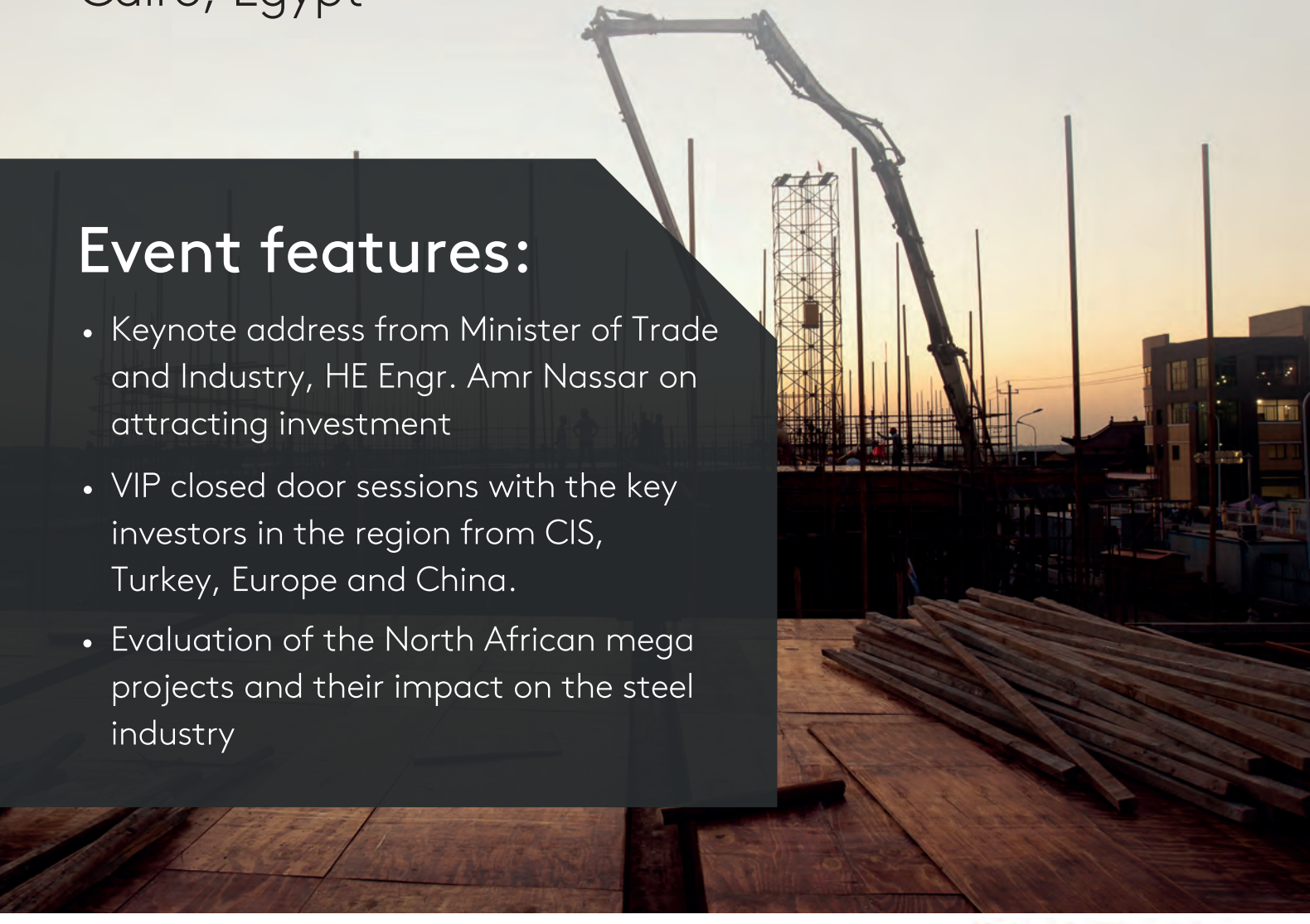

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- Keynote address from Minister of Trade and Industry, HE Engr. Amr Nassar on attracting investment
- VIP closed door sessions with the key investors in the region from CIS, Turkey, Europe and China.
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