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Metal Bulletin

Magazine

**Anil Agarwal
on Vedanta and
India's growth**

**Tube, pipe &
wire – markets
and innovations**

**Copper, lead &
zinc – mixed
market fortunes**





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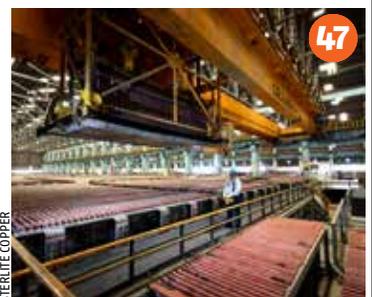
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Seeking certainties

In times of such depressed metal markets, it is human nature to seek solace in certainties, where they can be found, together with any reasons to believe that better conditions are just around the corner.

Readers will find limited cheer in this issue on the latter search, as the phrase 'lower for longer' appears to have gained traction amongst analysts. One positive short-term thought, however, is that even markets with positive fundamentals have been dragged down by generally negative overall sentiment, which implies that beneath the gloom there are still reasons for positive thinking.

And after all – while they are facts that offer absolutely no immediate comfort to a mine, smelter, refinery or mill worker laid off in the downturn – it is a basic truth that copper has become no less an excellent conductor of heat and electricity, zinc no less a vital coating to protect steel from corrosion, and lead no less an important component of many battery designs, despite the depth to which base metal prices have sunk.

In addition to commenting on immediate market drivers and the uncertainties of the near-term outlook, market overview articles for each of those key base metals in this issue of *MB Magazine* give cause for longer-term optimism – not least due to the potential for comparatively new technologies to generate new markets for them.

And while everyone continues to look at China's economic slowdown and frets, India is booming – albeit from a lower production base. Our cover profile interviewee, Vedanta chairman Anil Agarwal, is certainly upbeat about India's growing potential as both a producer and consumer of natural resources.

The tube & pipe industries are living in the shadow of low oil & gas prices, forcing some mills to re-organise. For those markets too, geography has a substantial influence, as articles written by MBR's experts explain for OCTG and linepipe markets. Some regions are certainly a little more buoyant than others.

And while steel producers in many regions look to protect themselves against imports, technology innovation remains one weapon to try to stay ahead of the competition. As the last feature article in this issue reviews, steelmakers providing steels for the automotive sector continue to invest in pushing their product capabilities ever higher – as does the aluminium industry.

There are few certainties in metal markets of course, but good risk management usually achieves desirable outcomes.

'Beneath the gloom there are still reasons for positive thinking'

Metal Bulletin Magazine

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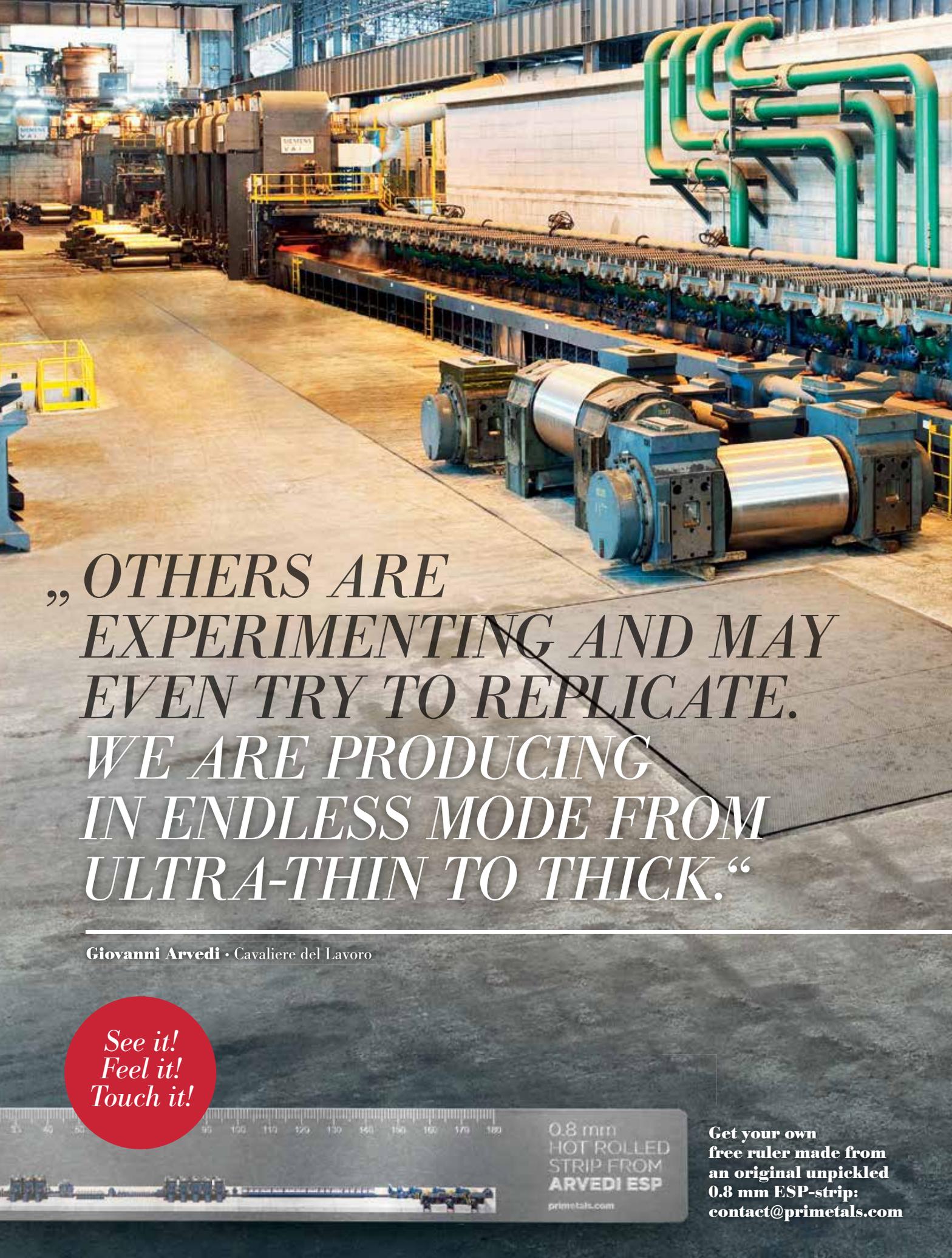
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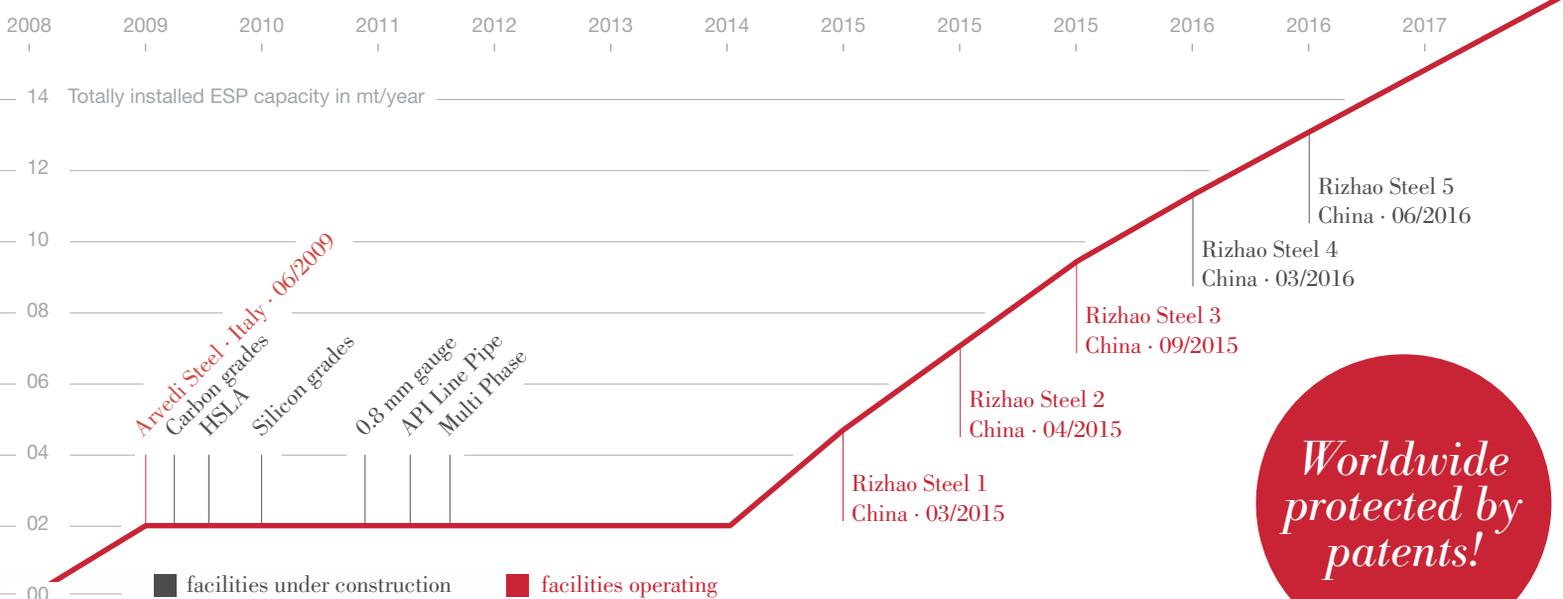
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News review: non-ferrous

Votorantim shuts nickel and cobalt production

Brazil's Votorantim Metais shut down its nickel and cobalt production from February 1, because of current low prices. The company, which has capacity of around 44,000 tpy of nickel and was estimated to have produced around 1,400 tonnes of cobalt in 2014, will shut down its mining operations at Niquelândia from February 1, while the processing at Niquelândia and refining at São Miguel Paulista will close from May 1. The mine and plants will be placed on care and maintenance until conditions improve.

Chinese tin and copper producers to cut output

Nine major Chinese tin producers are to cut 17,000 tonnes of production in 2016, according to a joint statement published on January 20. The statement called on all tin enterprises to actively respond to the call of "supply-side reform" from the government. It also called for the government to stockpile tin. The output of the nine participating producers amounted to around 140,000 tonnes in 2015. This is

equivalent to more than 80% of China's domestic production of refined tin and some 40% of the world total.

This follows an earlier announcement that China's ten largest copper producers agreed to cut 2016 production by 350,000 tonnes, according to a statement published by a newspaper close to the China Non-Ferrous Metals Industry Association (CNIA). The ten smelters' total output accounted for more than 50% of China's refined copper production in 2014. The producers include nine state-owned producers plus one private company, Xiangguang Copper.

Peru reports record copper production in 2015

Peru reported record copper mine production in 2015, boosted by the full operation of new projects (including Toromocho and Constanca) and the recovery at the country's largest mine, Antamina. The country produced a total of 1.7 million tonnes of copper in 2015, up by 23.5% from 2014, according to the mining and energy ministry, MEM. Peru is the world's third-biggest copper producer, behind Chile and China. In

2014, Peruvian output increased by a modest 0.26% from the year before.

Zinc output rises 8% in Peru

Peru's annual zinc production grew 8.1% in 2015, to 1.42 million tonnes, according to MEM. The country is the world's third largest zinc producer, behind China and Australia. Production at Antamina, the country's leading zinc producer, rose by 12.2% last year to 298,265 tonnes.

Noranda files for Chapter 11 bankruptcy

Noranda Aluminum Holding Corp has filed for chapter 11 bankruptcy and will undergo a court-supervised restructuring process as a result of unfavourable market conditions and recent disruptions to its business operations, the USA-based company announced on February 8. Alongside the bankruptcy filing, Noranda is seeking court authorisation to support the business during the restructure, including the payment of employee wages, salaries and health and disability benefits. It is intended that suppliers will be paid under normal terms.

Brazil's primary aluminium output falls 20%

Brazil's primary aluminium production fell 19.7% to 772,200 tonnes in 2015, according to the country's aluminium association, Abal. The figures reflect the recent capacity curtailments in the country amid high costs, weak domestic demand and a tougher global environment for the industry. Brazil's remaining primary aluminium producers are Votorantim Metais' CBA and Albras, which is 51% owned by Norsk Hydro and 49% by Nippon Amazon Aluminium Corp.

Korea Zinc commissions more lead smelting capacity

Korea Zinc has inaugurated 130,000 tpy of new lead smelting capacity at Onsan in North Gyeosang. The expansion cost 390 billion Won (\$320 million). With the expansion, Korea Zinc's total lead smelting capacity has risen to 430,000 tpy.

Horsehead files for Chapter 11

Pittsburgh, USA-based zinc producer Horsehead Holding Corp and its subsidiaries (Horsehead Corp, Horsehead Metal Products, Zochem and Inmetco) filed for Chapter 11 bankruptcy protection on February 2 to "gain greater financial strength and operational flexibility" in the face of liquidity challenges, although its production operations are expected to continue.

"The company plans to remain open and operating, with no interruption in service to our customers at our [electric-arc furnace] dust recycling facilities, Inmetco [International Metals Reclamation Co] and Zochem," Horsehead spokesman Ali Alavi said.



The Antamina mine contributed to record copper output in Peru in 2015, and 8% higher zinc output

Vedanta ships final ore from Lisheen

Vedanta Resources' Lisheen zinc and lead mine in Tipperary, Ireland, made its final shipment on 21 January. Mining ended in November 2015, and milling ceased in December, after 17 years of operation. Lisheen consisted of an underground mine, concentrator and backfill plant, and produced 300,000 tpy of zinc concentrate and 38,000 tpy of lead concentrate after operations began in 1999.

China's refined copper imports hit record in 2015

China's refined copper imports in December 2015 and the full year both hit record highs, according to Chinese customs data. The country imported 423,181 tonnes of refined copper in December, up 34.4% on an annual basis. Shipments for the whole year rose by 2.5% year-on-year to 3.68 million tonnes, despite the country's imports during the first eleven months seeing a decline of 0.6% year-on-year.

Total contained copper imports for 2015 – including metal, ores/concentrates and scrap – was estimated at 8.48 million tonnes, a 6% surge from the previous year's estimated total of 8 million tonnes, according to Barclays Research.

Asset writedowns drag Anglo American to \$5.6 billion loss

Anglo American incurred a \$5.6 billion net loss in 2015 as a 24% year-on-year drop in a basket of key commodity prices prompted major writedowns to its mining portfolio. Earnings before interest and tax totalled \$2.2 billion, down from nearly \$5 billion in 2014. Responding to the continuing deterioration in several key markets, Anglo is planning to "materially streamline" its business to focus on 16 core assets within its diamonds, platinum group metals (PGM) and copper



Rusal is undertaking a low-carbon aluminium campaign

businesses, the company told investors on 16 February.

In addition to previously planned sales of a number of coal and non-core platinum mines in Australia and South Africa, the company will also move to divest several other mines within its nickel, niobium and phosphates, metallurgical coal and iron ore, and manganese portfolios over the course of 2016. The targeted proceeds of these divestments is \$5-6 billion. Concerns about the company's balance sheet resurfaced as Moody's downgraded the company's debt rating.

Rusal pledges support for sustainable aluminium

UC Rusal has joined the Aluminium Stewardship Initiative (ASI) in order to contribute to the development of global sustainability standards for the aluminium sector. Since 1990, the aluminium producer has halved emissions from its

smelters, and is utilising the renewable hydropower resources of Siberia to reduce its carbon footprint. Over 90% of its aluminium production is sourced by hydropower.

Rusal is undertaking a low-carbon aluminium campaign, aimed at driving a new approach to the chain of custody, and a socially and environmentally responsible approach to the production of the metal. The ASI was launched at the end of 2012, and is supported by many aluminium producers, converters and end-users.

HKEx to launch Mainland spot commodities platform

Hong Kong Exchanges and Clearing (HKEx) plans to launch a Mainland spot commodities trading and financing platform capable of "physicalizing" China market benchmarks, the bourse said on January 21. The HKEx strategic plan provides the bourse's three-year road map for



Greater production of commodities such as bauxite, alumina and aluminium, did not prevent Rio Tinto recording a net loss in 2015

equities, commodities and fixed income and currency (FICC), with the aim of being able to bridge China and world markets. It plans to "financialize" the LME and sees a large untapped opportunity for the LME in Asia, particularly China, where financial interest in metals is unrivalled as the large derivatives volumes on Mainland commodity exchanges show, it added.

Rio Tinto promises cuts after 2015 loss

Rio Tinto registered a net loss of \$886 million in the full year 2015, after low prices for its products, currency losses on dollar-priced debt plus asset impairments. This compared with \$6,527 million net profit in 2014, and \$806 million net profit in the first half of last year. After these results, ceo Sam Walsh said that Rio is planning to cut operating costs by a further \$1 billion in 2016, followed by an additional goal of \$1 billion in 2017. Capital expenditure will be cut to \$4 billion in 2016 and \$5 billion in 2017 – an overall cut of \$3 billion on previous guidance.

Notwithstanding the losses made, the company's 2015 production of iron ore rose 13% from 2014, bauxite rose 4%, alumina rose 4%, and aluminium rose 1%. Output of mined copper and refined copper fell by 16% and 28%, respectively, but the company expects both to increase in 2016.

First copper shipment from new Peruvian quay

Freeport-McMoRan's Cerro Verde mine was responsible for the first shipment of concentrates – amounting to 5,000 tonnes – on 5 February from a new quay at Matarani port, in Peru's Arequipa region. Besides Cerro Verde, the new port quay will be used for the export of copper concentrates from MMG's Las Bambas and Glencore's Antapaccay. This first shipment from Cerro Verde took place two years after construction began for the new quay F, in February 2014. The port investment was \$320 million.

News review: steel

China aims to cut another 100M-150M tpy of capacity

The Chinese government is aiming to eliminate a further 100-150 million tonnes of annual crude steelmaking capacity amid an oversupplied steel sector. This new target will build on the 90 million tonnes of capacity that was cut over the past three years, premier Li Keqiang said at an executive meeting of the State Council on January 22. A time frame for the new target was not specified. The central government will guide enterprises with outdated capacity to quit the steel sector via mergers and acquisitions, as well as through upgrades and relocations, to have them adhere to stricter environmental and safety standards and energy efficiency, Li said.

Gusa Nordeste starts up billet line

Brazil-based pig iron maker Gusa Nordeste has started production at its Aço Verde do Brasil long steel project in the country's north-eastern Maranhão state. Located in the city of Açailândia, the 600,000 tpy billet line came into operation in December, and the 600,000 tpy rolling mill, capable of producing rebar and wire rod, will be commissioned in October 2016. The Aço Verde do Brasil steel plant will be supplied by two captive blast furnaces, while the remaining required pig iron will be supplied by local producers.

Russia boosts exports, but home market may plunge

Export volumes of semi-finished steel products out of Russia increased year-on-year by 8% or 940,000 tonnes to 13.2 million tonnes in 2015, national steel industry association Russtal reported. Total rolled steel exports stood at 25 million tonnes, up by 7% or 1.7 million tonnes year-on-year.



Russia's exports of semis rose by 8%, and of finished steel by 7%, in 2015

Meanwhile, Russian steelmakers sold a total of 31.5 million tonnes of steel products in the local market last year, down by 6% or 1.98 million tonnes year-on-year.

Russian steel demand is expected to drop by 10-20% in 2016, as the price of oil, the country's major source of revenue, has hit multi-year lows, according to ratings agency Fitch. The country consumed around 40 million tonnes of steel last year, down by 11% compared with 2014, according to preliminary figures from Russtal.

China's stainless output dips after seven years of growth

China produced 21.56 million tonnes of crude stainless steel in 2015, down by a marginal 0.6% or 129,500 tonnes from the previous year, and its first contraction in seven years. Apparent consumption of stainless steel, however, edged up by 1.4% on the year to 16.28 million tonnes, according to the China Stainless Steel Council (CSSC).

China's output in 2015 amounted to 6.33 million tonnes of crude 200-series

alloys (a 0.7% fall), 11.27 million tonnes of 300-series alloys (a 3.7% rise) and 3.97 million tonnes of 400-series alloys (a 10.9% fall).

Vallourec to slash European production by half

Tube and pipe producer Vallourec will cut its European production by 50% by 2017, compared with its output in 2014, it said on February 1. The French company cited global overcapacity and low-cost competition for the decision. A restructuring plan announced on January 15 will see the

closure of two rolling mills in northern France, at its Saint-Saulve site and at Déville-lès-Rouen, as well as one threading line at Mülheim in north-western Germany and a heat treatment line at Bellshill in Scotland.

The steelmaking unit and two blast furnaces at pipe producer Vallourec Tubos do Brasil (VBR) will be fully deactivated by 2018, the company said on February 2. The No 2 blast furnace in Belo Horizonte city, Minas Gerais state, will be shut down in April this year, while the No 1 facility and the steelmaking unit will be stopped in the second half of 2018. The



Vallourec is retrenching at some European and Brazilian plants

two furnaces have a combined capacity of 600,000 tpy.

US mill shipments down by 12%

US steel mill shipments dropped last year, according to the American Iron & Steel Institute (AISI). Shipments were nearly 86.55 million net tons in 2015, down 11.90% from almost 98.25 million tons the previous year. There was a 1.5% month-on-month rise in December, to nearly 6.56 million tons, but this was down 17.8% year-on-year.

ArcelorMittal confirms sales plan for US mills

ArcelorMittal has confirmed its intent to sell three long-product steel mills in the USA, with the aim of slashing debt. The mills scheduled for sale are LaPlace in Louisiana, Steelton in Pennsylvania and Vinton in Texas. In North America, ArcelorMittal posted an operating loss of \$705 million in 2015 in contrast to an operating profit of \$386 million in 2014, as sales fell 18.3% to \$17.29 billion. The steelmaker blamed the situation on cheap imports, low steel prices and growing losses at its North American operations. The company's net debt stood at \$15.70 billion at the end of 2015, down from \$15.80 billion at the end of 2014.

ArcelorMittal has also sold its 35% stake in Spanish car parts manufacturer Gestamp Automocion for €875 million (\$975 million), the company announced on February 5. It sold its stake to the majority shareholder, the Riberas family, for a cash sum.

Evraz North America to idle LD pipe mill

Evraz North America is indefinitely idling the large-diameter spiral-weld pipe mill at its Portland, Oregon, USA, facility beginning in early April. The idling applies solely to the

spiral pipe mill, with the flat products operations at Portland unaffected. Evraz's Portland spiral mill produces up to 200,000 tons of pipe annually, and employs some 230 people.

The company blamed the decision on "delays in regulatory approvals for pipelines in the [USA] and Canada, the influx of unfairly traded and subsidised imported large-diameter pipe to the [USA] and high import duties of up to 50% for potential pipe shipments into Mexico," a spokeswoman told *Metal Bulletin* sister publication *AMM*.

Severstal to launch new coating lines this year

Severstal in Russia is still planning to launch new hot-dip galvanizing (HDG) and pre-painted galvanized iron (PPGI) production lines by 2017, cfo Alexei Kulichenko said on February 3, despite the deterioration in the steel market. The addition of the 400,000 tpy galvanizing line and the 200,000 tpy colour-coating line will double the company's current HDG capacity and increase PPGI capacity by 50%. Imports have been providing 30-40% of Russian consumption of such products in recent years, but the weakening rouble has made imports more expensive.

EC reveals details of Vietnam trade agreement

The European Commission has released details of its free-trade agreement with Vietnam, which show how the EU steel sector will gain more access to this emerging market. A wide range of duties charged by Vietnam on EU iron and steel products will be scrapped less than ten years after the agreement is ratified and comes into force, which could happen next year. One example is Vietnamese duties of 7% on flat-rolled products of iron or non-alloy steel – cold-rolled but not clad, plated or coated. Some higher duties



EU steelmakers will gain easier access to the Vietnamese market

for iron and steel products coated with non-ferrous metals will also be phased out.

In contrast, most Vietnamese iron and steel exports already enter the EU free of duty. The remaining tariffs are generally small and will also be scrapped.

Turkey's production up 2.6%, but demand up 12%

Turkey's total output of finished steel products increased by 2.58% to 36.94 million tonnes in 2015, the Turkish Steel Producers' Association (TÇÜD) said on February 5. The association noted that 71.9% of total production was long steel products, and the remaining 28.1% was flat-rolled. But Turkey's crude steel production decreased by 7.4% to 31.52 million tonnes in 2015. The fact that finished steel output increased despite the decrease in crude steel production was due to a 65% increase in semi-finished product imports in 2015 to 7.9 million tonnes, the TÇÜD said.

Turkey's steel products consumption totalled 34.36 million tonnes in 2015, 11.67% more than the previous year's 30.77 million tonnes, with 52% of that being long products.

Ilva sale attracts 29 parties

Italian steelmaker Ilva, which has been in special administration since 2012,

received 29 expressions of interest in its sale before the submission period closed on 11 February. The deadline for Ilva's sale has been set for June 30, 2016. According to the company, the 29 expressions of interest in its sale were either for the whole Ilva group or for individual Ilva subsidiary companies. Italian re-roller Marcegaglia has confirmed that it is one of the businesses interested in Ilva.

However, the Riva Group, the former owners of an 87% stake in Ilva, filed a lawsuit on 5 February at the court of Lazio to appeal the ministerial decree that put Ilva up for sale. It is unclear at this stage whether the lawsuit could disrupt the sale process.

Japan's shipments and consumption decline in 2015

Japan's finished carbon steel shipments declined by 2.74% year-on-year in 2015, according to Japan Iron & Steel Federation (JISF) data. Shipments were 73.06 million tonnes last year compared with 75.12 million tonnes in 2014. H-beam and pipes & tubes were the only major products that did not experience a drop in shipments.

The country's apparent steel consumption dropped 8% year-on-year to 67.53 million tonnes in 2015, according to JISF data. December 2015 marked the 16th consecutive month of year-on-year decline.

MBR analysis

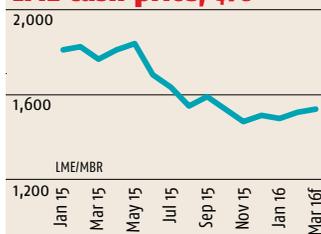
Aluminium

Prices range-bound, premiums diverge

MBR remains bearish about aluminium's fundamental outlook. Despite production cuts, the market remains well-supplied and total stocks are high. Even when quarterly supply deficits emerge, we doubt they will be large enough to rid the market of its stock overhang. As such, it is difficult to see a lasting price rally getting under way, though more sporadic short-covering rallies do seem likely. However, it is equally likely that they will run into selling, not least from marginal producers and from macro funds.

Physical premiums are getting interesting again because production cuts have had more impact on some regions than

LME cash price, \$/t



others – notably, the USA is now facing a much larger supply deficit. The divergence between Midwest and EU premiums is likely to encourage physical arbitrage, although metal is also likely to be in transit to the USA from Russia and the Middle East. This flow will drag tonnage from other regions, with Japanese contracts, for example, expected to rise.

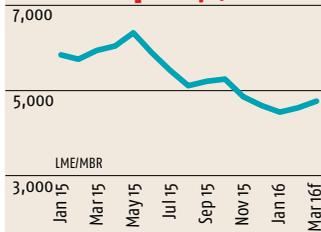
Copper

Another rung in copper's downward ladder

LME copper prices have oscillated around the \$4,500/tonne level from early December to the time of writing in the second half of February, despite a range of bullish factors. Against this backdrop, copper might have done better. Technically, however, a period of relative price stability like this has repeatedly been the precursor to the next leg lower in copper's five-year downtrend. That trend still dominates the charts, so although a fundamental case can be made that the bottom is here or hereabouts, prices remains vulnerable on the downside if support levels start to fail again.

We have recently extended our supply-demand balance to 2018.

LME cash price, \$/t



We continue to model a small deficit this year and a net deficit across our three-year forecast period. This is on the back of supply cutbacks and disruptions more than demand recovering. Nevertheless, it is a fundamental background that should support higher prices. First a bottom needs to be found for confidence, and buyers, to return.

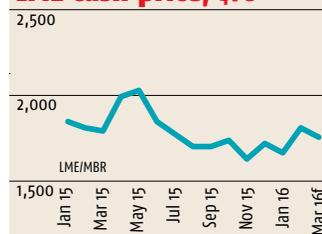
Lead

Toying with a bull market

Since November, lead prices have risen by just over 20% – a threshold often used to define a bull market. Lead's fundamentals may justify that optimistic claim, but with everything else going on, MBR doubts whether these price gains can be built on yet. We do think a base is in place though, and we are looking for prices to consolidate and for dips to be well-supported. Beyond that, we continue to forecast higher prices in the coming quarters amid tightening supply and low stocks.

Surprisingly, the latest ILZSG data suggest lead finished 2015 in quite a hefty surplus. However, the data are provisional and do show a

LME cash price, \$/t



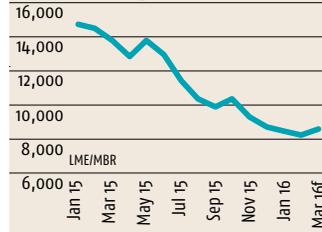
near-20% fall in Chinese usage last year. That implies some major destocking, which could be distorting the real supply/demand picture. If China has destocked so aggressively, then demand is in danger of swinging the other way as the market starts buying hand-to-mouth, or restocks. This could be prompted by a pick-up in prices.

Nickel

Still the most vulnerable base metal

Nickel has been left on its own in setting fresh multi-year lows again – 13-year lows to be precise. Nickel is the most vulnerable base metal on the downside given the lack of adequate production cuts and the fact that stocks are so high. Some cutbacks have finally emerged this year – not enough to make a real difference yet but perhaps enough to indicate to nickel bears that prices are only now reaching producers' pain thresholds. The perception is also growing that hidden stocks of nickel are building in China, which is a reasonable conclusion given the scale of imports last year, but lack of real demand. It is still very hard

LME cash price, \$/t



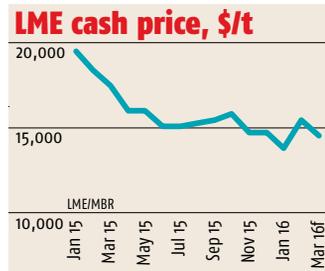
to justify a price recovery in nickel either from the fundamentals or the technicals. In fact, both views of the market warn that prices may still need to go lower first. And talk of copper prices potentially overtaking nickel (or rather nickel 'undertaking' copper) is certainly not helping sentiment either.

Tin

Supply deficit here to stay

The latest trade data from Indonesia show tin exports of just 2,486 tonnes in January. This is due to government policy tinkering, but also to prices reaching new cycle lows in mid-January near \$13,000/tonne. A month later they were more than \$2,000 higher and we think there is a good chance of holding on to the gains given that LME stocks have retreated to their lowest levels since 2008, with Chinese smelters agreeing to a coordinated 17,000-tonne production cut, and talk of stockpiling metal in China.

All this is supportive and underpins our view that tin will be in deficit again this year.

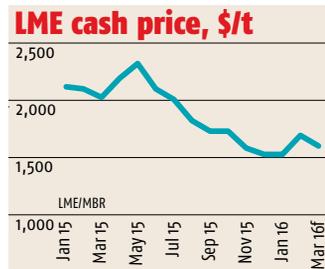


In fact, MBR is modelling a deficit in 2017 and 2018 too, by which time tin stocks would be down by a net 25,000 tonnes. This gives tin one of the most bullish fundamental outlooks. Prices should start to reflect this, but tin also has one of the weakest demand profiles, which is damaging sentiment.

Zinc

Getting ahead of itself again

Zinc has had a strong start to the year, with prices up over 7% to mid-February. The main source of price strength has been dollar weakness, so for zinc to have outperformed its peers suggests either that impatient zinc bulls are getting twitchy again or that the underlying fundamentals are really improving. While we do expect the supply-demand balance to tighten over the course of the year, it is hard to make a case that it should be exerting such a pull on prices so soon. TCs have fallen sharply – probably too sharply – and we will continue to watch their direction closely as they offer the best gauge as to how quickly



the concentrate market is tightening up in response to mine cutbacks and closures. But how and when concentrate market tightness feeds into the refined market, and LME prices, depends on the scale of unreported stocks of both concentrate and metal. For both, we sense that stocks are high.

Analysis by **Andy Cole**, base metals analyst and editor of MBR's *Base Metals Weekly Market Forecaster*. Email: Acole@metalbulletinresearch.com

Ask an analyst

Have base metal prices hit bottom?

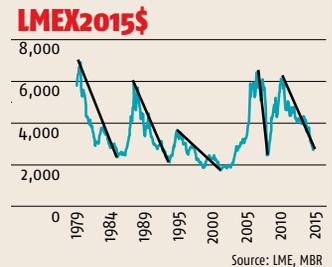
After many of the base metals recorded fresh multi-year lows in January, there have been signs of stability in February, even rallies the like of which have not been seen for some months. It is encouraging too that this firmer tone has emerged despite certain key Chinese macroeconomic data remaining generally disappointing: data that up until recently would have been near-certain sell-triggers.

Widespread production cuts and even programmes to stockpile excess metal may have finally started to create the perception that base metal prices are bottoming out.

The dollar is looking vulnerable to more correction weakness, and oil prices seem more stable, both of which are also supportive factors for the base metals. Overall, it does feel like the mood has changed in the base metals in the last few weeks. So is this the bottom?

It might be a mug's game to try to make that call, but it is a question we are often asked. We would point to the above indicators to suggest that there is a case to call a bottom here or hereabouts and we note that surveys of analysts' forecasts, like MB's Apex, indicate that this is the consensus view now too.

Another way of looking at it is to compare this downswing with those from other price cycles. Using the LMEX and adjusting for inflation, we see five clear cycles going back to



the late 1970s. On average, each downswing has lasted 59 months and seen prices retreat from their highs by 53-66%, averaging 62%. The current downswing is 60 months long and has fallen 56%, so is well in the realms of a 'normal' full downswing, but it could quite feasibly extend a few more percentage points as well.

'We maintain our view that 2016 will ultimately be characterised by a U-shaped, rather than V-shaped, bottoming process'

Whether it does or not, we maintain our view that 2016 will ultimately be characterised by a U-shaped, rather than V-shaped, bottoming process. And if we are not quite at deepest part of that trough yet, then it is very close and the worst is certainly over.

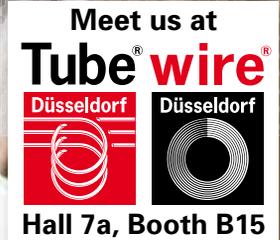
Analysis by **Andrew Cole**, Metal Bulletin Research

Every month an MBR analyst answers a question raised by readers. If you have a question for our analysts, please email: acole@metalbulletinresearch.com

provides independent, detailed and timely analysis on the latest data, price movements and developments that impact the market conditions and outlook for LME-traded base metals.

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Steel

Steel cutback boost may be short-lived

A relatively tight supply of steel products was the major theme from late December into January, which pushed average long and flat-rolled prices higher. As restocking before the Chinese Spring Festival in early February appeared to be less pronounced this year, the market failed to hold up more recently. Since market participants have returned to work, both flat but especially long products prices have been gathering speed, and not only in China.

Chinese steelmakers' lower production and disrupted transportation in winter have contributed to tighter market supply. Medium- and large-sized Chinese steel producers cut output further in January and the year-on-year decline increased to 11% for finished (hot-rolled) and 14% for crude steel, according to provisional data.

The reduced supply to the domestic market was, however, partly misleading. In fact, mill stocks fell further in the month, as they have done since last October, adding to already tight conditions, with mill stock amounting to just 25% of production, which is low even by Chinese standards. Implied shipments to actual customers, however, fell by just 3% year-on-year according to MBR's own calculations, in line with our view that the downturn in Chinese demand will continue this year but at a slower rate than in 2015.

Although falling Chinese exports are positive for international prices, it is interesting that steel mills abroad also appear to be cutting production by more than demand, reducing their own inventories further. Production



in the UK fell by more than 50% year-on-year in January, owing largely to the recent closure of some integrated works.

EU import competition may decline in future, but greater volumes booked late last year continue to cause UK and EU steel mills in general severe problems. Indeed, even German mills, who actually exported more than they imported last year, have been cutting output sharply since December under the import stress.

Price rallies only from production cuts are not sustainable. But encouragingly for suppliers, the fact that steel prices rises are proving at least partly successful, suggests that demand in the spring, and in some cases the summer, may be better than usual. Now that steelmakers' margins are improving, some have resumed normal production, and more steel mills may follow suit. Should they actively resume production to capitalise on higher prices, the post-holiday rally will be short-lived. The higher prices seen so far are within our expectations and so we continue to expect average prices in 2016 to fall further.

Analysis by **Ginger Ding**,
Metal Bulletin Research

Steel raw materials

Why have iron ore prices risen?

Iron ore spot prices are trending upwards, though largely against the grain of coal, coke and alternative metallics. At the time of writing the daily average iron ore price (MBIOI62) in February had moved to over \$45/tonne cfr, over \$3/tonne up month-on-month. Moreover, evidence suggests that supply, rather than demand-side dynamics, has been responsible. Indeed provisional data for January at least suggest, rather unusually, that Chinese iron production fell further in the month, by 1.1%, and as much as 9.7% year-on-year.

A recovery over February, meanwhile, will have been unlikely. It is more likely that the shorter month will have been worse for iron ore demand.

So while it is logical that prices have been responding more to supply than demand-side dynamics, it is interesting that reported stocks held at Chinese ports have been rising steadily since September and exceeded 95 million tonnes on Valentine's Day, which was the highest since the end of April 2015. The revival in stocks from the summer lows had certainly coincided with falling prices and people's perceptions of surplus supply conditions reappearing. Yet since the start of 2016, though stocks continue to rise at the same pace and, as detailed earlier, demand continues to fall, prices have changed course.

Though iron ore is a fundamentally driven market, non-fundamental factors can play their part, especially in how they affect sentiment. Are the rising stocks not so much a reflection of an oversupplied market but a sign that steel mills



are gearing up for stronger developments in the spring?

MBR has remained bearish on iron ore this year and still struggles to see how prices above \$40/tonne can persist, especially in an increasingly oversupplied market. Our stock/demand ratio in China, which averages under one month's worth of stock, has exceeded one month since last November, and in January we estimate it had also risen on a year-on-year basis when surplus supply conditions were particularly stark. And the prospects of surplus supply increasing this year, and especially from the second half, can only increase in this higher than expected pricing environment.

Chinese iron ore imports did fall in January and we suspect mined output also slipped, as it always does in the first quarter, but it may be too early to say that the 'higher-costed producers' are leaving the market. A worry for market fundamentals in China is that although local production did fall 8% last year, the reduction in Q4, when prices were similar to current levels, did not accelerate but slowed to less than 4%.

Analysis by **Alistair Ramsay**,
Metal Bulletin Research

For access to MBR's detailed product and regional price, supply and demand forecasts or for a free sample of MBR's Steel or Steel Raw Materials Market Trackers: www.metalbulletinresearch.com/freesample.aspx

Regional review

North America

Myra Pinkham

Customs bill strengthens trade laws



In a move that has been applauded by several domestic steel trade groups, US

Congress passed the long awaited Customs Bill, which they see as an important tool to enable the government to more effectively enforce their trade laws.

“This is an important piece of legislation that gives U.S. manufacturing industries and their workers new tools to fight back against unfair trade,” says Thomas J. Gibson, president and ceo of the American Iron and Steel Institute. Philip K. Bell, president of the Steel Manufacturers Association, called the legislation an important step in stopping “rampant” duty evasion.

“The US steel industry remains in crisis mode. Market conditions are the worst we have seen it in over 15 years,” Bell said at a recent press conference. “Our recovering economy accompanied by the stronger dollar has made the United States a dumping ground for unfairly traded, subsidised steel,” he maintains, blaming this for the

over 12,000 US steel industry layoffs that were announced 2015 and the 8-10 million tons of production capacity that has been either temporarily idled or permanently shut down.

According to AISI, US domestic steel shipments fell 11.9% last year to 87 million short tons from 98 million tons in 2014 on the back of “all-time record” imports. While down from its 33% peak in the first quarter, the full year 2015 import share hit 29% against a 10-year average of 23%, Gibson told reporters in mid-February. “As a result, domestic steel mill production has been below 70% of capacity since last October.”

Included in the newly passed Trade Facilitation and Trade Enforcement Act, is the Enforce Act, which ensures that anti-dumping and countervailing duty orders against imports are fully enforced at the border. Amongst the other provisions in the Customs Bill are new protections for intellectual property rights and additional tools to identify and address currency manipulation. President Obama was expected to sign this legislation.

Europe

Richard Barrett

UK referendum campaign commences



After prolonged negotiations at a Brussels summit in mid-February, UK prime

minister David Cameron returned to London to declare that he had got a deal with the EU and that he would be going ahead with an in/out referendum about Britain’s EU membership on 23 June 2016. Thus the British electorate has four months to decide.

On announcing the referendum date, Cameron also declared that he and his government would be campaigning for Britain to stay in “a reformed EU”. He says that concessions won during his negotiations in Brussels grant Britain a special status and that they have addressed the four main things that he thinks need to change (*see February issue regional review*).

Sceptical observers claim that the terms of the deal do not go far enough and that some elements still risk amendment or being voted down in the process of EU implementation.

Six members of the UK government’s Cabinet

immediately declared that they would be voting for Britain to leave. Many people looking to exit see the EU as an over-bureaucratic and insufficiently accountable organisation, which they believe is too ready to over-rule decisions made by national parliaments. They also believe that the EU is unable to control its borders, and has created unsustainable economic tensions by having allowed some new member countries to join the single-currency Eurozone before fully passing stringent entry tests.

Those campaigning to stay say that Britain will be stronger, safer and better off staying in the EU, will have greater influence over its future shape and direction from within, and that to leave would be a ‘leap in the dark’.

About half the UK electorate is said to be undecided. It seems likely that most wavering voters will make a choice based on how they believe the outcome will impact their individual circumstances in terms of work, business, family, wealth and local community.

Asia

Juan Weik

Australia’s steel woes



Two years ago, Australia was shaken when Toyota, the world’s largest automobile

manufacturer, announced that it would stop making cars in the country by the end of 2017. The announcement effectively meant that all local car production would come to an end, as Ford and GM, the two other vehicle manufacturers still operating in Australia, had

previously disclosed the same decisions.

Fast-forward to 2016 and Australia is now facing similar threats in its steelmaking industry. There are only two companies producing crude steel in the country, and both of them have recently mulled options that could include shutting down their blast furnace operations and resorting to steel imports, amid the global steel industry’s slump.

BlueScope Steel, the biggest producer in Australia, spent several months last year considering closing its historic Port Kembla steelworks in New South Wales. It decided to keep the plant open for the next three years after reaching key agreements with its workers and the local government late last year. A total of 500 job redundancies were announced then, as well as a three-year wage freeze and bonus suspension, while the New South Wales state government agreed to defer A\$60 million (\$43 million) of payroll tax for the steelmaker during the same period.

Last month, Arrium Mining & Materials, the other local crude steel producer, said it had started to study a plan to place its Whyalla steel plant in South Australia on “care and maintenance”. The plan would involve shutting down Whyalla’s blast furnace, steelmaking plant and coke ovens, while the unit’s rolling mills would continue to operate using imported semi-finished steel.

Arrium’s study will be completed in the middle of 2016. Until then, there can only be much speculation about the potential outcomes to be seen in Australia’s news coverage.

Middle East

Serife Durmus

Negative factors still pressurize steel sectors



In Saudi Arabia, reduced government spending, mainly because of low oil

prices, is hitting the construction sector, with some companies in this industry reporting problems since October. The Saudi government cut spending in the last quarter of 2015, and since then few new projects have been started, while existing ones have slowed. Construction constitutes less than 10% of Saudi Arabia's gross domestic product, but directly affects industries such as steel, cement and logistics. Steel production in the country amounted to 5,662,000 tonnes in 2015, 10% less than the 6,291,000 tonnes in 2014, according to worldsteel.

Steel producers in the GCC member states plan to form a committee to combat steel import volumes into the region. Representatives from eleven large GCC-based steel companies met in early February in Riyadh, Saudi Arabia, to discuss the formation of this committee, which is intended to create a united plan to deter low-priced steel

imports into the area, and further discussions are planned.

In Turkey, the Turkish Steel Producers' Association (TÇÜD) emphasized the losses the country's steel sector had in 2015. There was a 7.4% decrease in crude steel output, meaning Turkey had the 3rd sharpest decline of the top 15 producers in the world. The country ranked as the 9th biggest producer in 2015, while it was ranked 8th in 2014. Turkey's steel imports increased sharply by 38% to 19.06 million tonnes, while exports shrank by 6.7% to 16.7 million tonnes in 2015.

Turkey set new import duties for hot-rolled coil imports from Japan, France, Russia and Ukraine late in January. Russia had the biggest change in duties, with a new duty at 13.66% applied to MMK (2.22% was set in August 2015), 9.42% for Novolipetsk, 12.43% for Severstal, and 3.76% for other producers in Russia. Novolipetsk and Severstal were previously exempt from duty.

Meanwhile, MMK is considering the disposal of its Turkish flat-rolled mill, MMK Metalurji.

Latin America

Ana Paula Camargo

Wind power to boost steel use



Gerdau's decision to create a steel joint venture with Japanese firms Sumitomo and

Japan Steel Works (JSW) to serve Brazil's growing wind power industry put all eyes on the country's energy sector.

Announced in late January, the 280 million Reais (\$69.9 million) project will be located at Gerdau's special steel mill in Pindamonhangaba, in São Paulo state, and will supply parts for wind turbine towers – main shaft and bearing rings – starting in 2017.

Gerdau's interest in the joint venture should surpass 50%, giving it the principal interest in the partnership, while the interests of the other partners will be defined when executing the project's agreement.

The move comes at a time when the mill's major steel consuming sectors in Brazil, including the automotive and construction industries, are reporting reduced activity levels, directly affecting steel demand volumes in the domestic market.

The wind-power segment is one of the highlights of the Brazilian energy industry,

according to the national mining and energy ministry. The number of wind power generations plants in Brazil more than quadrupled over the last few years, reaching 316 units in early 2016 from 70 facilities in 2011, the ministry said.

Brazil's installed wind-power capacity currently accounts for 6% (8 GW) of the national electricity generation output, according to the local wind power association. This figure is expected to reach 11% (24 GW) by 2024, according to the ten-year energy expansion plan announced by the ministry.

Wind power generation is especially well suited to the country's north-eastern and southern areas, given these regions' regular winds and favourable conditions for the installation of equipment, according to Gerdau. The steelmaker also emphasized the fact that wind energy is a clean and sustainable form of power generation and avoids carbon dioxide emissions.

This "green profile" is helping to attract more attention to renewable energy sources in Brazil such as wind power, in comparison with non-renewable sources such as fossil fuels.

Africa

Bianca Markram

Mining cycle is yet to reach the bottom



The Moody's downgrade of Anglo American's rating to Ba 3 on

February 15 underscored the truth that mining is in for a rough ride in 2016. If a mining stalwart such as Anglo American is struggling to maintain its investment status, how many other companies with lesser assets, resources and diversity are battling for survival?

An alarming observation emerged from the recent Investing in African Mining Indaba in Cape Town, South Africa, held on February 8-11, that the cycle has not yet reached its lowest point, since far too few failures and consolidations have happened to date. There are still too many projects, many of these in Africa, that have no prospects for survival, according to commentators who attended this major annual event.

Either the demand for minerals must increase or the marginal and high-cost projects must not materialise at all in order for balance to prevail in the market. The consensus was that a substantial portion of projects fall in the latter category.

Funding is scarce, especially for juniors, with expensive private equity being about the only place to still find some capital. Even here, a company has to have good quality assets and often be in or close to production in order to qualify.

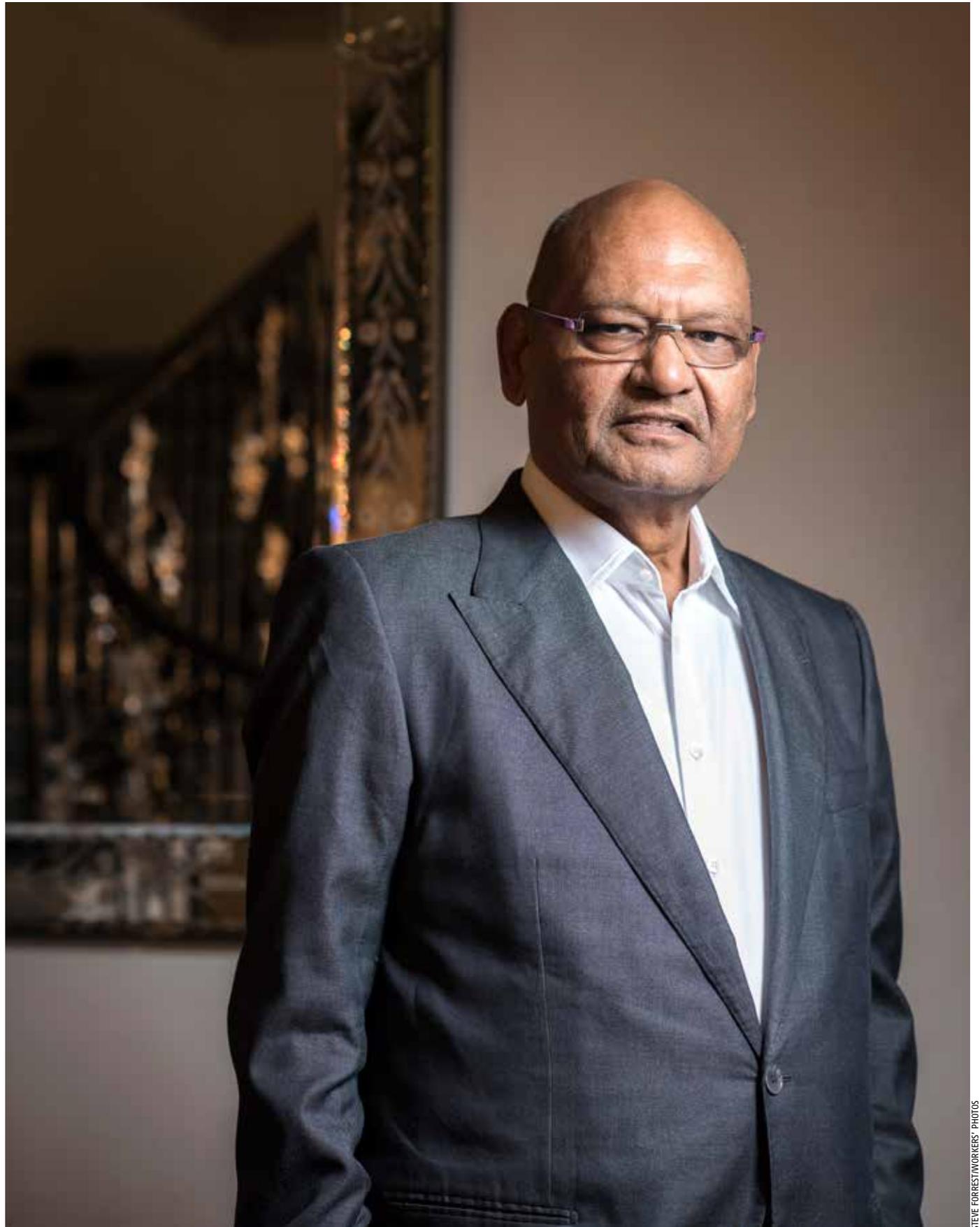
Some commentators said they expect that at least a

quarter of all junior miners could either fail in the coming months or be consolidated, with the former being a more likely option for most.

Delegates from law firm Baker & McKenzie said that a large number of mining clients globally have been approaching the firm for advice on business and debt restructuring. Some companies could start to default on covenants and finance arrangements within a few months, it was reported.

And some observers estimate that it could take another 12-18 months for the mining industry to reach rock bottom.

Profile



STEVE FORREST/WORKERS' PHOTOS

Anil Agarwal

“India is on the right track”

Vedanta chairman Anil Agarwal has spent a lifetime building a major international resources company. Andrea Hotter asks him about highlights of that path and his vision for the future of Vedanta and India

If the past decade has been all about China then economists are tipping the coming years to focus on India, already the fastest growing economy of 2015. It is a view shared enthusiastically by Anil Agarwal, the Indian-born founder and chairman of Vedanta Resources, who believes India's mineral-rich natural resources can help lift the nation out of poverty. “India still has poverty and one of the things that will change that is its natural resources,” says Agarwal, speaking during an interview with *Metal Bulletin Magazine* at his London residence in Mayfair.

“India's economy will grow at between 8% and 9% every year. It will be in a position to produce 50% of its oil, 50-60% at least of its metal needs, and around 100% of its agriculture. Resources under the ground are the one area that can give India wealth, be its game changer,” he adds.

India is one of the original developing nations within the group defined by BRIC – the acronym coined by Goldman Sachs economist Jim O'Neill back in 2001. But its fellow BRIC countries are struggling: Brazil is wrestling with high debt levels, Russia is constrained by

sanctions and weak oil prices, while China is making a transition from a manufacturing to a services economy, leaving its days of double-digit growth behind it.

In contrast, India now stands out as a star performer, the emerging market positioned for steady growth. There is still a way to go, Agarwal says, but “India is on the right track.”

“Either India is not producing [a natural resource] and is a big importer of it, or whatever it is producing is only 10% of what ultimately is required for the country,” he notes. “India has a nice geology – it is quite similar to that of Australia. But Australia produces 600 million tonnes of iron ore annually and India only produces 100 million tonnes. There is so much more potential,” he adds.

It is a potential that Vedanta is extremely well-placed to tap into. The London-listed natural resources company has a global portfolio spanning from Australia to Namibia, and including vast operations across India in base metals, iron ore, oil, gas and power, which make it the country's largest and only diversified natural resources firm.

“India needs at least 10-15 more Vedantas,” Agarwal says, and he is

determined that his company will continue to play a huge role in growing the south Asian country's economy and lifting its population out of poverty.

Building Vedanta

The career of Agarwal and the company he created could have come straight from one of the many Hindi-language Bollywood film industry films that he enjoyed watching as a teenager. Born in 1954 in Patna, in the eastern India state of Bihar, after finishing school Agarwal took over his father's business of manufacturing aluminium conductors in 1972. At the time, the only English that he knew was ‘yes’ and ‘no’, and his dream was to live in Bombay (Mumbai).

A few years later he made the move to that city and established Vedanta Resources, a business originally selling scrap collected from cable companies in other states. He acquired cable company Shamsher Sterling Corporation in 1979 through a family firm, and in 1986 Sterlite Cables Limited acquired Shamsher Sterling and changed its name to Sterlite Industries (India) Limited.

It was in the tough clashes between employers and labour unions during the 1980s that Agarwal experienced “the most difficult, harrowing years” in his career. He adopted different tactics to handle the situation, welcoming union leaders with banners and a brass band instead of aggressive confrontation. It worked – Agarwal broke the cycle, and there were no more strikes at his firm after 1986.

The expansion of his business operations continued, with aluminium sheet and foil as well as optical fibre, added to the company's list of activities in the early 1990s. Next Agarwal expanded into energy, with Sterlite Industries acquiring a majority stake in aluminium producer Madras Aluminium Company (Malco) in 1995. Malco was struggling: it had been deemed a ‘sick’ company and was held by India's Board for Industrial and Financial Reconstruction. Agarwal set about turning Malco around. In the same year, he beefed up his copper business by acquiring Copper Mines of Tasmania and Thalanga Copper Mines. ▶

‘India needs at least 10-15 more Vedantas’

At that time, a number of Indian state-run enterprises were considered to be inefficient and somewhat sleepy, leading the Indian government to announce a programme of disinvestment. It was a prime opportunity for Agarwal: he grew his business empire further by taking stakes in India Foils Ltd and Hindustan Zinc, along with a majority-ownership in aluminium producer Bharat Aluminium Company Ltd (Balco).

By then, Agarwal had sealed his position as one of India's leading businessmen, yet his biggest constraint was capital. "I was getting frustrated, and realised London had all the listings for global metals and mining companies," Agarwal says. "But I thought, 'London? It's impossible!'" until my father inspired me to focus and succeed," he adds.

Agarwal moved to London and took on his biggest challenge to date – listing Vedanta Resources on the London Stock Exchange (LSE). He secured the help of former BHP Billiton ceo Brian Gilbertson for the flotation, appointing him chairman ahead of its roughly \$875 million IPO in 2003. The young boy from Patna who had played marbles on the streets after school had become the founder of the first Indian company to list on the LSE.

He did not stop there. Vedanta bought a stake in Konkola Copper Mines, a majority-stake in Sesa Goa, India's largest producer-exporter of iron ore, and listed Sterlite Industries on the New York Stock Exchange. Agarwal's group also bought iron ore in Liberia plus Anglo American's zinc assets, and in 2010 the deal to acquire a controlling stake in vast private sector oil and gas firm Cairn India "was done on a handshake" between Agarwal and Sir Bill Gammell, then chairman of Cairn.

Vedanta (which means 'ultimate knowledge') is now India's largest miner, with a 78% share of the market place, and the world's second largest zinc miner. It is also the largest aluminium producer in India, with a 48% market share, plus a major supplier of iron ore to the Indian, Japanese and Chinese markets. The group's copper operations span India, Australia and Zambia, and its oil and gas assets include operations in India, Sri Lanka and Africa.



STEVE FORRESTWORKERS' PHOTOS

"Resources under the ground are the one area that can give India wealth, be its game changer," says Vedanta chairman Anil Agarwal

Agarwal's knack for deal-making and India's place on the global metals and mining map firmly established, he is now in the process of simplifying Vedanta's group structure. He and his team – which currently includes former Rio Tinto ceo Tom Albanese as ceo and former Anglo American ceo Cynthia Carroll as a key strategic adviser – have consolidated some of his businesses in India and are now in the process of merging subsidiaries Cairn India and Vedanta Limited in a \$2.3 billion all-share deal. Additional simplification of the structure is expected to follow.

"At the moment investors have four places to invest – Vedanta PLC, Vedanta Limited, Hindustan Zinc and Cairn India. We're looking to simplify the process and to put things together," Agarwal says. This will not include any spin-offs, he notes, but for a company built on acquisitions there could be more to follow if the right opportunity presents itself. "Any opportunity that comes along, we'll open our shop to consider it; we'll look at it," he adds.

It won't include gold right now, though. Despite being rich in reserves of gold, India is the largest gold importer in the world and does not produce much of the metal itself. This will change for the nation eventually, Agarwal predicts. "At the moment we are producing gold as a by-product, but not directly mining it. At the moment our hands are full, so we're not looking at mining gold," he adds.

Commodities downturn

It is certainly the environment for mergers and acquisitions as mining firms scramble to cut costs and offload assets to reduce debts. Hit hard by the decline in commodity prices and the drop in demand from key consuming nations like China, the natural resources sector is in the midst of what many describe as its toughest time ever. "I have not seen something like this, for sure. It's the first time it has been this bad," Agarwal says.

He still tips the prospects for zinc in the longer term – "it is always in short supply" – and thinks the outlook for aluminium will improve. "Aluminium will do better because China has announced it will cut

production that is polluting. The government is saying it will not support the industry through subsidies, so that's also a good sign," he notes. "Iron ore is definitely going to be steady and I see the price sticking in a \$35-40 per tonne range," he adds.

Vedanta has not been immune to the bearish backdrop. In its interim results for the six months to the end of September 2015, it reported that its revenue of \$5.7 billion was 12% lower than the first half of its fiscal year 2015. EBITDA was down by 39%, at \$1.3 billion for the same period, primarily due to lower commodity prices. Like its peers, Vedanta has prioritised reducing debt and increasing cash flows. In the same interim results, it also reported a decline in gross debt by \$0.2 billion to \$16.5 billion, and a reduction in net debt by \$0.9 billion to \$7.5 billion.

It has also decided not to pay an interim dividend and its board plans to review dividend payments when it delivers its full-year results. The company plans to deliver cost savings and marketing synergies of \$1.3 billion over the next four years.

"The natural resources industry is experiencing a transition time. On the one hand, I don't think China will slow down significantly more because it still has further to develop," he tells *Metal Bulletin Magazine*. "At the same time, I don't see much change in commodities prices for at least one year. I think this is the bottom. Anything can happen, but I believe that this is the bottom," he adds.

Even if the markets have bottomed out, Vedanta has a five-pronged strategic plan designed to help it weather the challenges of the current weak commodity markets. These include production growth and asset optimisation, with a disciplined approach towards ramp-up and positive free cash flow at each segment being a top priority.

It also includes a deleveraged balance sheet, optimising operational and capital expenditures to maximise cash flows and reduce debt. A more simplified structure, ensuring a continued licence to operate and a disciplined approach to exploration make up the other priorities.

Silver lining

Despite the tough backdrop for mining companies, Agarwal argues that Vedanta's geographical footprint in India is its own "silver lining." As India's largest diversified natural resources company, Agarwal says Vedanta has the right mix of commodities to benefit from future demand, both domestically and globally.

He cites the International Monetary Fund's recent statement that India is the world's fastest-growing major economy, and says the country's trajectory is set to continue, with declining inflation and interest rate cuts supporting the government's growth agenda. "India has a similar population to that of China, but produces only 10% of what China produces. It also has a much younger population than China," he adds.

According to Agarwal, a key driver for Indian growth on the natural resources side in particular will be technology, which has developed considerably over the past several decades. "In one respect India is very fortunate, because when mining companies including Vedanta were born, technology was not as advanced as it is today. It's the same as comparing medical surgery today with decades ago," he says.

"At the same time, exploration and the removal of natural resources from the ground, whether oil, gas, gold, silver, are now much more environmentally friendly, sustainable, and more predictable because of technology. So for India, this is very helpful for developing its resources going forward," he adds.

Work still remains to be done on challenges such as inadequate infrastructure, however, a central part of pro-business Prime Minister Narendra Modi's goal of boosting economic growth. Agarwal says that Modi's plans to improve roads, ports and railways coincides with a time when international companies are looking for projects to invest in.

"The requirements for infrastructure are huge – highways, roads, bridges, ports, railways need to be built. This is a great time (for projects) as large international companies don't have enough work, at the same time as India has opened up and is in a position for large

companies to come and do these infrastructure projects," Agarwal says. "It will give a lot of employment to locals, plus the infrastructure will be built," he adds, a process which will also open up previously inaccessible areas for mining and other development.

The often laborious processes of securing permits has also become less bureaucratic, Agarwal notes. "The ease of doing business is definitely improving. Prime Minister Modi has said repeatedly there will be 'no red tape, only red carpet.' India is a country people feel safe in, are able to do business in comfortably, and it has a home market which is a great advantage," Agarwal says.

"Prime Minister Modi has said that the Indian economy will grow from \$2 trillion to \$20 trillion. India has never in its history defaulted on its commitment, so credibility comes along with that promise," he adds.

Family and philanthropy

Agarwal has a home in India, where his daughter Priya and son Agnivesh live. He spends most of his time in London, where Vedanta – "his passion" – is headquartered. His closest friend and confidante is his wife Kiran; the couple lived in a small apartment in Bombay when they married, and remain as happy now as they were then.

Family is very important to Agarwal. He is very close to his India-based parents, whom he credits for his success. "I wouldn't be here without my parents. I speak to my father every day – we are inseparable. He is 87 and my mother is 83," he says. "My father never allowed me to be lazy or unfocused. I'm really grateful to my parents, because if they hadn't supported me mentally, morally, I would not have been here," he adds.

His faith is also an important influence. He first read a copy of the Bhagavad Gita during the 1980s and he says that it changed his life. Agarwal wants to remain "a common man, a man of the street," he says. "You must laugh at least once a day, and accept whatever comes. I am not seeking fame," he adds.

Inspired by the innovation of Rockefeller, Carnegie and Ford, he believes that business is about giving back to society, and he gives 75% of

'The natural resources industry is experiencing a transition time'

his personal wealth to charitable work, supporting in particular education, healthcare and eradicating poverty. He set up the Vedanta Foundation in 1992, a philanthropic organisation actively supporting programmes including nutrition, education, healthcare, women's empowerment and computer literacy.

He is currently in the midst of building many centres across India where entire villages can access schooling, food and healthcare along with training in key professional skills. He is also planning to build a world class, multi-disciplinary university in India to strengthen the country's education and research infrastructure, modelled along the lines of Oxford, Harvard and MIT.

"I wanted to have the full circle of my life – I started humbly, and I've built my fortune. But fortunes are like the currents of a river, yielding to the provenance of the sea," he tells *Metal Bulletin Magazine*.

Agarwal says his team is working hard to ensure Vedanta carefully addresses complex land, social and cultural issues, especially in the context of tribal and indigenous communities – areas in which Vedanta has sometimes faced criticism in the past.

"I'm looking for Vedanta to be ahead of others in environmental research and development, and to satisfy society in terms of water, air and soil. I always emphasise to my staff that I am looking for Vedanta to remain very conscious about its social obligations to the people they work with and in the communities. These things are very important," he notes. Vedanta has "a long way to go," he says, but already has a "phenomenal foundation of almost 20,000 professionals."

He does not plan to hand over the reins of Vedanta to his family, and has a different kind of succession plan in mind. "All companies have been built by somebody, over the years, including BHP Billiton and Rio Tinto. Someone came along and built them. The same thing is happening here at Vedanta," he says. "This company is not going to remain family-owned, but it will be a great institution. I'm very excited for the day that it is run by the people, for the people," he adds.



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People moves

Sail appoints new chairman

The Indian government has appointed Prakash Kumar Singh as chairman of the Steel Authority of India Ltd (Sail). He took charge on 10 December. Singh had been ceo of Sail's Durgapur steel plant since 2012, and he also led Sail's IISCO steel plant at Burnpur, West Bengal, from July 2015.



ANGLO AMERICAN

Didier Charreton

Charreton appointed by Anglo American

Anglo American has named Didier Charreton as group director of human resources, and as a member of the group management committee, effective December 1 and based in the UK. He has held a number of senior global HR roles over a 25-year career, most recently with oilfield services company Baker Hughes.

United States Steel Corporation and Kobe Steel, has appointed Richard E. Veitch as its president, effective January 18. Veitch most recently served as general manager of US Steel Granite City Works in Illinois. He first joined US Steel full-time in 1985, and has held positions at several US Steel plants, including vp, operations, at US Steel Kosice from 2006 and vp, general director, of US Steel Serbia from 2007.

Gundersen joins Mercuria

Erik Bay Gundersen became head of aluminium trading at Mercuria Energy Trading in Geneva in December. Bay Gundersen was a director, and traded aluminium, at Noble for nine years until he left in October. Prior to that, he was at Norsk Hydro.



PRO-TEC

Richard E. Veitch

Evans joins Rusal as project director

UC Rusal has appointed Chris Evans as project director for price benchmarking, responsible for maintaining the effectiveness of current price discovery mechanisms as well as working with customers to implement alternative pricing options. Evans has many years of experience in metal markets, including as head of business development at the LME, associate director at Rostron Parry and non-ferrous editor at *Metal Bulletin*.

Lowitt appointed as ceo of Marex Spectron

Following the retirement of John Wall, Ian Lowitt, previously cfo, has been appointed as ceo of Marex Spectron, from January 8. At the same time, non-executive chairman Jeremy Isaacs stepped down and was succeeded by Simon Heale, a non-executive director and previously a London Metal Exchange ceo. Isaacs remains on the board.

Rob Watts, the company's group financial controller, becomes cfo, while Simon van den Born, Marex Spectron's global head of metals, joins the board.

Roshan heads 5N Plus, with Bertrand as chairman

5N Plus has appointed Arjang J Roshan as its president and chief executive officer, effective February 15. He replaces Jacques L'Ecuyer who decided to step down from both positions. Roshan worked at Umicore for the previous 18 years, initially in the automotive catalysts business and more recently in its electro-optic materials business. He has also worked at Bosch North America and at the Ford Motor Company.

5N Plus has named Luc Bertrand as chairman. He replaces Jean-Marie Bourassa, who will remain on the board as chairman of the audit and risk management committee. Bertrand is vice-chairman of National Bank of Canada, and serves on the boards of the International Finance Centre of Montréal, the Montreal Canadiens/CH Group, and TMX Group.

Vedanta appoints Cairae

Vedanta has appointed Samir Cairae as ceo of its Diversified Metals (India) division. He will be a member of the Vedanta executive committee and reports to ceo Tom Albanese. Cairae is an electrical engineer with a masters in management from HEC in Paris, and has previously held several leadership positions at building materials company Lafarge and oilfield services provider Schlumberger.

Kaiser names Harvey as president and coo

Kaiser Aluminum has named Keith A. Harvey president and chief operating officer. He will continue to have the duties of his previous position of executive vp of fabricated products, including responsibility for the sales, marketing, manufacturing and advanced engineering functions of Kaiser's fabricated products business. Harvey joined the company in 1981 as an industrial engineer, and was named vp in 1994.

Uys is new ceo of Tshipi

Manganese ore producer Tshipi é Ntle has appointed Wilco Uys as its new ceo. Uys was previously head of operations at Exxaro Resources and replaced Brendan Robinson from January 2016. Robinson will oversee a handover period, and remains on the Tshipi board as a non-executive director.

Rahbary is ceo of Metalliage

Mohammad Rahbary has been named ceo of Canada-based ferro-titanium producer Metalliage. Rahbary has been chairman of the board since September last year, and had previously been the company's commercial director and chief financial officer. Before joining Metalliage, Rahbary worked in London at Mariana Capital Markets.

Veitch appointed president of Pro-Tec

Pro-Tec Coating Company, a 50/50 joint venture in Ohio between

Chin Hwee Tan joins Trafigura

Trafigura Group has appointed Chin Hwee Tan as ceo for Asia-Pacific. Chin Hwee Tan was most recently the founder of the Asian operations of Apollo Global Management, and prior to this he was an md at Amaranth Advisors, USA. He sits on various other for-profit and non-profit boards, and is also on the finance centre advisory panel of the Monetary Authority of Singapore.



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People moves

New appointments at Rusal

Rusal has made a number of new appointments in its aluminium division. Evgeny Popov has been named md of the Sayanogorsk aluminium smelter, while Evgeny Kuriyanov has been appointed md of the Irkutsk smelter. Previously, Popov was a director in the aluminium division's production department, and Kuriyanov was director for reduction processes at the Krasnoyarsk smelter.

Anton Savchenko, formerly md at Sayanogorsk, joins Rusal's government relations team, while Vladimir Berstenev, previously md at Irkutsk, becomes an adviser to aluminium division md Evgeny Nikitin.

Rare Earth Minerals names Suckling as chairman

Andy Suckling, founder of asset management firm Verulam, has become non-executive chairman of London-listed Rare Earth Minerals, having previously been a non-executive director. Suckling, who has been in the industry for some 25 years, takes over from David Lenigas, who has retired as a director.

Thompson joins ICBC Standard Bank

ICBC Standard Bank has appointed Mark Thompson as head of base metals trading. His career began at Deutsche Bank working as a metal derivatives, futures and options market maker before moving on to NM Rothschild where he became the head of base metal options. Thompson joins the Bank from his role as executive chairman and ceo of Treliver Minerals. He has founded several companies in the natural resources sector, and he is also a non-executive director of several listed mining companies, including North River Resources and Margaret Lake Diamonds.

British Metal Corp (India) appoints coo

Trading house British Metal Corporation (India) has hired Nikhil Supekar as chief operating officer to



SANDVIK

Tomas Eliasson



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Lars Engström

enhance the company's metal trading book within and outside India. Supekar, who will continue to be based in Mumbai, was most recently head of international sales at Hindustan Zinc. He also previously worked for Gold Matrix Resources as a base metals trader in Singapore.

Pucci is new md of Ilva

Marco Pucci has been appointed md of the Ilva group, replacing Massimo Rosini. Pucci, an engineer, was appointed to the position of md by the steelmaker's special administrators – Piero Gnudi, Enrico Laghi and Corrado Carruba. Pucci previously worked for Ilva at its Taranto plant in the early 1990s, before assuming a position at Acciai Speciali Terni, where he rose to serve as ceo from 2012 to 2014. He returned to Ilva in 2014 as the company's commercial director.

Cebecioglu appointed chairman of Irepas

The International Rebar Exporters & Producers Association (Irepas) has appointed Murat Cebecioglu as the new chairman of its board. Cebecioglu has been export manager at Turkish rebar producer Içdas since 2009 and will replace Kim Marti, commercial director at Celsa, at the helm of the association.

New appointments at Sandvik

Tomas Eliasson has been appointed executive vice-president and cfo of Sandvik, and a member of the group executive management, effective no later than July 2016. Eliasson is currently chief financial officer for Electrolux, a position he has held since 2012. Previously, he was cfo for Assa Abloy during 2006-2012.

Lars Engström has been appointed president of Sandvik Mining, and he will be included as a new member of Sandvik's group executive management, from December 15. Engström, previously president and ceo of the air treatment solutions company Munters, has an extensive industrial background with over a decade's experience in the mining and construction industry, including

leading positions at Atlas Copco and Seco Tools.

Post-separation executives at Alcoa announced

Alcoa has announced major appointments for its future Upstream and Value-Add companies after the proposed separation in 2016. Roy Harvey, executive vp and president of Global Primary Products, will be ceo of the new Upstream company. William Oplinger, Alcoa executive vp and cfo, will be cfo of the Upstream company. In the Value-Add company, Ken Giacobbe will be the cfo; he is now cfo of the Engineered Products & Solutions business. Klaus Kleinfeld will lead the Value-Add company as chairman and ceo, and he will also chair the Upstream company for the critical initial phase.

Alcoa is also expanding its investor relations team in preparation for the separation, with Matt Garth, vp of Financial Planning and Analysis, taking on the additional leadership of investor relations.

Tragl leads Alcoa's transportation and construction

Karl Tragl has been named by Alcoa as president of its Transportation and Construction Solutions Group, effective February 15. Tragl joins from Bosch Rexroth AG, Bosch's automation solutions company, where he held the role of chief executive officer from 2010. Prior to joining Bosch Rexroth, he was a partner of Siemens Management Consulting.

Alliance Magnesium names Normand as cfo

Alliance Magnesium has named Eric Normand as vp, finance and information technology. Normand brings 25 years of experience in corporate finance and information technology acquired through a cross section of industries including the manufacturing, mining and oil & gas sectors. He recently served seven years as director of professional services for Performance Analytics Corporation.

Mixed fortunes for linepipe

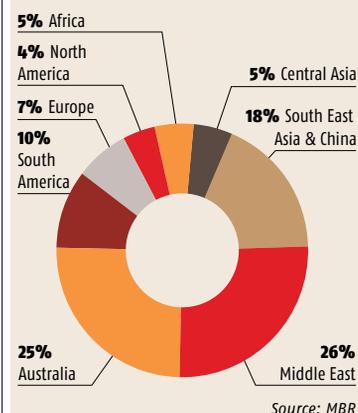
The oil & gas price slump of the past year has dominated the latest chapter in a five-year story for linepipe that saw total production in 2014 significantly lower than 2009. James Ley tells the story and considers the outlook now

Linepipe markets conveniently fall into three main categories: large-diameter (typically 16in/406.4mm OD and over), small-diameter, and clad and lined pipe. Each of them have their own market characteristics and, interestingly, over a five-year timeframe have shown distinctly different levels of performance.

Large-diameter output

From peak output of around 11 million tonnes in 2011, large-diameter LSAW linepipe production slumped to about 7.5 million tonnes in 2013, before a small recovery to around 8 million tonnes in 2014 – still 1 million tonnes short of output five years earlier in 2009. Global HSAW production levels followed a similar pattern (see graphs).

2014 demand share for clad and lined pipe



MBR estimates that total output for LSAW and HSAW linepipe in 2015 was 8.5 million and 7 million tonnes, respectively.

Europe, India and Japan are established LSAW producers, but each location has experienced different market dynamics.

In Europe, large-capacity LSAW mills have been heavily under-utilised in recent years, and this has been illustrated by the idling of Italy's Ilva LSAW pipe mills and Europipe's French LSAW mill. Asian producers, such as JFE and Baosteel, have provided stiff competition in European markets. To make matters worse, former export markets in Iran and Russia dried up. The Iranian market could, once again, show potential though in coming years as the sanctions have now been lifted.

Nevertheless, Tata Steel Europe's mills have been more successful at focusing on the niche deep-water, small-diameter, higher-value part of the market, while others have still been able to win orders for major projects as far away as Australia. The market in Europe certainly seems challenging with the possibility for takeovers. Nevertheless, coming into 2016, the region's largest producer, Europipe, has picked up some decent-sized LSAW linepipe projects in Europe and Egypt.

Japanese mills have won major tenders, such as in Azerbaijan, and for South Stream. Both of the country's leading producers have won projects from Norway's Statoil

in recent years: first JFE with the Polaroid project, and more recently NSSMC with the Johan Svedrup pipeline for Statoil. However, South East Asia is a challenging regional market with limited opportunities, while China and the Middle East have become harder markets in which to compete. Could these developments see some of the Japanese mills relocate?

Meanwhile in India, the country's domestic market has failed to live up to expectations, resulting in a great reliance on export markets, which account for 70-80% of Indian mills' production. While producers such as Welspun and Jindal SAW have been quick to localise outside India by acquiring international assets in countries such as the USA and Saudi Arabia, rising local LSAW capacity from competitors in the Middle East – India's major export market – has limited opportunities.

Generally speaking, markets have been brighter for mills based in the newer regions for LSAW production – China, Russia and the Middle East.

LSAW production capacity has grown in China, but HSAW has climbed faster still. China now competes in export markets, such as South America. The domestic market also has potential, with the market set to strengthen with gas linepipe activity.

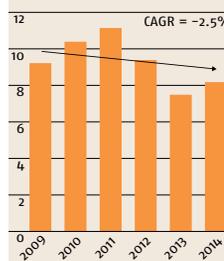
Russia has seen huge growth in LSAW capacity, now standing at around 5 million tpy. Its domestic demand is strong and set to stay so in 2016. However, to date, Russia's mills have limited experience of competing for projects outside Russia other than Gazprom's.

New mills in Saudi Arabia have recently succeeded in picking up orders from Saudi Aramco and, with Saudi demand rising, local mills are expected to win both HSAW and LSAW business. Those mills are likely to remain focused on the local markets for which they were designed, with capacities relatively limited to reach export markets as well.

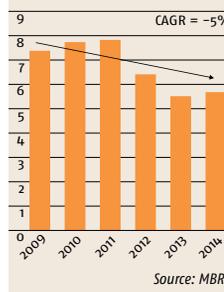
Large-diameter demand

On the five-year timeframe from 2009 to 2014, Russia and the CIS region is the only one to have seen demand for large-diameter linepipe in the last year of that range exceed that in the first – 260,000 tonnes

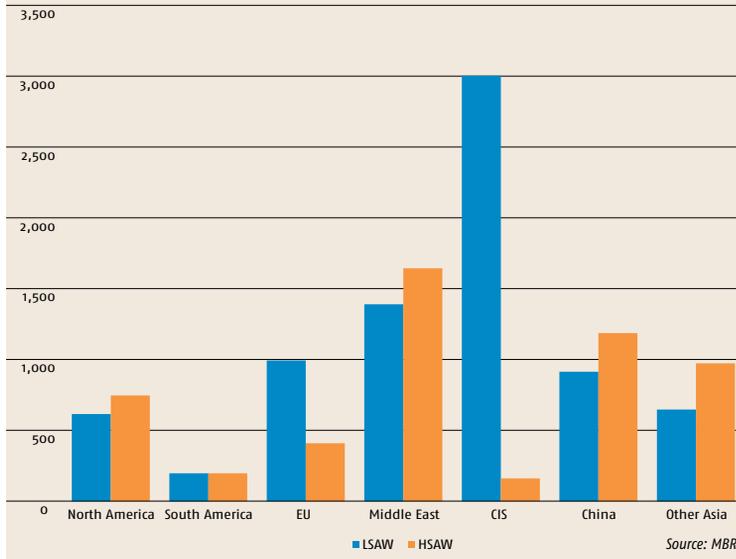
Global LSAW linepipe production 2009 - 2014 (Mt)



Global HSAW linepipe production 2009 - 2014 (Mt)



Market split between LSAW and HSAW consumption in each region in 2014 (kt)



higher. The rest of the world saw lower consumption in 2014 than in 2009, with the total standing 3.4 million tonnes lower at 14.6 million tonnes. China saw the largest fall, by about 1.3 million tonnes, but Europe also saw 1 million tonnes less consumption than five years earlier.

At 3 million tonnes, LSAW linepipe demand dominated Russia & CIS consumption (accounting for over 90% of all large-diameter pipe demand in this region), while the EU consumed twice as much LSAW (1 million tonnes) as HSAW in 2014. South America saw an even balance, but the lowest regional demand in that year, while Asia the Middle East and North America just favoured HSAW over LSAW (*see graph*).

Despite its sag in fortunes in recent years and struggling oil & gas markets, the large-diameter linepipe demand will be relatively stable over the coming years to 2020, Metal Bulletin Research believes, with an average annual market growth of 3%. The reason for that optimism is based on demand being driven as much by politics as economics.

In Russia, demand-sustaining projects include Power of Siberia, South Stream/Turkish Stream and Nordstream 3 & 4. Greece and Turkey have TAP/TANAP. Saudi Arabia has Master Gas Expansion Phase 2.

And by no means least – particularly since sanctions have been lifted – Iran has the IGAT

pipeline series, four branches of which on their own could add 3 million tonnes of 56 inch outside-diameter steel pipeline demand in the country before 2020. That would go some way to restoring Iran's share of the Middle East market, which fell to just 11% in 2014 – down from 41% in 2009.

Small-diameter

By contrast with its larger diameter cousins, small-diameter linepipe saw more buoyant markets over the five years to 2014. ERW linepipe demand saw a compound annual growth rate of 6.6%, while seamless linepipe consumption growth was 7.6%. Seamless took just over three-fifths market share over the period (*see graphs*).

China's production capacity for seamless and ERW linepipe exceeds domestic demand, leading to global exports of over 2 million tpy, for which North America is a key destination.

The relatively upbeat markets for small-diameter linepipe were dented a little last year and MBR expects that the market is unlikely to return to 2014 levels before 2017. Declines have been the sharpest in North America, where ERW gathering-line activity in small diameters has reduced.

Looking further ahead, Russia and the CIS region is forecast to become the largest market by 2020,

MBR's Tube & Pipe Group

Metal Bulletin Research's Tube & Pipe Group is a team of analysts monitoring market developments globally. The team produces monthly price trackers as well as major annual five-year strategic outlook reports and consultancy work. Reports include industrial and structural tube & pipe, seamless OCTG & linepipe, and welded linepipe & OCTG. The team comprises: James Ley (London), Roman Filiminov (London), Kim Leppold (USA), Marina Vertemberg Bozkurt (Istanbul) and Ginger Ding (Shanghai).

Contact: info@metalbulletinresearch.com

Projects likely to need clad pipe

Project	Location	Comment
Browse Basin	Australia	Investment decision expected 2016
Ichtyis	Australia	A major clad pipe consumer with a 40-year investment pipeline
Habshan	Saudi Arabia	May be a major consumer in 2016
Block B, PetroVietnam	Vietnam	-

Source: MBR

supported by projects such as the Eastern Gas Programme and Yamal.

The combination of low steel prices with over-capacity look set to suppress Chinese export prices over the next couple of years, preventing major global price rises. MBR predicts that the average price of Chinese seamless small-diameter linepipe in 2016 will be \$650 per tonne for seamless and \$450 per tonne for ERW – well below forecast equivalent prices in Western Europe and elsewhere.

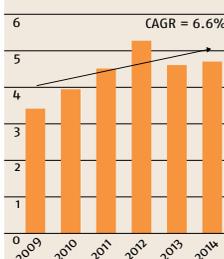
Clad pipe

Clad and lined pipe is used in highly corrosive sour well environments – often offshore for flowlines and risers. While tonnage demand is unsurprisingly more than an order of magnitude smaller than large-diameter markets, the global clad and lined pipe market has been growing and reached a record high of about 90,000 tonnes in 2015, with markets in the Middle East, Central and South East Asia being major consumers (*see piechart opposite*).

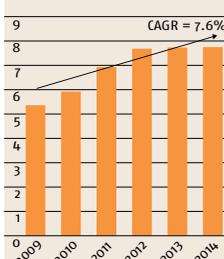
MBR has identified a number of projects between 2016 and 2020 that could use clad pipe (*see table*), although prolonged low oil prices will clearly have an influence on project timing and future demand.

The author is head of Metal Bulletin Research's Tube & Pipe Group (see box).

ERW linepipe consumption (Mt)



Seamless linepipe consumption (Mt)



Source: MBR

Marcegaglia: a new organisation for even greater steel-industry leadership

Major changes are afoot in the steel industry: with its headquarters in Gazoldo degli Ippoliti, Mantua, Italy, Marcegaglia – the major international steel processing corporation with output of 5.4 million tonnes per year and one of the leading steel-industry players with production plants on three continents – recently completed a major internal reorganisation of its steel operations, aiming for strengthening and “industry-leading growth”.

“With the aim of greater transparency and clarity,” Chairman and CEO Antonio Marcegaglia explains, “we have completed the split-off of our non-core equity holdings (tourism, white goods components, building...) from our core business, steel processing, which we aim to focus on and strengthen.”



BUSINESS:

- Hot and cold rolled stainless steel coils and sheets
- Stainless steel welded tubes
- Stainless steel drawn bars
- Stainless steel flat bars
- Cold-formed sections
- Carbon steel drawn bars
- Drawn steel bars for high-speed machining processes

STAINLESS STEEL FLAT

Yearly capacity:

A/P lines (HR/CR): 500 – 300,000 tpy • 2 lines

Cold rolled: 250,000 tpy • 2 lines

STAINLESS STEEL TUBES

Yearly capacity: 500,000 tpy

Manufacturing lines: more than 100

Products: welded tubes in stainless austenitic, ferritic, duplex steels and other special alloys.

Marcegaglia Specialties is the top producer of stainless steel welded tubes

In over 50 years in business, Marcegaglia has created a unique production mix, strictly linked to the structure and organisation of the entire group, ranging from the processing of carbon and stainless steel tubes and flat products, through to verticalisations in the building & construction industry (with the production of insulated panels and crash barriers, for example), and in electromechanical components, composites, energy and DIY sectors, to name just a few. The reorganisation, completed on 1 November 2015, has led to a regrouping of Marcegaglia's three main businesses – Carbon Steel (tubes and flat products), Specialities (stainless and drawn steels) and Plates (heavy plate manufacture) – in separate companies owned by a holding corporation, Marcegaglia Steel.

The operation had two main aims: on the one hand greater transparency, both within and outside the group, and on the other: “Our industrial objective is to achieve industry-leading growth, potentially by merging or forming alliances with other players, in a process which I believe may also involve the consolidation of the first and second transformation phases. We want to be actively present, we want to grow and we want to do it as the industry-leader, and rather than adding capabilities, we believe this process based on external lines is better for the business's profitability and sustainability,” Antonio Marcegaglia concludes.

According to this vision, the strategic key drivers continue to be focused on four main themes: assets optimization – focusing on the best assets/plants to improve efficiency also through full utilization of their capacity, and eventual reallocation of the production/logistic flows; product development – focusing more on high grade steel, highly demanding industry segments (such as automotive); process efficiency – focusing on costs reduction especially in the areas of consumables, maintenance, energy consumption and logistics; raw material sourcing – a wider and more competitive international network of suppliers to sustain growth also in the value-added products, both in carbon and stainless steel.

www.marcegaglia.com
phone +39 0376 6851



BUSINESS:

- Production of carbon steel flat products (coils, strips and plates)
- Production of pre-coated steel flat products (coils, strips and plates)
- Welded carbon steel tubes, drawn carbon steel tubes and refrigeration tubes

CARBON STEEL FLAT

Yearly capacity:

Pickled and oiled: 3.5 million tpy • 3 lines

Cold rolled: 2.5 million tpy • 8 lines

Annealing/skinpass: 1.2 million tpy • 75 lines

Hot Dip Galvanized: 1.8 million tpy • 4 lines

Pre-painted: 570,000 tpy • 2 lines (including a combined galva-painting line, a prototype worldwide, that allows the complete in-line coil galvanizing and pre-painting processes)

Service Centre: 2.50 million tpy • 5 plants

CARBON STEEL TUBES

Yearly capacity: 3.0 million tpy

Manufacturing lines: more than 100

Products: carbon steel welded tubes (round, square, rectangular) also for structural applications

Thickness: 0.3 mm to 16 mm

Diameter: 8.0 mm to 406.4 mm



BUSINESS:

- Heavy plates from quarto rolling mill

HEAVY PLATES

Yearly capacity: 400,000 tpy

Manufacturing plants: 1

Products: heavy plates from quarto rolling mill

Global OCTG markets try to find a floor

In line with the slump in oil & gas prices, OCTG mills and distributors are generally suffering from correspondingly sharp falls in demand for their products. Kim Leppold surveys the scene – region by region

In 2015, global OCTG consumption declined 25% year-on-year, to just over 14 million tonnes, down from 18.7 million tonnes in 2014. The North American market saw, by far, the sharpest fall in demand year-on-year, dropping by over 50%.

North America is historically the largest market for OCTG in the world, accounting for just over 40% of all demand. Outside that region, the next largest markets for OCTG are China, Russia & CIS, Middle East and South America, respectively.

China actually bucked the trend in 2015, seeing a slight increase in demand – up by 10% on the previous year. But demand had been suppressed in 2014 in reaction to a corruption scandal at China National Petroleum Corporation (CNPC). The CIS saw a moderate decline of 5%, with the Middle East dropping by 17% and South America down by 6%.

Moving into 2016, global oil prices continued to collapse through the start of the year, affecting drilling rates and OCTG demand further, especially in the North American markets. Oil prices have yet to stabilise and threaten the \$20/bbl threshold at times. In late 2015, the consensus was that 2016 oil pricing would slowly move higher through the year, but the “lower-for-longer” outlook is prevailing, with 2017 now expected to exhibit the long-awaited modest recovery.

North America hit hard

OCTG demand and prices have been slipping for more than a year with monthly incremental declines. Indeed, seamless J/K55 casing prices are down by nearly \$600/tonne from their peak in late 2014. In the 15 months since that price peak of \$1,630/tonne, US rig counts, an indicator of OCTG demand, have been cut to less than one-third of their peak, owing to the decline in oil prices.

Moreover, the decline in rig counts picked up pace in the first quarter of 2016, falling by 78 units in the first two weeks of February alone to 541, the lowest level in nearly 17 years. Part of the reason for the swift decline now, in addition to oil prices breaking new lows, is that fewer barrels of oil have been purchased through derivatives at higher prices.

Last year at this time, crude oil that was produced was largely hedged at higher prices thus sustaining production. Most of these contracts have now expired and oil companies are receiving closer to market prices for their output, which can potentially be below production costs.

As a result, capex cuts by energy companies are continuing to mount. Anadarko Petroleum, for example, which lost \$1.25 billion in the fourth quarter of 2015, recently announced that spending in 2016 will be \$2.8 billion, half of 2015 spending, which was itself

substantially below 2014 spending levels. The company also shifted its focus towards deep-water offshore projects from onshore shale plays given the longer lead times and better production rates of offshore drilling.

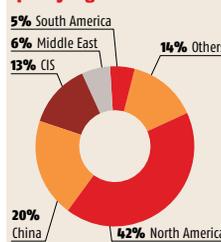
Oil companies across the region are rethinking fracturing plans. Pioneer Natural Resources, for example, announced in its fourth quarter 2015 results released on 10 February 2016 that it plans to reduce horizontal drilling activity by 50% from 24 rigs at year-end 2015 to 12 rigs by the middle of 2016, while still growing 2016 production by 10% or more.

The large Eagle Ford shale basin has seen rig activity fall significantly. An area that at one time had over 100 rigs running now has just 58 operating, according to Baker Hughes data.

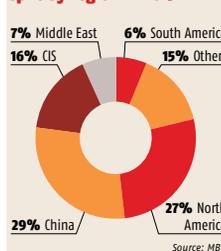
OCTG prices still fall

OCTG distributors, a common service provider in the regional value chain, are still working down inventories to keep in line relative to demand. Two months of OCTG supply, for example, would signal that the market is in balance, where prices could potentially rise. Yet, declining mill shipments and a levelling off of imports in the fourth quarter of 2015 and into 2016, while helping to keep supplies under control, are still running short of the downturn in demand. Inventories, in months-of-supply terms, are still too high. MBR understands that supplies relative to demand are holding at nine to twelve months of inventories in the Houston area. Such high levels suggest that OCTG prices will remain under pressure and distributors and end users are unlikely to come back into the market for purchases in the near term.

Global OCTG market split by region in 2014



Forecast global OCTG market split by region in 2015



Source: MBR

Recovery slower than decline

A recovery in oil prices will not bring about a swift recovery in rigs and drilling rates, and ultimately OCTG demand. Many wells have been drilled and capped and have yet to produce oil or gas. Those wells will be utilised first before new ones are drilled. The only positive in the onshore shale drilling is that depletion rates are such that wells need to be replaced at a faster rate than offshore or conventional wells, so when drilling resumes the rate of recovery in drilling rates will pick up pace more quickly than in conventional drilling.



SHUTTERSTOCK

A recovery in oil prices will not bring about a swift resurgence in rigs and drilling rates

China sluggish too

In the Chinese market, the world's second-largest OCTG market, it is difficult to see any clear signs of a significant pick-up in OCTG recovery occurring. The plummeting oil prices have been dampening OCTG drilling even in China itself as companies reduce their capital expenditure to preserve capital to shore-up their balance sheets.

Chinese seamless mills remain focused towards the export market, which indeed has led to Chinese mills offering the lowest prices for seamless linepipe in the world. With standard casing grades of J/K 55 being offered at below \$500/tonne cfr.

Russia bucks trend

In Russia and most of the CIS countries the market for OCTG demand remained stable throughout 2015, with overall OCTG production in the region increasing by 5% on the back of growing oil production and declining imports. Flexible taxation along with the weak ruble has allowed local energy companies to remain sheltered from the effects of falling oil prices, resulting in record oil and gas condensate production levels in 2015 (up 1.3% year-on-year).

In Russia, seamless OCTG shipments in 2015 have grown by 11% and ERW by 10%. Local OCTG production in Kazakhstan has reportedly grown by 45% (although from a low base), benefiting from access to the market of The Eurasian Union (mainly Russia).

'MBR is not confident that there will be any major pick-up in OCTG demand globally this year'

The market within the Union remains well protected from most international competition, with trade limitations as well as recently weakening currency and international sanctions helping to make any international competition even harder.

At the same time, Ukrainian production still has not been able to compensate for the loss of the Russian market, resulting in a 58% production drop – this is the only negative OCTG production result in the region. As oil and gas production levels in the region are expected to remain high, the level of OCTG consumption is likely to remain stable, with a very limited access for international competition.

Good Middle East demand

The Middle East market has seen major OCTG tenders awarded in the UAE and Kuwait in 2015 for three-year drilling programmes from the National Oil Companies (NOCs), ADNOC and KOC. Indeed, the purchases of OCTG from these two countries are historically high. If all pipe is delivered it will amount to more than 1 million tonnes in the next couple of years.

These countries are not the largest consumer of OCTG in the Middle East, which is Saudi Arabia. Saudi Arabia's NOC, Saudi Aramco, has been largely absent from OCTG purchasing in 2015 as it looked to run down its inventories, which it had built up heavily by the first quarter of 2014. Coming into 2016, the company has now returned to quarterly buying of OCTG. This is encouraging for the rest of 2016.

Even so, while underlying demand for OCTG remains strong in the Middle East, the global capacity available to supply OCTG is so large that prices continue to fall. As a result, major buyers in the Middle East continue to push OCTG prices down without any resistance from the market.

Brazilian demand curtailed

One of the key OCTG markets in South America, the fifth largest market, is Brazil. Not long ago, the reserves in the pre-salt developments off the coast of Brazil were some of the most promising

deposits for future drilling. However, low prices, high costs, and troubles at Brazil's NOC, Petrobras, have reduced the outlook for production and OCTG demand.

Demand from Petrobras has run well below expectations over 2014 and 2015. The outlook for demand in 2016 is even more downcast. Petrobras, facing \$130 billion in debt and persistent low oil prices through much of the year, has now slashed its energy reserves as well as capex plans. Energy reserves are now down to 10.52 billion barrels of oil equivalent (boe) from 13.13 billion boe last year. The reason for the steep decline is that the reserves are not viable at current energy prices. This puts a damper on the excitement that was building over the further development of the offshore pre-salt basins.

Moreover, the reduction in planned capex spending over the five years to 2020, lowered from \$130.3 billion to \$98.4 billion last year, and reduced further to \$93 billion now, will also stunt the exploration and development of new reserves over the period. MBR expects Brazilian OCTG consumption then to be undermined by these developments over the medium term.

These developments have caused Vallourec to reorganise its Brazilian assets, opting to combine the two seamless OCTG operations in the country and close steelmaking at the Belo Horizonte site. Nevertheless, the company will probably need to export excess material or otherwise curtail production. Yet, exports will be met with steep competition for sales in all the main consuming regions.

In conclusion, MBR is not confident that there will be any major pick-up in OCTG demand globally this year, especially if demand in the USA continues to fall. This could easily outweigh any recoveries seen in other markets. A period of stable and rising oil prices will be needed to encourage demand to pick-up, but MBR now believes this will be unlikely to happen until towards the end of 2016 at the earliest.

The US-based author is part of Metal Bulletin Research's Tube & Pipe Group (see previous article for more details)

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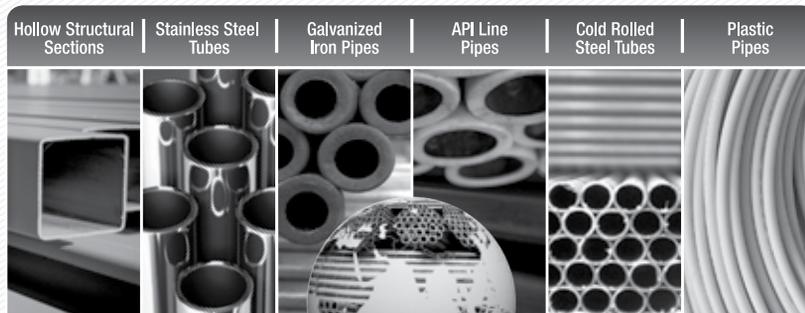
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Pipe Innovation Technologies develops its service business

Pipe Innovation Technologies has invested in plant, equipment and engineering to extend its range of products and services.

The company Pipe Innovation Technologies (PIT) is well known in Russia as a supplier of large-diameter pipes for major gas transport facilities. PIT participates in projects such as the pipelines Bovanenkovo – Ukhta, Ukhta – Torzhok, South Corridor, and Force of Siberia.

The company's business is based on a complex approach to operations in the pipe markets – from scientific developments, in the sphere of technical standards for manufacturing and the introduction and testing of pipe products, to supplies of pipes and fittings to end-customers.

Following the logic of complex development, since 2014 the company started to expand asset portfolio with service facilities.

VACUUM INSULATED TUBING

The first step was construction of a plant for manufacturing and servicing vacuum insulated tubing (VIT). Such pipes are used in oil, gas and gas condensate wells at the permafrost or shelf fields, as well as in the production of high-viscosity oil.

In the territories of the North, VIT prevents frozen earth around the borehole from melting and falling.

In the production of high-viscosity oil, such pipes are used for steam injection. Hydrocarbon production at the shelf with VIT secures environmental balance.



In VIT manufactured at our plant, premium threaded connections are used that secure a high level of safety and make them leak-proof.

CONCRETE COATING

The second service asset in the company's structure is an automated plant for concrete coating large-diameter pipes, which was launched in 2015.

PIT's concrete coating plant. The technology used at the plant allows the use of such pipes in the construction for overseas pipelines.

The technology used at the plant provides for use of large-diameter pipes at a crossing of water barriers of any type and allows the use of such pipes in the construction of overseas pipelines in compliance with international requirements (DNV-OS-F101).

The plant can accept pipes from 219 to 1,420 mm in diameter. Plant capacity is 75 km/year of coated pipes. A testing ground for coated pipes will be built at the site of the plant.

ENGINEERING SERVICE TOO

Along with the development of its service business, PIT continues work in the sphere of engineering.

Especially designed for active tectonic subduction zones, new technical requirements have been developed, and new pipes have been designed and launched into production, with the participation of the PIT engineering service.

The new pipes' feature of high-deformation capacity provides reliability in conditions of seismic impact in the active tectonic subduction zones.



PIT's vacuum insulated plant. Such pipes are used in oil and gas wells.

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www.pipeintech.com

Innovation in products and technologies

A steady stream of innovative tube, pipe and wire products and technologies have been launched over the past year. The selection here gives a taste of recent progress and developments

Lighter high-strength steel forgings in fewer steps

ArcelorMittal has developed a forging steel, SOLAM® B 1100, for the production of automotive components.

Supplied as round bar in diameters from 40 to 170 mm, or square bar in dimensions from 65 to 150 mm, after hot forging the steel achieves an ultimate tensile strength of 1,100 MPa or higher. Good toughness and weldability are also claimed for the steel.

ArcelorMittal notes that a robust transformation process is achieved by customising the chemistry with part dimension and cooling facilities in the forging plant. The steel has a completely bainitic structure and it has an HV30 hardness of 350. Carbon content is limited to a maximum of 0.200%, manganese to 1.900% and chromium to 1.500%. Its European designation is 18MnCr 5-3 mod.

André Fontaine, marketing director at ArcelorMittal Europe – Long Products, says that SOLAM B 1100 allows forges to reduce the weight of automotive parts by up to 20% and reduces production costs by eliminating the heat treatment steps needed for existing steels.

Steels such as 42CrMo4, for example, require austenitisation, quenching, tempering and straightening steps after forging and cooling, notes ArcelorMittal. The steelmaker's new grade uses natural or controlled cooling to fine-tune

the chemistry and process before a light straightening step.

Applications include truck front axle beams, steering arms and steering knuckles. Heavy parts with an equivalent diameter of 30 to 110 mm are typical applications. Steering knuckles, for example, usually weigh between 5 and 10 kg, with the biggest dimension of the component being between 30 and 50 cm. The raw material used for such a component is usually a round bar of diameter between 40 and 80 mm.

The latest grade is part of a family of high-strength SOLAM steels for forging, which Fontaine says “offer extreme performance and in many applications have no competition from other, lighter materials.”

In addition to the exhaust emission savings to be gained from lighter automotive components, noise reduction is another advantage. “With our steels, the functioning of motors and rotating parts can be improved, since vibrations are the main source of noise,” said Fontaine.

ArcelorMittal continued to invest in high-grade steels for forging last year. “New continuous casting equipment provides higher quality products,” said Fontaine, “especially rotating parts for trucks and cars made from products rolled in Duisburg, Germany, and Gandrange, France.” SOLAM B 1100 is mainly produced at ArcelorMittal's wire rod mill in Duisburg, but also in Gandrange. The grade is mainly used for truck



A front axle beam



A prototype steering knuckle design

components at the moment and delivered through ArcelorMittal's customers in the forging sector to manufacturers across Europe.

ArcelorMittal's European long steel business comprises 19 plants, of which four are dedicated to the automotive industry. The business as a whole sells about 12 million tpy of steel.

Improved copper tube eccentricity

Danieli Centro Maskin, in cooperation with Danieli Automation, has developed a system to measure the eccentricity of copper tubes during production and correct it during the in-line drawing process. The technology supplier says this is achieved without reducing drawing speed. The patented system is specifically designed for the chain track drawing process.

The entire straight length tube produced has a final eccentricity of 3 to 5%, resulting in material saving and consistent tube quality, with average tube eccentricity of 4%. Danieli says that the system's very compact design and high-precision operation makes it suitable for both new and existing plants, enabling retrofitting of existing Danieli plants as well as plants designed by other suppliers.

The plantmaker says that DEC (Danieli Eccentricity Control) technology, combined with the DED (Danieli Eccentricity Detection) system installed in the downstream processes, provide excellent material eccentricity for real-time tube supply, enabling top-quality control certification to be obtained.

Tube eccentricity is a critical control parameter for copper tubes since the greater the eccentricity ▶

Danieli W+K continuous improvement approach in process and design, and the extensive know-how inherited from Hoesch, led to state-of-the-art pipe mill technology. Design, manufacturing, modernization, erection and commissioning of single machines up to complete turnkey plants are provided.



✓ Four latest references out of total 35

**SALZGITTER MANNESMANN
PRECISION GERMANY**
Heavy wall thickness automotive tube
OD 60 mm ERW tube welding line
with finishing floor.
Start of production: 2012.

TUBE PRODUCTS OF INDIA (TPI) INDIA
Heavy wall thickness automotive tube
OD 180 mm and heavy hollow sections
ERW tube welding line with finishing floor.
Start of production: 2014.



DANIELI W+K
Longitudinal
and spiral welded pipe plants



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- > ERW 26" LSAW 64" HSAW 120"
- > For oil & gas, chemical, petrochemical, automotive and power applications

ALFAPIPE ALGERIA

2 spiral pipe mills, both for OD 20" to 80" with conventional technology, each line producing up to 100,000 tpy
Start of production: 2016 and 2017.

BORUSAN MANNESMAN BORU TURKEY

Fully automated spiral pipe mill.

Large API product range from OD 20" to 64".
Start of production: 2012.



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of the tube, the greater the amount of copper material consumed during manufacturing. Because of the high cost of copper, an improvement in eccentricity of even only 1 or 2% can provide significant savings in operational costs.

Advanced quench & temper technology

After several months of close collaboration between SMS group and TimkenSteel in the USA, a new heat treatment line – the Advanced Quench & Temper Facility (AQTF) – was developed. The compact line will use a combination of induction preheaters and combustion furnaces for both the austenitizing and tempering processes.

SMS group will install and commission the line, which will be capable of processing up to 10 tph of tubes and bars. Their diameter will range from 4 to 13in, comprising a variety of different steel grades in TimkenSteel's range.

The AQTF will incorporate a new Quenching Shell® – an advanced outside- and inside-diameter water sprayer designed to provide high-severity, but also flexible, quenching to adapt to changing process conditions. The Quenching Shell was created to serve the needs of this particular project, but SMS reports that it promises to become a standard for similar applications.

The plantmaker is scheduled to install the line ready for operation, at TimkenSteel's Gambrinus complex in Canton, Ohio, in the second quarter of 2016 – to take just a half-year "from greenfield to commercial operation."

Energy-saving coil compactor

Sund Birsta's new coil compactor, Sirius, will use mainly electro-mechanical drives for its functions and only limited hydraulic power. All systems will be on board, thereby limiting installation and commissioning time. The company says that the Sirius will use about 20% less energy consumption compared with conventional compactors.

Carriages travel with electrical gear motors quickly and with low

force. Final compacting is then done by hydraulic cylinders with short stroke and high force. The press forces will be kept within the framework of the two press carriages since they are locked together before final compacting is done. Wire feeding is entirely electrically driven, using frequency converters to control speed.

In December 2015, Sund Birsta was awarded a contract for its first Sirius coil compactor by the RIVA Group. The RIVA mill in Sam Montereau, France, has already been successfully using earlier versions of Sund Birsta compactors and coil handling systems, notes the technology supplier.

Sund Birsta has also introduced a new fully electrical binding unit, KNBe, which will use servo motors to operate. A large range of analytical tools are available with servo drives and these can be used to generate feedback for preventive maintenance. The electrical binding units also avoid any risk of getting hydraulic oil on the coils.

The Sirius will enable mills to save energy while optimising time, speed and efficiency, says Sund Birsta. Machine dimensions are smaller than traditional compactors, which will enable substitution for older machines on existing foundations.

The coil weight range that the Sirius coil compactor can handle is 700-4,000 kg. The diameter range of the wire rod that it can compact is 5.0 – 28 mm. Sund Birsta is part of the Danieli group

New compactor and unloading design

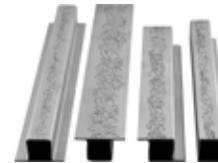
A new vertical compactor and unloading station design, which allows the automatic loading of loose coils from a floor-mounted cradle onto a vertical compacting system – replacing a former manually operated secondary processing system – has been supplied by Primetals Technologies to upgrade and automate the compacting and coil handling process of French stainless steel wire rod producer Ugitech.

The mill's previous horizontal compacting system was slow and did not provide the necessary coil package for efficient downstream



SUND BIRSTA

Sund Birsta's Sirius coil compactor saves energy by using electromechanical drives and only limited hydraulic power



BORAY PIPE AND PROFILE CO

Boray Pipe and Profile Co has added patterned T, Z and L profiles to its range

processing, says Primetals. The new solution also includes a special feature located after the shot blast process, which delivers a denser coil package prior to compacting. The system is fully automatic without a dedicated operator, where fork-lift truck drivers simply drop off loose coils at a loading station and pick up compacted coils from an unloading station.

The new system processes a 1.1 ton coil scratch-free with four wire tie bindings every two minutes with a variable compactor force range of 2 to 20 tons.

Part of the Schmolz + Bickenbach Group, Ugitech produces and sells a wide range of stainless steel long products (more than 200,000 tpy), including bar, wire rod and wire.

Pretty profiles

Boray Pipe and Profile Co, a 60,000 tpy carbon steel tube producer in Mersin City, Turkey, has added patterned T, Z and L profiles to its range. Designed for use in door and window frames, each is embossed with flower, wood grain or grape patterns to create an attractive profile.

The new products complement the company's range of longitudinally welded plain and patterned tubes, as well as other profiles, used for products as diverse as pergolas, gates, railings, and balusters and handrails for stairs and balconies.

To suit different customers' preferences, hot rolled carbon steel or pre-galvanized steel coils are used to make the profiles. Hot-dip batch galvanizing is another option. A modular production flow allows in-line production of the patterned profiles, which can also be supplied spray-painted by an automated coating module.

Steel with a thickness range of 1.0-4.0 mm is used to create square-section profiles from 20x20 to 80x80 mm, and rectangular profiles from 20x30 to 60x100 mm. Circular tubes range in diameter from 20 mm to 101.6 mm.

Boray's sales of patterned profiles are mainly in its home market of Turkey at present, but the company is looking to build its European export markets with the goal of selling up to 14,000 tpy of them.



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Sentiment and fundamentals compete to drive copper

There are times when overall market sentiment has much greater influence than the fundamentals of supply, demand and stock levels. In what seems to be just such a period for copper, Richard Barrett asks several leading metal analysts for their views on market drivers in 2016 and beyond

A two-year historical price chart tells a story of recent copper price descent – a continuation of a long-term trend which has seen the red metal's value fall from heights of \$10,000 per tonne five years ago to the mid-4,000s now.

As for many commodities, concerns about China's slowing economic growth have been a relatively recent market driver, but what other factors have metal analysts seen as key, and which will impact the market most over the coming year?

Andy Cole, Metal Bulletin Research senior base metals analyst, points out that to assess the copper market outlook as far as a year ahead demands analysis of the fundamentals. But he also notes that, at present, investor sentiment is much more in the driving seat: "All the while the current miserable, negative sentiment prevails, the market often overlooks the fundamentals."

Casper Burgering, senior sector economist for industry and industrial metals at ABN AMRO in the Netherlands, has similar thoughts: "Sentiment is dictating the copper market, but the fundamentals are still positive for copper going forward. The effects of production cuts will become evident this year and next year, so there should be a market balance in 2016."

He says that copper prices dropped too far in late-2015 and early-2016: "From a fundamental point of view there is no reason for these low prices," he adds.

China dominates

Copper stock levels have climbed a little on the LME, but the price direction has been determined by the macroeconomic news flow rather than real copper market fundamentals. "Good news is ignored while bad news is taken seriously," Burgering stresses. He gives an example: "End-user demand is especially of interest this year, particularly in China. For example, investment in power transmission and infrastructure is showing some signs of improvement, but such positive news for copper is ignored."

INTL FCStone's Edward Meir says that copper market direction is dominated by China. He does not think that LME copper will test the \$4,000 per tonne level, mooted by market bears, in the first quarter of 2016, but he would not be surprised if price erosion sees it plumb those depths by mid-year. He asks who will be the physical buyers of expanding copper supplies: "Will the Chinese really come back?"

China has seen a slump in demand and needs to work off the consequences first, he notes.

Factors depressing Chinese consumption include a property glut and comparative recession in manufacturing as new developments are cancelled.

Meir acknowledges views that India could become a more significant market to support global copper demand, but compares its 700,000 tonnes of consumption last year with a 10 million tonne market in China. For copper demand, "It just comes down to the Chinese," he stresses. He also notes that spending on China's electricity distribution grid was down in yuan terms, but that cheaper copper may encourage greater spending to support volumes bought for that application.

"The current state of the copper market is very turbulent as macroeconomic events and news in every part of the world, and particularly China, are weighing on end-user demand and market sentiment," says Burgering. "Demand in China has now slackened somewhat. However, if you look at fundamental demand in China, from ore through semi-finished to finished copper products, it was actually up in 2015, by 5% in total."

Supply disruptions

Cole also points to the importance of China: "For a sense of demand, you can mostly look to China and ignore the rest of the world." On the supply side, disruptions are a continuing trend: "While, on paper, the supply coming on stream should swamp demand, in reality strikes, low grades and delays and other disruptions impact capacity growth," adds Cole.

He says that there was an estimated 1.6 million tonnes of lost production last year: "Much of the anticipated new supply in copper never hits the market."

'All the while the current miserable, negative sentiment prevails, the market often overlooks the fundamentals'

For 2016, there are already 1.1 million tonnes earmarked in estimates for ‘disrupted’ supply on an annualised basis, notes Cole. That figure includes pre-planned production cutbacks declared by majors like Glencore and Freeport, slow progress on some others’ project developments, and unexpected setbacks like hydroelectric power problems caused by drought in Zambia.

“There was a mine surge born out of the \$10,000/t copper price in 2011, which is still coming on stream, but when the world doesn’t need it,” says Cole. Nevertheless, he adds that China continues to surprise the market with its strength of demand, “Even though the market bears don’t like to admit it.”

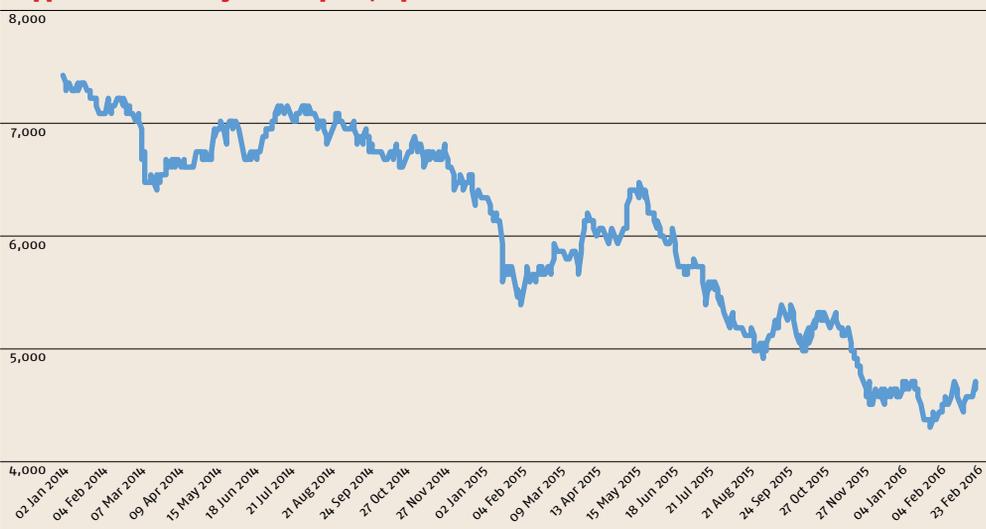
Burgering says that copper has seen a classic “hog cycle”. In other words, a surge in investments in new copper mining projects when the market price was high, only to find that they are ready to deliver when demand has fallen. “Such investments are not easily cancelled even though the market is down.”

Cole points to the unexpectedly high levels of copper imports by China in December. While analysts have advanced various theories for their cause, “Whatever the story, the big copper arrivals into China in December were still not a negative factor for demand,” he stresses.

Given the implications for the fundamental supply-demand balance of such statistics, Meir says that surging refined copper imports to China in December 2015 and January 2016 do not make sense other than as potential collateral for finance deals, playing the LME-SHFE arbitrage or simply restocking.

According to some analysts, devaluation of China’s yuan was the trigger for the surge in purchases of copper concentrate and refined metal by Chinese buyers keen to build a stockpile before further potential currency devaluations. By contrast, Meir says that he has spoken with Chinese consumers needing copper for manufacturing, who said that their business was down by 30-40% last year.

Copper cash LME daily official price, \$ per tonne



Source: LME, MB

Cole also notes that a calculation taking into account the supply, stocks and demand movements of the copper market in China results in an overall balance in which apparent consumption was up by 4% last year: “Not disastrous, by any means,” he notes.

So, taking into account supply disruptions and better demand in China than might have been suspected, he consequently keeps seeing reasons to “take a pinch of salt” with bear market stories.

All that said, he still sympathises with the attitude of Chinese hedge fund traders surrounded by colleagues and other companies with genuinely increased concerns about China’s economic direction and choosing to sell into the negative sentiment thus generated. He also notes that negative sentiment can set in so strongly that it becomes hard to change, and that traders have consequently found rewards by short selling copper.

While exchange stocks are transparent, and still relatively low, volumes stored off exchange, and unreported, remain opaque. Meir says that the best barometer for physical market tightness is actually regional premiums: “But they’re not doing much,” he notes.

Not enough cutbacks

Meir sees production cutbacks as another key market driver and thinks there have not been enough.

He acknowledges some recent estimates of a 650,000 tpy cumulative cutback in copper mining capacity, but notes that is a relatively modest figure for a 20 million tpy global copper market.

He recalls that China was seeing 10% growth per annum in its copper demand 4-5 years ago — a figure that he says has fallen to somewhere between flat and 1-2% now: “That represents a fall in demand of about 1.5 million tpy in terms of incremental growth in China alone. Production cuts are just not enough,” says Meir.

He notes that Chilean copper output this year is due to be the same as in 2015 — a figure that was slightly higher than in 2014. Peruvian output is set to increase as new projects come on stream. Forecasts for growth in overall global mine supply in 2016 range from 0.2% to 4.5%, with ICSG’s estimate at the top of that range: “Whichever way you look at it, it’s still up,” says Meir.

Reasons for less negativity

Cole denies optimism about the copper outlook, but he also identifies several reasons not to be too negative. Both the planned and unplanned cutbacks in copper supply are one. The fact that TC/RC levels are falling — suggesting a tightening of the concentrate market that may spill over into the refined metal markets — is another.

‘The question is exactly when the market will say it’s starting to see serious cutbacks and maybe the low prices are no longer warranted’



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“The headline cuts of Q4 2015 have not been fully felt yet,” adds Cole. “And stocks are pretty modest by comparison with other base metals.”

He also notes that speculative short positions in copper have reached record levels. “It’s like stretching a coiled spring until you cannot load it any further. Sooner or later it pulls back to relieve all the potential energy stored in it,” he explains, adding that it is possible to measure how bearish a market is by the number of short positions held on it. “It’s never been so imbalanced,” says Cole. “Traders will start to question themselves about how much further the market can go and whether it has become excessively bearish.”

Demand’s fine structure

“The big cloud over copper is that China’s demand is slowing,” Cole acknowledges. However, he also points out that China’s demand comes in five main types: basic manufacturing; stocks; finance; governmental strategy; and scrap replacement. They do not all respond to the same stimuli.

“When you get to the bottom, some of that demand comes alive,” he explains. Examples would include China’s State Reserve Bureau “bottom fishing” for cheap copper. Likewise, some physical consumers may stock up at low prices, particularly if they fear another devaluation of the yuan. There may still be some appetite for financial deals and “playing the arb” too. “Some elements to Chinese demand might surprise us,” says Cole.

Despite all of these reasons for less negativity, Cole says that the whole market needs to “believe that story” rather than the bearish sentiments being expressed and acted on by many participants. And while the copper market will bounce back when fundamentals come once more to the fore, in the short term the risk that “The charts break down, fall through a technical level and trigger even lower prices” remains.

All of the current nervousness and anxiety in the markets needs to be dispelled before copper can

stage a significant price recovery based on the fundamentals, Cole concludes.

Inflection point

Meir says that an inflection point is now on its way, after a tumultuous year in 2015, but will not land until late 2016 heading into 2017.

“The question is exactly when the market will say it’s starting to see serious cutbacks and maybe the low prices are no longer warranted,” Meir told *Metal Bulletin*. “You will need to get more people either closing production or shutting mines. Suspending production is not enough.”

There will not be an immediate rebound, however: there is likely to be a wave of exits, followed by up to another two years of prices bumping along a bottom, Meir believes. “Once demand picks up and supply isn’t there, people will start re-opening and building new facilities as higher prices incentivise them to do so,” Meir added. “Everyone piles in at the top when prices are going up, and then when they’re down, they’re on their way out. We need to see more exits”.

In the meantime, there is more pain to come for metals market participants as further price declines are on the cards. “In 2015, I think China transformed from a slowdown to a recession in the industrial sector. That really knocked their demand back a lot for many months,” Meir said.

“Some sectors were still growing, but only in the low single digits. It was quite startling to see the extent of the pullback on the demand side.”

Meir said that, in aggregate, there was not much response on the supply side across the base metals, as producers preferred to keep output up than to shut down. “They will do everything they can before that to stay afloat, including cutting costs and operations, using the beneficial impact of cheaper currency and government support to tide them over” Meir explained.

“We saw a lot of elements being called upon to stave off production cutbacks. I think it’s going to become more difficult to do that this year. Suppliers will have to

‘It’s going to be a year of transition and then we might see sideways to upward movement in 2017’

start cutting back more significant tonnages if they want to survive.”

In 2016, the “big collapses” in base metals prices may no longer be a possibility, but further falls are certainly on the horizon. “It’s going to be a year of transition and then we might see sideways to upward movement in 2017. Copper is still quite vulnerable. I think it could test \$4,000 per tonne this year and even break it,” Meir said.

Central bank impacts

Meir thinks that Central Banks have “painted themselves into a corner.” Noting the rise in interest rate (by a 0.25% uptick) applied by the US Federal Reserve in December, Meir believes it cannot aggressively raise rates further or the US economy could suffer. While the Fed signalled last year that rates could rise by similar increments in as many as four further small hikes this year, Meir is convinced that will not happen now.

He points to the US dollar selling off in forex markets because traders do not believe in the rate hikes either. “Interest rates could be as low as zero, or even negative, for years”.

Low interest rates have already contributed to the existing surplus situation evident in a number of commodity markets. “Cheap money has contributed to years of mounting debt and investment in oil, mines and other capex: it has fuelled the excess,” says Meir. “The pendulum has swung too far and now it needs to swing back the other way,” he concludes.

Burgering is more optimistic about the outlook than prevailing market sentiment: “Looking at the wider economic picture, ABN AMRO does not expect recession in the US or the Euro zone, nor a hard landing in China. The global economic outlook gives no reason for the copper price to be that low.”

He believes copper prices will see a small price uptick this year to reach a more stable level.

Nevertheless, he believes that there will be some project delays and cancellations, while other new mines will go ahead. “Overall, the market will be more balanced in 2016/17,” he concludes.

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TMK-ARTROM expands its seamless steel pipe range

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TMK-ARTROM is located in the South of Romania in Slatina city in Olt county. It specialises in the production of seamless steel pipes. These are mainly for industrial applications, from carbon, low alloy and alloy steel, hot rolling and/or cold drawn, pipes for mechanical applications and precision pipes for the automobile industry, pipes for boiler and high temperature services, pipes for the oil industry, pipes used at low temperatures, pipes for water and gas installations, grinding pipes and pipes skived and roller burnished for cylinder production.

TMK-ARTROM has a production capacity of 220,000 tons a year and in recent years has upgraded its technological flow, reaching to produce at present a range of seamless steel pipes with outside diameters from 15.88 mm up to 250 mm, and wall thickness from 1.5 mm up to 60 mm, for which

various heat treatments can be made (for example, normalization, stress relief, annealed, quenched and tempered etc.).

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NEW PRODUCTION UNIT

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- *Outside grinding pipes for production of piston rods.*



Outside grinding pipes for production of piston rods

- Precision cut pipes at fixed lengths.

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The production process of inside skived and roller burnished pipes

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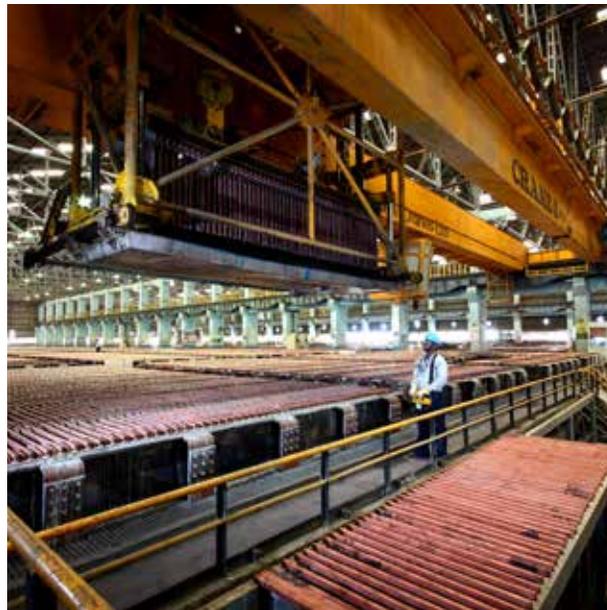
Planning for expansion

India's copper industry is optimistic that domestic demand will be boosted by new investments and economic growth, writes Kunal Bose

A primary focus of Indian prime minister Narendra Modi's much heralded 'Make in India' (MII) programme is to get the world's defence industry leaders to set up manufacturing bases in India in partnership with local companies. India, which happens to be the world's largest arms importer, is not comfortable that it is import-dependent for about 70% of its requirements for military hardware and software. In fact some foreign arms manufacturers have already found appropriate local joint venture partners in the companies Tata, Reliance and Mahindra & Mahindra.

As the Indian defence industrial base (DIB) may be finally poised to take off, local copper producers could see a new important demand centre opening up. S Ramnath, chief executive officer of Sterlite Copper, part of Vedanta Ltd, says: "Any manufacturing sector inviting large investments will give a boost to copper consumption. When you talk about expected local defence production rising through the joint venture route, for us it is looking beyond regular infrastructure projects such as electrification. We are waiting for the expanding DIB to source copper locally."

A spokesperson for the Confederation of Indian Industry says: "Under the 'offset obligation', foreign companies winning major defence orders are required to invest at least 30% of the contract value in the Indian defence



industry." He believes that copper, aluminium and steel will all benefit from DIB expansion. Boeing, for example, has a growing share of India's commercial and defence aircraft purchases. The US company consequently has a growing network of manufacturing partnerships in India.

By contrast, to the disappointment of India's copper industry – which is working at around 75% capacity – leading air-conditioner makers are importing nearly all of their copper coil. They defend imports on the grounds of quality requirements and not because they come cheaper than the locally produced metal. This is, however, hotly

contested by all three domestic copper producers – Hindalco, Sterlite and the government-owned Hindustan Copper Limited (HCL).

According to B Thiagarajan, executive director of leading air-conditioner manufacturer Blue Star: "Annual sales of room air-conditioners in India are around 4 million units compared with 50 million units in China. But we expect Indian demand to rise to 10 million units by 2020."

Help from the government by way of tweaking copper import duties could create the conditions for air-conditioner manufacturers to use the locally produced red metal.

Many of the leading air-conditioner manufacturers in India are either of Japanese or South Korean origin such as Daikin, Hitachi, Samsung and LG. "They have a natural inclination to import copper from their respective countries," says an industry official. He thinks that copper produced in India is more likely to be purchased if New Delhi invokes trade defences in the form of import duty.

Rising imports

India's imports of refined copper were up from 58,000 tonnes in 2010-11 to 177,000 tonnes in 2014-15. "Copper imports have continued to burgeon, thanks to our free trade agreements (FTAs) with Japan and South Korea. FTAs allow them to sell copper here by paying negligible import duty, which is to become zero by 2021. Japan has, however, petitioned for nil copper import duty straightaway. It's unacceptable that in our domestic consumption, imports have a share of around one-third while the local industry nurses idle capacity," says Ramnath.

According to an industry official, local producers find it "disturbing that imports originating in Japan are without any value addition. For any concessional duty, value addition of 30% to 35% is required. The domestic industry will get relief if copper is taken out of the ambit of FTAs." ▶

Sterlite is planning to double its copper smelting capacity at Tuticorin to 800,000 tpy

STERLITE COPPER

Ramnath says the industry wants the government to do two things: raise import duty on cathodes, rods and other downstream products to 7.5% from 5% and scrap the 2.5% duty on copper concentrate imports. "The recommended duty revisions will improve our competitiveness both in the domestic and foreign markets," he says. Last year, India was left with an exportable surplus of 375,000 tonnes of copper since, of the production of 775,000 tonnes, domestic sales amounted to only 400,000 tonnes.

India is recording the highest rate of demand growth among consuming countries. Ramnath is expecting Indian copper demand to leapfrog to 660,000 tonnes in the current year (to end in March 2016) from less than 600,000 tonnes in 2014-15. He notes: "Copper demand growth is generally tied to gross domestic product (GDP) growth. India, with an expected GDP growth of 7.5% in 2015-16, claims the title of the world's fastest growing economy. Copper consumption growth will continue to be a few percentage points more than GDP growth rate. Much, however, depends on the launch of new projects where copper finds major application. I'm encouraged by the speed at which the government is clearing copper-relevant infrastructure projects like electrification, railways and highways."

The copper industry is also pinning much hope on the push the government is giving to clean and renewable energy capacity building. Under the Jawaharlal Nehru National Solar Mission, India's solar power capacity is to be raised to 10 gigawatts by 2022 from 4.11 gigawatts now. At the same time, taking advantage of the abundant availability of wind power in a number of states, the country will increase wind energy capacity to 32 gigawatts in the next six years from 3.8 gigawatts at present.

"The ambitious clean energy programme will generate a minimum annual copper demand of 28,000 tonnes for the next six years. Solar and wind power stations are big users of copper.

Creation of 1 megawatt of solar or wind power capacity will require the use of over 2 tonnes of copper," says Ramnath.

Infrastructure investments

The government is to build 100 'smart cities' and rejuvenate 500 others in phases. "This major urbanisation initiative encompassing infrastructure upgrades, energy-efficient green housing and transit-oriented development will generate good demand for copper. Use of the metal will also get a boost if copper-indium-gallium-selenide (CIGS) replaces silicon, the most commonly used semi-conductor in photovoltaic cells," observes Ramnath.

Another "new" outlet is antimicrobial applications. "I think the general awareness about copper's antimicrobial properties is growing in the country. It's a rediscovery of what ancient civilisation has known about copper's effectiveness in killing microbes. So you will find... high touch areas such as faucet handles on sinks, toilet levers, cabinet pulls and call buttons in offices, hospitals and homes having copper surfaces. This will lift demand for the metal," says Ramnath.

The industry believes that, for a fast-growing economy targeting 9% GDP growth, the per capita copper consumption cannot remain at a low of 0.5 kg for long, compared with a world average of 3.1 kg.

In the hope that copper demand will continue to grow at healthy rates in the long term, and that the government will positively respond to industry pleas for import duty revision, Sterlite has kept plans ready for doubling its smelting capacity to 800,000 tpy in Tamil Nadu's port city of Tuticorin. Expansion work will start once Sterlite receives all the approvals from central and state government agencies. For the brownfield expansion, Sterlite has in possession extra land adjacent to the operating smelter.

Of the country's copper smelting capacity of 1 million tpy, as much as 900,000 tpy belongs to the custom smelters of Hindalco (500,000 tpy) and Sterlite, which depend on

'Copper consumption growth will continue to be a few percentage points more than GDP growth rate'

imported concentrate. The profitability of Hindalco and Sterlite is, therefore, directly linked to the treatment and refining charges (TC/RC) agreed in a season, and plant operational efficiency. Benchmark TC/RCs of copper concentrate for 2016 are \$97.35/tonne and 9.735 cents/lb, a fall of 9.9% over last year. "To compensate for this, custom smelters will be required to cut production costs and operate with greater efficiency," says Ramnath.

The government-owned Hindustan Copper Limited (HCL) is a vertically integrated producer, with a capacity of 50,000 tpy. But a combination of falling mine production and ore grades restricted HCL's copper cathode output to 21,205 tonnes in 2014-15, and 22,855 tonnes in the previous year. Ore production in 2014-15 was down to 3.5 million tonnes from 3.8 million tonnes in the previous year. India has copper reserves of about 4.8 million tonnes of contained metal, according to HCL.

Secondary smelter

Another smelter of 50,000 tpy capacity in Gujarat's Bharuch district, originally owned by Kolkata-based SWIL and commissioned over a decade ago, is designed to handle scrap of all kinds with a copper content as low as 30%. Having been closed for over five years, the Bharuch plant was sold in an auction in January 2015 by Asset Reconstruction Company (India) to the highest bidder, HCL.

HCL is already busily engaged in expanding its mining capacity from about 5 million tonnes now to 12.4 million tonnes by 2018, but it was a determined bidder at the auction. Smelter revival work is now taking place at Bharuch, but a production restart date is yet to be announced.

A spokesperson for HCL says: "The acquisition will significantly complement our existing smelting operation and provide an opportunity to venture into the profitable business of recycling scrap metal, including e-scrap, in an environment friendly manner."

The author is a specialist writer based in Kolkata.

***“You need a team. You need people to push you.
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Wynton Marsalis.



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Tightening up slowly

Zinc has been showing signs of improving fundamentals, but any significant price boost may have to wait until next year, reports Myra Pinkham

While the global zinc market has been negatively impacted by a weakening of economic growth in many major regions of the world, especially China, recent supply cutbacks are expected to help it to get back on the road to recovery this year at a quicker pace than most other base metals.

Already zinc prices have begun to move up and further strengthening is expected as the market moves from surplus to deficit in the next few months. The zinc supply-demand balance is expected to tighten through 2017 as well, with zinc demand being unable to compensate for production cutbacks.

Some of the cutbacks were expected due to the end-of-life closure of several substantial zinc mines, observes Andrew Cole, senior metals analyst for Metal Bulletin Research. But some others were in reaction to rock bottom zinc prices, which had tumbled to as low as \$1,450 per tonne on the London Metal Exchange by mid-January from a near-\$2,300 per tonne peak last May.

At the same time, Cole points out that last year global zinc demand growth slowed to its weakest since 2012. He says this was largely a function of the economic slowdown in China, which accounts for nearly 50% of global zinc consumption. However, he also notes that inventory destocking in many other regions of the world – especially the USA and Japan – were also a contributing factor.

With at least visible zinc inventories – still at about five weeks of consumption – continuing to be worked down at the same time as production rates continue to decline, most industry observers



predict that the global zinc market balance, which has been tightening up each month since the second half of 2015, will shift from its current slight surplus to deficit, possibly as early as the second quarter of this year. This quarter tends to be a strong one for zinc consumption with the pick-up of construction activity. That deficit is expected to continue to increase at least through next year.

Few new projects

“Zinc is the base metal that I like the best,” says Vivienne Lloyd, base metals analyst for Macquarie Bank. “I believe that the zinc market could continue to be strong through the end of the decade, especially given that there aren’t a lot of new projects planned,” she says.

Until recently the zinc market had been dominated by fairly heavy volumes of zinc short selling, Steve Hardcastle, head of client liaison for Sudden Financial, notes. But recently the volumes of zinc short selling positions have been declining. That, he says, is a symptom that the market is slowly tightening.

While continuing to be volatile, in mid-February LME zinc prices

Several zinc mines have suspended production in the past year because of low zinc prices, thus reducing concentrate supply

were already trading at around \$1,680-\$1,720 per tonne. Industry observers contacted by *Metal Bulletin* are estimating that the average zinc price for 2016 will be somewhere between \$1,600 and \$1,850 per tonne with the potential to go even higher. This compares with an annual average price of \$1,928 last year.

Frank Hoffman, senior economist for the pricing and purchasing service of IHS, for example, says that prices could move above \$1,800 per tonne by the end of the first quarter of 2016 before breaking \$2,000 per tonne sometime in the second half and rising even further next year.

“It all depends upon the strength of global economies and market sentiment,” observes Hardcastle, who points out that the speed of cutbacks in the zinc market has been quicker than it has been for many other metals.

The International Lead and Zinc Study Group’s (ILZSG’s) recently reported preliminary data indicate that global zinc concentrate production fell a slight 0.7% last year following a 3.5% rise in 2014. This occurred with increased output in Australia, India, Peru, Russia and Sweden being offset by declines in Canada, China, Ireland and Namibia.

According to ILZSG’s 2016 Mine and Smelter Project report, a total of 900,000 tpy of zinc mine capacity was closed in 2015 – the highest total since ILZSG began collecting this data. The biggest reduction came in August with MMG ending operations at its Century Mine in Queensland, Australia, which resulted in a 500,000 tpy reduction in zinc mining capacity. Another big chunk of zinc capacity – 175,000 tpy – was taken off-line in November when Vedanta Resources shut down its Lisheen Mine in Ireland.

ILZSG points out that while those two mines were closed permanently due to the exhaustion of reserves, several other zinc mines have been

suspended, largely due to unfavourable market conditions.

Mine cutbacks

Blaming the “challenging metals price environment”, Nyrstar in December placed its three Middle Tennessee mines on care and maintenance, removing 50,000 tpy of zinc-in-concentrate capacity. That came after the producer removed 100,000 tpy of zinc concentrates from the market earlier in 2015 with the suspension of its Myra Falls mine in British Columbia, Canada, and the Campo Morado mine in southwestern Mexico.

In October, Glencore announced that it could be reducing its zinc mining production across its operations in Australia, South America and Kazakhstan by 500,000 tpy. That, according to Lloyd, will result in a 3.7% reduction in Glencore’s zinc mine production for 2016 – its largest year-on-year contraction since 1993.

MBR’s Cole observes that there have also been delays bringing new projects on-stream, most notably MMG’s Dugald River project in Australia, which was intended to replace most of the mining output lost from the closure of its Century mine.

“Of course, it’s not a one-way street,” he adds: “Some previously closed mines have been restarted and some expansion projects are boosting output in areas such as India and Peru. The net effect, though, is still that the international concentrate market will tighten.”

ILZSG says that total zinc mining capacity was expanded last year, of which the most significant increases came from Trevali Mining’s 40,000 tpy Caribou mine in New Brunswick, Canada, and the 45,000 tpy expansion of Minera Milpo’s Cerro Lindo mine in Peru. ILZSG says that several mines are also committed to open in 2016, including Nevsun Resources’ 85,000 tpy Bisha operation in Eritrea; Trafigura’s 58,000 tpy Aguas Tenidas expansion in Spain and the expansion of Vedanta’s Sindesar Khurd operation in India.

However, with the timing of some of the restarts and brownfield expansions still somewhat

Zinc settlement LME daily official price in \$ per tonne



World refined zinc balance*

	2012	2013	2014	2015
Mine production	12,898	13,054	13,512	13,416
Refined production	12,627	13,033	13,509	13,953
Metal usage	12,388	13,142	13,733	13,830
Balance	+239	-109	-224	+123
Reported stocks, end of year†	2,211	1,880	1,556	1,501

*'000 tonnes. †At producers, consumers, merchants, LME, SHFE, SRB.

Source: ILZSG

uncertain, it remains unclear how quickly availability of zinc concentrates will tighten, says Robin Bhar, head of metals research for Société Générale. Suctden’s Hardcastle, however, says there is already evidence of tightening, pointing to zinc treatment charges, which have already come down from \$165-\$175/tonne last year to about \$135-\$150/tonne.

ILZSG’s preliminary data indicate that global production of refined zinc increased 3.3% last year following a 3.6% rise in 2014, with output increases in Canada, China, India and South Korea outpacing declines in Iran, Japan and Namibia.

Smelter capacity pegged

In 2015 no additional zinc smelter capacity was added while the only closure was Sumitomo Metal Mining’s 90,000 Imperial facility in Harima, Japan, which in September halted production of prime western grade zinc as part of a switch in focus to nickel sulphate production. Nyrstar, however, announced in December that it was reducing zinc metal production at Clarksville, Tennessee, USA, by about 7% (or about 9,000 tpy.)

Just days before it filed for Chapter 11 bankruptcy protection, Pittsburgh-based Horsehead Holding Corporation announced early in February that it was temporarily idling its new

Mooresboro, NC, USA, special-high-grade and continuous-galvanizing-grade zinc smelter.

“I don’t think that the Horsehead bankruptcy will have much of an impact upon the global zinc market, other than possibly a psychological impact,” says IHS’s Hoffman. Bhar agrees, stating that he is not convinced that the “gentle rally” of zinc prices could necessarily be attributed to Horsehead and is more likely to be because China was back buying base metals after returning from its New Year holiday.

ILZSG’s preliminary data indicate that global refined zinc consumption increased by only a very slight 0.7% last year following a larger 3.1% rise in 2014. This comes as apparent consumption by China was only up 1.3% in 2015 against nearly 8% the previous year.

“Despite the risk created by slowing growth in China and other socio-economic factors, I expect a steady pace of global zinc demand growth over the next few years, albeit somewhat more modest than in the last few years,” says MBR’s Cole.

Hardcastle is not so optimistic. He says he expects global zinc demand to probably slip by nearly 2% to about 13.6 million tonnes this year. Hoffman also believes zinc demand could fall, pointing to China as being the big mover in the slowdown. He says that while Chinese GDP growth remains at about 7% – higher than just about anywhere else in the world – Chinese domestic zinc use will probably fall by about 3.8% in 2016 due to slowing domestic demand growth for galvanized steel by both its construction industry and in other manufacturing sectors.

He observes that galvanized steel accounts for about two-thirds of global zinc use with the remainder being more or less equally used for zinc die castings and brass alloys.

One problem, according to Robert Cartman, an MBR senior metals analyst, is that the makeup of Chinese economic growth has been changing. He says that last year China’s manufacturing sector growth was only about 1% while its services industry was up 10-11%.

“It isn’t that the Chinese domestic industries have stopped dead. It is ▶

just that there aren't the same big increases in their building and construction and manufacturing sectors that were seen in the past decade," Bhar observes.

More modest auto growth

China continues to have one of the strongest automotive industries in the world, Bhar notes. "However demand is down from the blistering rates of the past," with Chinese car sales growth moderating from double-digit percentage rates to about a 5% year-on-year increase, at least for the time being.

Bhar remarks that a recent tax cut on smaller cars did result in a boost in auto output in the second half of 2015. "And as car volumes increase and as Chinese vehicles move up the value chain and contain a greater percentage of steel with galvanized coatings compared with today, it should help to underpin additional Chinese zinc usage going forward."

The big question is whether China will begin to step down its galvanized steel production or whether it continues to try to export the excess to other countries. "Given that galvanized steel is a value-added steel product, the Chinese government has been promoting it as a preferred export product," maintains Christopher Plummer, managing director of Metal Strategies, Pennsylvania, USA.

But given the massive anti-dumping and countervailing duties expected to be levied in a few months against Chinese corrosion-resistant sheet, Chinese companies soon will not be able to export galvanized steel to the USA, Cartman observes. He says that could be followed by trade action elsewhere in the world. The European Union has already filed a trade case against Chinese cold-rolled steel sheet and could follow through with a galvanized steel case as well. Plummer agrees that this is a possibility given that the Europe will probably face increased import pressure as Chinese steel is being blocked elsewhere.

Hoffman predicts that overall European zinc demand will be relatively flat this year, much as it had been in 2015. He notes that while its automotive output is up, its

appliance and equipment sectors remain stagnant. According to Lloyd, Europe's automotive demand accounts for about 25% of the region's zinc consumption.

"While the US market continues to chug along, there have been some poor economic numbers there lately," Hardcastle points out.

However, because of the strength in the auto sector, zinc die casting is holding up reasonably well and while US galvanized production has impacted oversupply conditions, it has been holding up better than output of some other flat-rolled steels, he says. And it could begin to pick up without the competition of cheap Chinese imports thanks to the corrosion-resistant steel sheet trade case, which comes at the same time that destocking by distributors is nearing a close.

Inflection point

"The US automotive market is currently at an inflection point," Plummer says. "Production is already at record levels and it is uncertain how much it will go up from here." But on the plus side, US galvanized steel use is being helped by the fact that, assisted by new galvanizing technologies, about half of the advanced high strength steels (AHSS) being increasingly used in newer light vehicle models can be coated using the cheaper hot-dip method without changing the steel's properties.

Ducker Worldwide, Troy, Michigan, USA, estimates that the average AHSS content per average North American light vehicle will increase from 275 lb per vehicle last year to over 400 lb per vehicle by 2025.

Plummer notes that total US galvanized steel production declined 3.7% last year, including a 3.9% decline in hot-dip galvanized product, a 12.6% decline in electrogalvanized and a 7.5% increase in 'other coated steels'. He says much of the strength in 'other coated steels' has been for Galvalume®, which is largely used in the construction sector. Plummer notes that overall steel demand by the construction sector was up 10% in 2015 and is expected to grow by a high single digit percentage this year as well.

'We expect zinc prices will detach themselves somewhat and gradually strengthen as the scale of producer cuts feeds through'

This year US galvanized steel production will probably be up around 1-3%, with most of the strength being for the cheaper hot-dipped product, which continues to take market share from electrogalvanized. This, Plummer says, is largely due to the trade case, which has resulted in a decline in import market share. The ending of inventory destocking by service centres is also helping.

In general it is the steel mills as opposed to independent galvanizers that are seeing improvements. Phil Rahrig, executive director of the American Galvanizers Association, says that demand for batch galvanizing is likely to remain fairly flat in 2016, much as it had been during the past few years.

Certain independent galvanizers have found a unique niche to fill, says Michael Noble, chief commercial officer for Materials Sciences Corporation, Canton, Michigan, a company that has seen double-digit growth due to its ability to electrogalvanize AHSS. Noble says that Materials Sciences is the only independent galvanizer with the capability of electrogalvanizing sheet in North America.

Steady die-casting

US zinc die-casting demand is also expected to be fairly steady, rising about 2% this year after a similar gain in 2015, according to Daniel Twarog, president of the North American Die Casting Association.

All told, North American zinc demand should be fairly flat this year before seeing some improvement in 2017.

Despite recent signs that the global zinc market is finally tightening up, MBR's Cole says that further downside pressure cannot be ruled out, particularly given the overall negative sentiment towards industrial commodities currently. "However, we expect zinc prices will detach themselves somewhat and gradually strengthen as the scale of producer cuts feeds through," he says, but any price hike will probably remain somewhat subdued until next year when fundamentals tighten more convincingly.

The author is a specialist writer based in New York.

Staying resilient

Lead has shown more sturdiness than other base metals over the past year, and its fundamentals should continue to offer support in a bearish environment, writes Steve Karpel

Most metals, indeed most commodities, are suffering from the effects of an all-pervading pessimism sweeping the markets, which tends to override the fundamentals of supply and demand. Lead is no exception, but it has been showing more resilience than other base metals, and it is forecast to at least hold steady this year in the face of economic turbulence.

Over the course of 2015, lead suffered the least decline of all the base metals, starting the year at \$1,845/tonne (LME cash settlement) and starting 2016 at \$1,762/tonne. There was a climb up to a peak of \$2,140/tonne on 5 May last year, but for most of the last 12 months, the metal has been in a \$1,600-1,800 band. At the time of writing, the price has been on an upswing for a couple of months, rising quite steeply from a low of \$1,551/tonne in November to around \$1,820/tonne in mid-February – a rise of some 20%.

Metal Bulletin Research (MBR) is cautious about seeing a continuing rally in the near future, however: “Although we feel that lead’s supply fundamentals have tightened up significantly, and lead stocks are low, we are wary of expecting prices to run on unchecked,” it reported in mid-February. “Instead, now that prices have climbed, we would expect them to trade sideways in a higher range,” it added.

For 2016 as a whole, most analysts see a consolidation this year and no dramatic trend in the price, with the Metal Bulletin Apex consensus for average LME cash price standing at \$1,706/tonne, with the highest and lowest forecasts being \$1,867 and \$1,579/tonne, respectively. MBR’s base case sees a higher average of

\$1,794/tonne, with high and low case scenarios of \$1,925 and \$1,676/tonne.

Lead’s fundamentals have remained reasonably good (especially compared with other metals), with a small supply surplus this year and continuing low stocks. According to recent preliminary data from the International Lead and Zinc Study Group (ILZSG), total refined lead production last year was 10.119 million tonnes, and consumption 10.056 million tonnes, giving a small surplus of 63,000 tonnes. Compared with the previous year, refined production declined by 7.8%, and consumption by 8.3%, while there was a smaller surplus of 10,000 tonnes in 2014 (*see table*).

Total end-of-year reported stocks of lead fell to 503,000 tonnes compared with 586,000 tonnes at the end of 2014, reports ILZSG. The former comprised 181,000 tonnes at producers, 117,000 tonnes at consumers, 192,000 tonnes at LME warehouses, and 13,000 tonnes at SHFE. The total represents only 2.6 weeks’ demand.

The China factor

The fundamentals of the market – as with many other metals – depend heavily on the biggest producer and consumer, China, and the global changes to mine output, refined production and refined usage in 2015 have all been predominantly down to the Chinese sector. Its mine output slumped by 25.2% to 1.72 million tonnes, while its total refined output fell by 18.0% to 3.86 million tonnes.

China’s lead consumption fell by almost the same extent – 17.9% – last year, ILZSG reports. This, however, is apparent consumption

and does not take account of destocking. “Given that China’s economy was growing around 7%, such a drop in domestic lead consumption is difficult to believe, but taking the data at face value, it suggests considerable destocking,” says MBR. This destocking could be distorting the real supply-demand picture, it points out.

A characteristic of China’s lead sector is that it mainly comprises a large number of small mines, says Paul White, ILZSG director, market research and statistics. Mine output is flexible and can be idled easily if conditions warrant it, such as arbitrage or exchange rates making it more economic to import. This is what seems to have happened, because China’s imports of lead concentrates rose to a record level in 2015 to generally counterbalance its mining slowdown: imports of concentrates increased by 5.9% to over 1 million tonnes of contained lead.

Overall, China has kept its refined lead production and consumption remarkably well synchronised in recent years, with exports and imports of metal being minuscule in comparison with its total market (*see table*).

When we look at the data for the total world market outside China, it is evident that the lead sector saw very little change in 2015 year-on-year, with slight declines in each category: mine output fell by 0.6% to 2.63 million tonnes, refined production fell by 0.1% to 6.26 million tonnes, and refined usage fell by 1.0% to 6.19 million tonnes.

Outside China, falling mine production in Australia, Ireland and the USA was largely counterbalanced by increases in India (up 31.1%), Peru (up 13.4%) and Sweden. In refined production, there were increases in Europe (up 4.3%) and India (up 5.0%) to balance out declines elsewhere: the global decline of 7.8% last year was almost entirely due to the 18% fall in Chinese refined output to its lowest level since 2009, notes ILZSG.

Lead production has two notable characteristics that contrast with other base metals: more than half of refined metal output is secondary, derived from battery recycling. And in mining, it is usually an



Automotive batteries account for 58% of the lead battery market

economically lesser component of zinc extraction. This means that when zinc mines are idled or cut back due to the low zinc price, it also cuts back on lead output, thus supporting its fundamentals.

There are also two recent examples of major zinc mines reaching the end of their economic life, and which have thus tightened lead supply to some extent: MMG's Century mine in Australia closed in 2015, having produced 466,000 tonnes of contained zinc and 64,400 tonnes of contained lead in the previous year. Vedanta's Lisheen mine in Ireland has also closed, having produced 165,000 tpy of zinc and 22,000 tpy of lead in concentrates in recent years.

The 80,000 tpy Paroo Station mine in Western Australia, a rare example of a mine dedicated solely to lead, was put on care and maintenance in January 2015 owing to low lead prices, where it has remained.

Secondary share rises

The various mine cutbacks have resulted in secondary lead taking an even bigger share of refined output: last year, it accounted for 58.6% of production compared with 57.2% in 2014. The well-organised lead battery recycling systems in operation result in a steady supply of metal that is not significantly affected by the price, says White.

Accounting for some 90% of lead consumption, according to the International Lead Association (ILA), the lead-acid battery is obviously the vital heart of this metal's market. Automotive batteries are the biggest single sector for lead batteries, accounting for 58% of the lead battery market, reports the ILA. In most countries, this is divided between around 75% for replacement batteries and 25% for OEMs or new cars, notes White.

The large replacement battery market makes lead less prone to swings in the economy, he adds, although pointing out that vehicle populations in mature markets such as the USA and Europe are not growing quickly. In addition, lead batteries are becoming more efficient and more durable, and their manufacture is increasingly concentrated in countries such as China and Mexico.

One major boost to lead consumption in recent years has been the electric or e-bike market in China, which has grown to such an extent that it is estimated to account for a third of China's lead demand, and, estimates the ILA, around 18% of the global lead battery market. However, a slowdown in production and sales last year is believed to be a factor in the country's apparent drop in lead demand. "E-bikes probably peaked in 2014, and they may now be on a plateau as Chinese incomes rise and more people buy cars instead," says Robin Bhar, head of metals research at Société Générale.

Rechargeable E-bike batteries have a relatively short lifespan, but their recycling is not as well-developed as for car batteries, says White.

Bhar believes that China will continue to be the engine of lead demand in future: "Even if it is growing more slowly, the base overall is larger," he says. Another growing source of lead demand in China is likely to be industrial batteries as it invests in its telecommunications infrastructure, he adds.

New technologies

The whole sector of vehicle propulsion is undergoing something of a revolution, with a range of electric and hybrid technologies being commercialised. The lead industry is determined that the metal will still play a vital role in future vehicle technologies, and much research is being carried out in this area. The most common type of hybrid vehicle is the "mini-hybrid" with stationary engine cut-out, says White, and advanced lead batteries are being used in this fast growth area.

In other hybrid types, such as the mild-hybrid, advanced 48V

World refined lead supply and demand*

	2012	2013	2014	2015
	Jan-Dec			
Mine production	4,920	5,264	4,944	4,347
Metal production	10,598	11,110	10,921	10,119
Metal usage	10,524	11,089	10,911	10,056
Balance	+74	+21	+10	+63

*'000 tonnes.

Source: ILZSG. Data for 2015 are preliminary

Lead in China*

	2013	2014	2015
Mine production	2,697	2,301	1,720
Refined production	4,935	4,704	3,858
Primary metal	3,428	3,173	2,664
Secondary metal	1,507	1,531	1,194
Imports:			
Ores/concentrates	788	971	1,028
Refined lead	14	13	8
Lead metal exports	22	35	50
Usage	4,912	4,709	3,866

*'000 tonnes of lead or contained lead.

Source: ILZSG

LME lead cash price forecasts*, 2016

MBR base case	1,764
MBR high case	1,925
MBR low case	1,676
Apex consensus	1,706
Apex outliers: high	1,867
Apex outliers: low	1,579

*\$/tonne Source: MBR

lead-carbon batteries have been shown to allow 'significant engine downsizing without a loss of performance', according to the Advanced Lead Acid Battery Consortium (ALABC, a part of the ILA). This engine downsizing means less fuel consumption and lower carbon dioxide emissions. "The low additional cost of introducing 48V mild-hybrid powertrains is continuing to attract automakers because it is the most cost-effective means of complying with stringent CO₂ regulations over the next 10 years," said Alistair Davidson of the ALABC.

In the automotive battery sector, lead is in fierce competition with other technologies, especially lithium-ion, and increasing efforts are being made to ensure its long-term future. With this in mind, four organisations announced last month that they would be forming a new strategic alliance to promote lead battery technologies: these are the International Lead Association, Eurobat, Battery Council International and the Association of Battery Recyclers. While these organisations have been working informally together, there is now a common action plan and an agreed joint strategy.

So, while lead is showing resilience in the current environment, there is good reason to believe that its long-term future will also be assured.

Lead, LME daily settlement, \$/tonne



Source: LME, MB



Realising potential

The zinc sector in India has begun to flourish since privatisation, and has considerable scope for expansion, reports Kunal Bose

After independence in 1947, India's government was determined to gain control of the "commanding heights of the economy". This found expression in the government building and running large steel plants and also owning comparatively modest enterprises such as Hindustan Zinc Ltd (HZL) and Hindustan Copper Ltd. Following the nationalisation of the zinc and lead industry in 1965, HZL was created by an Act of Parliament as an integrated zinc, lead and silver producer with mines linkages.

But HZL's growth under government ownership fell short of the potential that the country's zinc and lead resources offered. Moreover, as a public sector enterprise (PSE), it could never find

enough money to capitalise on growth opportunities.

Following the launch of headline-grabbing economic reforms in 1991, the government finally sold 26% of the company in an open bidding process to Vedanta in April 2002. This was quickly followed by the sale of another tranche of 18.92% equity to the company. Vedanta acquired another 20% of HZL through an open offer to shareholders. Vedanta succeeded in making HZL the world's second largest producer of zinc and one of the lowest cost producers of the metal.

This is the golden jubilee year for HZL and there is much for the management to celebrate in terms of manifold rises in mine and smelter production, successes in

finding new deposits that more than compensate for mine resource depletion, and profits growth that allows for planning of all-round major expansions in the next few years.

Capacity growth

"HZL remains an outstanding example of what privatisation can achieve. We have also seen major capacity growth in Bharat Aluminium following the government handing over majority ownership and management to Vedanta," says a spokesperson for the Indian Chamber of Commerce (ICC).

India's zinc story relates predominantly to HZL. The other industry player, the privately owned Edayar Zinc, which has a 38,000 tpy smelter close to the southern port city of Kochi in Kerala, suspended production in November 2014. Edayar's earlier announced plans for a zinc smelting capacity expansion to 100,000 tpy, to be backed by plans to own mines in India and abroad, are still on the table, however.

Reform-minded politicians, as they push for further disinvestments, cite the example of HZL's progress under private sector management. Since 2002, the company's metal production capacity has risen to 1 million tpy from about 200,000 tpy, and mining capacity to 10.25 million tpy from 3.45 million tpy. Sunil Duggal, ceo of HZL, says: "We have undertaken multi-year expansion projects across all our mines. Once complete, our mine capacity will rise to 15 million tpy and mined metal to 1.2 million tpy. If you are talking about vision then in our case it is to become the world's largest and most cost-effective zinc, lead and silver producer."

A mines ministry official says: "What we like about HZL is that it remains aggressive in finding new mineral resources through exploration of areas contiguous to its existing mine sites and also at greenfield centres. In exploration, it has few peers in the industry."

Duggal explains: "We continue to add a lot more by way of reserves and resources (R&R) than we mine as mineral every year. Since our ▶

HZL has launched expansion projects across all of its mines

takeover of HZL, accretion to R&R is 290 million tonnes against our taking out 73 million tonnes from our mines. At the last count, HZL has reserves of 266.9 million tonnes and resources of 108.2 million tonnes giving us security of raw material supply for the next 30 years." The strategy is to build a portfolio of "predominantly long-life and low-cost mine assets remaining profitable" through good and difficult times.

Up till now, the company's mining and smelting operations have remained confined to the northern state of Rajasthan, which is endowed with reserves of zinc content up to 14% and lead content over 3%. But Duggal says: "If there is an opportunity, HZL will be

ready to explore any zinc reserve potential anywhere in India."

RK Sharma, secretary-general of the Federation of Indian Mineral Industries, says: "The use of advanced mineral exploration technologies has enabled the owners Vedanta to establish R&R four times greater than what is excavated, setting a unique example in India. There were times when HZL was under self-created pressure to raise smelting capacity to be able to use the additional ore production."

Robust performer

Anirban Dasgupta, metals sector analyst with CD Equisearch, observes: "The stock market likes two things about the company.

'If there is an opportunity, HZL will be ready to explore any zinc reserve potential anywhere in India'

First, the rapid addition to R&R and zinc and lead smelting capacity. Second, the [financial performance of] HZL was fairly robust during the third quarter ending December 2015 when for most of the time LME zinc prices were at a multi-year low."

Indian miners are concerned about the likely fallout of the Mines and Mineral (Development and Regulation) Amendment Act (MMDRAC) introduced in March 2015. HZL has noted that Indian royalty rates for zinc and lead are among the highest in the world and much higher compared to other base metals. The concern now is that under MMDRAC, payments by mines to the government can be raised by up to 100% on account of compulsory contribution to the District Mineral Foundation. Miners are concerned that such a significant additional cost could make low-grade and deeper deposits economically unviable.

The potential for growth in the use of zinc for galvanizing in India is high. It could be good news for consumption that the International Zinc Association (IZA) has written to Suresh Prabhu, minister of railways, emphasising that the galvanizing of railway tracks would not only be significant for the safety of trains but would also extend track life.

Rahul Sharma, the director of IZA India, says the cost to the economy for laying non-galvanized tracks proves enormous in the long run, since corrosion reduces their useful life to half that of galvanized ones. Disruptions to the rail movements of goods and passengers when rusted tracks are relaid also need to be factored in to the cost. "The country's annual loss due to replacement of corroded rails is an estimated Rs4.4 billion [\$66 million]," he says.

The Indian car market, being highly price sensitive, is also using less galvanized steel in car production than it could (see box). Cost too is the reason why aluminium is only making a very slow penetration into the automobile industry.

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The future for zinc in India

Kunal Bose asks Sunil Duggal, ceo of Hindustan Zinc, key questions about the future for the metal

Q: How do you look at zinc demand growth in India in the coming years?

India has remained a low consumer of zinc because of our poor awareness of the good that the metal does in more than one way. Millions of tonnes of junk are produced every year due to non-use of galvanized steel in the making of car bodies. Rail tracks here are not galvanized, reducing their useful life and compromising safety of rail movement. Our farmland is zinc deficient, which affects crops. Yet another concern is zinc deficiency in nutrition. But planned promotion of the positive features of this marvellous metal will certainly boost its consumption in future.

Q: You are actively campaigning for galvanizing car bodies?

We need a government mandate making the use of galvanized steel in car bodies compulsory. The country loses up to 4% of gross domestic product (GDP) due to corrosion and the automobile sector has a significant share in that. Galvanizing rail tracks and the steel used in high-rise buildings will increase their useful life and safety. I'm hoping that a roll out of the 'Make in India' programme that emphasises world standard production in every sector will lead to higher zinc use in areas I have mentioned.

Q: At 6.9%, China's GDP growth in 2015 was the slowest in 25 years, and its steel production is also falling. Will all this not curb that country's zinc consumption, which accounts for 46% of the world total?

Economic growth leaves its impact on zinc consumption. Zinc demand growth in China did slow down last year. But interestingly, Chinese galvanized sheet production grew 3% over 2014 due to a pick-up in auto production in the 2015 final quarter. Globally, auto sales drive 20% of zinc consumption. I have a feeling the 'one belt, one road' move of China, which will create an economic land belt of countries on the original Silk Road, will give a major push to zinc demand growth.

Q: Concerns about China brought LME zinc prices down to a multi-year low in December. When will there be a recovery in prices?

The market is settling down. After every few years we see corrections in base metals prices. Zinc prices have started improving. But how far this will be sustained will depend on factors like the behaviour of China's economy and the growth rates of major zinc-using sectors such as automobile, construction and infrastructure. On the price outlook, you have to consider the closure of two major mines last year – MMG's open-pit zinc mine Century in north-west Queensland and our own [Vedanta's] Lisheen mine in Ireland. There are no new mining projects in sight to compensate for the loss of production resulting from Century and Lisheen closures.

Q: Where will Hindustan Zinc be in the next five years?

Our target is to become the world industry leader. To reach that goal we have launched multi-year expansion projects across all our mines. We will start shaft mining at our two large sites at Sindesar Khurd and Rampura Agucha in Rajasthan in 2018 and 2019, respectively. This will further bring down our mining costs.

New plant orders

Metal Bulletin Magazine's quarterly review of recent orders announced for both new and upgraded plant

Customer	Supplier	Order details	Start up
ARGENTINA			
Ternium Siderar	SMS group	Revamp primary dedusting system for 3 x 190-tonne converters; capacity increase 2.9M to 3.3M tpy	–
AUSTRALIA			
TNG	SMS group	TVAN® refinery for Mt Peake titanium–vanadium–iron project in Northern Territory. Binding Heads of Agreement for due diligence, design, engineering and costing, and assistance with construction funding	– –
AUSTRIA			
AMAG	SMS group	6-high aluminium cold rolling mill, plus heat treatment line with passivation section, a high-bay warehouse and packaging line to weigh and pack coils	2017
Voestalpine	Duma-Bandzink/ EMG Automation	Modernise hot dip galvanizing line with EMG eMASS strip stabilisation system plus Duma-Bandzink air-knife. Improves energy consumption, coating precision and control, and noise reduction	Sep 2016
BANGLADESH			
BSRM Steels	Danieli	Revamp 20-tonne ladle furnace	Q3 2016
BRAZIL			
Gerdau	Danieli	Raw material handling system at Pindamonhangaba	Q3 2016
CANADA			
Gerdau	Danieli Centro Recycling	Upgrade non-ferrous scrap separation system at Whitby, Ontario, steel mill. For separating over 40 million lb/year of non-ferrous material from ELV scrap. Value \$10 million	– –
Société Internationale Métallique	Midrex; Primetals Technologies	2.0 million tpy HBI plant at Bécancour, Quebec. Construction expected to start in 2017	2019
CHINA			
Baosteel	Danieli	New side trimmer for 2050 line	Q1 2017
Henan Zhongfu Industrial Co	Danieli Fröhling	Aluminium strip slitting line with vacuum roll technology, plus 1,500 m/min trimming line	–
Mintal	Outotec	Ferro-chrome plant in Baotou, including 700,000 tpy steel-belt sintering plant and two 75 MVA smelting furnaces with preheating technology. Capacity 300,000 tpy of ferro-chrome	2016 2016
Shandong Iron & Steel	Primetals Technologies	Two twin-strand continuous slab casters for new plant in Rizhao region. Total capacity 4.6 million tpy, with machine radius 9.5 metres, slabs 230 mm thick, 1,000–1,950 mm wide, casting speed up to 1.7 m/min. For carbon, peritectic, structural, HSLA, deep-drawn and pipe grades of steel	June 2017
Shandon Rizhao Iron & Steel	Paul Wurth	Two Bell Less Top® charging systems for two new blast furnaces, each producing 11,500 tpd of iron	2017, 2018
Shandong Wantong Metal Technology	Fata Hunter	hSystem automation for 4-high aluminium cold rolling mill. Includes automatic gauge control, automatic flatness control, flatness measurement, coolant spray bars, gauge measurement	–
Tsingshan Stainless Steel Group	Danieli	New stainless wire rod mill, including 10-stand wire rod block, pinch roll, loop laying head, roller guides, snap shear and automation package	–
Xinxing Ductile Pipe Co	Danieli	Modernise 600,000 tpy wire rod mill, including Twin Module Block for 5.0–20.0 mm diameter wire rod in 2 tonne coils, at rolling speeds up to 112 m/sec. Plus double pipe oil film bearing loop laying head and wire-rod-controlled cooling line suitable for low temperature rolling	Mid-2016
Yongxing Special Stainless Steel Co	Primetals Technologies	250,000 tpy combination bar, bar-in-coil and wire rod mill in Huzhou for rolling several stainless and alloy grades, in bar diameters 30–130 mm, bar-in-coil 14–40 mm diameter, and wire rod 4.5–16.0 mm diameter. Includes reversing sliding breakdown mill and 14 Red Ring stand mill train; straight bar, coiled bar and wire rod processing equipment; in-line annealing furnace for wire rod	Early 2017
GERMANY			
ArcelorMittal Eisenhüttenstadt	Duma-Bandzink	Expand galvanizing line VZA2 with a third set of air-knives	–
Otto Fuchs	SMS group	GUJ4-type hydraulic closed-die forging press, force 540 NM, for Weber Metals subsidiary in Los Angeles, USA. For extra-large aerospace forgings in nickel and titanium alloys	End-2017
Rheinzink	SMS group	Coating line for architectural zinc sheets, giving a chemical pre-weathering treatment. Sheets are 500–1,200 mm wide and 0.4–1.5 mm thick	Aug 2016

New plant orders

Customer	Supplier	Order details	Start-up
INDIA			
JSW Steel	Danieli	3-strand bloom caster for Salem works	Q1 2017
Tata Steel	Danieli	Upgrade recoiling line no.1	Q4 2016
Visakhapatnam Steel Plant	Uralmashplant	Upgrade sintering plant, including sinter mixing and pelletizing, crushing and screening facilities, and supply areas. Plus latest automation and visualisation systems	2016
ITALY			
Forgia Rapida	SMS group	RAW 100/80-3000/480 ecocompact® radial-axial ring rolling machine. For rings up to 3,000 mm diameter and height 480 mm. Radial rolling force 1,000 kN, axial force up to 800 kN. Innovative design of electro-hydraulic direct drives mounted on the roll shafts reduces energy consumption by up to 40% (see <i>Innovations page</i>)	Sep 2017
Indinvest LT	Danieli	28 MN extrusion press	Q1 2016
Riva Acciaio	Danieli	Revamp continuous caster at Stab. Di Leseugno	Q3 2016
JAPAN			
Tokyo Steel	Danieli	New billet and bloom caster for structural steel at Okayama	Q4 2017
MEXICO			
TYASA	Castrip, Siemens and IHI	Castrip plant to produce 500,000 tpy of thin-gauge, high-strength steel sheet for local markets, up to 1,680 mm wide and 0.8-1.8 mm thick	Early 2017
ROMANIA			
TMK-Artrom	SMS group	Heat treatment line for tubes up to 60 mm wall thickness, includes walking beam austenitizing furnace, quenching head, quenching tank, walking beam tempering furnace, cooling bed	Q2 2017
RUSSIA			
Evraz ZMSK	Danieli	Convert 2-strand slab caster to 12-strand billet caster	Q1 2017
Mechel Group	Primetals Technologies	Modernise an LD converter in Chelyabinsk plant, including trunnion ring, suspension, tilt drive with AC motors, and basic automation	-
NLMK	Duma-Bandzink	Expand galvanizing line 1 with third set of airknives	-
Tulachermet Stal	Uralmashplant	Nine 280+100/20 cranes for iron and steel works	2016
SOUTH AFRICA			
Hulamin	SMS group (Parkegate Engineering)	Constant-force twin-head ironing roll for S5 aluminium cold rolling mill, to improve coiling	Aug 2016
SOUTH KOREA			
SeAH Changwon Speciality Steel	Inteco	One 8-tonne vacuum induction melting furnace, one 8-tonne and one 4-tonne electroslag remelting furnace and one 8-tonne vacuum arc remelting furnace	Q3 2016
SPAIN			
Acerinox	Andritz	Cold strip annealing and pickling line for Campo de Gibraltar plant. Capacity 300,000 tpy. Includes skin pass mill and leveller, electric and automation	Q3 2017
SRI LANKA			
Melwire Rolling	Danieli	50 tph pusher type reheating furnace	Q2 2017
TAIWAN			
Feng Hsin Steel	Danieli	Bar in coil line for existing rolling mill no. 2	Q2 2016
Feng Hsin Steel	Danieli	Upgrade rolling mill no. 2 with wire rod line	Q4 2017
TURKEY			
Atakas Metal	Danieli	Temper mill, cleaning line and batch annealing furnaces	Q3 2017
Cemtas Çelik Makina	Danieli	Heat treating furnace for bars	Q2 2017
UKRAINE			
MMKI	Primetals Technologies	Twin-ladle furnace with alloying station and dedusting system, plus twin-strand slab caster. Caster CC4 will be 2.5 million tpy, radius 9 metres, slabs 170/250 mm thick, 900-1,550 mm wide, max speed 2.2 m/min, processing peritectic, alloyed, low-, medium-, high- and ultra-high carbon grades. 150-tonne 28 MVA twin-ladle furnace plus dedusting system processing 206,000 cu m/h	-
UAE			
Emirates Global Aluminium	SNC-Lavalin	Engineering services contract for Emal and Dubal aluminium smelters, ensuring optimal delivery of portfolio of projects	For 3 years to July 2018
USA			
Champagne Metals	Butech Bliss	111-inch wide aluminium coil cut-to-length line for Middlebury, Indiana facility, processing aluminium up to 0.375in thick, 35,000 psi yield strength, at maximum speed 200 fpm	2016

Customer	Supplier	Order details	Start-up
Feralloy Corporation	Butech Bliss	Upgrade cut-to-length line in Huger, South Carolina. Includes Synergy [®] hydraulic roller leveller, 1,850-ton stretch leveller, Hawkeye [™] flatness detector. For processing carbon steels up to 0.75in thick, 74in wide into memory-free flat panels	2016
Nucor Nebraska	Primetals Technologies	Upgrade coil handling equipment for long products mill, including continuously rotating shear, coil receiver, pallet system conveyor, transfer and cooling equipment, and automation	Sep 2016
Voestalpine Stahl	Primetals Technologies	160,000 tpy residuals briquetting plant for recycling dust, sludge and pellet fines at HBI plant in Corpus Christi, Texas, USA	July 2016

VIETNAM

Dana-Y Steel	Danieli	Roughing mill	Q1 2017
Tong Dong A	Danieli	150,000 tpy hot dip galvanizing line at Binh Dong, for widths up to 1,250 mm, gauges 0.16-1.0 mm. Includes X-Jet air knife, annealing furnace with U-type radiant tubes, jet cooling section for CD, DQ and FH grades, skin pass mill and tension leveller. Plus 400,000 tpy 4-high cold reversing mill, for low-carbon strip down to 0.11 mm	Q1 2017
TVP Steel	Danieli	Continuous galvanizing and Galvalume line	Q2 2017

Metal Bulletin Magazine welcomes details of new plant orders for inclusion in this section. Please send details to Steve Karpel, associate editor (skarpel@metalbulletin.com)

Steel plants for all occasions

This regular compilation of new and upgraded plant orders has been published in *Metal Bulletin Magazine* for over a year – and before that, in the Focus section of *Metal Bulletin* – and so it is interesting to see if any noticeable pattern emerges, and what some of the largest investments have been, in the past year.

If we survey the number of orders included purely geographically, then since the March 2015 issue, and up to and including this one, it will not come as a surprise to find that China heads the list with a total of 50. In second place over the past year is the USA with 39 orders. This is followed by Germany with 22, Russia and India with 17 each, Turkey with 12, Mexico and the UAE with 11, and Austria with 10. This broad overview does not take into account the value or size of each order. It is also important to note that customers placing new plant orders sometimes choose to keep them confidential. Nevertheless, taken as a whole, the numbers give an approximate idea of the regions seeing the most activity. While the lists include metallurgical plant for both steel and non-ferrous projects, the dominance of steel orders makes ferrous trends easier to pick out.

In a period of poor steel prices and struggling economic growth in many countries, it may be considered encouraging that many companies are still taking a long-term view and investing in more efficient plant or greater capacity. What have been some of the largest investments included in the past year?

Complete steelmaking plants are major projects, and one of the biggest is Big River Steel in Arkansas, USA. This greenfield plant is being set up to make special grades, including tube, silicon and AHSS. The plant, which is being supplied by SMS group,

includes a 150-tonne EAF and LF, with single-strand CSP caster and 6-stand rolling mill of 1,930 mm width. There is also a pickling line/tandem mill, skin-pass mills, continuous galvanizing line and annealing furnace. The plant capacity is 1.5 million tpy, but this can double with the addition of a second casting strand. The mill is due to come on stream from the second quarter of this year.

In Algeria, Algerian Qatari Steel will be a 2 million tpy mini-mill supplied by Danieli, planned to start up in the third quarter of 2017. It will comprise two 120-tonne EAFs, refining furnaces, two 5-strand billet casters, two 750,000 tpy bar rolling mills and a 500,000 tpy wire rod mill.

Sun Metals in Sur, Oman, is investing in a 2.5 million tpy steelmaking and rolling plant for billet and special steel bar, supplied by Posco E&C. Start-up is planned for mid-2017.

Smaller-size mini-mills are also among steel projects ordered. CMC in Durant, Oklahoma, USA, has ordered 500,000 stpy mill for rebar, with start-up scheduled for the third quarter of 2017.

Taybah Group in Pakistan has a mill of the same capacity due to commission in early 2018.

Grupo Simec in Mexico is investing in a 600,000 tpy greenfield mini-mill in Tlaxcala. It will produce SBQ round blooms, large diameter bars and wire rod, from the end of 2017. Mexico is also the site of the first direct-casting Castrip mill outside the USA: TYASA has ordered a 500,000 tpy Castrip plant from the consortium of Castrip, IHI and Siemens, which is due to start in early 2017.

Again in Mexico, a special steels plant is being built for Frisa, comprising an EAF, ladle furnace, vacuum degasser and ingot caster. The plantmaker is Inteco and

partners, and it is due to commission early this year.

Galvanized into action

A notable feature of plant investments over the past year is the number of new galvanizing lines, such as in the Big River Steel project mentioned above. This trend is likely to be spurred by the relative buoyancy of the automotive market in some regions, and the forecast increases in demand over the longer term. Danieli, SMS group, Primetals Technologies, CMI Industry and Andritz are key suppliers of such lines.

Turkey has several galvanizing projects, including: Tezcan Galvanizli (350,000 tpy); Tosyali Toyo Çelik (450,000 tpy); and Erdemir (350,000 tpy). Russian steelmakers are also investing in this area, with projects at Magnitogorsk Iron & Steel (360,000 tpy) and Severstal (400,000 tpy).

China, the world's biggest automotive market, has a number of new galvanizing plants in the pipeline, including: Rizhao Steel (700,000 tpy); Anhui Masteel; Tangshan Iron & Steel (two lines totalling 650,000 tpy); and Shandong Iron & Steel Rizhao (400,000 tpy).

Vietnam has three galvanizing lines being built, at the Hoa Sen Group, Tong Dong A, and TVP Steel. A new galvanizing line is also scheduled at Wuppermann Group, Hungary (500,000 tpy), while there are also a number of expansions and upgrades at existing producers such as ArcelorMittal and voestalpine.

Low gas prices may encourage further investments in DRI/HBI plants. Recent examples of new units are a 2 million Midrex HBI plant for Société Internationale Métallique in Quebec, Canada, and a 2.5 million tpy Midrex DRI plant for Tosyali Holding in Algeria.

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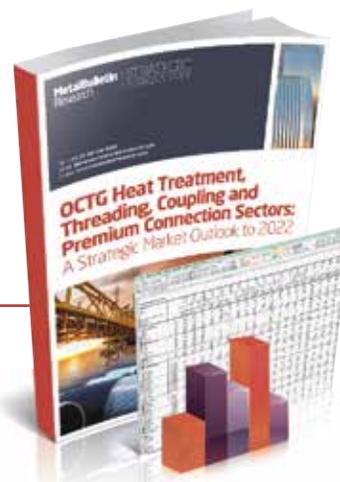
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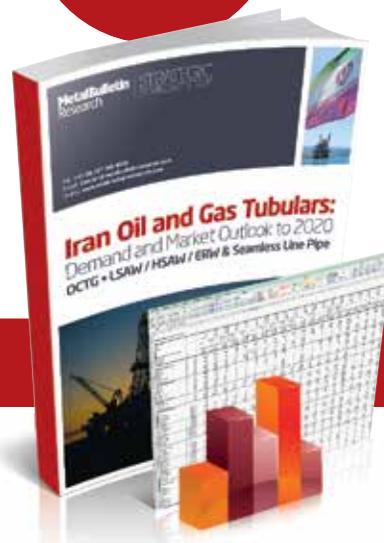
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Weight-watchers

The quest for lighter vehicles is producing extraordinary and rapid advances in the steel and aluminium automotive sectors, reports Myra Pinkham

It has been said that necessity is the mother of invention. There has never been a truer statement to describe recent and near-term future development of next-generation metals and other materials designed to help automotive OEMs meet the increasingly stringent government fuel efficiency and greenhouse gas emissions regulations.

“There has never been a period of time when things have changed so fast and so dramatically for both steel and aluminium suppliers to the automotive industry,” maintains Mark Stevens, project manager for the Ann Arbor, Michigan-based Center for Automotive Research (CAR).

This is not surprising, says Alan Taub, chief technology officer for the Lightweight Innovations for Tomorrow (LIFT) institute – one of the institutes formed as part of the US government’s National Network for Manufacturing Innovation initiative: “I don’t know of one vehicle that isn’t being targeted for at least one weight class reduction for its next model through not just better design but the use of advanced materials.”

While advanced high-strength steels and aluminium are at the top of the list, Stevens says that going forward other lightweight advanced materials such as carbon fibre composites and magnesium will also begin carving niches in automotive applications, although their use to date remains quite limited.

Nevertheless, as they are being presented with a growing range from which they can choose when designing or redesigning new passenger car and light truck models, it is becoming increasingly

apparent that automakers are taking an increased mixed- or multi-material approach using the right materials in the right place, observes Abey Abraham, director of automotive and materials practice of Ducker Worldwide, Troy, Michigan.

Steel is certainly not abdicating its crown as the dominant automotive material, but is rather re-inventing itself by being willing to substitute the milder steels previously used by automakers with a new and growing line of higher-strength yet formable advanced high strength steels, which the industry believes will allow it to remain dominant.

At the same time, the aluminium industry continues to step up its capabilities to win market share through the introduction of higher strength alloys and new production technologies.

In addition, two steelmakers – South Korea’s Posco and Germany’s ThyssenKrupp through its Magnesium Flachprodukte subsidiary, have been working

cooperatively to produce magnesium sheet for the automotive market through a casting-rolling technology that uses lower-cost input materials and greatly reduces the number of production steps compared with conventional magnesium sheet production, the companies say. Lighter than either steel or aluminium, to date automakers are using it in their vehicles for die castings. Ducker’s Abraham says that in 2015 there were about 9 lb of magnesium castings per vehicle and by 2025 that volume is expected to grow to 25-30 lb.

CAR’s Stevens says that sheet could also be used within the next three years. “Sheet magnesium has always been the dream, but it is harder to form, which is why people die-cast magnesium,” he explains.

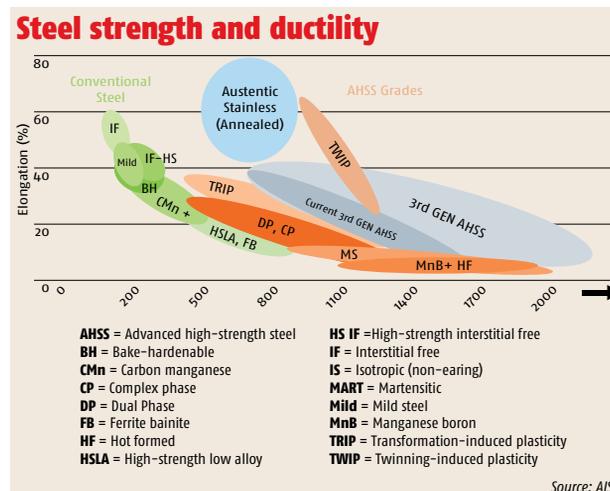
Steel reinvention

The steel industry is investing in a diverse portfolio of steels for the automotive sector.

Automotive OEMs find steel “a very comfortable material” for them, their parts suppliers and outside processors to work with, Ducker’s Abraham maintains, especially as the industry expands the number of steel specifications “to ensure that it meets the specific nuances for the parts, applications or type of environments that is steel is going to be used in.”

The overall percentage of steel per average North American vehicle has declined and could fall further in the next decade or so as automakers look at lightweighting, in addition to other strategies, to comply with upcoming fuel economy and greenhouse gas emission regulations. Abraham says that from 2008 to 2015 the total steel content of the average North American light vehicle reduced from 58% to 56% and will probably fall further to 54% in 2020.

This comes as the use increases of advanced high strength steels



Lighter vehicles

(AHSS), which John Anton, director of IHS's steel analytics for the pricing and purchasing service, calls vital for steel's market in the auto sector.

Jody Hall, vice-president, automotive market, at the Steel Market Development Institute, says that AHSS is currently the fastest growing automotive material. Its climb has largely been at the expense of "milder" steels. There has, however, been some instances of it replacing alternative materials as well, she says, including stamped AHSS replacing wrought aluminium for front door control arms for certain vehicles.

Blake Zuidema, director of automotive product applications for ArcelorMittal global research and development, comments: "Today's advanced high strength steels and ultra-high strength steels, together with the grades we are working on for the future – including the soon-to-be-commercialised third generation advanced high strength steels that offer both greater tensile strength and formability without compromising performance – are up to five times stronger than the steels that they replace." He maintains that they are a cost-effective solution to achieve the weight reduction necessary to enable automakers to attain the mandated 2025 fuel economy performance and lower life-cycle carbon footprints.

If it is not changed after the mid-term review in 2017, the US Environmental Protection Agency will be raising its corporate average fuel efficiency (CAFE) standards

Steel sheet in the US auto market, lb/vehicle

Year	Mild steel	High strength steel	AHSS & UHSS	Total sheet steel/auto
2016F	1,047	631	362	2,040
2015E	1,089	638	343	2,071
2014	1,133	660	309	2,103

Source: Metal Strategies Inc

for light vehicles to 54.5 miles per gallon by 2025.

Tenfold strength increase

The auto industry is responding. According to Craig Parsons, president of automotive for NanoSteel, Providence, RI, USA, just about all models of newly designed or redesigned cars and light trucks are using increased quantities of high-strength steels on a continuum of incremental steps that match the incremental improvements in steel strength and formability. Zuidema observes that, for example, the tensile strength of steels used in automotive applications has increased almost tenfold in the past 20 years, from 270 to 2,000 MPa.

This acceptance by automakers could be seen at the recent North American International Auto Show, says Lawrence Kavanagh, president of the SMDI, noting that both the show's car of the year, the Honda Civic, and the truck of the year, the Volvo XC90, are AHSS-intensive vehicles. Even the aluminium-intensive Ford F-150 pickup truck also contains a lot of AHSS, notes Philip Gott, senior director of long-range planning at Lexington, MA-based IHS Automotive.

LIFT's Taub predicts that by the end of the decade, little if any steel

used for automotive applications will have tensile strengths below 500 MPa, with the greatest trend being towards the press-hardened and third-generation (Gen 3) AHSS. The first such grades, with tensile strengths of 1,000-1,100 MPa and ductility above 10-12%, are now starting to be introduced.

Abraham says Ducker has found that from 2008 to 2015, the use of AHSS has increased on average by 16% annually for the typical North American light vehicle, largely at the expense of mild steel, which fell from 27% to 21% over that time frame. Ducker estimates that demand for AHSS will increase to 375 lb (170 kg) per vehicle and a total of 7.1 billion lb (3.22 million tonnes) by 2020 from 275 lb per vehicle and 4.8 billion lb overall in 2015. That is predicted to increase further to over 400 lb per vehicle for a total of about 7.6 billion lb by 2025.

Filling in the gaps

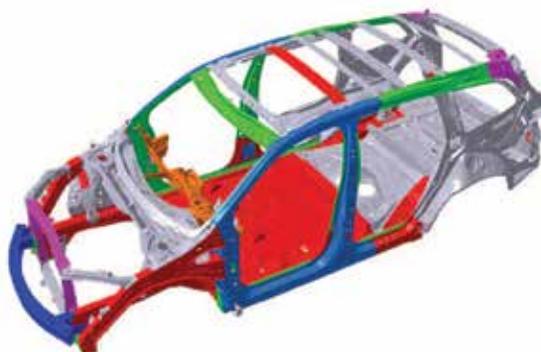
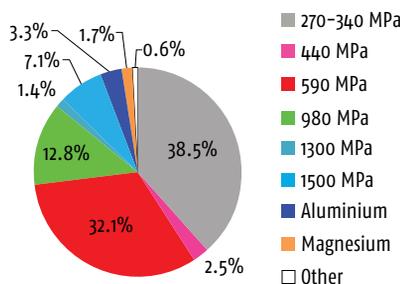
Recent development work has improved the nanostructures of such grades as transformation induced plasticity (TRIP) and dual-phase steels, as well as martensitic steels. The Gen 3 steels are geared to fill the current gap in properties that automakers require – up to 1,800 MPa (or possibly a little higher) tensile strengths with about 20-50% elongation to improve workability and weldability.

Abraham says that a key advantage of Gen 3 AHSS is that they are formable at room temperature, so there is no heating required of the material, result in a cost saving. Also, because of increased ductility and elongation, they could be formed into more complex shapes.

SMDI's Hall says that some new AHSS grades with tensile strengths of 1,180 MPa were introduced a year ago on certain vehicles, including the Nissan Murano and some 2015 and 2016 Honda and Acura vehicles. She says hydro-formed 980-1,000 MPa dual-phase steel is being used in the Ford Edge and a press-hardened tailor-rolled blank is being used in the Chevrolet Colorado and the GMC Canyon.

Taub says that with all the new modelling tools and the flexibility

Steel grades, aluminium and magnesium in the Honda Pilot body-in-white



Source: AISI

resulting from new microstructures, companies can actually tailor the heat treatment during forming to get different properties locally, allowing for further weight reduction.

“We have already seen some applications using up to 1,800 MPa steel, including in Mazda bumper systems, observes David Anderson, senior director of SMDI’s automotive technical and long products programme.

Zuidema says that ArcelorMittal recently commercialised several new grades, including MartINsite®, which sheds weight from simpler shapes that can be manufactured by roll forming; Usibor®, an aluminium-silicon pre-coated hot-stamping grade that supports weight reduction in more advanced shapes that require higher tensile strength; Ductibor®, an energy-absorbing high strength steel grade designed specifically to complement Usibor® in hot-stamping applications and offer ductility; and Fortiform® which provides both good formability and good energy absorption in cold-stamping applications. The steelmaker has also been expanding its S-in-Motion® brand products – a programme it initiated in 2010.

Hall says that “true” Gen 3 steels in the 1,000 to 1,200 MPa range will start to be commercially produced this year and that it is expected that production of 1,500 MPa Gen 3 steel, currently produced in pilot scale, could be scaled up to mass production by 2017 or 2018.

Parsons says that NanoSteel is also working closely with automakers on an AHSS grade that it says will create “a significant combination” of strength and ductility that “will offer OEMs some exciting opportunities to improve part performance.”

Meanwhile, adhesive and surface treatment products developed independently and cooperatively by the aluminium and adhesives industries could actually enhance the competitive position of the steel industry, maintains IHS’s Gott, who explains that OEMs could also use these products to join steels or steel and alternative materials

instead of doing so with spot welds, which require thicker steel at the weld joints.

Aluminium makes inroads

“Aluminium has been an increasingly important part of the automotive market for the past 40 years and usage in automotive applications continues to increase,” observes Heidi Brock, president and chief executive officer of the Arlington, Virginia-based Aluminum Association.

Last year, owing to the combination of record North American light vehicle output and the successful launch of the new Ford F-150 pickup truck – the first high-volume aluminium-intensive vehicle platform – “Demand for automotive-grade aluminium sheet exceeded our already quite high expectations,” says Michael Murphy, vice-president, commercial, global automotive, for Alcoa.

The aluminium industry remains optimistic that demand from the automotive sector will grow by about 30% per year for the next five years, and has been gearing up its production capacity accordingly.

The 2018 or 2019 model years could see aluminium-intensive platforms, says Timothy Hayes, a principal at New York-based Lawrence Capital Management, with General Motors possibly making its Sierra or Silverado trucks more aluminium-intensive or Toyota doing so with its Camry passenger car.

“But you aren’t going to find a vehicle that changes things as quickly as what happened with the F-150,” says Ducker’s Abraham: “That was a unique situation.”

But there are more aluminium-intensive vehicles in the works. For example, Ford’s new 2017 F-250 pickup truck that is to begin production later this year, like the F-150, will also have an aluminium-intensive body on an AHSS frame. In addition, the 2016 Cadillac CT6, General Motors’ largest Cadillac model to date, has an aluminium-intensive body and underbody similar to that of its AT6 vehicle, while the Jaguar XF body is 75% aluminium, the Tesla Model S electric vehicle uses aluminium in

‘No matter the size of the vehicle and the size of their energy footprint, they are all facing similar challenges related to the new CAFE standards’

its body structure, and a number of other new vehicles – many of which are in the luxury category – are using aluminium for a variety of components. Brock says she believes this symbolises where the US auto industry is heading.

Material use, however, varies widely according to carmaker, IHS’s Gott observes, with changes on a case-by-case basis, largely based on the loads exerted on a particular part and the expertise of the automaker and/or their parts suppliers when it comes to working with aluminium.

Following Ford’s example

“Even though they will amend some of their messages, it’s obvious that the new US CAFE regulations will require automakers to follow Ford’s lightweighting example,” says Andreas Gondorf, vp, automotive, at Aleris International. He maintains that this will most likely result in greater use of aluminium, at least for pickup trucks and sport utility and crossover utility vehicles, which he says are the types of vehicles where the greatest weight saving and miles-per-gallon gains could be achieved.

Atlanta-based Novelis agrees. “While some automakers are moving more rapidly than others, we are confident that aluminium will play a significant role in next-generation vehicle designs,” a company spokesman says. Alcoa’s Murphy says that it is not just for light trucks: “No matter the size of the vehicle and the size of their energy footprint, they are all facing similar challenges related to the new CAFE standards.”

Ducker’s Abraham estimates that total North American demand for aluminium by the automotive market (not including scrap generation), based upon an average of 390 lb of aluminium per vehicle, increased by 26.6% to about 6.8 billion lb in 2015 from about 5.4 billion lb (or 350 lb per vehicle) in 2012, with the greatest portion of that increase coming from demand for heat-treated sheet and plate, which accounted for an average of 59.3 lb per vehicle, and a total of about 1.04 billion lb.

He estimates that by 2025, when about 80-85% of North

American vehicles will have aluminium hoods and about 40-45% of their doors and more than 60% of their deck lids will be produced from aluminium, overall North American automotive demand for the metal could rise to about 500 lb per vehicle, for a total of about 9.5 billion lb.

Hayes estimates that North American shipments of aluminium heat-treatable sheet and plate to the auto sector nearly tripled to 733 million lb in 2015 from 258 million lb in 2014, and are expected to increase another 36% to about 1 billion lb this year.

Meanwhile the use of aluminium extrusions has also been increasing, largely for use in crash management systems, albeit at a slower rate than sheet and plate. Hayes estimates that North American extrusion shipments increased about 5% to 549 million lb in 2015 and could increase another 10% to 605 million lb in 2016.

Abraham says the majority of aluminium sheet continues to be used for closure, or “bolt on”, applications, and that will continue to be where the greatest growth lies.

From aerospace to auto

As with steel, there has been a shift toward higher-strength aluminium sheet aimed at enhancing the lightweighting of automotive components. CAR’s Stevens says this could include the eventual use of 7000-series heat-treated aluminium sheet, which to date has largely been used for aerospace applications, but is now being tested for automotive components as well. Abraham notes that 7000-series extrusions are already being used in certain bumper and body applications and could begin to see broader use in automotive crash management systems.

Novelis maintains that newly-developed 7000-series alloys, such as its Advanz 7000 products, could enable automakers to further reduce the weight of vehicles while ensuring high levels of passenger safety.

As has been traditionally the case, the lion’s share of aluminium components use either 5000-series

alloys (largely for inner panels) or 6000-series alloys (largely for outer panels and exposed parts). But since 6000-series aluminium is a stronger alloy and therefore could be used to make lighter gauge sheet, Stevens says some newer models, including the Ford F-150, are using 6000-series aluminium for both inner and outer panels.

Aluminium producers are also optimising existing alloys and developing new alloys to meet the evolving needs of the automotive OEMs and sometimes partnering with the automakers to do so. Novelis said it recently partnered with Jaguar Land Rover to develop a high-recycled version of the 5754 alloy to be used in 2016 JLR European models. It has also recently introduced several other new alloys, including its Advanz s615 alloy, which it says is formable enough for high-volume part stamping and assembly yet strong and tough enough to meet rigorous durability and safety requirements.

There has also been a push toward greater standardisation, Gondorf says, observing that Aleris is looking to develop a quality standard to satisfy OEMs’ requirements for forming, hemming, corrosion, surface appearance and strength.

New process, new properties

Aluminum Association’s Brock maintains that certain advanced aluminium production process technologies reinforce the value proposition of automotive aluminium. One example of this is Alcoa’s Micromill® continuous-cast sheet technology, which Murphy says is very different from anything out there before, resulting in material with as much as 40% higher formability and 30% higher strength than incumbent



The Alcoa Micromill® is reported to produce a combination of much higher strength and formability in aluminium alloy sheet

aluminium alloys. He also maintains that parts made from Micromill material will be twice as formable and 30% lighter than those made from high-strength steel. “We’re working with a total of twelve OEMs around the world on the review and development of Micromill material,” Murphy says.

With the anticipated rise in aluminium demand – especially if more aluminium-intensive vehicles are eventually announced – there has been concern as to whether sheet production capacity will be able to keep up with demand. “If you ask the automotive industry they say there isn’t enough aluminium capacity to do what they want to do,” Stevens says. “However the aluminium industry says they have more production capacity than they know what to do with,” he says, especially given the three to five years lag between when automakers announce their new designs and when metal needs to be supplied.

Abraham does not believe that capacity will be a problem, especially given recent investments that are still either under construction or ramping up. Alcoa’s Tennessee facility, which was upgraded to allow it to convert some can sheet production to auto sheet, began customer shipments in September at the same time as its brownfield facility in Davenport, Iowa, continues to ramp up.

Meanwhile, Novelis commissioned two new lines in the USA and one in China in 2015, a new line in Europe in 2015 and will be commissioning an additional line in the USA this year. Aleris expects to start up its brownfield auto body sheet mill in Lewisport, Kentucky, in 2017.

Additional investments are also being considered by a number of mills, Abraham says, with several holding off until there is more clarity from automakers and the outcome of the US government’s CAFE regulations mid-term review becomes known, to ensure that further capacity additions keep pace with demand.

The author is a specialist writer based in New York.

Aluminium sheet in the US auto market

Year	lb/auto	Total short tons
2017F	94	846,000
2016F	84	748,000
2015E	63	548,000
2014	30	255,000
2013	25	203,000
2012	20	154,000

Source: Metal Strategies Inc

MB's new website launches

Digital product manager Emma Goddard highlights the new MB website's benefits

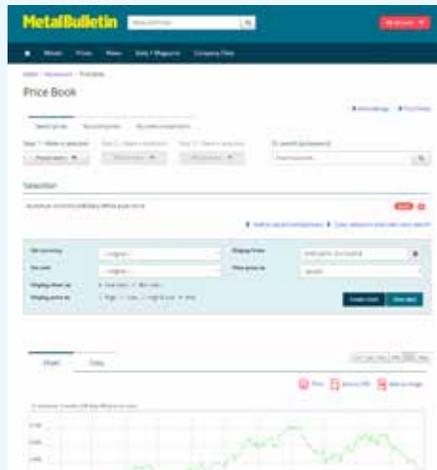
Last month saw the launch of the new *Metal Bulletin* website, created on the basis of extensive subscriber feedback to make it easier than ever to get straight to the most relevant news and prices, the *Metal Bulletin Daily*, and the pdf edition of *Metal Bulletin Magazine*. The focus is on improving the experience of using the website by making it more straightforward to find articles and prices, as well as making it easier than ever to get the most value from your subscription.

The navigation on the site has been improved to allow quick access to more web pages on more metals and news areas. The site is now divided into five clear sections:

Metals – use the menu here to navigate to pages on each of the main metal groups or the individual metals, allowing you to get straight to web pages with news and prices on your metal of interest, whether it be aluminium, selenium or tungsten. Each of these pages now contains a table of price assessments, organised in the same way as the Price Book. If you are logged in you will be able to see the latest assessments and the change on previous assessments on these pages.

Prices – use the menu for Prices to navigate to the Price Book, or to a number of other metal-pricing-related features. These include a new page to find all the pricing notices, plus access to Exchange News and Prices, where you can also drill down to see news on each of the individual exchanges. The Prices menu also gives access to Apex and information about Price Feeds and methodology.

News – this provides a new section for the *Metal Bulletin* website, leading to several new



webpages making it easy to drill down to news features, columns, Hotline, and videos and podcasts. If you do not use the website every day but want to stay up to date with the news and industry and market commentary, use this section to find the Daily Briefs, the Week in Briefs and the Week in Review articles. The News section also makes it easier to access opinion pieces, such as Hotter on Metals and Lord Copper.

Daily & Magazine – the latest *Metal Bulletin Daily* and *Metal Bulletin Magazine*, as well as past issues, are quicker to locate and download, straight from the top of the website, and from the homepage with one click.

MB Company Data – as a Premium subscriber to *Metal Bulletin* you have access via the website to the Company Data tool.

MB Company Data is an online database, providing access to data about companies, people, plants and mines, and covering more than 11,600 companies in the metals and mining industry. The database covers the following market sectors: base metals; carbon steel; minor and precious metals; scrap and secondary; stainless and special steels; and steelmaking raw materials. If you already have a Metal Bulletin Premium subscription this feature is included (at no extra charge) in your existing subscription package. Standard subscribers will need to upgrade to a premium subscription to access all the features of MB Company Data.

The Price Book has also been improved. Not only is there a cleaner and easier-to-use interface, but there are now improved features including quick search for prices, currency and unit conversion of prices both in charts and data, and improved views of data within the Price Book, making it easier to find the data points you need.

Make sure to save your preferred prices, which will make them appear both on your *Metal Bulletin* website homepage, but also in your My Account area. 'My Prices' can then be exported into Excel or printed directly from Price Book or from My Account area. To save prices is easier than ever and can be done from the Metals pages, as well as from within search and Price Book, meaning you are only ever one click away from the latest assessments on your preferred prices.

Use the main search to find relevant articles, now with the ability to drill down by date, category, or mentions of company or people. From here you can also search prices and see the latest assessments as well as click through to the full price history in the Price Book.

The My Account area has been improved to help you manage your personal details and change your password seamlessly. From here you can also update your Email Preferences and see which emails you are already signed up to or not. The email options are better organised so it is easy to choose new options and manage the amount of *Metal Bulletin* news and price updates you receive. The My Account area also lets you see when your subscription is due to expire.

The *Metal Bulletin* website will continue to improve and as such if you do visit the website and have some feedback to give, we would certainly appreciate receiving it. Please send to Emma Goddard, egoddard@metalbulletin.com



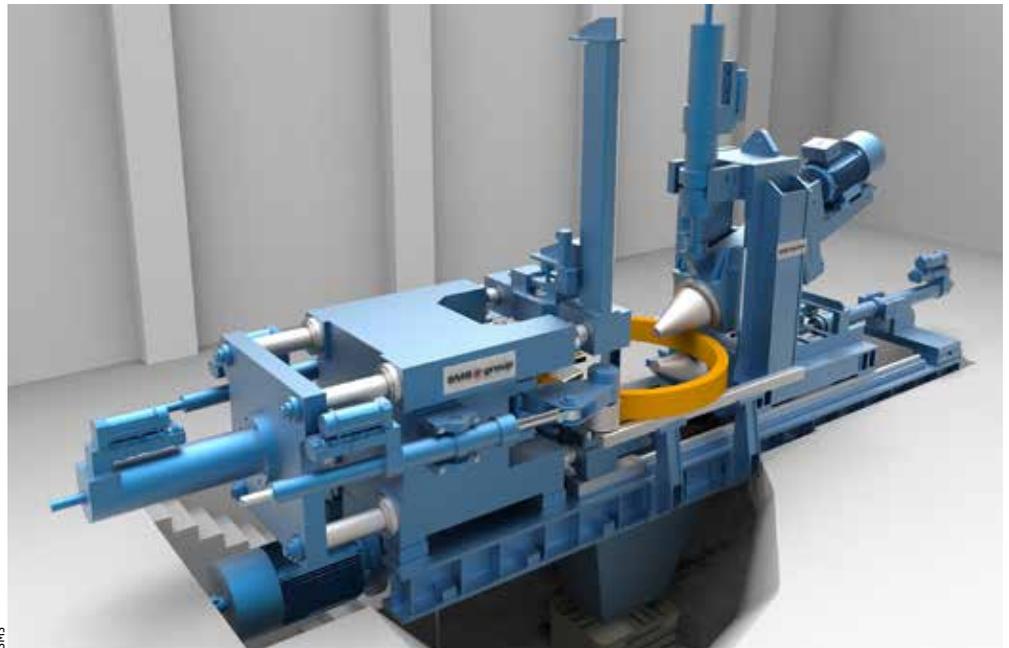
Ring rolling made simpler

SMS has developed an improved ring-rolling technology, and has already won its first customer for a machine. Italian ring producer Forgia Rapida has placed an order for a RAW 100/80-3000/480 ecompact® radial-axial ring rolling machine, which will replace a smaller machine at its Bologna works.

The new plant – expected to start up in September – is equipped with electro-hydraulic direct drives that are mounted on the roll shafts. This is an innovative drive solution for this applications, says SMS, which explains that the design can reduce energy consumption by up to 40% compared with conventional ring-rolling technology. Moreover, the investment costs are said to be about 20% lower.

Operating costs are reduced as a result not only of energy savings but also from the almost complete elimination of hydraulic oil. This means that no associated machinery and foundation pipework needs to be installed, while the threat of pollution from leaking oil is eliminated.

The RAW ecompact unit is mounted on a simpler foundation



SMS

RAW ecompact technology is said to reduce energy consumption by up to 40% and investment costs by about 20%

than conventional ring rolling machines, and additional space for a separate hydraulic power pack is not required. The machine operates automatically using ‘CARWIN’ (Computer-Aided Rolling under Windows) control software and ‘ROLLTECH Rings’ technology software. The latter

simulates the rolling process to ensure rollability of the planned products, and generates all the required process parameters.

SMS Group manufactures the machines in a range of sizes, up to the production of rings with an outside diameter of 3,600 mm, with horizontal unloading.

Many hands make light alloy

A research team from two Australian universities has discovered an ultra-light magnesium alloy that offers considerable potential for transportation and other commercial applications. The novel magnesium-lithium alloy has high strength and does not corrode, while its density of only 1.4 g/cm³ is half that of aluminium and 30% less than pure magnesium.

The researchers from the University of New South Wales and Monash University have shown that the alloy forms a protective layer of carbonate-rich film on exposure to air, making it very resistant to corrosion. This property was observed by chance when a heat-treated sample in a beaker of salt water showed no corrosion after several hours – magnesium would have normally corroded. Moreover, if the protective layer is scraped off, it rapidly re-forms in air. This phenomenon has been found to be due to the alloy’s particular microstructure.

The team, which includes researchers from Nanjing University of Technology and the Aluminium Corporation of China (Chalco), now plans to investigate how the alloy can be mass-produced as sheet in a standard processing plant.

Superior NiTi bearings with hafnium

Titanium powder producer Puris, of West Virginia, USA, has signed a limited term licence agreement with NASA’s Glenn Research Center, Cleveland, to produce a high-performance nickel-titanium alloy enhanced with hafnium, to be marketed under the name SM-103™. Nickel-titanium alloys have found widespread commercial use in the medical and dental industries, which take advantage of their biocompatibility and superelastic properties.

The new alloy SM-103, containing 60% nickel and up to 40% titanium by weight, plus a hafnium addition, delivers both wear-resistant and corrosion-resistant properties – usually thought to be mutually exclusive –

plus favourable load bearing properties. These attributes make it well-suited to industrial and precision bearing applications, says the company.

“Puris anticipates strong demand for SM-103 for industrial bearings in such applications as wind turbines, turbochargers, aircraft engines, gears and valves,” said Puris ceo Craig Kirsch. “We also expect it to find a market in precision bearings for timepieces, machine spindles and semiconductor manufacturing equipment, among others. But the most exciting opportunity for us will be the new applications where the alloy’s properties offer to enhance performance and endurance.”

Supply chain services

More advanced ED-XRF spectrometers unveiled

Spectro Analytical Instruments, Kleve, Germany, has launched a new range of spectrometers, Spectro Xepos, which the company says represents a leap forward in energy-dispersive X-ray fluorescence (ED-XRF). New developments deliver several advantages for the multi-element analysis of major, minor and trace element concentrations. Spectro explains:

– Innovations in adaptive excitation, and tube and detector technologies, greatly improve sensitivity, often by a factor of ten or more, leading to fast analysis of



elements from sodium to uranium, and exceptionally low limits of detection for a wide range of elements.

Xepos instruments claim an advance in precision and sensitivity

– The X-ray tubes remain powered on between measurements to prevent on-off variations from affecting readings. This ensures long-term stability, a very high degree of precision and substantially improved accuracy at all concentrations.

– Measurement times can be cut substantially, while still maintaining precision levels comparable to standard ED-XRF instruments.

The system's new TurboQuant II software quickly and accurately analyses practically any unknown liquid, powder or solid sample, says Spectro. In addition, the Xepos range exhibits a 'significantly lower' cost of ownership than wavelength-dispersive X-ray fluorescence (WD-XRF) spectrometers, says the company, thus delivering WD performance at an ED cost for many applications.

SPECTRO

SMS and Houghton form partnership

Global plant supplier SMS group and Houghton International of Pennsylvania, USA, have agreed to form a partnership for the development and marketing of oil-based cooling lubricants and emulsions for cold rolling mills. Under this arrangement, the two companies will be pooling their research and development resources with a view to offering innovative cooling lubricant technologies to steelmakers.

Houghton International operates

development and production facilities around the world, and has been serving the metals industries, as well as other sectors, since 1865. "We can now provide the worldwide manufacturers of steel and other metals with the only systems that integrate plant engineering and lubricant technology, thus allowing us to offer the most advanced integrated solutions to our customers," said Houghton's Marcello Boldrini, president for global metals & mining and Asia.



Cooling lubricants – a vital component of cold rolling

HOUGHTON INTERNATIONAL/USMS

SNC-Lavalin extends partnership with EGA

Emirates Global Aluminium (EGA) has awarded a three-year engineering services contract to Montreal-based SNC-Lavalin, which will provide operations support for its two smelters: Emirates Aluminium (Emal) in Abu Dhabi and Dubai Aluminium (Dubal).

SNC-Lavalin will provide engineering packages and manpower services to Dubal, and engineering and project management services to Emal Engineering in order to ensure

optimal delivery of a portfolio of projects and operations support.

"We have partnered with EGA and its operating subsidiaries for 12 years, having delivered major expansion projects to Dubal and, subsequently, the Emal Smelter Complex in Abu Dhabi, phases I and II," said José J. Suárez, president, mining & metallurgy, SNC-Lavalin. The company is now extending its partnership and contributing to Dubal's energy optimisation projects, where it is replacing existing pots with more energy-efficient ones.



A range of engineering and other services has been secured for Emal (above) and Dubal

EGA

Bodycote expands stainless facilities

UK-based Bodycote has expanded its capacity for the surface treatment of stainless steels (S3P) at its facility in London, Ohio, USA, and is also building a new S3P facility in North Carolina that will open this year. The company also recently opened a new heat treatment plant of over 5,000 sq metres in Taicang, China, increasing its plants in China to five.

The company's technologies are dedicated to improving resistance to surface wear in stainless steels, nickel-base alloys and cobalt-chromium alloys. Many surface treatments for stainless steel adversely affect its corrosion resistance, but the S3P process imparts improved wear and mechanical properties without diminishing corrosion properties, says Bodycote.

The benefits of the S3P process include higher surface hardness to 900-1,300 HV, alongside great resistance to wear such as that created by sliding combined with abrasion, and cavitation erosion.

Alcoa signs multi-material contracts with Boeing

Alcoa has signed long-term supply contracts worth over \$2.5 billion with Boeing, which illustrate Alcoa's growing diversification in the special materials sector. Under one contract, Alcoa Fastening Systems & Rings will supply advanced titanium, stainless steel, alloy steel, aluminium and nickel-based superalloy fastening systems for every Boeing platform, including the 777X – Boeing's newest commercial aeroplane – the 737 MAX (scheduled for first delivery in 2017) and the 787 Dreamliner. Alcoa will produce these fastening systems at seven of its global manufacturing facilities.

The company also announced a second agreement under which it is the sole supplier of ready-to-install



BOEING

titanium seat track assemblies for all three members of the 787 Dreamliner family. The seat tracks – which secure the passenger seats to the floor and reinforce the

Alcoa will supply titanium seat track assemblies for the whole 787 Dreamliner family

fuselage structure – will be made by Alcoa Titanium & Engineered Products (ATEP), from raw materials to finished part, utilising the titanium ingot melting and billetising, extrusion, machining, processing and assembly capabilities the company gained when it acquired ATEP, formerly RTI International, last year. RTI provided titanium seat tracks for the 787-8 and 787-9 variants under a 2007 agreement, and the new contract reinforces the earlier ones and adds the 787-10 plane.

These contracts build on Alcoa's deal with Boeing last year to supply flat-rolled aluminium sheet and plate products, valued at over \$1 billion. That agreement established Alcoa as the sole supplier of wing skins to Boeing for all of its metallic-structure aircraft, and also established deeper collaboration on new, high-strength and corrosion-resistant alloys, such as aluminium-lithium.

Galfan steels for long-life solar power

SSAB of Sweden is delivering a total of 25,000 tonnes of high-strength steel with a Galfan® (95% zinc - 5% aluminium) coating for constructing two thermosolar plants, one in Morocco and one in South Africa. The coated steel will be supplied to the Spanish company Cie Egaña, which will build the support arms for the parabolic reflectors of the solar plants. Deliveries began in December 2015

and will continue until October 2016. The Spanish company Sener developed the technology for these projects, which uses focused solar energy to generate steam, which in turn powers a turbine.

The support arms of the parabolic reflectors are constantly exposed to extreme weather conditions. The high-strength but formable steel has a thick coating of Galfan that prolongs the life of the plants, while



SENER

Galfan-coated steel prolongs the life of thermosolar power plants

the strength of the steel allows a lighter structure to be made, says SSAB.

The NOOR II thermosolar plant to be built in Morocco will have an output of 200 MW, and the Kathu plant to be built in South Africa will have an output of 100 MW. SSAB also supplied coated high-strength steel for the earlier 160 MW NOOR I thermosolar plant in Morocco.

Airbus sets new records in 2015

Airbus has exceeded its targets in 2015, and set a new record of 635 aircraft deliveries for 85 customers, of which 10 were new. This surpasses the record 629 aircraft the previous year. Its deliveries were up for the 13th year in a row, and in 2015 comprised 491 of the A320 family, 103 A330s, 27 A380s and 14 A350 XWBs.

Airbus also received 1,036 net orders from 53 customers (of which eight were new), comprising 897

single-aisle aircraft and 139 widebodies. At the end of 2015, the overall backlog had climbed to a new industry record of 6,787 aircraft valued at \$996.3 billion at list prices.

The company highlighted 'solid and wide ranging accomplishments' in 2015. The A320neo was certified by the aviation authorities on both sides of the Atlantic just five years after its launch, and parts are now in

production for the A330neo. Ten years after its first flight, the A380 programme broke even for the first time. There was also the opening of Airbus's first factory in the USA, in Mobile in September.

Airbus also launched three new incremental aircraft developments last year: the long-range version of the A321neo, the regional version of the A330, and the ultra-long-range version of the A350-900, capable of 19-hour flights.

China Iron Ore 2016

2 – 3 March 2016

Grand Millennium Hotel, Beijing, China

The major event for local and international iron ore players to start the year returns to Beijing in 2016, with a new set of roundtable discussions, breakouts and workshops.

metalbulletin.com/events

29th International Copper Conference

7 – 9 March 2016

Lisbon, Portugal

This conference will provide the earliest forum in the New Year for debating and analysing the prospects for copper. It will be attended by senior industry figures from around the globe.

metalbulletin.com/events

AMM's 9th Steel Tube & Pipe Conference

8 – 10 March 2016

Doubletree Houston Greenway Plaza Hotel, Houston, USA

The USA's largest gathering for the steel tube and pipe industry returns to Houston to discuss the numerous issues that now impact on the sector.

metalbulletin.com/events

17th Asian Ferroalloys Conference

22 – 24 March 2016

Shangri-La Hotel, Singapore

A key event in the ferro-alloys calendar, this event will cover the markets and outlook for all bulk, noble and specialist alloys.

metalbulletin.com/events

8th World Lead Conference

30 – 31 March 2016

Hilton Grand Palace, Brussels, Belgium

Delegates from each stage of the supply chain will be present at this conference, including recyclers, traders, smelters, battery manufacturers, equipment and technology suppliers, financiers, consultants and analysts.

metalbulletin.com/events

3rd Metal Japan

6 – 8 April 2016

Tokyo Big Sight, Tokyo, Japan

This conference and exhibition includes producers and processors of a wide range of metals as well as processing plant, testing and



SHUTTERSTOCK

Lisbon



SHUTTERSTOCK

Dubai

analysis, and recycling technologies
www.metal-japan.jp/en/

4th World DRI & Pellet Congress

25 – 27 April 2016

Park Hyatt Hotel, Dubai, UAE

This event brings together the entire DRI supply chain, from iron ore suppliers, technology suppliers, consultants, traders, producers, steelmakers and end-users. The state of the current iron ore and pellet market will be high on the agenda.

metalbulletin.com/events

ITRI International Tin Conference 2016

25 – 28 April 2016

Westin Lima Hotel, Lima, Peru

This conference will examine markets, investment, recycling and prices, with special sessions on the outlook for the South American tin industry, and the responsible tin supply chain. There is also a visit to the Minsur smelter included.

www.itri.co.uk

20th Zinc and its Markets Seminar

9 – 11 May 2016

Madrid Hesperia Hotel, Madrid, Spain

This well-established conference will review the entire value chain, focusing particularly on the question of future demand and the effects of an economic transition in China. There will also be an opportunity to visit either Técnicas Reunidas or Glencore Asturiana.

metalbulletin.com/events

AluSolutions

10 – 11 May 2016

ADNEC, Abu Dhabi, UAE

This international free-to-attend exhibition and conference addresses the challenges and opportunities of sustainable aluminium use, including energy, greenhouse gases, waste management and scrap recovery.

www.alusolutions.com

4th International Nickel Conference

11 – 12 May 2016

Pestana Chelsea Bridge, London, UK

Representatives from across the nickel supply chain will explore the major issues, such as the outlook for supply and demand fundamentals; China, Indonesia and Philippines updates; new projects; and market

growth opportunities.
metalbulletin.com/events

Iranian Steel Tube & Pipe Conference

24 – 25 May 2016

Parsian Evin Hotel, Tehran, Iran

Metal Bulletin's inaugural Iranian tube and pipe conference will give detailed coverage of the Iranian market, looking at projects, requirements, investment opportunities and the prospects for international trade.

metalbulletin.com/events

22nd International Iron Ore Conference

5 – 7 June 2016

The Steinberger, Berlin, Germany

This event is the ideal place to discuss the key issues affecting the iron ore market at a time of great challenges, as the price has fallen to multi-year lows with the market surplus and subdued demand.

metalbulletin.com/events

Steel Success Strategies XXXI

13 – 15 June 2016

Sheraton New York Times Square, USA

This major event covers world steel markets, raw materials, logistics, technology, iron ore and steel derivatives, and many other aspects of the sector.

metalbulletin.com/events

15th International Stainless and Special Steel Summit

6 – 8 September 2016

Hotel Intercontinental Lisbon, Portugal

Over 200 top executives from around the world and from all tiers of the global supply chain are expected to convene in Lisbon to discuss the world stainless and special steel sectors.

metalbulletin.com/events

2nd African Iron and Steel Conference

30 September 2016

Johannesburg, South Africa

Africa remains a continent of huge importance for a global market that is looking for the next wave of demand. Delegates will learn about the future of iron and steel supply and demand in Africa and will be able to meet government ministers and hear first-hand about their policies.

metalbulletin.com/events

Monthly prices

For the latest prices see
www.metalbulletin.com/my-price-book

January averages

	Low	High
Aluminium		
Aluminium Pro20A, in-warehouse premium		
Rotterdam duty unpaid spot \$/tonne	94.810	114.333
Aluminium Pro20A, in-warehouse premium		
Rotterdam duty paid spot \$/tonne	151.111	174.444
Alumina		
Index fob Australia	200.180	
Antimony		
MB free market		
Regulus 99.65%, max Se 50ppm,		
\$/tonne in warehouse	5,222.222	5,494.444
MMTA standard grade II \$/tonne	5,200.000	5,455.556
Bismuth		
MB free market		
min 99.99%, \$/lb, tonne lots		
in warehouse	4.144	4.667
Cadmium		
MB free market		
min 99.95%, cents/lb in warehouse	44.333	50.078
min 99.99%, cents/lb in warehouse	48.556	54.556
Cobalt		
MB free market		
High grade, \$/lb in warehouse	10.122	11.450
Low grade, \$/lb in warehouse	9.978	11.356
Copper		
US high-grade cathode premium indicator,		
\$/tonne	112.987	124.010
Germanium dioxide		
MB free market min 99.99%, \$/kg		
Rotterdam \$/kg	1,266.667	1,466.667
Gold		
London \$/troy oz		
Morning	1,095.65500	
Afternoon	1,097.37500	
Morning	760.85730	
Afternoon	762.53865	
Handy/Harman	1,097.81	
Indium		
MB free market		
Ingots min 99.97%, \$/kg in		
warehouse	230.000	280.000
Magnesium		
MB free market		
min 99.8%, \$/tonne	1,927.222	2,013.889
China free market min 99.8%	1,887.500	1,945.000
Mercury		
MB free market		
min 99.99%, \$/flask in warehouse	1,250.000	1,650.000
Molybdenum		
Free market in warehouse		
Europe drummed molybdic		
oxide \$/lb Mo	5.244	5.417
US canned molybdic oxide \$/lb Mo	5.225	5.500
Nickel		
Free market in warehouse premium		
Europe \$/tonne		
uncut cathodes	23.750	120.000
4x4 cathodes	155.000	220.000
briquettes	32.500	135.000
US		
Melting \$/lb	0.150	0.200
Palladium		
Morning \$/troy oz	498.20000	
Afternoon \$/troy oz	499.90000	
Platinum: per troy oz		
Morning \$/troy oz	853.45000	
Afternoon \$/troy oz	854.10000	

	Low	High
Rhodium		
European free market		
min 99.9% in warehouse, \$/troy oz	599.524	699.524
Selenium		
MB free market		
min 99.5% in warehouse \$/lb	6.200	8.156
Silicon		
MB free market €/tonne		
	1,930.000	2,030.000
Silver		
London		
spot pence/troy oz	973.74950	
spot cents/troy oz	1,401.57500	
Handy/Harman cents/troy oz	1,411.18	
Tin		
European free market		
Spot premium 99.9% \$/tonne	355.000	470.000
Spot premium 99.85% \$/tonne	305.000	375.000
Kuala Lumpur (ex-smelter) \$/tonne	13,735.74	
Titanium		
Ferro-titanium		
70% (max 4.5% Al), \$/kg d/d Europe	3.767	3.922
Tungsten		
European free market APT \$/mtu		
	162.778	179.444

FOUNDRY INGOTS

	Low	High
Aluminium		
LM24	1,165.000	1,260.000
LM6/LM25	1,380.000	1,480.000
Aluminium Europe €/tonne	1,580.000	1,654.000
Phosphor bronze		
PB1 ex-works £/tonne	4,925.000	
Zinc alloy		
10 tonne lots L3 £/tonne	1,604.000	

LONDON METAL EXCHANGE

High, low and average Jan (20 days)

LME averages are mean of buyers and sellers except for settlement and 3 months sellers.

	January 2016	January	
	Low	High	Average
	\$	\$	\$
Copper grade A (\$)			
Cash	4,310.25	4,646.50	4,462.30
3 months	4,320.25	4,647.25	4,462.08
Settlement	4,310.50	4,647.00	4,462.75
3 months seller	4,320.50	4,647.50	4,462.75
Copper grade A (£)			
Settlement	3,005.51	3,186.05	3,099.81
3 months seller	3,012.06	3,179.43	3,099.34
Tin (\$)			
Cash	13,225.00	14,862.50	13,768.88
3 months	13,212.50	14,787.50	13,730.25
Settlement	13,235.00	14,875.00	13,772.25
3 months seller	13,225.00	14,800.00	13,739.75

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	January 2016		January
	Low	High	Average
	\$	\$	\$
Lead (\$)			
Cash	1,596.50	1,761.00	1,646.54
3 months	1,597.50	1,759.00	1,647.21
Settlement	1,597.00	1,762.00	1,646.95
3 months seller	1,598.00	1,760.00	1,647.85
Lead (£)			
Settlement	1,098.84	1,198.95	1,143.96
3 months seller	1,100.75	1,195.20	1,144.40
Zinc (\$)			
Cash	1,453.25	1,609.75	1,511.88
3 months	1,466.50	1,608.00	1,520.19
Settlement	1,453.50	1,610.00	1,512.20
3 months seller	1,467.00	1,609.00	1,520.75
Aluminium (\$)			
Cash	1,452.50	1,529.25	1,479.09
3 months	1,451.25	1,523.75	1,479.75
Settlement	1,453.00	1,529.50	1,479.43
3 months seller	1,451.50	1,524.00	1,480.10
Aluminium alloy (\$)			
Cash	1,507.50	1,610.00	1,563.96
3 months	1,540.50	1,625.00	1,585.28
Settlement	1,510.00	1,615.00	1,567.48
3 months seller	1,541.00	1,630.00	1,589.55
Nickel (\$)			
Cash	8,177.50	8,722.50	8,479.88
3 months	8,192.50	8,762.50	8,523.50
Settlement	8,180.00	8,725.00	8,483.00
3 months seller	8,195.00	8,765.00	8,528.00
Nasaa (\$)			
Cash	1,670.00	1,739.50	1,705.76
3 months	1,685.00	1,747.50	1,718.93
Settlement	1,675.00	1,740.00	1,708.80
3 months seller	1,690.00	1,750.00	1,723.20
Cobalt (\$)			
Cash	21,705.00	23,750.00	23,208.50
3 months	21,900.00	23,750.00	23,227.50
Settlement	21,710.00	24,000.00	23,384.50
3 months seller	22,000.00	24,000.00	23,425.00
Molybdenum (\$)			
Cash	11,500.00	11,750.00	11,707.50
3 months	11,500.00	11,750.00	11,707.50
Settlement	11,750.00	12,000.00	11,957.50
3 months seller	11,750.00	12,000.00	11,957.50
Steel billet (\$)			
Cash	195.00	195.00	195.00
3 months	210.00	210.00	210.00
Settlement	220.00	220.00	220.00
3 months seller	235.00	235.00	235.00
LME Settlement Conversion Rates			
\$/£	1.4397		
\$/yen	118.183		
\$/€	1.0862		

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