

September 2016 | Leading for over 100 years

Metal Bulletin

Magazine

Steve Fisher explains Novelis strategy



**Aluminium
advances**

**Stainless
rebalances**

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back**



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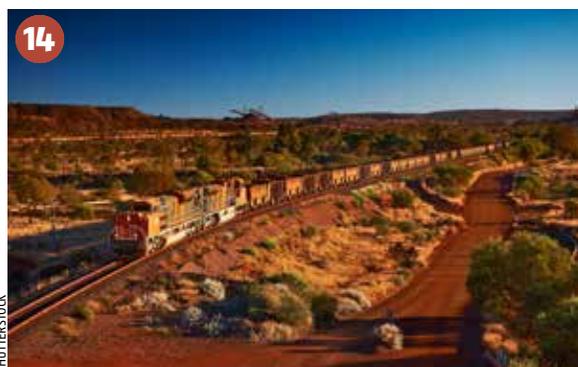
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Young and old

Although aluminium is a young metal compared with others – think Iron Age and Bronze Age – its use is of course already widespread in sectors where its properties allow it to excel: aerospace, packaging, heat exchange applications, electrical products, lithographic printing and building & construction in particular. Within the past few years, aluminium's competition with steel for automotive body sheet for mass-produced vehicles has become a high-profile battle for market share.

And the story continues. As articles in our big aluminium feature section outline in this issue of *MB Magazine*, alloy refinement and product development in castings, sheet and extrusions continues. New market niches, such as battery frames in e-vehicles, have emerged, while advanced processing and manufacturing technologies are moving towards industrialisation.

Our cover profile interviewee this month, Novelis ceo Steve Fisher, identifies innovating with the company's customers as one of the key components of his business strategy to advance.

While aluminium's practical values give it good long-term prospects for demand, questions about the locations and capacities of primary producers continue to dominate the light metal's shorter-term market prospects. The size and growth of China's aluminium smelting capacity contrasts starkly with the curtailments seen in the USA and Europe, while stock levels and other factors leave analysts to debate where the market balance lies – the subject of our global aluminium market overview.

Southeast Asian nations have also emerged as substantial players in downstream aluminium production. Developments in Vietnam, Thailand and Malaysia are the topic of another extensive feature.

Stainless steel's market is another to have seen China grow to dominate production – climbing from a low single-digit percentage of world output in 2000 to over half in the space of just 15 years. Our global review of that market suggests signs of recovery, while our regular Chartist page considers China's stainless options for the coming years, and their potential international ramifications.

Asia's importance is further underscored by one of the longest-mined metals, tin, for which the future key to its broadly balanced market is the risk of supply disruptions from China and Indonesia. Tin's global market prospects are reviewed in the last, but by no means least, of this month's feature articles.

'Aluminium alloy refinement and product development in castings, sheet and extrusions continues'

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Russian Copper to expand mine

Russian Copper Co (RCC) will invest about \$415 million in the second stage of construction of the Mikheevskiy mine in the south of Russia's Chelyabinsk region. RCC invested about \$431 million in the first stage, which was completed in December 2013. In 2015, the mine produced 322,000 tonnes of copper concentrate, with 23-35% copper content. The second stage, the construction of which will begin soon, will add about 9-10 million tpy of copper ore, or 100,000-150,000 tpy of copper concentrate to the mine output. This means total capacity of the enterprise will be 27 million tpy of ore, equivalent to 370,000-420,000 tpy of copper concentrate.

Additional geological exploration at the Mikheevskiy deposit has increased copper reserves to 2.5 million tonnes from 1.5 million tonnes.

Las Bambas starts commercial production

MMG's Las Bambas copper mine in Peru achieved commercial production – an official transition from project to operation – on 1 July, with the ramp-up achieved on schedule. Copper production at

Las Bambas started in the fourth quarter of 2015, with the first concentrate production on 26 November 2015. Las Bambas produced 118,612 tonnes of contained copper in concentrate in the first half of 2016, and MMG maintains its guidance of 250,000-300,000 tonnes for 2016.

Adani to build \$1.5 billion copper smelter in Gujarat

India's Adani Enterprises plans to build a copper smelter project in the town of Mundra, Gujarat, at a cost of Rs100 billion (\$1.5 billion). The proposed project will produce 1 million tpy of copper cathodes, 500,000 tpy of copper rods, 3 million tpy of sulphuric acid, 500,000 tpy of phosphoric acid, 30,000 tpy of aluminium fluoride, 288 tpy of selenium, 50 tpy of gold and 500 tpy of silver, according to an application submitted to the environment ministry for a clearance certificate in April. The project will take 30 months to implement, after all relevant approval and consent have been received.

Trafigura builds copper wire rod plant in India

Trafigura is partnering with India's Polycab Wires to build a 240,000 tpy copper wire rod plant in Gujarat, India, at a



Platinum metal will be available via BullionVault's online marketplace

planned cost of \$25 million. The plant is expected to be operational by the end of 2017 and will produce 120,000-140,000 tonnes of wire rod in the first year, and will ramp up thereafter. Trafigura will supply the plant with cathode from its domestic and international trading book and the wire rod product will also be available via Lykos, the online metals marketplace launched by Trafigura in 2014.

LME, World Gold Council, to launch precious metals platform

The London Metal Exchange and the World Gold Council (WGC) will launch a precious metals trading and clearing platform in the first half of next year, working with stakeholders including Goldman Sachs and ICBC Standard Bank. The LMEprecious platform will enable users to trade spot contracts and daily and monthly futures for gold and silver, while options, and platinum and palladium contracts, will also be offered in the future.

Alongside Goldman Sachs and ICBC Standard Bank, fellow stakeholders Morgan Stanley, Natixis, Société Générale and UK-based proprietary trading firm OSTC will act as market makers for the contracts, while LMEclear will act as the clearing house for the new platform.

WPIC, BullionVault to launch physical platinum platform

The World Platinum Investment Council (WPIC) and BullionVault have agreed to offer physical investment platinum on BullionVault's online marketplace alongside its existing gold and silver offerings. As part of the multi-year deal, WPIC will support BullionVault in the building, marketing and promotion of an online market for physical platinum, which will operate in multiple currencies and language websites. The physical platinum sold will be in the form of London Platinum and Palladium Market (LPPM) good delivery bars, with vaulting locations in Switzerland. The platform is due to go live in the fourth quarter of this year.

Indonesia plans royalty rate increases

The Indonesian ministry of energy and mineral resources (ESDM) is planning to increase the royalties mining companies must pay on various minerals. Royalties on gold would rise to 3.75% from 1%, copper to 4% from 3.75%, silver to 3.25% from 1%, and nickel to 2% from 0.9%, according to an announcement on the ESDM website. Indonesian news reports added that the



Las Bambas is ramping up to be one of the world's largest copper mines

increases would apply from next year to mines managed by contracts of work. Changes to royalty requirements on coal are still under discussion.

A new physical spot market for base metals

Metalprodex, a new Germany-based company, is launching a global trading platform in September for the physical buying and selling of base metals. Initially, the platform will allow participants to trade aluminium, copper, lead and zinc primary and semi-finished products on the spot market. Nickel may be added in future. The platform is not aimed at financial investors, but instead targets the physical market, and metals will be traded only in euros initially. The platform will provide physical metal within two days via an electronic trading system, and the minimum tonnage traded will be 1 lot, or 25 tonnes. It will provide regional trading at major hubs, supported by a network of approved warehouses.

Rusal sells Alpart to Jisco

UC Rusal will sell its 100% stake in the Alumina Partners of Jamaica (Alpart) mine and refinery to China's Jiuquan Iron & Steel Group (Jisco) for \$299 million. The sale forms part of the Russian aluminium producer's asset optimisation and debt ratio reduction programme, the company said on July 19. Alpart, which comprises a bauxite mine and alumina refinery, closed in March 2009 as a result of low alumina prices and weak demand during the global financial crisis. Before the shutdown, the Alpart bauxite mine and alumina complex had an annual capacity of 4.9 million tonnes of bauxite and 1.65 million tonnes of alumina.

ICSG cuts copper mine forecasts for 2018, 2019

The International Copper Study Group (ICSG) has revised its

annual copper mine production capacity for 2018 and 2019 downwards by around 200,000 tonnes and 500,000 tonnes respectively, mostly due to continued delays for many expansions and/or start-up projects. Annual copper mine production capacity until 2019 is nonetheless still expected to grow at an average rate of around 4% per year to reach 26.5 million tpy in 2019, an increase of around 3.9 million tonnes, or 17%, from 2015 levels. Concentrates production capacity will represent 83% of this growth at 3.2 million tonnes, while solvent extraction-electrowinning (SX/EW) capacity will represent 17%, or 670,000 tonnes.

USA launches WTO proceedings against China's duties

The USA has launched World Trade Organisation (WTO) disputes proceedings against China, alleging that it breaches global trading rules by imposing export duties on certain non-ferrous metals sold to the USA. The USA claims these duties range between 5% and 20%, and are levied on exports of antimony, cobalt, copper, lead, tantalum and tin. Washington says the tariffs prevent overseas sales and hence make domestic supplies of these metals cheaper for Chinese manufacturers. Under WTO procedures, China and the USA must try to formally resolve the dispute over 60 days. If these talks fail, the USA can demand the case be put to a WTO panel for a ruling.

Centerra Gold to buy Thompson Creek

Toronto-based Centerra Gold Inc has agreed to purchase Thompson Creek Metals Co Inc in a deal worth about \$1.1 billion. The acquisition, described as a move by Centerra to expand its North American operations, will give the company control of the Mount

Milligan copper-gold mine in British Columbia, Canada, as well as two idled molybdenum mines in British Columbia and Idaho and a molybdenum conversion plant in Pennsylvania. Centerra operates the Kumtor gold mine in Kyrgyzstan. The deal is subject to regulatory approval and agreement from Thompson Creek shareholders.

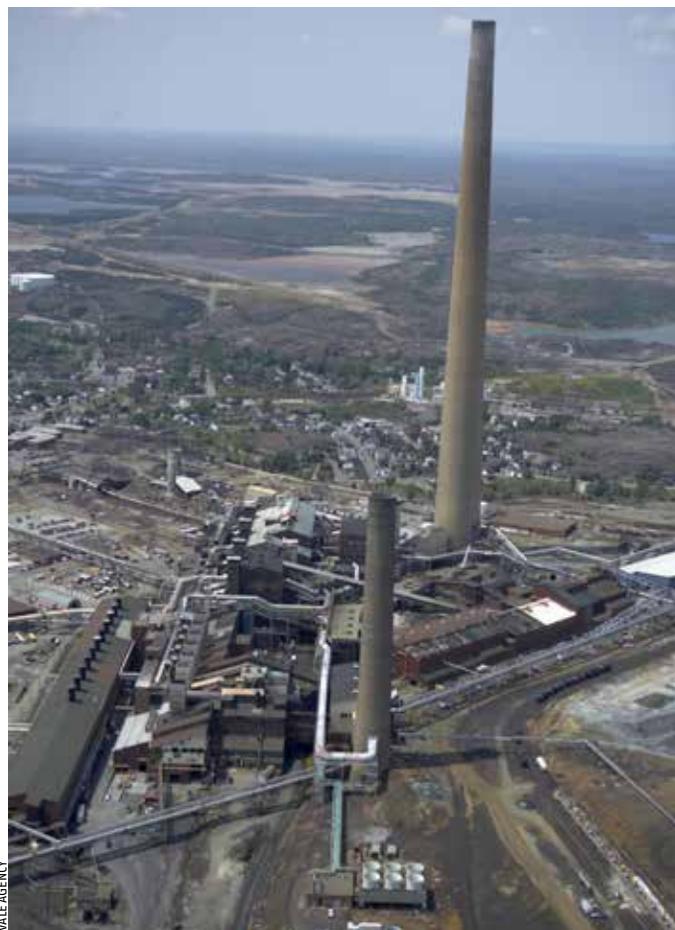
Ball Corp completes acquisition of Rexam

Ball Corp, Colorado, USA, has completed its \$6.1 billion acquisition of Rexam plc, becoming the largest manufacturer of beverage cans in the world. The company also completed the required sale of certain beverage can assets to Luxembourg-based Ardagh Group, receiving cash proceeds of roughly \$3.1 billion at closing. Ball's combined global metal

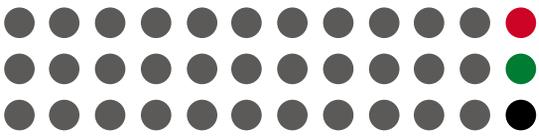
beverage business now operates 75 metal beverage can manufacturing facilities and joint ventures, as well as various support locations, in North and Central America, Europe and Russia, South America, Asia and the Middle East.

Vale Q2 nickel output reaches record

Vale's nickel production in the April-June period hit a new record for a second quarter, mainly on improved performance from its Thompson (Canada), Indonesia and Onça Puma (Brazil) operations. Its finished nickel output totalled 78,500 tonnes from April to June 2016, 17% higher than a year earlier. More than half of the volumes came from Vale's Canadian operations, which reported a total output of 43,100 tonnes in the second quarter of 2016.



Vale's nickel output hit a new second-quarter record



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News review: steel



DILLINGER HÜTTENWERKE

Producing slabs up to 500 mm thick at Dillinger Hüttenwerke

EU distributors' shipments up 4%

European steel distributors showed a sustainable increase in shipment volumes in the first half of this year, Eurometal said on 1 August. EU steel service centres for flat-rolled products shipped 4% more material year-on-year in January-June, with particularly strong growth (7%) in the second quarter. Sales of long steel products rose 7% year-on-year in January-June, with 8% growth in the second quarter.

Stock levels at all EU distributors at the end of June totalled 70 days of shipments, compared with 71 days at the same point in 2015.

El Marakby starts billet production

Egyptian rebar producer El Marakby Steel started billet production on 2 August at its new 350,000 tpy meltshop in the country's 6th October City. The investment was E£1.1 billion (\$123.6 million). The company has a rebar capacity of 250,000 tpy, but will raise this

to 350,000 tpy soon. Egypt's minister for industry, Tarek Qabil, said that the new mill will result in cost savings of about \$100 million per year as a result of falling billet imports.

Dillinger starts world's thickest slab production

Heavy plate producer Dillinger Hüttenwerke has invested more than €400 million (\$445 million) in a new continuous slab caster, CC No 6, which was officially commissioned on 5 July at its works in Germany. This will allow Dillinger to produce the world's thickest slabs: up to 500 mm thick, and

up to 2.20 metres wide. It will allow the production of new dimensions and new quality grades, and cover an increasingly advanced product mix, said the company.

Voestalpine opens innovative auto steel plant

Voestalpine has opened its first Phs-Directform facility, which makes press-hardened, high-strength car body parts in a direct process. The steel is heated, formed and hardened in a single process, whereas up to now the steelmaker has used its indirect Ultraform process which cold-forms and hardens in separate steps. The Phs-Directform is located in Schwäbisch-Gmünd in southern Germany, close to the automotive production around Stuttgart.

By 2020, Voestalpine said that it expects to have at least 16 such facilities around the world, including both the direct and indirect processes.

Tenaris to open OCTG hub in Canada

Tenaris plans to build a \$20 million service centre in Grande Prairie, northwestern Alberta to sell oil country tubular goods (OCTG) directly to rigs operating in the Canadian region's shale formations. The service centre, comprising a commercial office, storage yard and rail spur, is expected to open by the end of 2016. It will supply OCTG, accessories,

sucker rods and coiled tubes.

Tenaris is also building a rig-direct service centre in Midland, Texas, to complement its \$1.8 million seamless OCTG mill under development in nearby Bay City.

Kazakhstan to impose scrap export ban

Kazakhstan will impose a new ban on steel scrap exports starting in September, according to the country's Association of Mining & Metallurgical Enterprises. The reason for the embargo is "the critical lack of scrap for local steelmakers", Zhenis Kassymbek, minister for investment and development, said recently. An embargo was first imposed in December 2013, and the latest ban expired earlier this year. The country exported 691,628 tonnes of scrap in 2013, most of which went to Ukraine.

Shagang to invest in Castrip process

China's Shagang Group – the country's largest privately-owned steelmaker – has licensed the Castrip process for a new strip-casting line in what will be the first use of the flat-rolled steel technology outside North America. Hot commissioning is scheduled for the fourth quarter of 2017; estimated capacity will be 500,000 tpy. "Shagang Group is replacing a more energy-intensive casting and rolling process, resulting in less energy use and lower emissions – two important goals for China's steel industry," the Castrip company said. Castrip is a joint venture between IHI Corp, Nucor and BlueScope Steel.

Global DRI output falls 11% in first half

Global direct reduced iron (DRI) output fell by 11.38% year-on-year in the first half of 2016, according to the World Steel Association (Worldsteel).



ESGAR STEEL

World DRI production fell by over 11% in the first half of 2016

It recorded global DRI output as 26.88 million tonnes between January 1 and June 30, 2016. In this period, Iran surpassed India as the global leader in DRI output by volume, producing 7.91 million tonnes compared with India's 7.83 million tonnes. Iran's production rose by 7.28% year-on-year from 7.37 million tonnes while India's declined by 16.77% from 9.41 million tonnes. The third biggest producer was Mexico, with 2.59 million tonnes in this period, an 8.9% fall.

ArcelorMittal sells Zaragoza plant to Megasa

ArcelorMittal has reached an agreement to sell its long steel products mill in Zaragoza in Spain to Spanish steelmaker Megasa; the price of the deal was not revealed. The mini-mill produces about 500,000 tpy of commercial bar, billet and rebar. Megasa specialises in long products. "This plant no longer fits the long-term strategy of ArcelorMittal's long products division in Spain, which is the main reason we have signed the sales agreement with Megasa," said Augustine Kochuparampil, ceo of ArcelorMittal Europe Long Products.

Derichebourg to buy Bartin Recycling

Paris-based Derichebourg Group is expanding its metals recycling business in France by agreeing to acquire Bartin Recycling Group for an undisclosed sum. Bartin is wholly-owned by Veolia Group, and operates about 20 sites in France, processing up to 450,000 tpy of ferrous and non-ferrous metals. Derichebourg will fund the acquisition through existing credit lines, it said. Veolia purchased Bartin Recycling, then the third-largest metals recycler in France, in November 2007. Houston-



BHP BILLITON

BHP Billiton's Western Australia iron ore output reached a record 257 million tonnes in FY 2016

based subsidiary Derichebourg Recycling USA maintains six recycling operations in Texas and Oklahoma.

NSSMC and Sumitomo renew lineup contract

Nippon Steel & Sumitomo Metal Corporation (NSSMC) and Sumitomo Corporation have signed a long-term agreement to supply lineup to BP. The five-year master agreement between the two Japanese firms and global oil and gas company became effective on 1 July, 2016, and there is an option for it to be extended by a further five years. This is a renewal of a previous agreement between the three entities, as NSSMC and Sumitomo have held the long-term contract for supply of lineup to BP since the 1990s.

Galvanizing investments in Turkey, Vietnam

Turkish flat steel re-roller and coated coil producer Tat Metal has bought a second hot-dip galvanizing line, of 450,000 tpy capacity, bringing its total capacity to 800,000 tpy. It is expected to start up in early 2018, and target the automotive market. The company started producing colour-coated coil in January 2016 on a 120,000 tpy line.

Vietnamese steelmaker Hoa Phat group has invested in a new galvanized steel sheet plant with projected capacity of

400,000 tpy. The new plant cost \$177 million and will make pickled, cold-rolled, galvanized and colour-coated steel sheet. It is expected to start up in late 2017 or in 2018.

BHP's Western Australia iron ore peak

Output at BHP Billiton's Western Australia Iron Ore (WAIO) operations rose to a record high in the twelve months ended June 30, and the miner expects production to go even higher over the next financial year. WAIO produced 257 million tonnes of iron ore on a 100% basis during its 2016 financial year, a 2% annual rise.

BHP Billiton has set its production guidance for WAIO at 265-275 million tonnes for the year ending June 2017. It also forecasts WAIO's system capacity to rise to 290 million tpy in the 2019 financial year, with its focus on productivity and the ramp-up of additional capacity at the Jimblebar mining hub. Japan's Itochu and Mitsui collectively hold 15% of WAIO.

Gas pipeline planned for Estonia to Finland

The European Commission (EC) has allocated €187.50 million (\$209.18 million) for the construction of Balticconnector, the first gas pipeline between Estonia and Finland. Financial support for the project comes from the Connecting Europe Facility

programme and corresponds to 75% of the required funding. The pipeline will be built by Baltic Connector of Finland and Elering of Estonia, and will include a 22 km onshore section in Finland, 80 km undersea, and 50 km onshore in Estonia. The project is scheduled to begin operations by December 2019.

Rio Tinto to develop Silvergrass mine

Rio Tinto is to incrementally invest \$338 million to complete the development of its Silvergrass mine in Western Australia. Development of the mine is essential to producing and extending the viability of the company's premium Pilbara iron ore blend, Rio Tinto said, and will add 10 million tpy of capacity. Silvergrass is a low-phosphorus iron ore deposit near Nammuldi in the Pilbara region.

Duferco buys remaining 50% of Kreher Steel

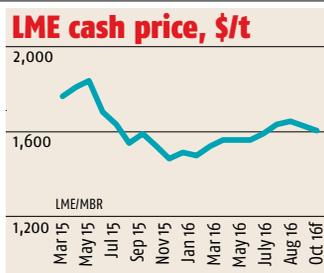
AM Castle & Co has agreed to sell its 50% stake in US steel distributor, Kreher Steel, for \$31.55 million, to its joint-venture partner Duferco Steel. On completion of the transaction, Duferco Steel will fully own the Melrose Park, Illinois-based steel service centre. Duferco said that it intends to increase its exposure to the US oil and gas market, with which Kreher has significant business.

MBR analysis

Aluminium

Ex-China deficit under threat

Aluminium prices have been surprisingly strong in August, breaching \$1,700/tonne for the first time this year. Premiums have gone the other way, however, as tightness in the LME spreads undermine the viability of financing deals, which tends to see availability increase in the physical markets. Although China's cumulative exports of unwrought aluminium and products in January-July were down 6.9% year-on-year, exports in the month of July alone rose 8.3% year-on-year to 390,000 tonnes. Our first instinct was that this reflects the ramp-up of new and previously-idled production capacity in response to higher prices – a threat MBR has often warned about. But primary



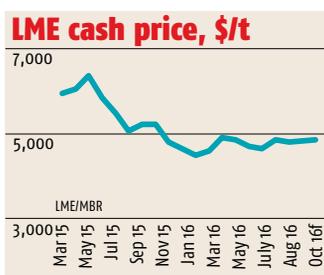
production was actually 4% lower month-on-month in July, so higher exports were probably more to do with seasonally weak demand. However, aluminium prices remain at high enough levels to continue promoting restarts/start-ups, so Chinese exports should stay elevated. This will eat into the supply deficit outside China and undermine prices, premiums and sentiment.

Copper

Fourth time lucky for \$5,000/tonne?

The softer tone to copper prices continues, with the metal looking increasingly out of synchronisation with the other base metals. The market is worried about oversupply due to mine capacity ramp-ups, and high spot concentrate TC/RCs – still around \$100/tonne and 10c/lb – are evidence of this. But we do not expect surpluses in the refined market to be as large as many copper bears fear. Technically, copper prices still have not yet bottomed out on the charts, and this alone may be keeping potential bulls at bay.

That could be about to change though. Copper tried, and failed, to consistently breach the \$5,000/tonne landmark again this summer,

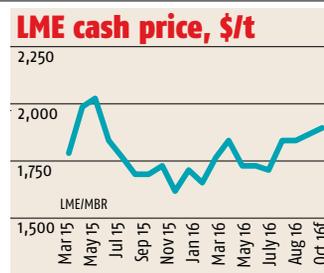


leaving a third progressively lower peak on the price chart this year marking failed rallies in March, May and July. That said, this year's major troughs are rising, from \$4,320/tonne in January to \$4,530/tonne in June. The resulting trading range is narrowing and, as it does, the likelihood increases of a major directional break-out. That should be to the upside.

Lead

Chinese clampdown could be a turning point

Lead prices have remained volatile, but struggled to make any progress on the upside in August. However, reports that China is clamping down on unregulated secondary lead production could be a turning point as this is potentially a significantly bullish factor for the market, especially with the Chinese and global primary industry feeling more tightness from less mine production. So we would not be surprised to see exchange stocks of refined lead start to fall in the coming months. LME stocks are already low at around 1.7% of annual consumption and SHFE stocks account for only 1% of Chinese consumption. So if supply does contract



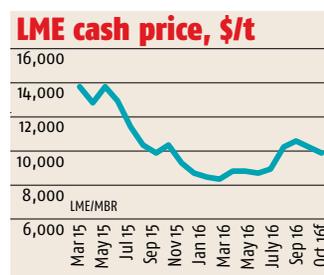
further and a deficit starts to be felt, prices could respond quickly.

We have been bullish on lead for a while, arguing that the fundamentals are tighter than the reported supply-demand data suggest. The latest developments support that view and so we continue to believe that lead prices are set to play catch-up before year-end.

Nickel

Philippines no game-changer, yet

Nickel prices exceeded expectations in August, touching \$11,000/tonne around mid-month for the first time in a year. The big story has been the environmental clampdown on the mining industry in the Philippines. It has fuelled more fund buying that is not really justified yet from a fundamental standpoint. Eight laterite mines have been suspended, but shipments of ore to China are accelerating as surviving mines ramp-up production and shipments after a weather-disrupted H1. Chinese ore stocks are already rising again, and NPI producers have also started to receive ore from New Caledonia for the first time in years, all of which could

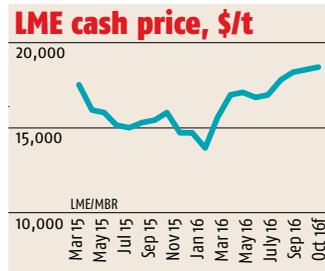


well fuel a rebound in Chinese NPI production in the coming months, not to mention growing NPI production in Indonesia too. So although we do believe the refined nickel supply-demand balance will tighten and prices rise in the coming quarters, we would not get too bullish too soon and certainly would not conclude yet that the Philippine situation is a game-changer.

Tin

Shutdowns to squeeze Chinese supply

Governments tightening environmental rules and oversight are impacting on lead and nickel production in China, but tin producers there have also faced a wave of inspections and suspensions over the past month. The focus of the tin closures are Yunnan, Guangxi and Jiangxi. SHFE tin stocks were just 2,700 tonnes as of mid-August, which means there is a very small buffer available from visible stocks. So the key question for the tin market as a whole is whether these closures in China will last long enough and cut deep enough into the domestic supply chain to boost imports of refined tin. Over the first half of 2016 the country



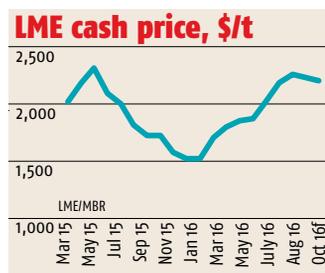
imported 3,943 tonnes of material, which was 2.1% below year-ago levels. A pick-up over the remainder of the year will draw on LME stocks, where available warrants stand at barely 3,000 tonnes. There is scope for prices to rally strongly in the coming months, with our technical analysis flagging up \$20,000/tonne as a target.

Zinc

Rally vulnerable to restart announcements

The uptrend in zinc prices lost some momentum in August, having found stubborn resistance around \$2,300/tonne. A deeper pull-back could be brewing if zinc continues to fail to overcome this level. The much-discussed concentrate market tightness is the main factor continuing to draw in the bulls. Potentially, this leaves sentiment and prices vulnerable to announcements from producers that mine capacity temporarily idled last year is being readied for restart.

In the absence of any such shock, we are interested in how the concentrate market deficit is entering the refined market. Exchange stocks have been



rising of late and premiums remain depressed, both of which suggest that physical market is not yet experiencing any significant tightness. However, we do note that the latest ILZSG estimates show that after a 15,000-tonne surplus in Q1 the global refined zinc market swung to a 152,000-tonne deficit in Q2.

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

Ask an analyst

Why is the steel recovery so delayed?

Earlier this year, MBR predicted that steel demand would partially recover in 2016 after falling last year. The recovery in apparent steel consumption, of about 9 million tonnes (just under 1%) would follow what we underestimated at the time was a 28 million tonne reduction (-2%) the year before. More recent updates and revisions to historical data suggest that the real decline last year was closer to 53 million tonnes, or 3.5%, beyond even the revisions the World Steel Association had already incorporated in their update in April. Yet despite starting the year from an even lower point than we thought, as both steel consumers and producers clearly slashed their inventories last year, we now see little prospects of even modest recovery until 2017.

Having eroded more sharply than expected, however, China's ongoing decline would appear to be over, as there was no decline in Q2 2016. Indeed in July, the provisional data indicate that Chinese consumption actually grew year-on-year by just under 2%, its fastest pace in a couple of years.

Today's bearishness for the steel world has frankly less to do with China and more to do with almost everywhere else. Despite ongoing expansion in key "emerging" markets such as India and Turkey, the rest of the world's steel consumption is still receding. Steel demand is on course to shrink by another 24 million tonnes this year, consistent with a 1.6% decline we have recorded in the first half. So what has gone wrong?

Year-on-year changes in global steel consumption, %



Back in January, the positive outlook reflected our industrial base case at the time. This included a projected rise in construction output of 3.5% – the best of the decade – and a projected rise of 4.1% in car and truck production, which effectively amounts to 3.7 million new units.

Unfortunately, however, these key drivers of global steel consumption, which together account for more than 60% of steel use, are failing to deliver.

In August, Oxford Economics made downward revisions for the short term industrial outlook, which will impact our own steel forecast updates in September. Encouragingly, industry stocks are starting to rise again, with data in China and the USA confirming month-month hikes in July. Without destocking, steel consumption is bound to rise but not by enough to overcome the first-half falls.

Analysis by **Alistair Ramsay**, 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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Metal Bulletin

Magazine



Three years to celebrate... just six questions to answer

To mark the third anniversary of the launch of *Metal Bulletin Magazine*, we are inviting readers to answer six questions about their views on the magazine and how it might be enhanced for future years.

To give us your opinion, please find our concise survey at:
https://www.surveymonkey.co.uk/r/mb_magazine

Respondents will have the opportunity to be entered into a draw for a prize of £100 of Amazon vouchers.

Respond by the end of September to be in with a chance of winning.

MBR analysis

Steel

Can US profitability be sustained?

During the past month, the downturn in international steel prices, as reflected in our steel price index (see chart), has continued as expected. The exception to this general rule has been the Chinese domestic market and, as a consequence, Chinese export prices. In last month's issue we detailed the upside risks to Chinese prices borne from how tight supply-demand fundamentals in that country had become. Partly reflecting the relative demand strength in China, seasonal weakness aside, and arguably more importantly, the rising production costs at the country's integrated producers, local prices have been rising more quickly than export prices. Chinese export prices are effectively lower than domestic prices for most flat-rolled steels, which some market participants would consider as dumping.

The gap in prices is relatively minor, however, at less than a \$20/tonne premium in the domestic market of HR coil and non-existent on major long products such as rebar when taxes are excluded, contrasting with gaps in Russia or Brazil that are now far in excess of \$100/tonne. Indeed MB's monthly assessment for HR coil on an ex-works basis in Brazil, which has been unchanged since June, is in dollar terms valued over \$900/tonne today, more than double the average of all MB's producer-price assessments and higher even than US cold-rolled prices in the Midwest. This is extraordinary because US domestic CR coil prices have been able to sustain hugely profitable premiums over already hugely



profitable HR coils thanks in part to various duties against major third-country (non-NAFTA) suppliers, including Brazilian and Russian, so far this year.

The large operating profits, which market contacts at *AMM* suggest could be as high as \$175/ton for HR coil have encouraged various analysts and forecasters to question how long such profits can be sustained. While local demand will always have its part to play, most of the analysis focuses on the duties: how effective they can be at stopping trade, and how easy will it be for US consumers to find other options?

MBR is somewhat surprised at the emergence of Vietnam as a key supplier this year (25% import market share) of CR coil, having had about 1% in recent years, compared with the Chinese (30%), Russians, Brazilians (7% each) and various other traditional suppliers now accounting for less than 1% each this year.

At the time of writing MBR calculates that any duties under 8% will only encourage more imports, but that actually leaves a majority of the USA's traditional suppliers out of luck; that is unless US prices can gain further momentum.

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

Steel raw materials

Surprising strength in integrated raw materials

Despite slipping more than 25% between peak levels, in mid-May and mid-July, the time of our last update, scrap prices may have finally found their floor. This is especially the case given an impending bounce in steel production, not least in the world's biggest scrap markets that always follow the summer. Not atypically for scrap, the relatively extreme falls over recent months, especially in key import markets such as Asia and Turkey, says as much about the extreme rises they came from than any more recent fundamental developments.

In the past quarter, for example, our recently published Steel Cost Service for Q2 2016 reveals that scrap had been relatively "overvalued".

While the recent downturn in scrap was relatively easy to predict, we have been much more surprised by the increasing strength of the integrated-route raw materials, including iron ore, up 11% month-on-month, and especially coking coal, which has risen at the same speed. We have been surprised in the circumstances of real demand, which has been seasonally depressed and in some cases more than usual.

In our latest weekly *Steelmaking Raw Materials Tracker*, MBR's Asia-based analysts understandably pay far more attention to raw materials supply. In the case of iron ore it is a question of quality, with better ore in relatively short supply for now, while in coking coal it is a quantity issue with Chinese output in freefall, thanks in part to government plans. Not only has it resolved to cut capacity but



arguably more effectively it has, since April, reduced the annual number of working days for all plants by 16%. We estimate that in the first half of the year, Chinese coking coal production fell by 6.4% year-on-year, far less than the cuts in more polluting thermal plants, but by enough to force coke producers to import over 25% more coking coal, supporting seaborne prices.

Even in June, when production fell more modestly, there was still a 17% surge in imports required. The problem, however, is merchant suppliers have bigger fish to fry than the Chinese and they are ensuring that the world's second-largest seaborne supplier, the US exporter, is dissuaded by, up until recently, very unattractive (less than \$100) prices.

Looking ahead, we suspect the price sensitivity in these raw material markets will remain extreme and if US exports resume with market prices back into three digits, Chinese coke and integrated steel producers may win back their purchasing power. Do not be surprised, however, if any correction in coal or iron ore fails to stop any seasonal rally in scrap.

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

**Metal Bulletin
Research**

In this section, MBR's steel and steel raw materials team summarise their in-depth reports to highlight key factors driving the markets and short-term price forecasts. MBR is a leading independent supplier of product and regional price, supply and demand forecasts for steel and raw materials. For free samples of MBR's reports, call Harriet Hall (+44 (0)20 7779 8000) or access www.metalbulletinresearch.com/freesample

Regional review

North America

Myra Pinkham

Uncollected duties a headache for USA



Despite the recent flurry of US trade actions, including a number of very high profile steel trade cases, it appears that a large amount of the antidumping and countervailing duties imposed has gone uncollected. But it is hoped that interim rules issued by US Customs and Border Protection (CBP), the US Department of Homeland Security and the US Treasury Department will be the first big step in addressing this issue. This issue comes at a time when both candidates in the USA's very contentious presidential election are making trade and trade enforcement a key campaign issue.

According to a recent report by the US Government Accountability Office (GAO), released in mid-August, as of May 2015 the US government was owed about \$2.3 billion in uncollected antidumping and countervailing duties, much of which is not likely to ever be paid.

"By not fully collecting unpaid [antidumping and countervailing] duty bills, the US

government loses a substantial amount of revenue and compromises its efforts to deter and remedy unfair and injurious trade practices," the GAO report says, noting that while, on average, the CBP collects duties owed for about 90% of antidumping and countervailing duty bills, on some it only collects about 31% of the amount owed.

Kevin M. Dempsey, senior vice-president of public policy and general counsel of the American Iron and Steel Institute, says the new interim rules, which were mandated by the Enforce and Protect Act, which is part of the Trade Facilitation and Trade Enforcement Act passed in February, will represent a critical breakthrough toward fixing the substantial antidumping and countervailing duty order evasion problem.

The interim rules, which detail the "rapid response timeline" by which CBP must investigate and respond to allegations of the evasion of duty orders, took effect on August 22 and are open for public comment until October 21.

Europe

Richard Barrett

Trade battles to recommence



As European politicians and the region's business leaders return from their July-August summer holidays, September will offer an opportunity to cast a fresh eye over the big list of issues from which their vacations may have provided brief respite from consideration, including trade.

In the meantime, in late July the spotlight was thrown yet again on EU steel and metal industries' concerns about the consequences of China's global dominance. Unusually, both the European Aluminium Association (European Aluminium) and European Steel Association (Eurofer) put out statements on the same topic – the European Commission's consideration of the potential granting to China of Market Economy Status (MES) – within a couple of days of each other.

European Aluminium was concerned that a deal might be considered for the steel sector in exchange for granting MES to China. Gerd Götz, director general of European Aluminium stated: "If this deal comes to pass

the EU would essentially be sacrificing its remaining manufacturing industry to save one sector." He added that "As EU leaders are well aware and have repeatedly acknowledged, China is by no means a market economy."

Eurofer raised its concerns just two days later, to coincide with European Commissioners holding an Orientation Debate on how to proceed with China's request for MES. It pointed out that the debate followed an EU-China summit from which it noted that policy makers attempted to equate reductions in steel overcapacity with the granting of MES designation.

"Chinese overcapacity should not be confused with the granting of MES to the country. They are distinct issues. The concern is rather that prematurely according the status would give Chinese producers an even greater unfair competitive advantage," said Axel Eggert, Eurofer's director general. "Straightforwardly, MES must not be granted so long as China does not visibly meet each of the EU's five market economy criteria," he added.

Asia

Juan Weik

One Singapore per year



Fears about a potential housing market bubble in China and the spread of the so-called "ghost cities" there have been dominating concerns for a few years now. But a recent report by credit ratings agency Fitch brought these long-term forecasts into the spotlight.

Between 2016 and 2030, China will need to build 800 million square metres of

residential-property space per year to meet demand, the firm estimated. Such a staggering number is similar to the size of Singapore, Fitch noted.

Demand will come from four main groups of buyers, according to the agency: residents who need new housing due to the demolition of their old homes; residents who wish to upgrade to better quality homes while keeping or selling their existing homes; residents who need new housing for marriage or child

raising; with new rural migrant families completing the list.

"We estimate there will be about 4.4 billion square metres of incremental housing demand, if all of the pre-1990 properties were demolished by end-2030 and the original residents rent or purchase a 30% larger space on average," Fitch said. Chinese properties built prior to the mid-1990s were mostly under six floors, without elevators, and often small and made of less durable materials than post-2000 modern apartments.

Another 4.3 billion square metres of housing demand would come from people looking to upgrade from properties built in the 1990s, while 3.7 billion

square metres would be required for newly married couples seeking independent residences, families with new children needing more space, and more urban single individuals choosing to live independently of their parents.

Finally, around 3 billion square metres of housing demand would derive from families migrating from rural areas.

As big as they are, the real figures could be even higher, Fitch suggested. "Our demand forecast assumes no speculative property investments," the credit ratings firm said. "If speculative demand increases, more properties will need to be built than in our forecast."

Middle East

Serife Durmus

Coup attempt shakes Turkey



An unspecified number of members of the Turkish military attempted a coup on July 15, but it failed, and the country announced a state of emergency for three months on July 21. Following this event, Standard & Poor's (S&P) downgraded the country's foreign currency debt rating to BB from BB+ on July 20. Another agency, Moody's, will examine the situation in Turkey for three months.

"Following the attempted coup on 15 July, 2016, Turkey's institutional effectiveness has been further eroded, raising risks to its externally leveraged economy," S&P said. "We believe these events will make rolling over Turkey's substantial short-term external debt more challenging."

The coup attempt did not have a direct effect on the Turkish lira, but worries continue in the steel market, and trading has been very slow since then.

Turkey's ministry of economy is planning to change some regulations in its import regime to protect the country's

steel sector from harmful import volumes, the ministry said on July 27. Turkey has become a net importer of steel, and the ministry is watching the sector closely. The steel sector is of strategic importance to Turkey's economy, the ministry added, and precautions such as new regulations on imports and trade policies will be brought in to protect the industry.

In Egypt, the USA's Harsco Corp signed a multi-year contract with Ezz Steel on August 9 for the provision of mill services at the Egyptian company's Sadat City plant. The contract is valued at more than \$35 million, Harsco said, and includes provision of slag and scrap management services at Sadat City, with future plans to design and deliver metal recovery and briquetting plants.

Egyptian rebar producer El Marakby Steel started billet production on August 2 at its new 350,000 tpy meltshop in the country's 6th October City. El Marakby Steel plans to increase its rebar production to 350,000 tpy soon, while it currently has a rebar capacity of 240,000 tpy.

Latin America

Ana Paula Camargo

Signs of recovery in Brazil



The second half of 2016 started showing the first signs of recovery in the Brazilian steel market, with local mills foreseeing a more positive scenario for the last months of the year. Domestic steel sales in Brazil increased by 0.70% year-on-year in June, to 1.48 million tonnes from 1.47 million tonnes, according to national steel association Aço Brasil. This was the first rise since March 2015, when local sales grew by 1.30% on an annual basis.

The first company to point out this rebound trend was flat steel producer Usiminas, which affirmed in late July that the Brazilian economy was stabilising. As a result, it was seeing indications that its results will be slightly better in the second half compared with January-June 2016.

At the beginning of August, long steel-focused Gerdau also said that it is seeing some signs of a recovery in confidence. The company cited Brazil's industrial production – which has seen positive growth in the past three or four months – to

back up its argument. Indeed, the country's industrial output increased by 1.10% month-on-month, according to the latest data from the country's statistics agency, IBGE.

In addition, the automobile industry, which accounts for around 22% of all the steel consumed in Brazil, saw July's car output rise by 4.7% month-on-month, to 189,900 units from 181,400 vehicles, indicating "market stability conditions", according to national automobile association Anfavea.

Meanwhile, flat steel-focused producer CSN announced in mid-August that it will restart its No.2 blast furnace in Volta Redonda city, in Brazil's Rio de Janeiro state, in early October, as it expects to see a rebound in local demand for steel. The mill idled the equipment in January for a 90-day maintenance period, but kept the facility idled due to poor market conditions.

Despite the positive outlook, it is still too soon to confirm if these first recovery signs are sustainable and the extent to which demand will rebound.

Africa

Bianca Markram

The future after Marikana anniversary



August 16 marked the fourth anniversary of the events that took place at Lonmin's Marikana mine during a strike there in 2012, when 34 miners were shot and killed by South African police. Miners and their representatives say that since the events of that fateful day, their circumstances have changed very little.

Lonmin was heavily criticised by Amnesty International in a new report on August 15 this year for providing "appalling" housing for its workers. In a press statement responding to Amnesty International's report, Lonmin acknowledged that the housing situation around its and other employers' operations near Marikana remains a challenge. It also noted that all of its hostel

blocks have been converted to single or family accommodation, with plans for more, that it is building apartments in the vicinity, and that it donated 50 hectares of land to government in 2013 for "integrated human settlements which also includes Lonmin employees." It said that "the challenges are huge" and that success needs partnership with government, the industry, community leaders, employees and NGOs.

Platinum mine workers' wages have increased since 2012, but any gains workers may have had over four years have been eroded by exchange rate changes. Fresh wage

demands are looming and more strikes are a real possibility within the platinum sector.

Unions have warned that another 57,000 jobs are at risk in the sector because of low commodity prices and South Africa's stagnant economy. In these circumstances, companies can argue that they have to cut costs and reduce work forces in order to stay alive. Social re-engineering, such as building houses for workers, costs capital that is hard to come by at present, and some companies are more inclined to put capital into keeping operations afloat.

Steve Fisher

'Our people are our most important asset'

Since taking over as ceo of Novelis last year, Steve Fisher has developed his plans to make the company the world's leading aluminium roller and recycler

It has been a year since Steve Fisher took over as ceo of the world's largest aluminium buyer, and his focus is simple: a renewed emphasis on the fundamentals of manufacturing.

It is a natural next step for Novelis, which has developed an ambitious sustainability vision, reshaped its product portfolio, and dramatically expanded. Having sold its remaining aluminium smelter last year, Novelis is now focused on converting aluminium into flat-rolled products, as well as recycling.

"Not that we've taken our eyes off that [manufacturing] by any means, but I think we really need to drive around some very important elements of our business," Fisher says during an interview with *Metal Bulletin Magazine*. These components include safety, innovating with its customers, and delivering high-quality, value-added products, Fisher says, along with driving operational efficiency and the continuous improvement of the company's assets to ensure their optimum performance.

Novelis, the world's largest aluminium recycler and a leading rolled aluminium products supplier, has operations in 11 countries on

four continents and shipped 3.123 million tonnes of aluminium flat-rolled products for fiscal 2016. It swung to a profit in the first quarter of fiscal 2017, reporting net income of \$24 million compared with a net loss of \$60 million in the prior year period.

"We see a tremendous amount of growth ahead of us. We're in a unique position of having [made] a lot of investment that we now have the opportunity to bring up to full capacity, and serve our customers in ways that we envisaged from the beginning," he says.

"We continue to want to be the number one aluminium rolling company in the world and very much intend to hold that position for a long time. We are also the world's largest recycler. These are things we are very proud of and want to continue to build on over the next couple of years," Fisher adds.

The company's global footprint extends to Nachterstedt, Germany, where it operates the largest recycling facility in the world at 400,000 tonnes per year capacity, as well as China, where its Changzhou plant is the company's first aluminium automotive sheet

production facility in the country. The Atlanta, Georgia-based company has eight of its 25 plants in North America, including three recycling operations.

Automotive pioneer

If there is one market in which Novelis has really located itself at the heart of, it is the automotive and transportation sector.

Lightweighting has become the buzzword among automakers in recent years, as concerns about fuel economy and greenhouse gas emissions have started to create a new generation of vehicles. Novelis' goal is to improve fuel efficiency, achieving weight reduction through the use of advanced aluminium alloys.

Novelis is partnering with automakers like Ford Motor and Jaguar Land Rover to make lighter, stronger, safer vehicles with a reduced environmental footprint, yet with the same comfort, utility and performance that consumers demand, Fisher says.

While Europe and Asia are showing strong demand, Fisher says that it is North America that is driving growth of aluminium used ▶

'We see a tremendous amount of growth ahead of us'



in automobiles and trucks, a situation he does not see changing any time soon. “I would say North America is leading the growth, obviously with the Ford F-150, with the Super Duty that will launch this year and with discussions that we’re having with a number of original equipment manufacturers (OEMs) across the North America system. We do see continued strong growth in the North American market,” he says.

It was a trend that Novelis, which has 40 years of experience in the auto industry, has been part of since the start. Yet as demand has grown since 2011, Novelis has tripled its automotive sheet capacity. Expansions at its Oswego plant in upstate New York have seen the company build out its capacity to supply automakers, including Ford’s aluminium-bodied F-150 pick-up truck – the best-selling vehicle in America.

The company commissioned its third continuous annealing solution heat-treatment line in Oswego in May, and Fisher says further investment will come as customers announce plans to use or substitute aluminium for other materials in their vehicles.

Going the aluminium route

“Ford took a very strategic view of aluminium and it has obviously paid off very well for them. I do envision others going in the same direction, I just don’t know the time frames specifically for when some of those changes might happen,” he notes. “But just thinking about the regulatory environment and the changes to Corporate Average Fuel Economy (CAFE) standards that must be met here, more aluminium will absolutely be a way that a majority of OEMs will lightweight their vehicles,” he says.

The CAFE standards are one of the most-awaited policy decisions in the automotive industry, with a mid-term review in June having led to a Draft Technical Assessment Report for public comment in July. Automakers, suppliers and other industry stakeholders are discussing the regulations, and their ability to meet them, with the regulators, with a final determination to be made in April 2018, according to the US

Environmental Protection Agency’s (EPA’s) website.

“We believe the majority of our customers believe the standards will be at the level that’s published today or even strengthened from where they are. We need to put ourselves in a position to be able to provide the innovative solutions to help them lightweight their vehicles in order to continue to meet these CAFE standards, or to meet the CAFE standards that come through,” Fisher says.

Similarly, electric vehicles will still require long-lasting batteries and substitution to lightweight materials, Fisher notes. “We actually believe that even if you see a shift and growth in electric vehicles, that’s actually very advantageous for the trend that we’re seeing for aluminium substituting for other materials,” he notes.

Novelis’s products are now featured in more than 180 different automotive models – including the Range Rover SUV, the first all-aluminium sports utility vehicle – and many of the world’s leading brands are working with the firm to bring their latest innovations to market. Fisher puts his money where his mouth is: he drives the latest Jaguar XJ model and his wife drives the Range Rover, both made out of Novelis aluminium.

It is a competitive backdrop; steel has been the material of choice in autos for decades. But the new fuel economy standards mean steel’s weight has potentially become something of an issue. Fisher says while Novelis believes aluminium is the right choice for OEMs, there is room for multi-materials on a vehicle: “We’ve never believed that aluminium would grow to the majority share of all vehicles.”

“When you look at the small percentage of specifically aluminium-flat-rolled-products play on vehicles today, we have a huge amount of growth to move just from single-digit percentage on all vehicles even into a double-digit percentage. That will drive significant growth in this industry over the next decade,” Fisher notes.

Premiums & warehousing

Like its peers, Novelis has in the past expressed concern that while it uses



Novelis has located itself at the heart of the automotive and transportation sector

derivatives contracts to minimise the price lag associated with LME aluminium prices, adequate cost-effective hedges are not available for local market premiums. Both CME Group and then the LME have each launched premium contracts, with varying degrees of success; CME’s are building liquidity, but the LME’s have yet to trade. Fisher says it will take time for the contracts to build the momentum needed to be an effective hedging tool.

“We’re glad to see the initiative of both the CME and the LME premium contracts, and believe that longer-term these contracts have a lot of promise to them, but for us at Novelis it’s still a little bit of a way away before we can utilise them at any significant level,” he says. “We’ve dabbled in them, we’re trying to support them because we do believe it’s the right direction for the exchanges to go, but we believe it will take some time,” he adds.

Fisher says that until liquidity improves, “It’s going to be hard for people to use premium contracts in the large quantities that Novelis for instance may look to use them in.”

“We are watching things develop. For it to be possible to use the contracts as part of normal business, the supply chain has to be prepared to make the transition,” he adds.

This transition would require the acceptance and use of premium contracts within commercial contracts, Fisher says. “The industry is slow to change. Premium contracts have to be accepted inside commercial contracts first, so things get to the point where there is the liquidity [for the contracts] to be successful,” he adds.

The impetus behind the aluminium industry’s desire for premium contracts has waned somewhat, however; the enormous basis risk created by record high physical premiums – which peaked at the start of 2015 before collapsing to five year lows currently – is an increasingly distant memory.

“We think we’re now back in a range for premiums that makes sense and it’s a range that we traded in for years. What I don’t think we would say is that premiums will never go back up – obviously there are different markets out there and

we should see some volatility in a commodity market,” Fisher remarks.

“But we don’t see a movement in the regional premiums in the near-term while, looking out six to twelve months, we think premiums are going to move in a band, plus or minus 10%. Hopefully some of the things the LME and CME have done will help the industry digest any volatility we might see going forward to the extent that we can get some of these premium contracts off the ground,” he adds.

LME prices have meanwhile been languishing below \$2,000 per tonne for almost the past two years although they have shown some signs of improvement in recent weeks, a situation that was relatively unexpected. “We have been a little bit surprised at the strength of LME prices over the past couple of months. Certainly at these price levels some smelters are now probably back in the money,” Fisher says.

“The drivers behind the gains are uncertain – obviously there is some positive sentiment around interest rates and other factors which are pushing money towards the commodity complex. Maybe it feels like the LME price is a little bit ahead of the physical market, but I don’t think there’s a dramatic gap by any means there,” he adds.

Rewind five years or so, and Novelis was extremely outspoken on its views about the state of the aluminium market, including criticism of the LME for its warehousing rules and its failure to amend them. Fast forward through a raft of new warehousing reform measures to today, and Novelis is far more confident that the exchange has made, and will keep making, good progress in addressing concerns.

“Novelis has been very vocal and tried to do everything we could to influence, as the largest buyer of aluminium in the marketplace, some of the LME regulations. We’re represented on both the LME aluminium and physical markets committees, and are actively contributing there,” Fisher says.

“Obviously there are lots of good ideas that the LME is actively exploring that we’re helping with on these committees and through

consultations. We believe the LME will make appropriate changes and has made significant effort in listening to the industry as they go through this process,” he adds.

The company has an element of protection built in from its diversified geographical footprint as well as its product mix: Novelis is the world’s largest producer of aluminium beverage can sheet and the world’s largest recycler of used beverage cans (UBCs). The sector accounted for 63% of the company’s flat-rolled products shipments last year, and is “more recession resistant” than automotive and other markets, Fisher says.

But a “huge focus” is being put on working to balance Novelis’ portfolio to ensure it is prepared to manage future downturns, such as the global financial crisis of 2008, which Fisher says was “extremely challenging” but which he believes taught the company some important lessons in the event of future downturns. Novelis executed a \$4.8 billion debt restructure that allowed it to begin 2011 with the financial flexibility to successfully execute its growth plans on its way out of the downturn.

China oversupply

Fisher links the price weakness to oversupply in the global aluminium market, primarily due to excessive capacity in China, where production has continued to increase despite announcements of closures and curtailments around the rest of the world.

“US-based smelters are having to shut down – in 2015 you saw curtailments or shutdowns at six smelters, leaving just four smelters in the USA, which is an extremely low level, I believe the lowest level since World War II. The massive overcapacity of primary aluminium coming out of China is creating broad issues in the industry and ultimately in the economy, as you can see,” he says.

“There are certainly other factors, there’s no doubt about that, but the largest factor impacting prices by far is the overcapacity in China. That’s outweighing everything right now, and despite the notion that China signals that it is taking capacity out, we’re just not seeing it,” he adds.

Western smelters have shown good discipline in cutting or curtailing capacity at smelters in efforts to balance the aluminium market, removing high-cost capacity and investing in more environmentally efficient production facilities. But it has still not been enough to revitalise prices.

China has also made cuts, although they have been outweighed by increases in, or new capacity at, domestic smelters during the same period. More cuts in China are needed. But provincial governments are reluctant to make curtailments due to the effect on local jobs, as well as the environmental clean-up they would face afterwards.

There have meanwhile been accusations that China has also been playing the ‘fake semis’ game, in which semi-fabricated aluminium products from China are sold for remelt. It has similarly been accused of using export restraints, including quotas, licensing, minimum prices, duties and other restrictions, to provide substantial economic advantages to a wide range of producers in China at the expense of foreign producers. Fisher says that as a large aluminium buyer, Novelis “needs to step up and have a voice” in the debate over excessive capacity, noting the company is supporting some of its upstream partners and suppliers in that effort.

“We obviously support fair trade practices and are certainly supporting policy makers whether in the USA or other stakeholders to review and ensure that we get a fair and balanced playing field as it relates to aluminium,” he adds.

Recycling

Back in 2011, Novelis laid out its goal of achieving 80% recycled inputs by 2020. At the time it was around 33%; Novelis will be around 50% recycled content this year. Recycling aluminum requires 95% less energy and produces 95% fewer greenhouse gas emissions than primary aluminum production.

But as the company slows its pace of investment and deepens its focus on innovation and optimising existing assets, Fisher says Novelis is unlikely to reach the “aspirational goal” of 80% within the next four years. “At this point in time we’re

‘The largest factor impacting prices by far is the overcapacity in China. That’s outweighing everything right now’



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backing off the time frame associated with the increase in recycled content, not the direction of moving to higher recycled content,” Fisher says. “We’ll continue towards higher recycled inputs where we see it’s appropriate.”

Fisher says there’s no specific timeframe, but stresses that the company is still very committed to recycling. “We’re doing it for the right reasons which are security of supply, a reduction in greenhouse gas emissions, various cost advantages as well as being something that fits very well with our customers’ views around their own sustainability agendas. So for all the right reasons we will continue down the recycling path, and we’ll do it at a pace that makes sense for our customers and also makes sense for Novelis, but it’s certainly nothing we’re going to walk away from,” he adds.

Novelis buys both new (from alloy and aluminium production) and old (post-consumer) aluminium scrap from a variety of sources and markets. Fisher says that getting access to scrap has not been an issue – “We’ve been surprised in finding pockets of scrap material around the world and feel as though we have the ability to get to the volumes that we need,” he adds.

“Obviously, with lower aluminium prices, that’s had a squeeze on the scrap spread. As we grew our recycled inputs towards 50%, that caused a bit more volatility associated with our cash flow and earnings profile, and certainly that’s part of our business model now and we understand it. As aluminium prices recover over the next couple of years, that should also benefit us,” he notes.

These days, it is the impact of lower aluminium prices that are dampening the recycled scrap spreads for the firm. “Over the long term we do see price recovery increasing in aluminium, which will help our scrap business – the spreads will expand, we should see some enhanced earnings associated with the initiative of growing our recycled inputs to 50%, so that’s a real positive thing,” he says.

Closed loop

Novelis’ ability to readily source scrap is in large part due to the

‘Our customers see why it’s important to segregate the various scraps, bring it back into the closed-loop system, recast it and provide coils back’

company’s partnerships with customers around closed loop recycling in the production process. It is a programme that Novelis has had in place for years with its beverage can customers, but has taken to new levels with Ford’s F-150.

Ford collects and segregates aluminium production scrap at its plant, then sells it back to Novelis. For its part, Novelis transports the scrap to Oswego in upstate New York to be recycled, re-rolled and delivered back to Ford’s manufacturing facility in Dearborn, Michigan.

Fisher says Novelis would now like to take the programme a step further and work with its customers around recycled alloys. That’s something Novelis is already actively doing in partnership with Jaguar Land Rover, whose Jaguar XE last year became the first vehicle in the world to use a new, high-recycled-content aluminum alloy called RC5754. This alloy is designed to contain up to 75% recycled content, and will also be featured in all new and legacy Jaguar Land Rover models.

The recycled vision for the Jaguar XE, already launched in Europe and North America, was part of an active sustainability agenda driven by Jaguar Land Rover – a vision that is also shared by Ford, Fisher says.

Closed-loop recycling deals are negotiated up front – “We certainly push for it,” Fisher says – although customers grasp the benefits of the system very quickly. “Our customers see why it’s important to segregate the various scraps, bring it back into the closed-loop system, recast it and provide coils back. They understand from logistics and supply chain carbon footprint standpoints, and they ultimately get a cost advantage as well,” he notes.

Energy background

Understanding carbon and energy comes naturally to Fisher, who spent most of his career in the sector before he joined Novelis. Fresh from his role at a Texas-based electricity utility, Fisher was placed in charge of Novelis’ strategic planning and corporate development, charged with providing a new perspective on the business.

The resulting deal was the \$6 billion sale in 2007 of Novelis to its now parent, India’s Hindalco Industries Ltd, the flagship of \$40 billion multinational conglomerate Aditya Birla Group. “It was exciting and certainly transformational for Novelis,” Fisher says.

His move out of the energy field was not an easy one, and Fisher was not initially convinced he would enjoy his new industry quite as much as he had his previous one. “I’ve been pleasantly surprised at how interesting this industry really actually is, and I do think there’s a lot you can apply from some of the things I have done either strategically or from a risk management standpoint in my past, and how that can apply to Novelis here,” he says.

After over eight years as the company’s chief financial officer, Fisher became its ceo in August 2015. Being both a ceo and a father, he sees the safety of Novelis’s 12,000 employees as his first priority and largest responsibility, and takes it very seriously. “It doesn’t matter how well we’re doing when it comes to safety – we can and should always do better. Our people are our most important asset and it’s my job to protect them,” he says.

Fisher is from the US Midwest, a region that is typically known for instilling values such as neighbourliness, honesty, hard work and a down-to-earth approach. He has been driving home a similar cultural message at Novelis: putting people first.

Noting that he sees the potential in everyone he meets, Fisher says what has impressed him most at Novelis is his employees’ pride and passion for what they do at all levels across the business and across all geographies. “A huge initiative of mine is to drive and implement a culture that we believe is a winning culture at Novelis; that is something I’m very focused on,” Fisher says.

“As ceo, I have the unique opportunity to engage with employees – whether that’s here in Atlanta or at one of our many plants around the world – and I see their passion, commitment and drive, and that inspires me to become an even better leader,” he adds.

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People moves

Gershon joins Sudden Financial

Barry Gershon, formerly global head of metals trading for Jefferies Bache, has joined Sudden Financial's LME metals team. The new role will primarily focus on business development in Europe and the Americas. Gershon has been involved in base metals trading for over three decades, having started his LME career in 1979. He joined Prudential Bache in 1985 and was global head of base metals from 2003.

American Lithium appoints Brock

American Lithium has appointed Dana Brock to the management team as vice-president of geosciences and engineering. He is a field-oriented civil engineer, geologist and engineering geologist, who for over 30 years has performed and directed investigations, designed facilities and supported construction and remediation.

New board positions at Hydro

Norsk Hydro has named Irene Rummelhoff as its new deputy chair of the board of directors, while Thomas Schulz and Marianne Wiinholt have been made new board members. Rummelhoff is executive vice-president, new energy solutions, in Statoil. Schulz is group chief executive officer of FLSmidth, and Wiinholt is executive vice-president and chief financial officer of Dong Energy. Hydro's board members are elected for a period of up to two years.

Carter appointed head of AIST

Wendell L Carter has succeeded George J Koenig as president of the Association for Iron & Steel Technology (AIST) for the 2016-17 term. Carter currently serves as vp and gm at ArcelorMittal's Indiana Harbor operations in East Chicago, Indiana, USA. He also oversees



NORSK HYDRO

Irene Rummelhoff



ISF

Roeland Baan



CONSTELLIUM

Jean-Marc Germain

ArcelorMittal's I/N Tek cold-rolling steel sheet plant and I/N Kote coating facility, as well as ArcelorMittal's Riverdale mill and Minorca mine operations.

Hasle heads Hydro's IR

Stian Hasle has been appointed head of Investor Relations in Norsk Hydro from 1 June. He joined Hydro in 2005 and was most recently a senior analyst in primary metal portfolio development. He succeeds Pål Kildemo, who becomes head of finance in the primary metal business area.

States is chairman of Rusal America

UC Rusal has named Scott States as the new president of Rusal America Corporation. He joins Rusal from Century Aluminum, where he was global director of procurement & logistics. States has also held marketing and transportation roles at Kaiser Aluminum and Gramercy Alumina, and will be responsible for developing Rusal America's sales portfolio.

Usiminas appoints Leite as ceo

Brazil's Usiminas has appointed Sérgio Leite as its ceo. His position will apply until the next general shareholders meeting due in 2018. Leite had been the commercial vp of the company, and Ascanio Merrighi de Figueiredo Silva was appointed to fill this position.

Thyssenkrupp appoints Hölz as cio

Dr. Martin Hölz took over as head of Group Processes & Information Technology (GPI) at Thyssenkrupp from 1 July. He also assumed the position of chief information officer (cio) for the Thyssenkrupp group. Hölz joined Thyssenkrupp in February 2014. Previous positions include senior partner at audit and consulting company Deloitte and various management functions at Daimler and Volkswagen/Audi.

Baan elected chairman of ISSF

Roeland Baan, ceo of Outokumpu, has been elected chairman of the International Stainless Steel Forum. The following were elected as vice-chairmen: Bernardo Velázquez, ceo of Acerinox Group; Tim Di Maulo, ceo of Aperam Group; Oh In-Hwan, head of Posco's steel division; and Hitoshi Ito, representative director and president of NSSC.

Noble Group names joint ceos

Noble Group has appointed William Randall and Jeff Frase as joint ceos, following the resignation of previous ceo Yusuf Alireza. Randall, based in Hong Kong, is president of Noble Group and an executive director, and will retain his board seat. Frase, based in Stamford, Connecticut, is president, Noble Americas, and head of oil liquids, and will join the board.

Contreras re-elected by Chile's steel institute

Chile's steel institute, Icha, has re-elected Sergio Contreras as president for the 2016-18 period, having first elected him in 2012. He will be responsible for the implementation of Icha's initiatives to ensure the quality of steel products sold in the country. The institute also elected Jorge Manríquez Pimentel as vp, Nemo Castelli as treasurer, and Juan Carlos Gutiérrez as secretary.

Germain becomes Constellium ceo

Constellium has appointed Jean-Marc Germain as ceo from 11 July. He was previously an executive director at the company, and takes over from the retiring Pierre Vareille. Before joining Constellium, Germain was ceo of Algeco Scotsman, a Baltimore-based business services provider. He has also held senior executive positions at Pechiney, Alcan and Novelis.

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People moves

Resontov named as cfo of Mechel

Mechel has appointed Sergey Rezontov as its chief financial officer. He joined the miner and steelmaker in 2006 and has headed its financial department for the past two years.

CME names Chang as head of metals

Young-Jin Chang has been named as global head of metals products at CME Group. Previously, Chang, who will continue to be based in Chicago, served as executive director, industrial metals products, for CME Group. Prior to joining CME in 2011, she was a ferrous alloy trader at David J Joseph company.

Miguel Vias has been made senior director and head of precious metals at CME, responsible for business in both futures and options.

Novelis appoints Ahuja as cfo

Novelis has named Devinder Ahuja as senior vp, finance, and chief financial officer, from August. Prior to joining Novelis this year, Ahuja was the cfo of Alcon US, a subsidiary of healthcare company Novartis, and before that held various financial positions with Novartis over a 15-year period.

Novelis has also appointed Steve Pohl, formerly interim cfo, to the newly created position of senior vp, business performance and execution. Ahuja and Pohl are both based in the company HQ in Atlanta.

Aleris names Govers to leading role

Aleris has chosen Jack Govers as its new president of Europe and Global Markets. He joins the company from diverse manufacturer Sabic, where he was most recently general manager for global forms, serving customers in the automotive, aerospace and consumer electronics markets. Before Sabic, he held various roles at General Electric.



Young-Jin Chang



Themba Mkhwanazi



July Ndlovu

Teräsvasara is appointed ceo of Outotec

Markku Teräsvasara has been appointed the new chief executive officer of Outotec, and will take up the post by 1 November. He has been employed by Atlas Copco since 1997, and was most recently president of its Mining and Rock Excavation Service division.

New becomes director of ATC Alloys

Vietnam-focused ferro-tungsten producer ATC Alloys has appointed Carol New as a director of the company. She is also the company's chief financial officer and secretary, and will continue in these roles.

New top managers at Sapa

Sapa has promoted Katarina Nilsson to Executive Vice-President Human Resources, and Rafael Fuertes to Executive Vice-President Strategy & Innovation, both positions effective from 1 September. Nilsson has had senior management roles for Sapa in Asia, and also headed the China offices of law firm Vinge. Fuertes has had senior management positions in the aluminium extrusion and precision tubing business.

Management augmented at Thyssenkrupp Industrial Solutions

Michael Höllermann and Johan P. Cnossen have joined the management board of the Thyssenkrupp Industrial Solutions business area, effective from 1 August. Höllermann is the new Chief Human Resources Officer (CHRO). Cnossen, who joined Industrial Solutions on 1 May, holds the new position of chief operating officer. The new chief financial officer, in place since 1 June, is Stefan Gesing.

Sucden Financial names China head of sales

Sucden Financial has appointed Lucy Wainman as its head of sales

for China, in charge of management and business development. She joined Sucden Financial in 2006, and started her commodity career at LME ring dealing member AMT in 2002.

Stock appointed ceo of Essar Steel Minnesota

Matthew Stock has replaced Madhu Vuppuluri as ceo of Essar Steel Minnesota, effective from July 14. Vuppuluri, who had been ceo of Essar Steel Minnesota since its inception in 2007, has been assigned to a position at Essar Capital, another affiliate of Essar Group. Stock has 25 years' experience in metals and mining, and most recently served as ceo of Mumbai-based non-ferrous mining start-up Veer Resources & Projects.

Gaddes joins London Commodity Brokers

David Gaddes has joined London Commodity Brokers (LCB) as head of base metals. He has more than 45 years' experience of trading and brokerage in the metal markets, and most recently left his role as managing director for Norilsk Nickel's European operations after 15 years with the company. He will focus on bringing improvements and innovations to the supply chain and customer procurement.

Anglo names ceo for Kumba Iron Ore

Anglo American has appointed Themba Mkhwanazi as the new ceo for its South African subsidiary, Kumba Iron Ore. Themba replaces Norman Mbazima, who steps down after four years to focus on his role as deputy chairman of Anglo American South Africa. July Ndlovu, the executive head of processing operations at Anglo American Platinum, is taking over Mkhwanazi's position as head of Anglo's coal business in South Africa. Both appointments are effective from 1 September.

Striking a balance

Globally the aluminium market has been fairly balanced and it looks likely to remain so for the foreseeable future, writes Myra Pinkham

Aluminium appears to have greater prospects for increased demand than most other base metals, but globally the aluminium market has been fairly balanced and it looks likely to remain so. That is because price rises seem to be met by the restarting of previously idled capacity – especially in China, which is where the greatest imbalance of supply and demand exists. This reaction, together with very high visible and invisible inventories, is likely to keep aluminium prices range-bound for the foreseeable future.

Despite all the trials and tribulations going on globally, aluminium demand growth continues to be “remarkable,” says Ron Knapp, secretary general of the International Aluminium Institute (IAI). He notes that global consumption will probably grow by 4% – perhaps even more – this year.

“As for end-market growth, aluminium has the best outlook of the base metals complex,” with potential to continue to grow nicely for the next five to ten years due to growing environmental concerns, not just in the Western World, but also in such big emerging markets as China and India, John Mothersole, director of research for the pricing and purchasing service of IHS Markit, says.

But while Kirstine Veitch, a principal consultant with Metal Bulletin Research (MBR), agrees that aluminium demand continues on a growth path, she says it is not booming, largely because China, which is said to account for about 55% of global aluminium consumption, remains an unknown quantity. She says that the Chinese central government’s “mini-stimulus” that was initiated late last year did help to some extent

– even better than expected. “But the question is what will happen in the next few months,” especially given the possibility that the Chinese economy could begin to slow down once again, as well as questions about China’s intensity of aluminium use.

Knapp says that, at least to date, Chinese aluminium consumption remains “impressive” with a 7-8% growth rate, which is a bit higher than the nation’s GDP growth.

Of course that is slower than it had been in the past. “Over the last 25 years China’s primary aluminium demand growth averaged about 16% per year,” Mothersole says, but that was off a much smaller base and different market conditions, including a rapid urbanisation of its workforce. He says part of that reflected the development of an urban infrastructure which did not exist before the country’s accession to the World Trade Organisation, as well as the development of a manufacturing base that since 2012 did not only bolster aluminium demand, but helped to create a widespread commodities supercycle.

More recently, however, Chinese economic growth has been slowing, Mothersole observes, noting that currently China’s top-line GDP growth is about 6.9% and that is expected to decelerate further to about 6.2% in the second half. “As a result there will be a transition away from fixed investments and manufacturing toward the service sector, which will have a negative impact upon commodities, including aluminium,” he points out.

The central government, being concerned about the recent softening of the Chinese economy,

has made some moves to stimulate growth, including its recent 5 trillion yuan infrastructure stimulus plan, which Mothersole says was responsible for a lot of the growth seen during the first half of this year. He, however, does not believe that this growth is sustainable, especially given that it does not address its highly stressed private sector, which might not just see its growth slow, but could actually contract.

Demand forecasts

MBR observes in its August 15 *Aluminium Weekly Market Tracker* that Chinese industrial production only increased by 6% in July, which was below both consensus forecasts and June’s level. At the same time July retail sales and fixed asset investment growth year-to-date to the end of July were lower than had been expected, indicating that China’s economy is still struggling. Despite this, MBR forecasts that Chinese consumption would still grow by 6.2% this year and by another 6.0% in 2017, which is still decent, but slower than the 8.3% growth rate in 2015.

While doing so at a slower rate than is being seen in China, aluminium demand in the rest of the world is also fairly solid this year, according to Leon Westgate, a commodities strategist at Standard Bank.

Year-to-date to the end of May, North American aluminium demand was up by 1.7%, with much of that demand being driven by downstream growth, particularly in the transportation sector, according to Matt Meenan, a spokesman of the Aluminum Association in the USA. This, he says, is a continuation of a long-term trend line of uninterrupted demand growth that began in 2009.

‘While we are still in a bear market, it appears as if the worst is over’

Veitch says the most important area of growth in North America has been increased use of aluminium sheet for automotive applications. Knapp says that already with increased auto output in North America and additional aluminium content in certain vehicles, such as the Ford F-150 pickup, there has been increased use of aluminium rolled products in the USA. "Over time there should continue to be a significant improvement in automotive sheet consumption there," he says. This comes as some industry observers predict another record year for North American light vehicle output with just under 18 million expected to be produced.

"While automotive is still a relatively small consumer of aluminium, it has a lot of growth potential," she says, as it is already moving from lower volume, high-end cars to certain higher volume, more commodity-oriented models, including its well-publicised, high-intensity use in the Ford F-150 pick-up truck. This is a big plus for domestic aluminium producers, Veitch adds, given that automotive aluminium sheet is a high-premium, high-value added product.

According to Sucten Financial's latest *Quarterly Metals Report*, North American aluminium demand is also being supported by its construction sector as the US housing market continues to enjoy a solid recovery.

Veitch says that while Europe is seeing similar growth for auto sheet, other sectors are pulling aluminium demand down, including lacklustre growth in the region's building and construction sector. Overall MBR is forecasting that Western European aluminium consumption will increase 1.4% this year after a fairly negligible 0.3% growth in 2015.

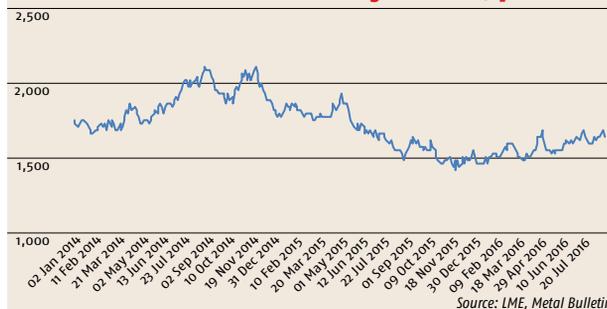
It seems to be too early to determine what impact the 'Brexit' vote will have upon aluminium demand. Steve Hardcastle, Sucten's head of client liaison, says that he does expect that it could have an influence on the UK's, and possibly the EU's, purchasing managers' indices. It does, however, seem that the Brexit decision is making people more cautious,

Global supply/demand balance in refined aluminium (millions of tonnes)

	2012	2013	2014	2015 (e)	2016 (f)
Production	47.8	50.8	53.8	57.3	59.0
Consumption	47.4	50.4	53.6	56.6	59.4
Balance	+0.4	+0.4	+0.2	+0.7	-0.4
Price (3m)	\$2,000	\$1,860	\$1,900	\$1,661	\$1,580

Source: IAI, WBMS, FastMarkets forecasts, Sucten

Aluminium Settlement LME Daily Official \$ per tonne



Source: LME, Metal Bulletin

especially on the semifabricated side, Veitch says. "It is making companies order more hand-to-mouth until they could assess the long term."

Veitch says that aluminium demand in Asia outside China is somewhat patchy with wide variations. Japan, for example, continues to have economic issues, while India appears to have some good growth prospects for the next 5-10 years even though its intensity of aluminium use has not been all that high to date. But that could change. "India's government is trying to make its economy more manufacturing based," she explains. "That could be a boon for aluminium in the next few years." Overall, MBR is predicting that that region will see a 3.6% growth in aluminium consumption in 2016 and another 5.0% boost next year.

There are also no particularly worrying substitution trends globally, according to Yang Cao, a MBR senior metals analyst, despite some movement towards carbon fibre composites in aerospace and some inroads by steel in the beverage can space. "Most of these impacts will likely be more margin-based rather than affecting overall volumes in the context of the aluminium market as a whole," he explains. Also there are some areas other than automotive that aluminium is making some headway, including winning some

packaging market share from PET and glass, and displacing copper in certain cabling and wiring applications.

"So barring an unexpected return to global economic stagnation, then aluminium's growth prospects still look good," Cao says.

The supply side

More attention has been paid to the supply side of the equation, and particularly the primary aluminium overcapacity in China.

Vivienne Lloyd, a senior analyst with MacQuarie, notes that there has been a lot of pressure for China to close some of its capacity, but some industry observers, including Standard Bank's Westgate, question whether that is necessary: "The question is whether the aluminium that China is producing is actually oversupply or just volumes that are needed to keep the market in balance," especially given the number of smelters that have shut down in North America and elsewhere in the world.

MBR's Veitch says that with China being in a technical surplus and the rest of the world being in a technical deficit, that is one reason that the global aluminium is so close to being in balance.

Others see it differently. Earlier this year Heidi Brock, president and chief executive officer of the Aluminum Association, testified that since the beginning of 2015 eight US-based aluminium smelters, representing about 60% of the total US primary aluminium capacity have either curtailed their production or have closed, leaving only two smelters fully operational in the USA today and only five US smelters left operating in some capacity.

"This rapid decline of primary production in the United States is clearly a major problem and an early indication of the consequences of sustained, non-market-driven aluminium overcapacity in China," Meenan recently told *Metal Bulletin*, noting that the Aluminum Association is calling for a bilateral, negotiated agreement between the USA and China to address the fundamental issue of aluminium overcapacity. "The industry will also be participating in a public hearing ▶

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in front of the US International Trade Commission as part of its Section 332 investigation into the factors that impact the competitiveness of the US aluminium industry," Meenan says.

Taken from a global point of view, however, changes in aluminium supply changes outside China, including closures in North America and Brazil and new capacity in Russia, India and Canada over the past few years, have been relatively small, MBR's Cao maintains. He points out that last year when LME aluminium prices fell to multi-year lows China not only delayed bringing on some new projects, but also has been idling some existing capacity. Cao estimates that China cut about 4 million tonnes of capacity in 2015 alone and idled another 1.6 million tonnes of capacity earlier this year.

Mothersole estimates that, after peaking at about 34.5 million tonnes in the first quarter of 2015, Chinese primary aluminium production slowed this year to about 27.5 million tonnes, which represents 75-80% capacity utilisation.

Sudden's Hardcastle notes that the recent production cuts were price-, not demand-, driven and were the reason that aluminium prices had not fallen as much as some other base metals.

Lloyd estimates that with the Chinese smelter closures the global aluminium market has come into much better balance, whittling down its surplus to just about 192,000 tonnes compared with the 1.3 million tonnes last year. This, Westgate says, is despite the fact that high aluminium inventories continue to "slosh around."

Just over the past year LME aluminium inventories have fallen to only 2.5 million tonnes, which is a 40-50% decline. "But there is a lot of uncertainty where those inventories are going," Veitch points out. "While some is going to the physical market, it appears as if some of the inventories are going off warrant to certain undisclosed locations and some material just seems to be dropping out of the system." She says this is also keeping the market in balance as opposed to slipping into deficit, or at least any sizable deficit. It is also helping to

keep aluminium prices fairly range bound.

That is not to say that prices have been flat. In the past few months they have drifted up with the LME three-month price trading at between \$1,600 to \$1,700 per tonne. Mothersole says there is some potential for prices to continue to gradually rise over the next six to eight quarters, possibly reaching as high as \$1,800 per tonne by early 2018. "The wildcard will be what happens in China."

Hardcastle says that now that aluminium prices have been going up it is very likely that China will restart some of its capacity. MBR's Cao agrees, stating that he believes that China is likely to not only reactivate 1.1 million tonnes of previously idled smelting capacity later this year but it is likely to commission about 2.4 million tonnes of new capacity as well. This could exert some downward pressure on prices, Cao says.

More semis?

At the same time there are indications that China could be increasing its exports of semi-finished aluminium products, taking advantage of government rebates to do so. "While there continues to be negative growth year-on-year, the amount they are exporting is becoming a little less negative," Cao says, explaining that in July China's exports were only down by 6.6% year-to-date to the end of July, compared with the 11% year-on-year decline for the first seven months of 2015. He says that he believes this trend will continue, especially with aluminium prices consolidating.

Robin Bhar, head of metals research at Société Générale, says to date that the only other countries where significant aluminium capacity has been added are Saudi Arabia with the Ma'aden joint venture, Bahrain with the additional production line at Aluminium Bahrain (Alba) and India. He maintains that the LME aluminium price would need to be much higher – \$2,000 per tonne or higher for a sustained period of time – for there to be more capacity growth outside of China.

"I think that it is inevitable that there will eventually be more

'I think that it is inevitable that there will eventually be more closures'

closures," Lloyd says. Mothersole agrees, stating: "There still are some zombies out there that are still walking. As long as that continues it will take a while for the market to turn around."

Raw materials

Aluminium market observers do not seem overly concerned with recent dynamics in aluminium raw materials, saying that there continues to be good availability of both alumina and bauxite. This is despite the fact that, according to Mothersole, the pricing mechanisms for these raw materials have changed. "In the past alumina and bauxite moved in conjunction with aluminium, but now they are becoming separate markets." That, he says, has been squeezing primary aluminium producers.

There has been a shift in supplying countries, Knapp notes. Indonesia was traditionally a major supplier of bauxite to China, but with the ore export ban there, a lot of that moved to Malaysia. But starting in January there was a temporary moratorium on mining in Malaysia due to environmental concerns. Knapp says that while there is still some bauxite coming out of Malaysia because of a build-up of inventories, the shortfall has largely been offset by an increase in imports from Australia, Guinea and Brazil. Cao says that in the first half of this year Chinese buyers also started to import bauxite from Vietnam and Turkey.

On sluggish aluminium demand, Cao says that alumina prices had fallen below \$200 per tonne – their lowest level since MBR started tracking the raw material – in July 2015. However, by the first half of this year the price recovered to \$260 per tonne, prompting some refineries to restart.

Overall, Westgate predicts that the aluminium market will remain somewhat "boring" for the rest of 2016 and into next year, remaining more or less in its current tenuous balance.

Bhar, however, sees more upside than downside. "While we are still in a bear market, it appears as if the worst is over," he says, predicting that in 2017 and beyond there could be a moderate improvement in aluminium prices.

Aluminium grows in Southeast Asia

Southeast Asia has built up a substantial downstream aluminium industry. Andrew Hall reviews the history, drivers, scope and scale of the region's sector in three key countries – Vietnam, Thailand and Malaysia

Vietnam

Vietnam has sharp divides between north and south. A glance at a map shows a long, thin territory, marked with development in the south around Ho Chi Minh City (Saigon) and development in the north around the city of Hanoi. In between is a largely undeveloped area, which includes such regions as the Central Highlands. These divisions have shaped the course of the country's development.

International influences and conflicts have shaped Vietnam's economic developments and the direction of its aluminium industry. By 1960 it was thought that the country had large bauxite reserves, but exactly how large, and to what grade, was unclear.

Some work was done on proving them in the 1970s by the Aluminium Corporation of China and a more extensive survey was undertaken in the late 1980s by a Japanese conglomerate that included Nissho Iwai and Sumitomo Corporation. A feasibility study estimated the proven bauxite reserves to be the third largest in the world and the quality of the bauxite to be very high.

Potential ready availability of hydro-electric resources in the general area of the reserves was also identified. Attempts were made to progress a joint Japanese-Vietnamese project, but no further progress was made at that time.

Some progress has since been made on realising Vietnam's potential for aluminium raw materials, but plans for primary

smelting in the country have been slow to progress (*see box*).

Downstream development

Although an aluminium rolling industry has not developed within Vietnam, a significant extrusion industry has been built. In the midst of an ongoing trade embargo imposed by the USA, interest in the sector was originally shown in 1990 by the Ministry of Heavy Industries through the Vietnam Electric Equipment Corporation in Ho Chi Minh City. With a brief to manufacture basic architectural products, but lacking experience in the extrusion industry, the company bought aluminium scrap from China, together with an old 400 tonne extrusion press with no instruction manual.

This hurdle was partially overcome when the company purchased an old 600 tonne press from a Russian source, which did come with an instruction manual. Unsurprisingly in the circumstances, the initial resultant products were of very poor quality.

The government had set up a company within the Ministry of

Building – Khanh Hoa Industrial, in Khanh Hoa province – in 1979 with a brief to develop building and construction, and transportation projects. It appears that its efforts to develop effective aluminium extrusion manufacture also ran into difficulties and the company accumulated large debts. It was privatised as a JSC in 2006 and restructured in 2012 – the business being pared down to concentrate upon aluminium architectural projects. Sources report that it is ramping up its production capacity to around the 100,000 tpy mark for domestic supply to the Central Highlands, and exports to Cambodia and the Asean countries.

Following the relaxation of the US trade embargo in 1995, the government set about developing industry incentives, including tax breaks, designed to attract foreign investment and the technology required. Very low production costs in Vietnam – including wage costs being typically 45% of those in South Korea and 35% of those in Japan – were a key driver for investment. By 2000 there were six extrusion companies operating, including two domestic companies set up by the government. The first of these to be established were Tung Kuang and Vietnam-Japan Aluminum Co (Vijalco).

Vijalco was established in 1996 as a joint venture between the Japanese partners Nissho Iwai (42%) and Ryowa Metal (Mitsubishi Group) (20%) together with the Vietnamese Sunimex company (38%). It was set up with a single extrusion press: a 1,630 tonne Cheng Hua machine imported from Japan. The Japanese partners brought with them a high level of technical expertise, and developed the company as one well able to supply value-added and niche products. The existing market, however, was predominantly for building products and furniture. The shareholdings of the Japanese partners swapped hands, with Tachibana purchasing the Mitsubishi lot, while the Vietnam's Ben Thanh Group took over the Sunimex holdings.

In 2010, the Sapa Group, seeking to develop its footprint in Southeast Asia, bought the Japanese holdings and made further capital investments to form a new joint venture with Ben Thanh, named Sapa Ben Thanh

Large extrusion companies in Vietnam

Company name	Company total capacity (tpy)
Global Vietnam Aluminium Co., Ltd.	100,000
Yng Hua Vietnam Co., Ltd.	42,500
Tung Kuang Industrial Joint Stock Co.	40,500
Khanh Hoa Aluminium JSC	40,000
Lixil Global Manufacturing Vietnam Company, Limited	31,500
East Asia Aluminium Co., Ltd.	29,500
Tung Shin Industrial Co., Ltd.	26,500
Hyundai Aluminum Vina	20,000

Source: Alken

Aluminium Profiles Co., Ltd., with shareholdings by Sapa (65%) and Ben Thanh (35%). Throughout the development of the Vietnamese extrusion industry the company has remained as one of the smallest in terms of production capacity, but with some of the highest technological capabilities. A further extrusion press of 2,800 tonnes was installed in 2016, more than doubling capacity from 5,500 to 13,000 tpy.

Tung Kuang was formed in 1995. It was originally established in 1989 as Pao Wei Industrial Co. in Changhua province, Taiwan, to manufacture architectural profiles for the local market. It became the first Taiwanese extrusion company to be attracted by the substantially lower operational costs in Vietnam. Its two extrusion presses of 600 and 800 tonnes were transferred to a 30,000 sq metre site in Bien Hoa. Two further presses were brought in from Taiwan, and production started in 1997 – mainly of architectural products for the local market. However, disagreements between the two principle shareholders resulted in the departure of one of them in 2000 to establish his own company, called Tung Shin.

Tung Kuang continued to expand business at their Bien Hoa factory and, with ever-increasing demand, a second factory was established in 2003 in Nhon Trac, to the southeast of Ho Chi Minh City. It was equipped with a similar portfolio of presses to that of Bien Hoa, but with additional powder coating facilities. A third factory was opened near Hanoi in 2010, equipped with eight presses. This factory manufactures 40% for export.

Tung Shin started operations in 2001 in Binh Duong province with six new presses in the 600-1,200 tonne range, imported from Taiwan, manufacturing building and construction products for the domestic market. Having established themselves, they turned their attention towards exports, starting in 2007. Together with a drive for exports came diversification into new industrial markets, typically components for automotive, bicycles, motorcycles and heat sinks. A new 3,000 UST extrusion press was purchased in 2010 – the largest press operating in Vietnam at that time.



TUNG SHIN

Tung Shin's 3,000 tonne press line in Vietnam

By 2016 the company had 13 extrusion presses, having installed a new 1,800 UST press at the start of the year, and with a 4,500 UST press in the factory, awaiting installation and production by the end of the year. Exports had increased to 50% and it is export manager Jeremy Sims' ambition to develop them further, with the production of a wider range of value-added products – some not previously manufactured in Vietnam. "Now we are aiming to produce aerospace profiles and are trying to get AS9100C certification, which is the standard required if we want to sell aerospace parts", he said. He acclaims the company as the pioneer in the country of manufacture on large extrusion presses.

Yng Hua was established in 1993 in Bien Hoa by the Yunghua Company, which is based in Taiwan, as a wholly foreign-invested company. The Yunghua Company had no manufacturing operations in its home country and relied upon the engineering and extrusion experience of its founder, Jung-Hua Kuo. Manufacture was originally of die castings for automotive and motorbike components. A second factory, the Mienhua Precision Mechanical Co. was opened in 2001 in Tan An, Long An province, to manufacture architectural extrusions.

A third factory was established in 2005, opening in Duc Hoa, Long An province in 2006 as a foundry, with facilities for the surface treatment and fabrication of electrical components. This factory was converted to an extrusion plant in 2015. A fourth factory was established to the south of Hanoi in 2012, manufacturing architectural products to serve the north of the country.

Two government-owned plants were established in 1999 in the Hanoi region: Gaet Company, and Song Hong Joint Stock Company.

Each had 4-5 extrusion presses in the typical range of 500-1,600 tonnes. These companies, along with most of the foreign-invested companies, were based upon the Chinese model of self-sufficiency. They were equipped with a small foundry for the melting and casting of aluminium ingot and scrap, a die manufacturing department, an extrusion shop with small Chinese presses and a surface treatment section with anodising and/or powder coating. A fabrication section would come later.

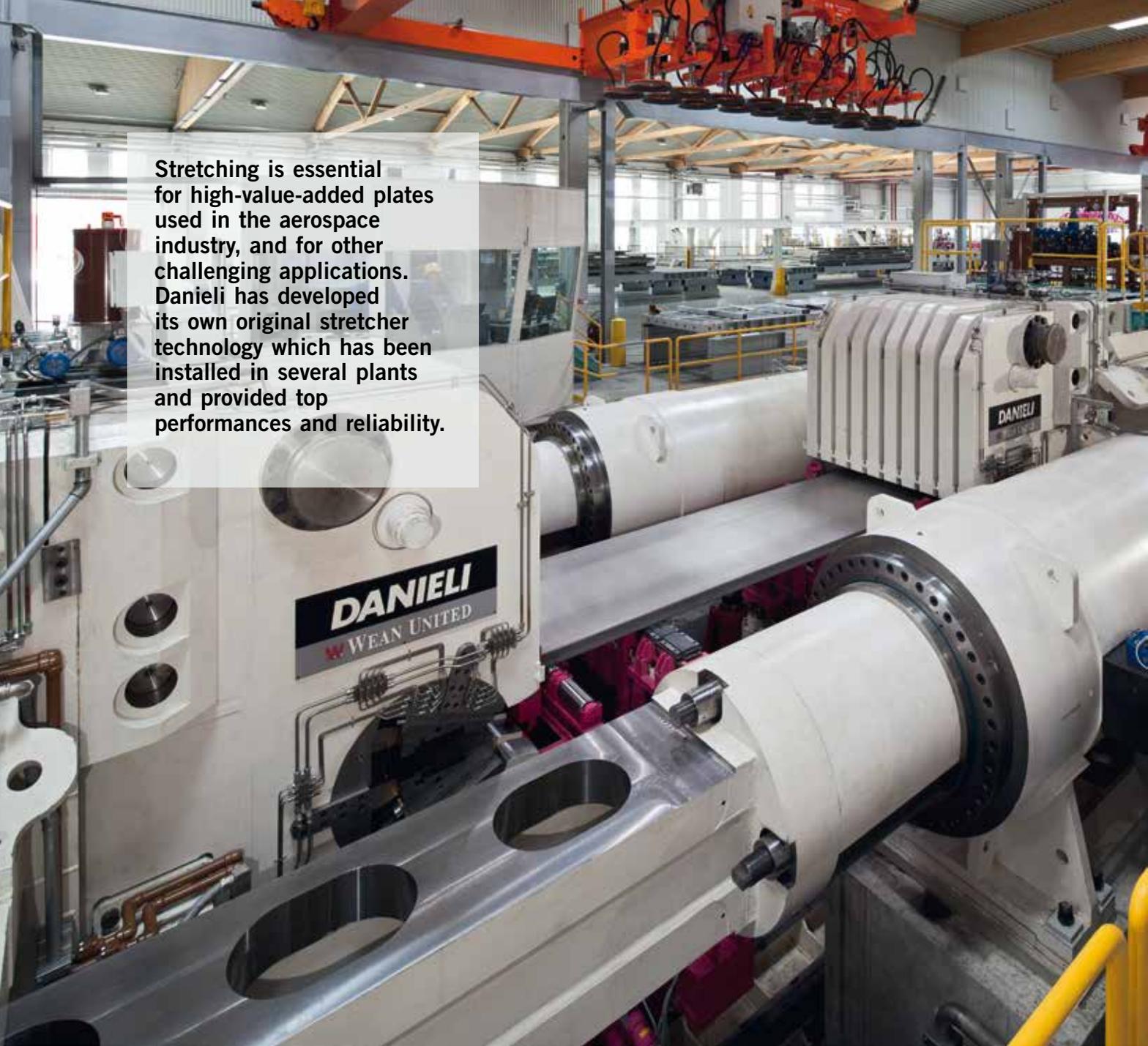
In all cases the most important section was that of engineering, and the ability to cope with frequent breakdowns of equipment. The Chinese model included an assumption that the expected lifetime of the extrusion presses was 6-8 years. Domestic demand was predominantly for very thin architectural profiles, with a thickness of 0.6 mm or less, which favoured production on small presses.

By 2000, annual extrusion production capacity was of the order of 30,000 tonnes – roughly that of domestic demand. This situation was to change rapidly in the following decade as more companies were established, particularly Japanese businesses as the 'hollowing out' of that country's aluminium industry gathered pace. For them the majority, if not all, of production was for export back to the home country.

Japanese companies established included Honda Metal Industries in 2005, Lixil in 2012 and Vina Washin in 2014. South Korean companies included Heung In Enterprises and Hyundai (2006). Another Taiwanese participant was Yihe Shern Enterprise, which established the Gold Well International company in 2002.

A particularly interesting development was the establishment of the company Global Vietnam Aluminium (GVA) in 2011. The company has spent a large amount of capital to build substantial production capacity.

GVA was set up with a large foundry to produce billet, comprising ten melting or holding furnaces in the 15-20 tonne charge range, three 15-tonne-charge homogenising furnaces and three billet casters, with capacity of 200,000 tpy. Its extrusion plant did not follow the well-trodden path of the majority



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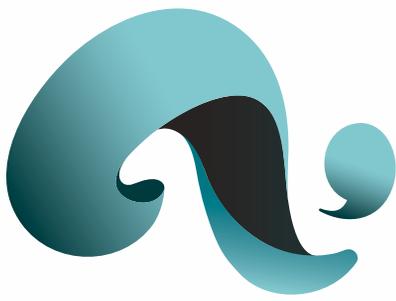
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Primary smelting plans in Vietnam

Vietnam's potential for primary aluminium smelting has been recognised by many companies over the past 20 years, but progress on a number of plans that have been drawn up has stalled or been slow.

The Vietnamese Ben Thanh Group developed a successful joint venture with a Japanese partnership of Mitsubishi, its subsidiary Ryowa and Nissho Iwai for an extrusion plant in 1996, called Vijalco. Following this success, the Ben Thanh Group approached Hydro Aluminium, which had itself been exploring development possibilities in Vietnam, and plans for an aluminium smelter were drawn up by 2006, but no further progress was made on that project.

Other international aluminium companies have also shown interest in Vietnam's smelting potential over the past 20 years, but have not proceeded. Aluminium Pechiney signed an agreement with the Vietnam National Minerals Corp (Vimico) in 1999 for feasibility studies to build a bauxite-alumina-aluminium complex in Lam Dong province. By 2006, Alcoa had formed a Cooperation Agreement with Vietnamese National Coal and Mineral Industries Holding Corporation (Vinacomin) for the development of a bauxite mine and alumina refinery in Dak Nong province, with first-stage capacity of between 1 and 1.5 million tonnes per year.

A further project was developed in 2006 by Dong Yang Gangchul, the largest extrusion

company in South Korea. The company had established a Vietnamese subsidiary, Hyundai Aluminium Vina, in the Hanoi region in the north of the country. It comprised three factories with 2,700 staff, dedicated to extrusion production, from casting through to surface finishing and fabrication. It also planned an aluminium smelting plant project in the north of the country of 350,000 tpy to serve an aluminium cluster of die casting, extrusion, rolling and forging utilising a hot metal road. This was devised with Vinacomin – its joint venture partner. Various socio-economic action plans were created, intended to contribute to the development of Vietnam basic industries, but ten years on the project has yet to proceed.

The mining of bauxite started in 2006, originally in Dak Nong province, later in Lam Dong province, as a loosely-defined joint venture between Vinacomin and China's Chalco. All of the mined bauxite was shipped to China. An alumina project started in 2008, again as a Vietnamese-Chinese joint venture, later to be taken over by the Chinese. Official export statistics for bauxite and alumina are not released, but are estimated to be about 4 million tpy.

In 2014, it was announced that work had begun on an aluminium smelting plant in the Central Highlands province of Dak Nong, with an estimated capacity of 300,000-450,000 tpy of aluminium. Commissioning of the first phase, with capacity of 150,000

tpy, was scheduled for 2016, and of the second phase, with a capacity of 300,000 tpy, for 2017. The final phase, with a capacity of 450,000 tpy, was scheduled for early 2019. The operation is due to be run by Tran Hong Quan Metallurgy Company and would be an important link between two alumina plants, in Dak Nong and Lam Dong provinces, and aluminium consumers. Tran Hong Quan Trading Company would be investing in the construction and development of the plant.

It was further announced that The Nhan Co alumina project, owned and operated by Vinacomin, would supply all materials for the plant. Vinacomin were said to have accumulated all the necessary experience and technology by this time. As of June 2016 the plant was still under construction and a final capacity of 600,000 tpy mooted.

The rather chequered pattern of primary aluminium project progress has been strongly influenced by the political picture of Vietnam that has evolved over the past 60 years. Vietnam sorely needed technological input from the West, but any production was destined to head towards China. In addition, some Vietnamese government officials have sometimes asked for substantial payments of what is euphemistically termed 'coffee money' in order for a project to proceed smoothly. If faced by such corruption, the participation of companies whose business ethics are governed by regulatory compliance has naturally been deterred.

of Vietnamese extruders, in which smaller presses dominate. By 2016, GVA's plant was equipped with multiple 800, 1,500, 2,000, 2,750 and 3,600 tonne presses, for an annual capacity of 100,000 tpy of extruded products.

Although the company started as a supplier to the domestic market, it soon switched attention to export markets. The majority of Vietnamese extruders and extrusion fabricators purchase their raw material from China in view of a price advantage in the 15-20% range, only excepting when material is required at short notice, when local purchases may be made. Since 2014, GVA has operated under an export-only manufacturing licence, with exemption on import tariffs and concessions on corporate income tax. It maintains a bonded warehouse within one of the southern area Free Trade zones.

GVA has comprehensive surface finishing equipment for anodising and vertical and horizontal powder coating, and has recently installed a fabrication department. This has enabled the export of a range of value-added products worldwide, in particular to the Asean countries, the Indian sub-continent and south America. A developing market is north America, where GVA has found demand for products from their 800 tonne press. Consequently the company has tentative plans to install up to 14 new presses in 2017, including several 650 and 800 tonne presses. So far they have not been using the 3.5 or 4 inch billet they manufacture, selling it instead; the new 650 tonne presses will give them this opportunity, and the prospect of further developing sales in North America, where presses of this size are scarce.

The Vietnamese local market appears strong in 2016, with a growth rate of 10-20%. The recently privatised JSC Khanh Hoa is said to be ramping up capacity to 100,000 tpy. It is also thought that there are plans to open a sister company, Quang Binh Aluminium, in Quang Binh province. Khanh Hoa is in the south central area, while Quang Binh is in the north central area, separate from the rest of the aluminium extrusion sector in Vietnam. Khanh Hoa, however, is close to Dak Nong and would be in a good position to profit as a downstream development of the Tran Hong Quan smelter whenever it comes into final realisation.

Thailand

Thailand's aluminium industry is relatively mature by comparison with Vietnam's. It has not seen the mushrooming of extrusion

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companies from Japan, South Korea and Taiwan that typifies Vietnam's story. The main Japanese inward investment in Thailand, Tostem Thai (which is the present-day Lixil, but is continuing to use the Tostem name in Thailand) had already set down its roots 30 years ago. The reduction of their operations in Japan occurred between 2003 and 2008. Lixil established the Lixil Global Manufacturing Vietnam Company in 2012 and the two companies operate in close association.

Industry in Thailand developed rapidly from the mid-1980s, following huge investment in the country, mainly by the Japanese. Development of the country's infrastructure and services failed to keep pace, and some of the investors withdrew in the 1990s. The biggest problems were water and power supply, and transportation. Access into Bangkok could only be effected by road, and Bangkok experienced some of the worst snarl-ups in traffic of any city in the world. Most of these problems had been overcome by around ten years ago, as had much of a historical problem of corruption within parts of the government.

Over the past ten years the transportation system has been dramatically improved, following the opening of Bangkok's MRT in 2004, and much of the outer ring road construction. Commercial negotiations have become more transparent, and many companies are gaining ISO, TS and other certifications, causing them to pay more attention to compliance.

Thai industries in general grew gradually but steadily until 2011 when a proportion was hit by floods. These had been a perennial problem in the area around Bangkok, but those of 2011 caused disruption that lasted for months at some companies and caused GDP growth for the year to drop from a 7.8% increase the previous year to just 0.1%. The impact encouraged Lixil to establish their Vietnamese plant as a back-up.

Economically, much of the Thai aluminium industry which focused on high-volume, low-quality products has been struggling for at least the past five years, and the blame is placed firmly on a different type of flood – that of imports of cheap aluminium products from China. The government has been



THAI METAL

accused of doing little to help local industry, with only very modest import taxes being imposed. This has affected the extrusion and rolling industries in equal measure, with certain extrusion companies in the extrusion industry reducing their workforce by up to 40% and idling up to 60% of their presses. The overall general state of the industry might be described as “Not so good, but not so bad”.

One of Sumitomo Light Metals' areas of speciality was the production of extrusions for automotive air conditioning systems. The company Sumikei Techno (Czech) had been established in the Czech Republic in 2002 and, in order to continue their policy of global expansion, a sister company, Sumikei Techno (Thailand) was established in 2010 in the Rojana Industrial Park in Ayutthaya. The plant was equipped with a 2,000 tonne Ube extrusion press shipped from Kobe Steel's plant in Chofu, Japan, a tube drawing line, heat treatment furnaces and cutting machines. Manufacture was of extruded shapes and multiport tubes for automotive air conditioners, much of it for supply to Denso, a Tier One supplier to many of the OEMs in Thailand. With the merger of Sumitomo Light Metals and Furukawa to form UACJ in 2014, the plant became UACJ Extrusion (Thailand) or UATH. A second plant in nearby Prachinburi was opened in 2014. It was also equipped with a 2,500 tonne extrusion press shipped from Chiba, a coating line and five cutting lines. Manufacture at the Prachinburi plant is of tubes and radiator fin stock. UACJ (Extrusion) are giving some consideration to moving at least the Rojana plant to the site of UATH's rolling plant in Rayong as a precaution against

Thai Metal's extrusion plant

flooding, the Rayong site being an elevated one, which is said to be flood proof.

UACJ's extrusion operations in Ayutthaya are in direct competition with another Japanese manufacturer of extrusions for automotive air conditioning systems – Mitsubishi Aluminum Co. It set up a joint venture operation with the domestic extruder Muang Thong back in 1997, Muang Max, for the production of multi-port tubing. Muang Thong's plant is adjacent to that of Muang Max, just off the Bangna-Trad road at Bang Chalong.

A private company, Muang Thong is owned by the Kuvinchkul family. It has established itself since 1980 as a reliable source of quality extrusions. It had a strong partnership with MT Alumet from 1993 to 2014, a company also based just off the Bangna-Trad road, at Bang Samak, with four extrusion presses, manufacturing for the building and construction industry, and with a modest production of furniture and heat sinks. The break for independence represented an amicable split within the Kuvinchkul family, Anchan (assistant managing director) moving to the new Alumet company.

Muang Thong added their fifth extrusion press in 2015, a 1,000 tonne press from South Korea. Despite the prevailing mood within the country of despondency in the midst of continuing cheap Chinese imports, Sirincha (assistant MD) was confident: “Yes, the market is difficult just now, but the extrusion market in Thailand has always been difficult. As far as competition from Chinese imports are concerned, we are well able to compete on quality,” she said.

Thai Metal Aluminium is one of the oldest extrusion companies in Thailand, having begun operations in 1979 as a small factory supplying extruded sections for further processing into doors and windows by other local manufacturers. With the upturn in the Thai economy in the mid 1980s, following industrialisation in the country, extrusion presses were installed. As a purely Thai-owned extruder at that time, it prospered and expanded into extrusions supplied to many industrial sectors. A foundry was completely rebuilt in 1996 and capacity increased to 22,000 tpy; production was

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extended to logs, which today are also supplied on the domestic market. A new factory was built in 2010, a mile from the existing plant. It was equipped with two new presses: a Taiwanese press of 1,000 tonnes and a 3,000 tonne Ube press, bringing their portfolio up to seven, with a combined production capacity of about 30,000 tpy.

The company was invested in by Sankyo Tateyama of Japan in 2015, and since then has benefited from the exchange of information with the other extruders within the Sankyo Tateyama group in Japan, Belgium, Germany and China. Supat Ratanasrivilai, managing director of the company, considers Thai Metal Aluminium to be the largest industrial extrusion producer in Thailand, with fully integrated facilities providing one-stop services to customers in a variety of industries in Thailand. “We don’t have the production capacity of some other extruders where most of their manufacture is for the architectural industry. We have a far greater variety of products in so many industries, such as hard disks, automotive, hardware and tools, electronics, exterior products, and buildings. In particular, we are Tier Two suppliers to the automotive OEMs such as Toyota, Isuzu, Ford, Honda, Mazda, Nissan and Mitsubishi. We have diversified into 4xxx series alloys for forging and 7xxx series for automotive crash management and now have an extensive fabrication department, so we can supply them with complete parts,” he said.

The stalwart of aluminium extrusion production has long been United Aluminium Industry Company (UAI). The company originated from two extrusion plants: The Sophonpun company, owned by Kumpol Pinijsophonpun, and Saha Loha Karn, owned by Kosin Chinmethipitak. The two companies joined forces in 1995 to form UAI, with Kumpol taking over ownership of both plants. A new factory was built on a site of 720,000 sq metres in Prachinburi. This has expanded to its present collection of six extrusion presses, including one Ube and one SMS 1,630 tonne press, and one Ube 3,000 tonne press.

The plant is also equipped with a large foundry equipped with

Hertwich furnaces, which supplies UAI as well as the local market with logs, and anodising and powder coating facilities. Saha Loha Karn became United Metal Works, and new presses of 1,130 tonnes and 1,630 tonnes were installed. Concentrating primarily upon supply to the building and construction industry, UAI has become the biggest supplier to the domestic industry, and one of the largest in Southeast Asia.

Rolling projects

The rolling industry in Thailand has seen two major projects implemented over the past decade. The first was that of Meyer Industries of Hong Kong, manufacturers of kitchenware. They set up a new plant in Laem Chabang, just north of the resort of Pattaya, in 1990. It began operations importing aluminium discs and circles from their rolling mill in Hong Kong to manufacture cookware. A continuous caster and rolling mill was installed in 2003 and by 2005 the mill was supplying circles for the adjoining fabrication plant, manufacturing at a rate of 100,000 pans per day. The Meyer operation – headquartered, and with its largest manufacturing facility, in Hong Kong – has grown to become the second largest manufacturer of aluminium cookware in the world.

The second major Thai rolling project began in March 2012, when Furukawa-Sky Aluminium Corp, with an investment of Y1.3 billion, began construction of a new rolling mill at the Amata City industrial estate in Rayong province – the first stage of a project to develop capacity to 300,000 tpy.

Two cold rolling mills of 1,420 and 1,470 mm width were decommissioned at the company’s

Large extrusion companies in Thailand

Company name	Company total capacity (tpy)
Tostem Thai Co. Ltd.	70,000
United Aluminium Industry Co., Ltd. [UAI]	27,000
Schimmer Metal Standard Co. [SMS]	21,500
Thai Metal Aluminium Co. Ltd.	20,000
Muang Thong Aluminium Industry Co. Ltd.	19,500
Almet Thai Limited	15,500

Source: Alken

Fukaya plant in Japan and shipped to Thailand for the new plant to manufacture such products as can body and end stock, automotive heat exchangers and electrical components. The plant began operations in January 2014, with hot rolled coils supplied from UACJ’s Japan plant. A coil centre, which was based at the Rojana Industrial Park, had been relocated to this site in 2012.

While the first stage was in progress, second-stage construction began in 2015 with the installation of a foundry with melting and casting facilities, together with a 2,250 mm wide 1+4 hot rolling line, a 6-hi cold rolling mill and ancillary facilities including a tension leveller, coating line and slitters. This was the first tandem mill to be installed in Thailand, and by far the largest rolling mill. It was the first rolling mill in Thailand able to supply can stock, with a capability to supply up to 40% of domestic demand. Second-stage commissioning was completed in 2016, with an integrated facility of capacity of 192,000 tpy. UACJ intend to increase capacity to 300,000 tpy and to transform the Rayong works into a major manufacturing and supply base, both in Thailand and worldwide.

Since the 1990s Thailand has seen the development of around a dozen companies operating pull-over and strip mills for the production of circles for the manufacture of kitchenware. Two of these have flourished – or at least coped with the ever-increasing challenges being encountered, which are primarily the rise of large fully-automated rolling mills, able to produce aluminium sheet and circles at lower costs, and the threat of cheap Chinese imports. Meyer is the first of these (discussed above), and the second is Aluminium Chue Chin Hua.

The latter’s operation is based upon two Hunter continuous casters producing coil of width 1,475 mm and a Hunter 4 Hi cold rolling mill ▶

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Aluminium

of roll width 1,625 mm. Also in use are four 2 Hi cold pull-over mills of roll width 950 mm. Half of the company's production of circles is for the manufacture of kitchen utensils, marketed under the 'Crocodile' brand, one of the largest in Thailand. The balance is sold to third-party manufacturers.

The main problem is with imports from China. Sheets and discs for aluminium cookware are selling at much lower prices and have become commodity products. There is no formal trade agreement between Thailand and China, consequently there is very little tax on the Chinese imports. Chue Chin Hua compete on quality, with some of their customers having returned to them after they have used the poorer quality Chinese product. The company has also extended its production into street lighting and poles – products which they have exported since 2005 to Myanmar, Cambodia, Vietnam and Laos at a level of 10% of output. The production manager commented: "We are better able to compete with the Chinese in these markets than we are in Thailand. They are looking for higher quality".

Malaysia

Malaysia's aluminium industry is relatively mature. It saw early investment by one of the majors in the global industry, Alcan, from 1960, and from VAW/Hydro Aluminium from 2001. Nippon Light Metal in Japan also became involved, partly in view of their investment by Alcan and subsequent cross-shareholding arrangements. Another Japanese company to invest in Malaysia was Fujisash, which established a subsidiary in 1972. It was invested in by Comalco of Australia in 1979 and renamed Federal Aluminium. Also, Japanese companies Fujikura Electric Wire and Cable and Furukawa Electric invested heavily in Malaysia's wire and cable industry.

The domestic industry saw the development of several small companies in the 1970s and first half of the 1980s, but an over-expansive building and construction programme in 1985-6 resulted in considerably more hotels and office blocks than were required. The net

result was severe depression within the aluminium industry throughout the latter part of the 1980s. The industry began to pick itself up on the back of the worldwide economic boom in aluminium, and Federal Aluminium was reinvested by Fujisash (80%) and Marubeni (20%) in July 1990. The company became one of the country's two major extrusion companies, the other being Alcan's Aluminium Company of Malaysia (Alcom, which was also a rolling company). The period to the end of the 1990s saw the rise of smaller domestic-grown companies, who all experienced tremendous increase in demand and developed new facilities: Jannik, LB Aluminium, Kamco, NCK and Press Metal.

The stand-out performers at the turn of the century were undoubtedly LB Aluminium and Press Metal, and the two companies have vigorously competed since their inception. LB Aluminium was established in 1985 and operated with two extrusion presses in a small factory in Kuala Lumpur, moving to a larger factory in Semenyih in 1990. By 2000 they had acquired five extrusion presses, ranging in force from 320 to 2,500 tonnes.

The latter press, installed in 1997, was the largest press operating in the country. Production was still predominantly for the building and construction industry. By 2010 their portfolio had expanded to 12 presses, ranging in force from 350 to 2,725 tonnes, including three Japanese Ube presses. The importance of the building and construction industry had dropped to 70%, with products for the electrical and electronics industry accounting for 20% and products for transportation beginning to develop.

LB Aluminium extended their operations to Sarawak in 2009 when they acquired the premises of the extrusion plant Classic Emas in Kuching – one of only two extrusion companies manufacturing in Sarawak. Classic Emas moved their presses to a new site nearby, while LB transferred over two presses from their Semenyih plant. One further extrusion press was installed at Kuching in 2013. By 2016, LB had 14 extrusion presses at their Semenyih site and three at their Kuching site.



LB Aluminium Berhad in Malaysia

Press Metal established in 1986 at a small factory in Balakong, in the south of Kuala Lumpur, with two extrusion presses of 350 and 500 tonnes. They moved to a new factory in Klang in 1989, adding a third press at this time, then to their present base nearby in Klang in 1994, with a factory area of 60,000 sq metres. By 2000 they had acquired five extrusion presses, ranging in force from 600 to 2,000 tonnes and their reliance upon the building and construction industry had fallen to 60%. The Alcom extrusion operation closed in 2002 and by 2005 Press Metal had incorporated their two presses, together with a newly-installed one, into a new company: ACE Extrusion, operating within their Klang site.

Press Metal began operations in China in 2005, building extrusion plants firstly in the developing Sanshui Industrial Park in Foshan, then in Hubei. This development was largely to fuel the ever-increasing demand for exports. Press Metal had opened an office in the UK in 1999 and just 5-6 years later had become one of the most successful companies exporting extrusions to the UK and Europe from their bases in China and Malaysia.

The extrusion plant in Foshan was rapidly populated with Chinese presses, totalling more than 20 by 2014, with a total production capacity of about 100,000 tpy. The development at Hubei was not quite so extensive, reaching a dozen presses by 2014, with a total production capacity of about 30,000 tpy.

Over this period the company gave priority for extrusion expansion to the Chinese Press Metal International plants and their Malaysian plant did not expand at the same rate, compared with their Chinese operations or to other

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Malaysian extruders. By 2016, the company had 13 extrusion presses with a total production capacity of 42,000 tpy.

In parallel with the development of extrusion operations in Hubei, Press Metal made an agreement in 2006 to acquire all of the assets and liabilities of a power generation plant and a smelting plant at the site, taking a 90% shareholding in the new company: Hubei Press Metal Huasheng Aluminium Electric Co. Ltd. Profitable operation of this company proved to be difficult, although the operation was invaluable in terms of the technical experience gained in the general operation of a smelting plant.

'1Malaysia Development' was established by the Malaysian government in 2008, with a minority shareholding by the Abu Dhabi-based Mubadala Development Company. It developed ambitious ideas for a primary aluminium smelter in Sarawak together with associated downstream industries: a large rolling mill, 10 extrusion plants and a casting plant, all within the scope of investments of \$1.8bn or more. 1Malaysia subsequently turned the whole project over to Press Metal, who had already shown interest in developing operations in Sarawak and had the necessary technical prowess, gained from their operation of the Hubei smelter. They undertook the development of Press Metal Sarawak in 2009 at Mukah, with Sumitomo Corporation later taking a 20% interest in the company and certain technology supplied by Chalco.

It reached its first phase production capacity of 120,000 tpy in 2011. This was followed by a second smelter, Press Metal Bintulu, which started in 2012 at the Samalaju Industrial Park with an initial capacity of 50,000 tpy, and reached its full production capacity of 320,000 tpy in 2014. Sumitomo Corporation again took a 20% interest in this company. Press Metal sold its assets in the loss-making Hubei upstream operations in 2013, having transferred technical know-how from them to Mukah. The profitability of the Chinese extrusion plants had always been low, and from 2014, exacerbated by the downturn in the Chinese economy,

Large extrusion companies in Malaysia

Company name	Company total capacity (tpy)
LB Aluminium Berhad	44,000
Press Metal Berhad	43,000
Selaco Aluminium Berhad	10,500
Harvest Aluminium Factory Sdn. Bhd.	9,900
P.A. Extrusion (M) Sdn. Bhd.	8,500
Winstar Aluminium Manufacturing Sdn. Bhd.	6,500
Tong Heer Aluminium Industries Sdn. Bhd.	6,500

Source: Alken

fell even lower. There have been rumours and news stories that Press Metal would close these plants and transfer the presses to Malaysia, but those have been denied by the company.

A second-stage development at Bintulu for a further 320,000 tpy capacity was started, for a total smelting capacity of 760,000 tpy. The plant is based around 400 kA technology, enabling a higher production output with lower energy consumption compared to lower amperages. There are plans for an extrusion plant to be developed at Mukah with capacity of 100,000 tpy on final completion of the smelter developments.

Both LB Aluminium and Press Metal have invested heavily in recycling facilities. LB Aluminium have an associate company, Formosa Shyen Horng, which is based opposite their main factory at Semenyih. It has a recycling capacity of over 100,000 tpy. Similarly, Press Metal have invested in their own foundry at Klang, as well as at their smelters in Sarawak to develop recycling facilities with capacity of 200,000 tpy. Both companies operate a toll recycling scheme, taking customers' factory scrap and processing it through to billet. With the extruders themselves taking back customers' scrap, the overall recycling rate in Malaysia has increased and has resulted in several extruders taking the decision to close their own foundries.

Outlook

The general outlook for the Malaysian aluminium extrusion industry since 2014 has been gloomy, based largely upon the slowing Chinese economy and its effect upon the emerging markets in Southeast Asia. The very high level of debt

incurred by most Malaysian companies as a method of operation, coupled with concern over the long-term status of some government-linked companies, has seen falls in stock market confidence and resultant capital outflow and depreciation of the Malaysian ringgit, which has seen deterioration from typically 3.2 in 2013 to 4.3 in 2016 against the US dollar. This has had a particularly severe effect upon domestic demand for extrusions and has generated a need to look outside Malaysia for markets in order to expand.

Kamco Aluminium was established in 1982 and has developed as one of the steady performers amongst Malaysian extruders. The company is equipped with four extrusion presses. The latest, a 1,150 tonne press from Qi Sheng, being installed in 2016. Kamco is one of a handful of extruders in Malaysia with fabricating facilities, the engineering department specialising in design fabrication, with two CNC machines and TIG welding. CEO T C Lim commented "Both our fabricated products and export percentages are increasing so we must take special care throughout the manufacturing process, and in particular the packaging requires a lot of work. A lot of our workers now are from Myanmar, and these people are very smart, they learn new techniques very quickly."

Another company enjoying success, with an ever-increasing percentage of both fabricated and exported products, is Genesis Aluminium Industries, established in 2010. With just two extrusion presses – a 1,000 tonne press installed at start up and a 1,500 tonne press installed in 2015 – they have made a speciality of the manufacture of shower enclosures in polished bright dip and nickel brushed finishes. These products are exported worldwide, in particular to the USA, UK, France, Germany and Thailand, and their exports are now over 95%. As with Kamco they have to take great care with the handling of products at all stages, where their major enemy is scratches.

The author is a UK-based expert on the global downstream aluminium industry



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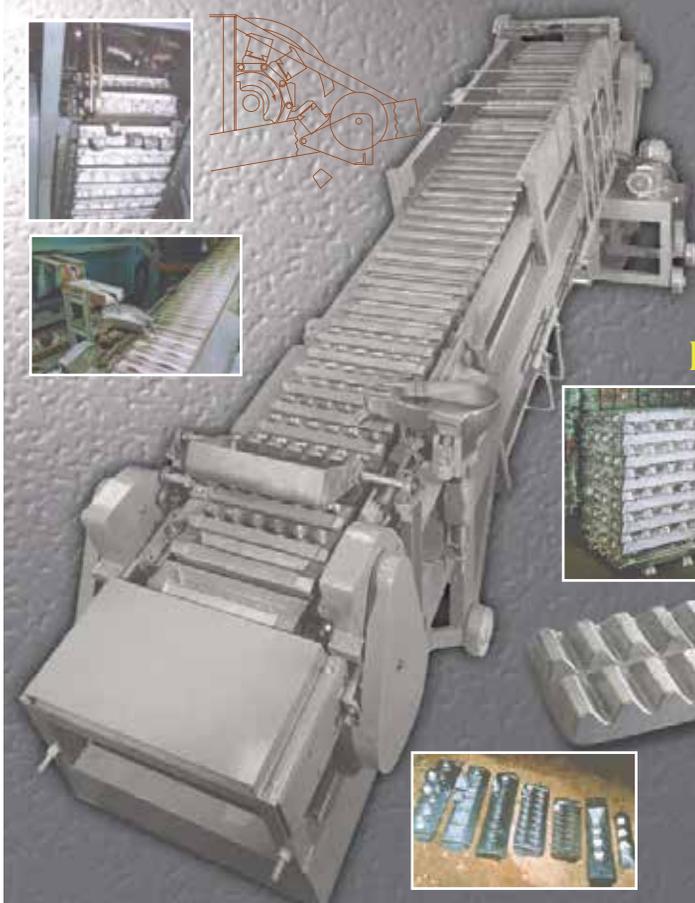
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Advancing aluminium

Research and development has become ever more important for competing materials to gain or maintain their advantage. Several senior Sapa staff explain to Richard Barrett how the major aluminium extrusion company's international approach to R&D works

Many users of products manufactured from extruded aluminium profiles, tubes or hollow sections will not give a second thought to the technology and effort that has been put in to make them. It is a mark of the success of the scientists, engineers, technicians, and plant operators who design and make them that they do not. If a final product functions efficiently, safely and reliably – and is sufficiently cost-effective and aesthetically pleasing to have been purchased by a user – its manufacturer's and their component and sub-component suppliers' work is done.

Tracing back the origins of any given product's design, such success ultimately rests on the expertise and skills of thousands of people, building on the experience of, commonly, decades of R&D work. That work occasionally generates 'breakthroughs', but more often than not advances depend on weeks, months and years of painstaking, iterative modelling, testing and prototyping to take multiple small steps forward and deliver the next generation of higher-performance products.

Alloy composition is a key factor for aluminium extrusions. Others are careful control of fundamental parameters such as pressure, temperature and metal flow speed during the extrusion process itself, followed by the forming, joining, and sometimes coating, processes used to turn them into useful components in their final applications.

Global extrusion company Sapa has experts in all of these areas. The company's 1,000 engineers world-wide work on aluminium alloys and process development,

heat transfer, transportation and building & construction. Each R&D division has its own specialisations, with work organised both by its nature and end-user sector (*see table*).

Janne Strid, vice-president of corporate R&D, confirms two main approaches for Sapa's R&D: a 'customer-led' approach and an 'R&D approach', leading to development by an applications engineer. Some call it "Market Pull" and "Technology Push", respectively, but that might be misleading, according to Strid. In explanation, he differentiates between specific customer issues needing study, and ideas generated inside Sapa itself that initiate activity. While any given project's

origins determine the urgency and the means by which it is handled – whether initiated by "push" or "pull" – Strid emphasises that all of Sapa's R&D is actually "business-case driven."

Many projects in Sapa's R&D portfolio relate to internal concerns, like Sapa's own production processes. While not being directly visible to an external customer, Strid emphasises that these activities often provide the preconditions to later create more obvious customer value. He says that they are consequently as important as the more visible product development activities. "Without such evolutionary development work, no industry will survive over time. Likewise, of course, nothing will ever be profitable if it fails to reach the market place," he explains.

To that end, Strid and his colleagues in Europe work closely with Jonas Bjuhr, director of product development for Sapa Extrusion Europe, on market-related R&D to assess the viability ▶

Sapa's international R&D

Sapa has R&D hubs in Sweden and the USA and does research and application development in China, Denmark, France, Germany and Norway. It also works with selected independent materials science and engineering institutions around the world.

European product development – Extrusion design and product optimisation, strength and thermal simulations, project management.

Precision tubing technology centre – Tube extrusion and tube welding technology, alloy and coating development, brazing technology, surface development, corrosion and corrosion design, product and heat exchanger design, Finite Element Modelling (FEM) simulation.

Application development Asia – Material and metallurgy, extrusion, application development, thermal analysis, friction stir welding.

North America technical centre – Product design and development, thermal analysis, product

simulation, EDM prototyping, metallurgical plant support.

Building systems R&D – Design of aluminium-glass system solutions for the building envelope, building physics, statics, thermal and acoustic performance, weather and tightness performance, fire resistance, security applications, testing and certification according to EN standardisation, zero-energy buildings.

Corporate R&D – Hubs in Sweden and the USA support application development activities with advanced calculations, metallurgical investigations and materials development, longer-term research and advanced equipment.

Sapa Profile Academy – The Sapa Profile Academy provides the company's main training programme for aluminium extrusions. It aims to provide its customers with a deeper understanding of aluminium principles, tooling design, fabrication, current applications and new technologies.

Hot gas forming – a long-term project

Hot gas forming of extruded aluminium tubing has similarities with hydroforming. But whereas the latter achieves a typical circumferential expansion of 13-15%, hot gas forming can deliver an expansion of 50% or more, says Martin Schön, manager of application technology. “The main benefit at elevated temperature is formability,” he adds. “We can create more complex shapes.” He also explains that the forces needed are much lower for hot gas forming of metal, allowing lower pressures to be used. Operational cycle time is similar to that achieved with hydroforming, so is feasible for medium- and high-volume production. The process has been developed and refined since work commenced on it nearly ten years ago.

Sapa has primarily been using the now well advanced hot gas forming technology to produce prototypes for the automotive industry, but it has also interested furniture manufacturers, who are attracted by its ability to produce complex and aesthetically pleasing shapes instead of using a draw-bench. Some tubes have been hot gas formed into complicated shapes for commercial mountain bike production.

“We are much closer to industrialisation now,” Schön stresses. “Customers are keener to work with us.” Aside from the advances made in hot gas forming itself, in explanation he points to the wider global trend of the growing use of aluminium for automotive applications – as castings, sheet and extrusions – as well as automotive customers’ experience of hot forming and stamping steel, making them more comfortable with the idea of hot-forming aluminium.

Jonas Bjuhr, director of product development, Sapa Extrusion Europe, and his team are at the forefront of explaining the merits of hot gas forming to potential users of the fruits of the process. They are identifying the markets and applications where it can be usefully deployed and explaining it to customers. “It’s a very exciting opportunity to demonstrate the many very different designs it enables and their advantages,” says Bjuhr. “What are the benefits?” is naturally the short question most commonly asked by customers, he notes.

For the R&D and process demonstrations undertaken to date, the largest-diameter hot formed components have been in the 150-170 mm range and



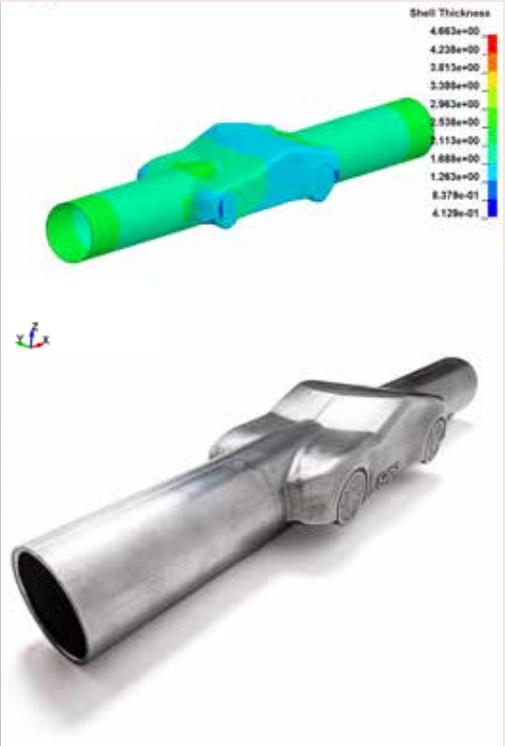
Complex shapes can be created through hot gas forming

the maximum length one metre. Schön is confident that as the process is more widely adopted on an industrial scale, the component sizes produced can be larger still.

Computer simulations

To assist potential users of hot gas forming, Sapa has also developed a detailed computer simulation model of the process, in order to support feasibility studies into the capabilities of the technology for making customers’ component designs. “The customer typically provides a CAD model and we do the process simulation,” Schön explains. A detailed simulation that models material behaviour at the high temperatures and strain rates needed is used. Advances in computer modelling and power now enable higher resolution finite element analysis to achieve more accurate simulations and process predictability.

“Models for hot gas forming have become quite reliable,” says Schön. Crucially they can be used to forecast whether a crack will appear in a component if too thin a tube wall thickness is selected, potentially saving a manufacturer the cost of purchasing an



expensive die when one designed to produce a thicker wall will actually be needed. Schön says that such computer modelling can predict an outcome to within 10-15% of the results achieved through physical testing. Sapa is also developing other simulation methods and models to describe processes like extrusion and friction stir welding, partly in house and partly with the help of external software houses.

For example, Sapa works closely with NTNU (Norwegian University of Science & Technology) in Trondheim, Norway, which has established its own centre for modeling, and other universities worldwide, as well as more commercial players. Janne Strid, vice-president of corporate R&D, explains that the work is “based around concepts of simulating (automotive) crashes and forming”, both of which entail very big material strains.

He confirms that the accuracy of computer modelling has increased as computers have become more powerful. “Extrusion models have come quite a long way in the last five or so years,” he says. International benchmarking events are also helping to improve accuracy. “We are getting more predictable results.”

of any given project. Bjuhr's role is to be close to both Sapa's customers and markets in order to help them optimise their products and to provide links to Sapa's R&D teams. Some projects will proceed on the basis of a business agreement with an external customer. Others go ahead where Sapa themselves see a compelling trend for potential future demand. Similar arrangements are being set up in the USA, says Strid, including the official opening of Sapa's Corporate R&D unit near Detroit in April this year.

Long-term projects

Martin Schön, manager of application technology, based in Finspong, Sweden, leads a team of nine researchers on forming and joining applications. He says that he spends 10-20% of his time on fundamental research, based on projects that sometimes can take 10-15 years to mature. Another 20% of his team's time is spent on applied research. The balance addresses the, usually shorter term, 'customer-led' projects.

Sapa's work on hot gas forming extruded aluminium tubing provides a good example of a long-term process technology development generated in house (*see box*). Strid explains that work on this technology was initially motivated about 10 years ago as a strategic project to address several key challenges faced by aluminium alloys. Those include a generally lower strength than steel, differences in forming properties, different spring-back behaviour leading to challenges relating to geometrical tolerances (or "exactness in shape") and also price differentials with most steels.

Strid says that hot gas forming has successfully addressed all of those factors. Working at high temperature makes aluminium alloys very formable; product strength may be delivered exactly where needed through more design freedom; the process consistently delivers components to high geometrical tolerances; and it is cost-effective in enabling extensive functional integration – effectively replacing many parts with one. "It puts the customer in a better position," he stresses.

Electric vehicles

The path leading to Sapa's supply of extruded products used as battery supports and frames for electric vehicles emerged as a future customer requirement.

Bjuhr says that Tesla has catalysed the market for electric vehicles and that all of the major car manufacturers are developing them now that vehicles with a useful range between charging can be made.

Aluminium alloy extrusions are light, strong and good at absorbing energy in a crash, making them a practical choice for housing batteries. The ability to design in cooling features (such as fins) to their design adds to their value to the electric vehicle sector, Bjuhr explains. They are also used to make smaller battery frames for hybrid vehicles.

The battery frame of an all-electric car can cover the whole floor of the vehicle and comprise between 30 and 100 kg of extrusions, notes Bjuhr. The largest frames, conceived with Sapa as a complete system, can include up to 20 different profiles, he adds.

For some automotive applications, aluminium extrusions are competing with aluminium sheet, but Bjuhr stresses that the choice is often influenced by the car manufacturers view on what will work best with their own technologies and for their quality, weight and tolerance requirements.

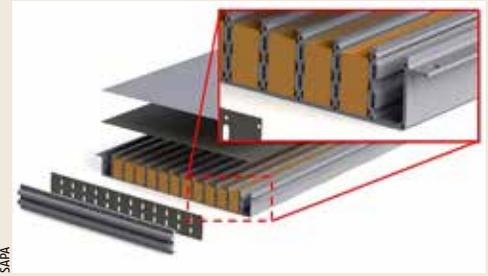
Automotive is a market sector in which Sapa's, and wider EU-funded, research into effective

While forming process developments are typically internal initiatives, most other far downstream projects are directly generated by customer demands. These projects come in many shapes and sizes, from short-term technical service troubleshooting – perhaps a tweak is needed to an existing production process – through to fundamental engineering design work that may take as long as a year or two in advance of a customer's major new product launch.

Experience tells

Bjuhr says that the best approach for a particular customer clearly depends on their existing level of experience in the end-use markets for their products, and in using aluminium and extrusions in particular. For those with a high degree of familiarity, it can be a rapid process to provide an optimised and cost-effective design.

Some customers may have very specific concerns, such as whether a



Battery packs with integrated cooling

means of joining dissimilar materials is particularly relevant. Schön's team helped by process validation of the likely impact on a battery of a crash and also looked at the options for joining the frames through MIG or laser welding. Sapa has studied mixed material joining techniques to join different grades of aluminium alloy as well as to some types of steel. Options include RSW, SPR, MIG, FSW or bonding with adhesives.

Studies were encouraged in recognition of the automotive industry's light-weighting requirements and the reality that no single type of material can serve every purpose in a car. Schön says that Sapa have been working with a US car maker on battery trays for 5-6 years and also notes other European carmakers' efforts to develop electric vehicles further.

new or existing product design will require modifications to maintain or improve performance in a new working environment or climate, where corrosion resistance may be a key factor.

If customers are less familiar, they may have more general ideas or questions about their goals, which means they may need help in evaluating a new design concept's influence on factors such as performance or weight. In such instances, Sapa can offer creative feedback to 'What if?' questions, Bjuhr explains.

"It is a process of having a dialogue and listening to the customer," says Bjuhr. "What are they really after? How will that customer, or the customer's customer actually use Sapa's products in the final end products?"

Bjuhr says that the engineers in his team need an open mind and solid experience from many different markets as well as a good understanding of global trends in order to form an effective

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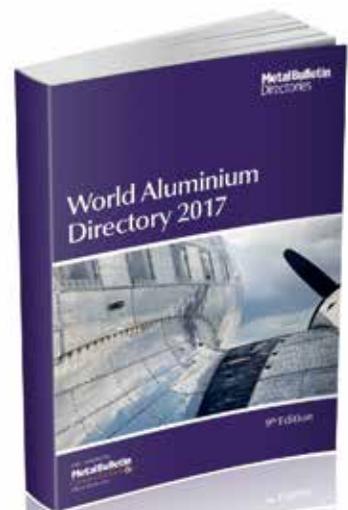
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partnership with Sapa's customers. They can work together on a conceptual design, detailed development projects and initial product testing in order to iterate through a number of loops to reach an optimal process and product. "Co-operation is the key word," stresses Bjuhr.

Advice provided along the way can include electrical as well as physical and heat-transfer properties of a design concept. Sapa are, of course, very willing to provide the comparative data needed for anyone considering a substitution of aluminium for steel.

Local and international

Bjuhr also stresses that extrusion markets in Europe have traditionally been relatively local markets, particularly for building and construction, making local knowledge and language skills another requirement for customer-focused engineers. The local engineers in turn have access to Sapa's central R&D to call on the company's international resources when required. In effect, Bjuhr is the 'customer' of Strid, Schön and colleagues. Their team efforts on applications like battery frames and housings (*see box*) are good examples of customer-generated product design work.

With his own European territory in mind, Bjuhr notes that markets such as marine/offshore, automotive, bus/truck as well as rail often have special demands. As a consequence the R&D and engineering activities for these special market segments are driven by central engineering teams in partnership with the experienced engineers from the dedicated lead plants for each market.

In addition to the specific customer involvement, Sapa also run many educational Profile Academies and Profile Workshops every year. The intention of these events is to educate current and future users in the possibilities of using aluminium. "We don't just want to make existing aluminium products better, we want to see aluminium extrusions being used in areas where it has never been used before," says Bjuhr (*see international resources list*).



The commercial model for all this support is also flexible and is matched to customer type. A large and long-established purchaser of Sapa's products may go to the company to get the additional engineering service. For new users of aluminium, Sapa may need to provide the extra support to demonstrate the benefits of aluminium and convince a customer that it is the right choice, explains Bjuhr. Some clients, however, prefer a more formal 'black & white' contractual arrangement with a project stage-gates process in order to match with their internal development process. The scope, scale and complexity of the work influences the commercial arrangements, but Bjuhr stresses that, either way, "We provide a solution that helps them."

In some cases specific technical solutions can be defined in just a few days, but at other times the full development cycle can take years. Fundamental new conceptual designs for new product ranges or material substitution will obviously take considerably longer to complete as many more development steps are needed.

Strid says that new alloy variants can be quite quick to develop because "They are often an adaptation of an existing alloy that is almost right, but requires some 'sharpening' for an application that is a little more demanding than last time." Nevertheless, he acknowledges that performance sometimes hits a ceiling as to how much more can be achieved from an existing alloy family. "That situation obviously calls for a different ambition, but developments of new

Torch-flame brazing at Sapa's aluminium tubing technology centre in Karmøy, Norway

products will require minor alloy tweaks more often than not."

R&D outlook

Strid reminds that fundamental R&D is a long-term (10-15 year) process and that new researchers themselves can take 3-5 years to mature. Consequently it needs some protection from the short-term volatility of markets and even the medium-term nature of business cycles in order to avoid R&D investment peaks and troughs in counter-phase. He says that is understood by Sapa's senior management and that the company has been making steady investment in proportion with the company's own substantial growth over the past decade. The new centre in Detroit, mentioned earlier, is the latest example.

In general, whatever hyperbole might be generated by the promoters of one competing material or another, Strid has faith that engineers will ultimately ensure that for any truly optimised application, the most suitable material will win out and that the right choices are made. "There are no tricks to push one way or another, no way to cheat in the long run. Engineers reach the right decisions, eventually," he asserts.

Extending that fundamental thought, while aluminium itself will continue to play a prominent and growing role, he sees a multi-material future in which the best type of material is optimised to provide the particular functionality required for each part of a product. That drives Sapa's research into technologies for joining different aluminium alloys and forms – castings, sheet and extrusions – as well as other materials to aluminium. "Optimised structures will require connecting dissimilar materials," he summarises.

Continuing work on shaping and forming processes as well as alloys will be important says Strid, who notes the success of 6xxx series alloys in particular. While, for example, 7xxx can offer greater strengths, their zinc content can also present challenges, for example on recycling, he notes. Meanwhile, material competition remains a highly motivating factor: "The steel people are not sleeping," Strid concludes.

Innovations abound

New alloys, applications and processing technologies demonstrate the potential for boosting aluminium demand further, reports Steve Karpel

A wide spectrum of aluminium alloys is available to suit myriad applications and to be compatible with the common processes of rolling, extrusion and casting. But as innovation continues, new aluminium-based materials are being investigated which are able to improve both the production processes and final properties of finished parts. Some current and recent projects are described here.

Better castings with cerium

Researchers from Oak Ridge National Laboratory (ORNL), USA, its US partners Lawrence Livermore National Laboratory, and Wisconsin-based Eck Industries, recently announced the development of aluminium-cerium casting alloys that are said to be lower cost, easier to cast and more resistant to high temperatures than existing aluminium products.

The most promising alloys are reported to be ternary compositions of aluminium, cerium and magnesium. Ambient-temperature strengths in the as-cast condition for the Al-8Ce-10Mg alloy, for example, are 30 ksi (206.8 MPa) tensile and 23 ksi yield strength. At 500°F (260°C), the respective values are 20 ksi and 18 ksi. The key to the high-temperature performance is an aluminium-cerium intermetallic compound formed during melting and casting, which melts at temperatures above 1,093°C.

Tests have shown the new alloys to be stable at 300°C, when some standard aluminium alloys would start to break down. This heat tolerance makes the alloys attractive



CARLOS JONES/ORNL

for possible use in internal combustion engines, where there is the potential for greater fuel efficiency by running the engine hotter. These alloys could also increase fuel efficiency by replacing denser materials and making the engine lighter.

Alloys that have exceptional properties also tend to be more difficult to cast, but aluminium-cerium alloys have similar good casting characteristics to the aluminium-silicon system, noted a spokesman for Eck Industries. An ORNL physicist confirmed that their 'exceptional castability' allows for the complete filling of complex moulds.

The research team has cast prototype aircraft cylinder heads in conventional sand moulds, as well as a cylinder head for a fossil-fuel-powered electricity generator using 3D-printed sand moulds. This was followed by a successful demonstration engine test at ORNL which showed that it could handle exhaust temperatures over 600°C.

A US patent application (15/204,169) for castable cerium-

An engine head cast in a cerium-modified alloy

modified aluminium alloys was filed in July 2016, while castings and the alloys themselves are available from Eck Industries.

Soaring with scandium and beryllium

IBC Advanced Alloys of Vancouver, Canada, is involved with two separate projects to further the application of aluminium materials: one to formulate new scandium-containing alloys for a range of applications, and another to develop aerospace prototypes made from its commercial beryllium-aluminium alloys.

IBC and NioCorp Developments of Colorado, USA, formed a joint agreement in June to study and develop applications for scandium-containing alloys of aluminium and other metals for multiple downstream markets. Transition metal scandium is able to increase the strength and weldability of aluminium alloys, while improving corrosion resistance, says NioCorp. As a result, it can deliver strong benefits to the aerospace and other transportation sectors in particular, such as lighter structures that lead to fuel and emission savings.

NioCorp states that the application of aluminium-scandium alloys can deliver up to a 20% weight reduction in aircraft. In addition, it allows for more reliable welding by stabilising a finer grain structure and minimising recrystallization in the welding zone. Aluminium alloys with less than 1% scandium can eliminate the need for airframe rivets, resulting in simpler, lower-cost manufacturing, the company states.

The commercial use of scandium has been hindered up to now by constrained and unreliable global production: the US Geological Survey estimates that only 10-15 tpy of the metal are produced. However, NioCorp is developing its Elk Creek mine project in Nebraska, USA, which will produce niobium, scandium and titanium. Its projected annual production includes 97 tpy of scandium trioxide, with a 32-year mine operating life. The company produced its first test sample of scandium trioxide in June, and is now building a pilot-scale production circuit.

The president of IBC Engineered Materials, Chris Huskamp, will be ▶



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leading the joint project for IBC. He is a named co-inventor in two pending patents relating to scandium-containing aluminium alloys.

IBC Advanced Alloys also signed a contract in June with BAe Systems to jointly develop prototype aerospace components from the former's proprietary Beralcast[®] beryllium-aluminium alloys. Under the contract, IBC will make initial prototype components to demonstrate the suitability of Beralcast alloys for BAe Systems' specific applications.

Beralcast alloys have more than three times the stiffness of aluminium but are 22% less dense, and have around 35% lower thermal expansion. They can be precision-cast to complex configurations, says IBC, and have a proven track record over many years in the aerospace and defence sectors. The alloy family includes Beralcast 191, used mainly for moderate-strength cast electronic and thermal packaging applications; Beralcast 310, used for extrusions; and Beralcast 363, designed for aerospace, defence and other commercial markets.

An alliance for innovation

Canada is a major aluminium producer, with nearly 2.9 million tonnes produced last year, and its smelters made over half of the light metal used in North America. The National Research Council of Canada (NRC) is now spearheading a national research programme to develop innovative aluminium products for ground transportation vehicles. It has recently set up ALTec Industrial R&D group, a multi-client collaboration project that allows its members to share costs and risks, and also gain access to NRC's expertise and advanced facilities in Quebec and Ontario.

Activities are focused on three areas of R&D: the manufacture of advanced aluminium components; assembly of aluminium and multi-material parts; and durability and performance evaluation.

So far, the group has seven 'major partners' and 17 member companies. The current projects include:

- Aluminium-steel friction stir welding.
- Development of durable structural adhesive joints.

- Production of large hollow extrusions with thin walls.
- The mitigation of galvanic corrosion.
- Vacuum-assisted high-pressure diecasting of hollow parts.
- Warm- and hot-forming of sheet alloys at high rates.
- Weldability assessment and optimisation of alloy 7075.
- Stress corrosion cracking of high-strength alloys.
- Heatable coatings for multifunctional intelligent moulds.
- Tribological coatings for multifunctional intelligent moulds.

"By 2020, the world aluminium market in the transportation sector alone is forecast to represent more than 65 billion US dollars," noted Michel Dumoulin of the NRC. The targeted industries for ALTec are parts manufacturers for light- and heavy-duty vehicles, the rail sector (passenger and freight) and recreational vehicles.

The best of both worlds

It is often the case that as one important property of an alloy is improved, so another vital property is found to deteriorate. In 7000-series aluminium alloys, for example, as their strength increases, so their resistance to stress corrosion cracking tends to be reduced. Multi-material company Kobe Steel has this year launched an alloy called 7K55 which it reports as having a high yield strength combined with 'outstanding' resistance to stress corrosion cracking. It is being employed by one Japanese carmaker to make bumper beams – reinforcements designed to absorb the energy of a collision.

7000-series alloys contain zinc and magnesium to increase strength, which in turn enables thinner and lighter designs of extruded bumper beam to be produced, compared with the 6000-series alloys that are most often used in this application. Kobe Steel has optimised the composition and heat treatment conditions of the 7K55 alloy, which has resulted in a high yield strength in the 400 N/sq mm class, while maintaining good resistance to stress corrosion cracking. The alloy is about 30% stronger than the company's conventional 7000-series alloys.



An extruded bumper beam in 7K55 alloy

When used in bumper beams, 7K55 alloy has enabled a 30% reduction in component weight compared with 6000-series alloys, says Kobe Steel, and thus it contributes to greater fuel efficiency and lower exhaust emissions.

Novelis is another company that has been extending the potential of 7000-series alloys, and has introduced its Advanz[™] 7000 aluminium alloys as high-strength materials specifically designed for protecting car passengers, in applications such as bumper systems, crash ring components and door intrusion beams. The new alloys are measured to be 2-3 times stronger than conventional aluminium alloys in laboratory tests, says Novelis.

More sustainable carmaking

The recycling of scrap aluminium into new products uses a fraction of the energy required to produce and subsequently process the primary metal. Accordingly, the use of aluminium alloys with a high recycled content is one key aspect of creating more sustainable manufacturing.

Novelis and carmaker Jaguar Land Rover have jointly developed RC5754, an aluminium alloy containing up to 75% recycled content, and it has been successfully integrated into the carmaker's REALCAR (recycled aluminium car) project.

Launched in 2008 by Jaguar Land Rover, REALCAR is a multi-partner programme to create a closed-loop vehicle production model that recycles cars at the end of their life. RC5754 was developed to serve this programme by absorbing the highest levels yet of processed automotive aluminium scrap. The alloy has been introduced in the new Jaguar XE, and it will be featured in future in all new and legacy Jaguar Land Rover models.

A Novelis production line dedicated to automotive aluminium sheet



Metal Bulletin aluminium premium fundamentals

The Metal Bulletin Group reports leading pricing intelligence, including independent industry benchmarks, for the metal and mining industry and trade. In this first of a series of articles highlighting the fundamentals of Metal Bulletin price families, we look at the group's aluminium premiums

Aluminium premiums started out as a way to cover the logistical cost of buying metal, after the London Metal Exchange aluminium contract gained traction and liquidity in the early 1980s. The exchange-traded LME price did not include any consideration for those costs, and Metal Bulletin launched its first European aluminium premium in 1987 that would, when added to the LME price, supply a benchmark that did include those costs.

When the global financial crisis pushed an enormous amount of capital away from crashing securities markets and into the haven of commodities markets, the LME price ceased to reflect aluminium's fundamentals and began to follow financial market trends. As a result, the premium became the part of the price that could be negotiated between counterparties and thus reflect

fundamental supply and demand trends.

As markets recovered following the crash, physical aluminium consumers found themselves competing with these haven investors, who dominated supply and left many buyers scrambling for available metal. While the LME price did not react to this trend and continued to reflect ailing financial markets, the premium shot up to unprecedented highs in 2014. The premium became almost a quarter of the cost of buying aluminium, from traditional levels of less than 5%.

The rise of aluminium premiums as a proportion of aluminium buying costs has seen their inclusion in supply contracts further and further downstream, as companies on each rung of the value chain seek to protect themselves from premium movements by enshrining them in their own sales contracts with customers.

For example, many foundry alloy buyers and wire rod consumers have found premiums becoming a part of their supply contracts, and they will likely be looking to do the same with their own customers in forthcoming negotiations.

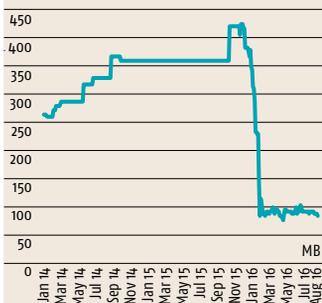
Although premiums have fallen back to more manageable levels they remain volatile, and the experience of the past few years has made consumer buying a far more conservative affair. Adventurous purchasing managers at family-owned shops have been replaced by cautious employees buying for multinational public corporations, and the new breed is far more likely to buy at the market level rather than attempt to save a few dollars at the negotiating table. The risk/reward nature of purchasing has swung heavily in favour of risk, and the use of benchmark premiums is becoming more common even in spot deals.

With more business now being done on Metal Bulletin's aluminium premiums, a reliable, transparent benchmark is now more important than ever to ensure a functioning, liquid market. Metal Bulletin has invested heavily in improving the provenance of its premiums, with new systems in place regarding data collection, assessment, and peer review ensuring the most accurate market premium available.

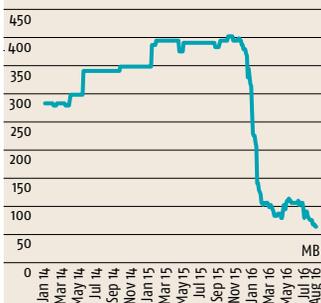
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Aluminium P1020A, cif Shanghai, spot, \$/tonne



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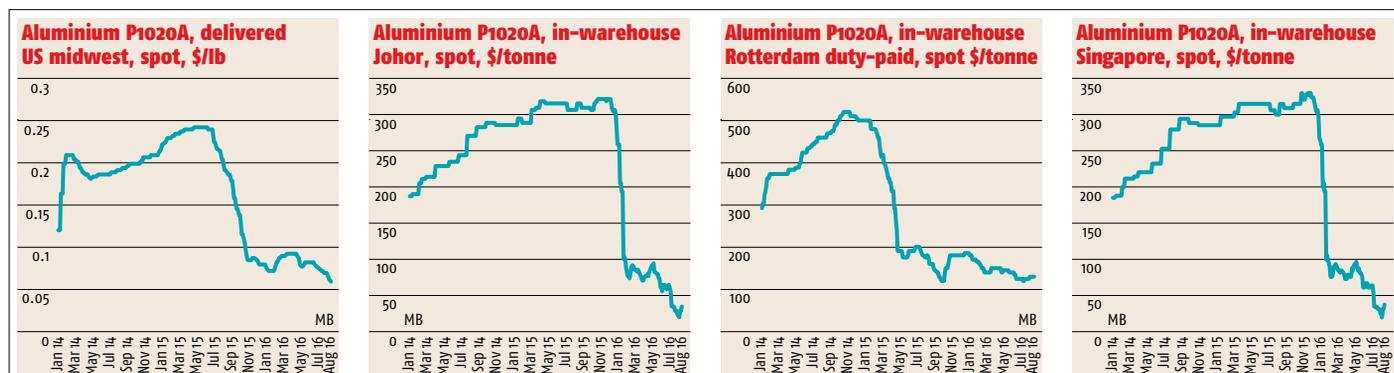
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Metal Bulletin's objective is to produce independent, fair and representative price assessments for the daily aluminium premiums it assesses.

Metal Bulletin reporters aim at all times to talk to a broad sample of market participants specifically involved in the buying and selling of aluminium in the European market, with a representation from both sides of the market – producers and consumers – as well as traders.

Data is collected primarily by telephone, and also by email. All input data is kept confidential and stored in a password-protected secure database for reference and to maintain the audit trail.

The reporters' goal is to discover at what level market participants have concluded business, made offers or received bids over a certain defined period – the period since the conclusion of the previous price quotation.

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Greater weighting is given to actual concluded transaction data, although bids, offers and market participants' indication of value of the market are also included in the price discovery process. When required, Metal Bulletin may seek to confirm all information on deals either by requesting a signed copy of the contract or other materials as evidence of claimed deals, or by checking the deal information with the counterparty.

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 - d. China (Shanghai)
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For more information on the MB pricing process please refer to Metal Bulletin Methodology Guide available on the Metal Bulletin website

A gradual upturn

The nadir of the stainless steel market appears to be behind it, but recovery is expected to be slow and uneven, reports Myra Pinkham

While it started off slowly, the world stainless steel market has been gaining some steam in recent months on the back of rising raw material – particularly nickel – prices. It has also been helped by better than expected economic performance in China.

Thus far it has been a mildly positive, but not extraordinary, year, says Jason Kaplan, manager of IHS Markit's pricing and purchasing service. "I think that the worst is now behind us," observes Markus Moll, director and senior market analyst for Steel & Metals Market Research (SMR), Reutte, Austria. He sees 2016 as a year of recovery that is likely to be followed by further healthy developments next year and increased stainless consuming project activity in 2018 and 2019 as well. "So if stainless steel supply tightens, or even remains stagnant, that could result in further price recovery,"

But a lot could depend on what happens with nickel prices, Robert Cartman, senior metals consultant for Metal Bulletin Research (MBR), maintains. "If they continue to increase they could spur further demand and stainless steel mill profitability," he says. But that is not necessarily seen as a given, even with many nickel miners struggling to be profitable even at current price levels, which have come up significantly from the recent over-10-year lows.

While it is somewhat circular, that, in turn, largely depends upon what happens with stainless steel given the amount of nickel consumed by the market – 60-70% of all nickel. Jim Lennon, managing director of Red Door Research, points out that nickel accounts for 35-40% of the cost of producing austenitic stainless steel.



OUTOKUMPU

Moll observes that global stainless steel demand has been fairly stagnant over the last two years, resulting in the only changes in production being due to inventory destocking or restocking. MBR's Cartman says that thus far this year both global stainless steel consumption and production have been fairly flat, a view that is supported by the latest stainless and heat-resisting meltshop steel production data from the International Stainless Steel Forum, which reports a 0.4% year-on-year increase in global stainless steel production in the first quarter of 2016. That, Cartman says, follows an almost equal decline for the full year of 2015.

Stockbuilding to resume

While to date this year there has not been a lot of stock building, despite

the shortages that have developed from the destocking that occurred last year, Cartman believes that it will pick up as the year goes on and that global stainless steel production will therefore increase 4-5% for the year as a whole following the 0.3% decline in 2015.

Already, according to Moll, there has been some restocking. "As result, availability in some areas of the world has become more limited," he says, noting that this first occurred in the USA, where lead times moved out considerably, with some mills putting their customers on either controlled order entry or allocation. This has enabled them to substantially increase stainless steel cold-rolled base prices.

However, Cartman says he has heard that in recent weeks, both because of the usual seasonal slowdown that is common during the summer and with certain mills catching up with their orders, the US supply situation has loosened up slightly.

While domestic market leader North American Stainless continues to be on controlled order entry (allocation), it is not controlling its orders quite as stringently as it had been doing just a month ago.

Lead times at some other US domestic mills have shortened to varying degrees to about 8 to 13 weeks as of mid-August compared with 13 to nearly 20 weeks early in July. In particular, Cartman says Outokumpu Coil Americas' lead times were cut almost in half as it increased production. This builds upon the previous progress it had already made. In the second quarter it had an all-time quarterly stainless steel shipment record of 177,000 tonnes, which was 51.3% higher than a year earlier.

Moll says that if such trends continue, not just in the USA but elsewhere in the world, stainless steel mills should have a better year this year – not just in terms of sales volumes, but also profit margins. This is despite the fact that that global market is oversupplied.

Global stainless steel demand, while largely remaining stagnant, is expected to be about 2% higher than last year, according to Robin Bhar, head of metals research for Société Générale, who says this is largely due

to a moderate rebound of demand out of China, which accounts for about half of the world's stainless steel consumption.

While there is no doubt that the Chinese economy continues to be going through a very challenging time, Cartman says that this year China surprised on the upside, largely due to efforts by its government to prop up the economy. "The government wants to rebalance the economy from an export-based economy to one based on domestic consumption," Bhar says.

Chinese demand to soar

Now that it managed to avoid a widely anticipated economic meltdown, Moll predicts that despite the many trade cases that China is facing around the world, its stainless steel consumption will actually increase by at least 5% in 2016 following zero growth last year. This comes amid increasing demand not only in its automotive and appliance markets with the growth of the nation's middle class, but increases in its construction sector as well.

The biggest reason for that, according to Cartman, is the 5 trillion yuan infrastructure construction stimulus programme that the Chinese central government put into place late last year. He observes that China's private construction sector also has not performed as badly as had been expected with construction floor space basically remaining flat year-to-date through April compared with levels seen during the first four months of 2015.

"While the Chinese government's stimulus programme could invigorate trade and could be beneficial in improving infrastructure construction, I'm not sure how much that will benefit the stainless steel industry," says IHS Markit's Kaplan. John Tumazos, principal and metals analyst with Very Independent Research, agrees, especially given that the Chinese stainless steel market, much like most of its commodity markets, continues to be oversupplied.

Kaplan notes that when China's building and construction sector was stronger it was able to "suck up"

Stainless steel production and consumption*

Production	2014	2015	2016f	2017f
Europe	7.364	7.262	7.201	7.283
Americas	2.814	2.747	2.726	2.787
Asia	31.027	31.023	32.255	33.261
Total world	41.677	41.547	42.672	43.822
Apparent consumption	2014	2015	2016f	2017f
EU15	6.473	6.727	6.985	7.253
USA	2.397	2.581	2.758	2.947
Asia	23.554	24.749	25.988	27.290
Total world	41.677	41.547	42.672	43.822

*million tonnes.

Source: Metal Bulletin Research

much of the nation's excess stainless steel and, in the past, once that sector slowed, China simply exported the excess.

But now, with all the trade cases around the world, most notably those in the European Union and the USA, it has reached a point where China is having problems exporting its stainless steel, Bhar explains. "If this continues it could – at least in theory – lead to cutbacks in Chinese production capacity," he says.

This is precisely what some market observers were expecting to happen, even with the Chinese government's predilection to do whatever it can to keep its citizens employed, Moll says, noting that there were expectations that there would be some Chinese meltshop consolidation that would have resulted in about 1.5 million tonnes of idled capacity.

"But so far we haven't seen the promised rationalisations and there is now over 6 million tonnes of new capacity expected to come online in the next few years," Moll says.

Elsewhere in the world, stainless steel demand, other than that related to restocking, seems to be somewhat subdued, with only very slight growth at best. However, with restocking, and the benefits that are being reaped from antidumping and countervailing duty trade cases against Chinese and Taiwanese imports, MBR is predicting that US apparent consumption will increase 6.9% this year, while European apparent consumption could rise by 3.8%.

Europe divided

The European stainless steel market, much like the European

economy, is still struggling with at best subdued growth, Bhar says. That is not to say that there are not some sectors that are doing fairly well. Moll points out that the European building and construction sector has seen growth and its auto and heavy duty truck markets are also relatively strong. But stainless demand in those sectors will be offset by underperformance in energy and certain other industrial applications.

Actually the European construction sector could be said to be two very different markets, Kaplan maintains. He observes that Northern Europe's construction market has been somewhat positive although it has only been slowly edging up from year-ago levels after even greater gains prior to that. Meanwhile the story in Southern Europe is not as positive. Not only is its construction demand still only about half what it was prior to the global recession in 2008, but this year it has come down slightly from 2015 levels. Northern Europe's construction sector registered 99.7 points year-to-date through May on Eurostat's construction index compared with 93.0 points for the first five months of 2015, while Southern Europe's reading was only 49.6 points year-to-date versus 52.8 points for the same period a year earlier.

It also still remains uncertain what impact the 'Brexit' decision could have on the stainless steel industries both in the United Kingdom and elsewhere in Europe. Kaplan, however, speculates that in the longer term it could result in weaker margins for UK stainless steel producers, but is likely to just have a minimal impact elsewhere in Europe. That, however, is assuming that no other countries also leave the EU, MBR's Cartman says. Ever since the 2008 crash there have been fears that other countries might consider leaving as well.

Nevertheless, the European stainless steel market as a whole appears to be on a sounder footing compared with where it had been three to four years ago, Cartman says, noting that domestic producers are clearly beginning to benefit from both industry restructuring and increased



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market protection from imports. In fact, Outokumpu had its best quarterly net result in the second quarter since the first quarter of 2012 and other European companies, including Acerinox and Aperam, are also seeing their profitability increase.

At the same time European stainless steel production is expected to increase substantially – by about 5% year-on-year – in the second half of this year, according to Moll. He, however, notes that about 80% of that rise will be due to restocking.

Growth in USA

The North American stainless steel market has been seen as being the strongest worldwide for the past few years and, according to Bhar, it continues to be relatively healthy. “According to recent economic data it is still growing across the board,” he says. Not only did US industrial production, as reported by the US Federal Reserve, increase for the second consecutive month in July, July’s 0.7% month-on-month advance was the index’s largest since November 2014. Also, in what is an indication of further growth, the Institute for Supply Management’s manufacturing purchasing managers’ index (PMI) continued to indicate further expansion with a reading of 52.6. It has been above the 50 point threshold for the past five months.

But while the US economy as a whole is in a better state than Europe’s, it remains fairly lacklustre with only 1.2% GDP growth in the second quarter following 0.8% growth in the first quarter.

As for the US stainless steel consuming sectors, Cartman says that automotive, which really is a relatively small user – mainly just ferritic grades for exhaust systems – is the most impressive. The US construction sector, while clearly improving, is still not very strong from a historical perspective. Growth has also been supportive of the demand for major home appliances, which continue to overwhelmingly favour the use of stainless steel.

However, Cartman notes that weakness in the energy sector continues to have a negative impact despite a slight pickup in domestic

drill rig counts in the past few weeks. That, he says, is not expected to have any real positive impact upon steel consumption until late next year or even 2018. “Business investment hasn’t been that good either,” he adds, especially with uncertainty about the future magnified by the very contentious US presidential election.

A lot of the recent positive market dynamics are coming from some modest restocking as well as certain supply side challenges, Moll says. In addition to the impact of trade action which is expected to essentially keep Chinese imports out of the US market, Moll says two major US producers have been refusing some commodity stainless steel business, leaving more orders to be filled by North American Stainless (NAS) and Outokumpu. That is what resulted in controlled order entry and/or allocation by NAS and very long lead times at Outokumpu, which was already working to catch up on some backlogs.

With these market dynamics, US stainless steel producers have been able to successfully push through four cold-rolled sheet base price increases totalling about \$240 per tonne. That, Moll says, could possibly be a little too much given that US spot base prices have recently retreated slightly.

There has, however, been some talk of one or two more US base price increases later this year. Whether they are actually announced largely depends upon what happens with nickel, Moll maintains. “If nickel continues to go up, so will stainless steel base prices.”

Nickel recovers

Kaplan observes that LME nickel prices hit bottom in the first quarter of this year at just over \$8,300 per tonne and for several months afterwards were “bobbing along that bottom” until June when they shot up to over \$10,000/tonne. By August 12 they peaked at \$10,754/tonne before easing back down to \$10,385/tonne the following week.

While this is still generally seen as being an unsustainably low price, it is at least moving in the right direction,” Red Door’s Lennon says, given that at the current price level

‘The big question is whether China will make any moves to constrain its production’

only 20-30% of nickel mines are losing money, against 75% last year.

Much of the nickel price increase has been attributed to concerns about possible nickel mine closures in the Philippines, which is the main country to “step up to the plate” after Indonesia enacted its ore export ban in 2014. Lennon observes that Philippine nickel exports to China jumped up to 375,000 tonnes from less than 100,000 tonnes prior to the Indonesian ban.

However, during the first half of this year Philippine nickel exports were down 25-30% year-on-year, partly because of seasonal flooding, as well as the closure of certain mines there that ran out of reserves. In addition, Regina Paz Lopez, the country’s new secretary of the Department of Environment and Natural Resources, closed six nickel mines because they did not meet the nation’s environmental standards.

There is also growing speculation that Lopez could attempt to close more mines, Tumazos says, maintaining that she publicly opposes open pit mining and the use of explosives in mining.

A final government report regarding the Philippines’ nickel mining industry is expected to be released in about a month. Bhar, however, does not believe that any further closures by that country, short of an all-out ban, will have a significant impact upon the nickel price.

“I don’t think there is a realistic prospect that Philippines will institute an ore export ban,” Lennon says, especially given that the average grade of Philippine nickel ore is only 1.5% versus 1.8% for Indonesian ore, which would discourage smelter plant investments.

Going forward, it appears that stainless steel market dynamics should improve, Cartman says, with consumption increasing in China and remaining steady elsewhere. “The big question is whether China will make any moves to constrain its production,” he says. Kaplan agrees, maintaining that no matter what the USA and Europe do to cut capacity, they cannot do enough to make up for oversupply in China.

The author is a specialist writer based in New York.

Balancing act

The tin market is broadly balanced, and the risk of supply disruptions from its two main producers, China and Indonesia, is the key to price sentiment, reports Steve Karpel

In the base metals complex, tin has been one of the most buoyant members over the past year, and has risen to break through the \$18,000/tonne barrier in recent weeks, although the momentum may not be sufficient as yet to propel it much higher. In January of this year, the price slumped to a trough of \$13,235/tonne (LME official daily settlement) but quickly rose to over \$17,000/tonne in around three months, before consolidating for a period and then gradually climbing again.

Continuing questions over possible supply disruptions in China and Indonesia have been supporting the metal's fundamentals for a while, which is not surprising when it is calculated that these two countries were responsible for 68.1% of global mined tin output last year (215,000 tonnes out of 315,900 tonnes, according to WBMS) and 67.7% of refined tin production (234,300 tonnes out of 345,900 tonnes).

On the demand side, total tin consumption has been broadly stable for many years, making the global market balance – and sentiment – much more dependent on the supply situation. Refined tin consumption is forecast to be 341,200 tonnes this year, according to UK-based tin consultancy ITRI, and has barely changed over the past five years (*see table*). ITRI forecasts a market deficit of 10,900 tonnes this year, slightly larger than the 9,000 tonnes last year.

The biggest producer and consumer of tin is China, and in recent years its production has not been able to quite match its even larger consumption, a trend that has continued this year (*see table*).

In the first half of 2016, the country's refined production rose by 14.1% year-on-year to 90,104 tonnes, while its refined consumption increased by 12.6% year-on-year to 93,481 tonnes, reports WBMS.

This imbalance has made China a net importer of refined tin for some time, while its exports have fallen to very low levels. Net imports were 8,922 tonnes in 2015, and 3,377 tonnes in the first six months of this year. In addition, China imposes a 10% export duty on refined tin. The USA and the EU are both challenging China's export duties on tin, and several other raw materials, at the WTO, claiming that they give Chinese companies an unfair cost advantage. These cases are expected to take 2-3 years to be resolved.

New mine source

But the most significant addition to global production has been the rapid rise of tin mining in Myanmar over the past four years. This has seen its production of contained tin in ore rising from 2,100 tonnes in 2012 to 24,000 tonnes last year, reports WBMS. Mine output has since doubled, with some 21,500 tonnes of tin produced in just the first five months of this year.

Myanmar's ores and concentrates are shipped a short distance across the border to be smelted in China, and China's imports of Myanmar ore have risen rapidly along with the mine output: from 89,000 tonnes in 2013 to over 291,000 tonnes in 2015 (figures are gross weight). And in the first half of this year, imports increased a further 88% year-on-year, to 245,120 tonnes, containing

an estimated 30,000 tonnes of tin, according to ITRI, commenting on Chinese customs data.

However, these figures mask the possibility that tin mining in Myanmar may actually be peaking at about 50,000 tpy of tin, and the big rise in Chinese imports this year is partly due to shipments of above-ground stocks that have accumulated, ITRI noted recently following its visit to the area. Peter Kettle, manager, markets, at ITRI, points out that production in Myanmar started with the easily-accessible and high-grade (around 10% tin) ores near the surface, but these have largely been depleted and most mining now is underground with higher operating costs and lower ore grades.

Originally, the "low-grade" mined material of up to 3% tin was discarded into stockpiles, says Kettle, but now it is being beneficiated into valuable concentrate and shipped, as it is economic to do so with local investments in ore processing technology, and a higher tin price.

Overall, ITRI commented that Myanmar's tin mining is now characterised by larger, well-organised and well-financed companies that have invested heavily in mine mechanisation, ore processing and local infrastructure. This output appears to have displaced some Chinese mining, rather than augment China's total production, says Kettle: "We have heard of mine closures in China, and we think that Chinese mine output is around 80,000 tpy, whereas it was 90,000-100,000 tpy for a long time."

China's tin smelting operations have been affected recently by the enforcement of environmental regulations, says Metal Bulletin Research (MBR). Several plants in Yunnan, Guangxi and Jiangxi temporarily halted production, although precise details of such stoppages, including how long they will last, have not been available.

Furthermore, in order to cut oversupply, Chinese smelters agreed to cut production by 17,000 tonnes in total this year, and this reduction has been effectively carried out, a representative of

'There is considerable spare capacity in primary tin smelting around the world'

Yunnan Tin told *Metal Bulletin* in May.

The world's second largest national tin producer is Indonesia, and, unlike China, it exports all of its refined tin output, which rose 4% to 67,350 tonnes last year. But the sector has been increasingly regulated, which contributes to missed targets in production and exports.

Having satisfied all the 'clean and clear' conditions to obtain an export licence, a company must also obtain a letter of permission to export, but these are only valid for six months, after which it must reapply. This process can be subject to bureaucratic delays.

Target missed

Indonesia's biggest producer, PT Timah, confirmed to *Metal Bulletin* in August that it would not meet its target of 30,000 tonnes in 2016, and total production of 24,000-27,000 tonnes is expected. It experienced significant declines in mined and refined output in the first quarter owing to extreme monsoon weather, plus delays in its export permit renewal, it explained. Total Indonesian production is expected to add up to 60,000-65,000 tonnes this year, says Kettle, who points out that this compares with volumes of around 100,000 tpy in the past.

Aside from PT Timah, the more stringent regulations have halved the number of operational private smelters in Indonesia to about 20, Kettle observes, although this does not affect tin exports, which are primarily controlled by mine output. In fact, there is considerable spare capacity in primary tin smelting around the world, and ITRI recently reported that this is greatest in Indonesia, where the average smelter utilisation rate was just 21% last year, as calculated from Indonesian government data. The average smelter utilisation rate in China was 64%, while the global average was 47%.

ITRI says that the responses to its global smelting survey indicate that there will be a 5% fall in primary refined tin production this year, with South America being the only region for which an increase in

Refined tin supply and demand*

	2012	2013	2014	2015	2016f
Refined production	334.7	340.1	369.1	335.0	330.3
DLA sales	0.0	0.0	0.0	0.0	0.0
Refined consumption	339.4	349.1	358.5	344.0	341.2
Global market balance	-4.7	-9.0	+10.6	-9.0	-10.9
<i>Reported stocks</i>					
LME	12.8	9.7	12.1	6.1	4.0
Producers	15.9	13.7	15.8	14.0	12.0
Consumer/other	10.7	10.9	11.2	11.3	10.0
Total	39.5	34.3	39.1	31.4	26.0
Weeks' demand	6.0	5.1	5.7	4.7	4.0

*'000 tonnes. Source: ITRI, April 2016

Tin in China*

	2014	2015	2015 H1	2016 H1
Refined production	187,100	166,900	78,988	90,104
Refined consumption	193,934	175,842	82,992	93,481
<i>Imports:</i>				
Ores/concentrates (gross wt.)	177,950	291,384	137,827	254,726
From Myanmar	173,237	285,593	135,180	254,720
Refined tin	7,771	9,503	4,028	3,943
Refined tin exports	937	581	24	566

*tonnes. Source: WBMS. Some latest data are provisional

Tin in Indonesia*

	2014	2015	2015 Jan-May	2016 Jan-May
<i>Production:</i>				
Ores/concentrates (tin cont.)	69,600	68,400	29,000	28,000
Refined tin	64,800	67,350	28,350	30,000
Refined tin exports	70,238	69,804	29,419	20,484

*tonnes. Source: WBMS. Some latest data are provisional

output is expected.

Are there any other potential sources of new mine supply on the horizon? In a 2014 survey, ITRI reported that it was aware of 69 tin projects, including 25 in Australia, ten in Russia and ten in Bolivia. However, none of these have started up yet, and most of them are quite small-scale and still looking for finance, says Kettle. Some of the larger ones will probably not start up until 2018 at the earliest, he adds.

Steady demand

On the demand side of the equation, ITRI's latest estimate puts electronic solders as by far the largest refined tin end-use with 43.5% of demand, while industrial solders add another 4.8%, making solder alloys 48.3% in total. Chemicals are in second place with 15.5%, followed by tinplate with 14.7%, lead-acid batteries with 7.3%, brass and bronze with 5.2%,

float glass with 2.0%, and others 7.0%.

While most of these markets could be described as mature, there has been notable growth in two of them. Tin chemicals are being boosted by their main application in PVC stabilisers, and ITRI estimates that chemicals surpassed tinplate as the second largest use in 2014, consuming a forecast 56,000 tonnes of tin in 2016.

Lead-acid batteries have also been a significant growth area for tin, where its current use is estimated at 25,000-30,000 tpy. Tin is used in lead-calcium-tin alloys that form the grids in 'maintenance-free' batteries, at an average content of 1%. From 2013, China started to reorganise its lead battery sector, notes Kettle, and changed from using antimonial lead to lead-calcium-tin alloys. Demand for lead batteries is expected to continue rising worldwide, from automotive use (including in hybrids and electric vehicles) and other areas such as energy standby and storage.

In the electronics sector, solder demand is largely dependent on consumer electronics, and Kettle points out that the switch to high-tin, lead-free solders has not been made yet in certain sectors such as military and aerospace, although this may be some years away. Manufacturing in China and other parts of Asia has also not yet fully converted to lead-free solders.

Looking at the market in the more immediate future, MBR is forecasting a deficit of 6,000 tonnes this year, shrinking to 3,000 tonnes next year. MBR and ITRI agree that demand will barely grow this year compared with last year, with sentiment – and price – largely dependent on the supply situation. The market is broadly balanced with little flexibility in the system, says MBR, with exchange stocks currently being low on the LME (around 3,000 available tonnes) and the SHFE (around 2,700 tonnes).

MBR forecasts an LME tin cash price base case of \$18,250/tonne for the third quarter and \$18,100/tonne in the last quarter. The MBR base case forecasts an average cash price next year of \$19,075/tonne.



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Supply chain services

A flexible heat treatment for heavy plate

A new steel plate quenching technology was successfully launched at Acroni in Jesenice, Slovenia, at the end of June. MultiFlex-Quench® has been developed by SMS group and is stated to have an exceptionally high degree of flexibility compared with standard systems. All cooling patterns from slow cooling to abrupt quenching can be covered, making possible a wide product portfolio. MultiFlex-Quench is also said to offer improved plate flatness owing to active hydraulic clamping.

The SMS-supplied plant at Acroni is designed to process at least 80,000 tpy of heavy plate.



Acroni, a company of the Slovenian Steel Group, is a specialist supplier focusing on plate and strip in stainless, tool steel, abrasion-

The first heavy plate enters the MultiFlex-Quench line at Acroni

resistant and HSLA grades. With the new heat-treatment line, it will be expanding its product portfolio.

The plant can handle plate in thicknesses from 3 to 100 mm, with a maximum width of 2,500 mm. It is equipped with a high-temperature roller-hearth furnace for hardening and normalising. This furnace has two chambers where plates are annealed in a nitrogen-base inert atmosphere. Radiant tubes heat the material indirectly up to 1,100°C. The line also has a low-temperature roller-hearth furnace for plate reheating, where quenching and tempering at 400-800°C can be carried out.

Nucor awards 10-year contract to Kinder Morgan

Kinder Morgan (KMI) of Houston, USA, has signed a new 10-year agreement to provide in-plant services to five of Nucor's steel mills: at Decatur, Alabama; Hertford, North Carolina; Berkeley, South Carolina; and two facilities at Blytheville, Arkansas.

These facilities produce about 13.4 million tpy of steel products in total. KMI will be handling

about 14.8 million tpy of steel scrap, direct-reduced iron, pig iron and other feedstocks, as well as providing ancillary services. The contract is valued at around \$900 million.

"Nucor is one of our largest customers in our Terminals division. This new agreement ensures that KMI will continue to provide handling, processing, warehousing and marine services



Five Nucor mills will receive a range of in-plant services from Kinder Morgan

to Nucor," said KMI Terminals president John Schlosser. "These facilities provide Nucor and other customers access to our growing national network of marine and rail terminals," he added.

KMI states that it is the largest energy infrastructure company in North America, owning an interest in, or operating, around 84,000 miles of pipelines and 180 terminals.

Industry 4.0 from a single source

Primetals Technologies Germany and Düsseldorf-based PSI Metals have signed a worldwide cooperation agreement for the sale and implementation of Industry 4.0 (or 'industrial internet') production management solutions for the steel and aluminium industries. The goal is to provide customers with a perfectly-matched tailor-made solution from a single source, consisting of equipment, basic automation (level 1) and process automation (level 2) from Primetals Technologies, together with a production management solution (level 3) from PSI Metals.

The harmonised solutions are designed to reduce integration costs, shorten project runtimes and simplify IT processes. Horizontal integration of locally distributed automation data with the system-wide production management for Supply-Chain-Planning & Execution makes it easier to identify and realise the potential of Industry 4.0, says the partners.

Taken together, the two companies will have around 450 automation and IT experts around the world working on end-to-end solutions for optimising production in the steel and aluminium industries.

DRI heading for Peru

Private iron ore developer Ferrobamba has signed an agreement with Tenova to develop its iron ore mine in the Aymaraes region of Peru. Tenova will oversee the technological design and build a 500,000 tpy pelletizing plant plus a Micro Module 250,000 tpy high-carbon (4%) DRI plant. "The Micro Module uses the same ZR technology applied in Nucor's Louisiana plant, but is one-tenth of the size and allows junior mining companies like ours to enter the DRI production market with a limited capital investment," stated Alfonso Navarro, ceo of Ferrobamba. The projected start-up is at the end of 2018.

Flexible furnaces for steel and pgm production

Tenova has commissioned a new steelmaking furnace concept at Jindal Steel & Power's (JSPL's) Raigarh plant in India. The Flexible Modular Furnace (FMF) is a system that allows a steelmaker to change the charge mix substantially, handling various iron units such as scrap, DRI, liquid hot metal or pig iron. It is thus advantageous to a steelmaker using a significant amount of hot metal in the charge, but which wants to change to, or revert to, a more scrap-based feedstock. Conversely,

it can assist electric steelmakers that wish to increase the proportion of hot metal in the mix.

Tenova FMF is a modular system that is built up from core equipment called the base module, to which other modules can be added. Each module is designed with specific features in order to meet the requirements of the charge mix.

In the JSPL plant, the existing EAF was converted to a Tenova FMF. This resulted in a production cost saving of \$15-18 per tonne of

JSPL's Flexible Modular Furnace has resulted in notable cost savings

steel, or an annual saving of \$15-20 million – achieving an ROI in less than four months, says Tenova. The furnace has comfortably achieved 32 heats with an 89% yield, and achieved 42 heats on one campaign. The furnace project was started last August and was successfully completed in six months.

The high energy costs and inconsistent availability of raw materials in some countries have intensified the search for cost-effective steelmaking and raised the importance of flexible technology such as FMF, Tenova maintains.

Meanwhile, subsidiary Tenova Pyromet has announced that its innovative platinum group metal (pgm) furnace for Northam Platinum at Thabazimbi, South Africa, is now half completed and on track for an August 2017 handover.

The 20 MW furnace will support Northam Platinum's pgm expansion, which requires the flexibility to handle high-chromite, low-base-metal and high-sulphur concentrates. Northam will be able to operate the furnace either as a submerged arc operation or brush arc operation and will therefore have a sufficiently broad operating range to accommodate feedstock with a widely varying mineralogy.



Rapid welding assurance for high-strength steels

High-strength steel (HSS) applications are often subjected to high levels of stress, which puts extra stress on any weld area. If any failures or fractures occur in HSS products, they usually occur around the welds, which makes it especially important to assess weld quality. However, this is normally done only after the manufacturing process is complete, and even then, it may only be done on a fraction of the output owing to time and cost constraints.

A new quality assurance technology developed by Thomas Stenberg at KTH Royal Institute of Technology, Stockholm, Sweden, is able to automatically

assess weld quality in real time as it is being carried out, and give instant feedback to the welding operator or robot. The robot will be able to adjust the parameters to ensure the required weld quality without disrupting the process or repeating the work. The system uses a laser profile scanner to assess the weld bead surface and the quality of the weld.

Stenberg, who won the 2015 Swedish Steel Prize 'University Challenge' award from steelmaker SSAB for this development, says that he expects manufacturing productivity to increase by about 50% due to greater robot travel speeds, with a reduction of up to 30% in weld

filler material. The need to scrap or rework products will also be minimised.

The new QA system is compatible with several welding methods, including MMA, MIG/MAG, TIG, SAW, Laser and Plasma welding. It is expected to be available on the market in 1-3 years.

According to Anders Ohlsson, SSAB's manager of joining and thermal cutting technologies, the technology has the potential to revolutionise the ways in which high-strength steels can be applied, enabling their use in many applications where they cannot be used today, such as in machines and components that are subject to high stress concentrations.

'There is the potential to revolutionise the ways in which high-strength steels can be applied'

Kobe Steel starts large titanium forgings

Kobe Steel began the production of large titanium forgings in July to supply France's Safran Landing Systems. The forged parts will be used in the landing gears of the Airbus A350 XWB aircraft. Kobe Steel – an integrated producer of pure titanium and titanium alloy products – undertook the development and certification work after entering the supply agreement in 2013 with Safran Landing Systems (known as Messier-Bugatti-Dowty before May 2016).

The forgings are made by Kobe Steel and its group company Japan

Aeroforge of Kurashiki. The former is responsible for process planning, quality assurance and other processes, while the latter carries out the forging operation. Japan Aeroforge is a joint venture owned by Kobe Steel (40.5%), Hitachi Metals (40.5%) and four other companies. It is equipped with a 50,000-tonne hydraulic forging press, one of the largest in the world.

The Airbus A350 XWB is a new family of medium-size planes for long-range flights. They are stated to consume 25% less fuel compared with existing aircraft in this size category.



The titanium landing-gear forging on display at Farnborough International Airshow

Magnesium demand to grow by 3.4% pa

Global growth in the magnesium market is expected to average 3.4% annually, to reach almost 1.2 million tpy by 2020, according to a new magnesium survey (12th edition, 2016) published by Roskill Information Services, UK. The fastest growing markets are forecast to be aluminium alloys (containing on average 0.8% magnesium) and die-casting, at about 4% annual growth. The single main factor affecting demand will probably be magnesium's use in vehicles, as a result of both greater consumption per unit and increasing vehicle production, says the report.

But there are some developments that could increase demand significantly in the long term, it observes. Magnesium composites

containing silicon carbide (14% by volume) have several enhanced properties (such as strength, stiffness and high-temperature stability) and could enable the metal to penetrate new markets.

Another potentially important development is the magnesium-ion rechargeable battery, which is reported to have twice the capacity and energy density of lithium-ion batteries. Toyota's announcement in May of a compatible battery electrolyte for magnesium was hailed by the company as an important technology breakthrough.

World primary magnesium production declined by 4% to about 900,000 tonnes in 2015, with about 78% produced in China, the report notes.

JFE supplies steel for Trans Adriatic Pipeline

JFE Steel will provide 78,000 tonnes of material, including hot-rolled coils and plates, to the consortium of Corinth Pipeworks Pipe Industry (CPW) and Marubeni Itochu Steel (MISI), which has won a contract to supply steel materials to the Trans Adriatic Project (TAP). JFE Steel will be one of the project's major subcontractors, and will ship the steel from Japan by the end of this year, via MISI,

to CPW, which will process it into pipe.

TAP is an 878-km pipeline that will transport Caspian natural gas from the Greek-Turkish border to Italy via Greece, Albania and the Adriatic Sea. It will require up to 526,000 tonnes of steel in total. TAP AG, headquartered in Switzerland, has shareholders BP (20%), Socar (20%), Snam (20%), Fluxys (19%), Enagas (16%) and Axp0 (5%).

Umicore expands catalyst production

Umicore opened a new plant for the production of automotive emission control catalysts in June. The plant, in Nowa Ruda, Poland, allows the company to meet growing demand for such catalyst systems in Europe, a trend supported by tightening environmental legislation in the EU.

Situated in the special economic zone of Wałbrzych, the factory complements Umicore's existing European catalyst facilities in Germany, France and Sweden. It uses the newest generation of process technologies, says the company, which notes that it has been researching automotive catalysts for over 50 years, and manufacturing them for over 40 years.



Inspecting a catalyst at Nowa Ruda

Iranian Base Metals Conference

6 – 7 September 2016

Parsian Azadi Hotel, Tehran, Iran

MB's inaugural Iranian Base Metals Conference will examine the market dynamics for aluminium, copper, lead and zinc, and how Iranian base metal industries fit into the global picture. The impact of sanctions lifting will be discussed, along with guidance on conducting business in Iran.

metalbulletin.com/events

Mining Strategic Excellence: South America

6 – 7 September 2016

Sheraton Santiago Hotel and Convention Centre, Santiago, Chile

This inaugural conference addresses innovation and operational excellence from a strategic perspective. It will look at case studies drawn from base metals, ferrous metals, precious metals, industrial minerals and coal.

metalbulletin.com/events

21st Galvanizing and Coil Coating Conference

6 – 7 September 2016

Bratislava, Slovakia

Key topics to be discussed at this flagship event include supply and demand balance, developments in coatings and technologies, zinc supply, demand outlook and the effect of trade cases.

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

North American Automotive Metals Conference

14 – 15 September 2016

The Dearborn Inn, Michigan, USA

The second event in this series will focus on the lightweighting debate, the latest OEM user preferences, supply chain issues and the latest developments happening across the US and Mexican markets.

amm.com/events



SHUTTERSTOCK

Chicago



SHUTTERSTOCK

Esfahan

North American Ferroalloys Conference

19 – 21 September 2016

Eaglewood Resort and Spa, Chicago, USA

This new event from AMM Events will facilitate vital networking and business connections in this sector, with purchasing individuals from steel mills, speciality metals producers and foundries.

metalbulletin.com/events

4th Asian Nickel Conference

20 – 21 September 2016

Jakarta, Indonesia

This conference will address many vital aspects of the Asian nickel industry, including the Indonesian export ban, local project investment, future policy in the Philippines, stockpiling in China and the future of NPI production.

metalbulletin.com/events

9th Indian Iron and Steel Conference

20 – 21 September 2016

ITC Maurya, New Delhi, India

The Ministries of Mines and Steel will give the latest information about government plans for the steel sector, and a wide range of key issues will be addressed by senior figures from the steel supply chain.

metalbulletin.com/events

2nd Iranian Iron & Steel Conference

26 – 28 September 2016

Abbasi Hotel, Esfahan, Iran

Connecting the Iranian iron ore and steel markets with the world, this conference will be the ideal place to learn about Iranian markets and create international links.

metalbulletin.com/events

31st International Aluminium Conference

27 – 29 September 2016

Melia Avenida America, Madrid, Spain

This major aluminium conference will cover the difficult issues facing the industry, including capacity cutbacks, weak prices, and uncertain future demand growth. Discussion and debate will take place across the entire value chain, with ample opportunity for networking and negotiation.

metalbulletin.com/events

30th Stainless and its Alloys Conference

17 – 18 October 2016

Hilton Philadelphia, Philadelphia, USA

This conference will bring together over 150 industry executives from the entire supply chain, from raw materials (nickel, chrome, molybdenum and scrap), to US and global mills, distributors and fabricators.

amm.com/events

20th Met Coke World Summit

18 – 20 October 2016

Pittsburgh, USA

This summit convenes hundreds of international coke, coal and steel decision makers, and connects the leading companies with the most informed industry analysts to address critical issues in the sector.

<https://www.metcoke.com>

32nd International Ferroalloys Conference

6 – 8 November 2016

Hilton Prague, Czech Republic

The premier meeting place for senior executives in the ferro-alloys market features a number of extra benefits this year, including bespoke packages, free registration for steel mill buyers, enhanced networking and a streamlined programme.

metalbulletin.com/events

International Mining and Resources Conference

7 – 10 November 2016

Melbourne Convention & Exhibition Centre, Australia

IMARC is Australia's one-stop, truly international mining event, where over 2,500 mining leaders, policy makers, financiers, technical experts, innovators and educators are brought together under one roof.

<http://imarcmelbourne.com>

12th Asia Copper Conference

15 – 17 November 2016

Grand Hyatt Shanghai, China

Held during CESCO's Asia Copper Week, this conference gives first-hand insight into the region's copper market, including demand patterns, the effect of China's monetary policies and future concentrates supply.

metalbulletin.com/events

Monthly prices

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

July averages

	Low	High
Aluminium		
Aluminium P1020A, in-warehouse premium		
Rotterdam duty unpaid spot \$/tonne	60.00	70.95
Aluminium P1020A, in-warehouse premium		
Rotterdam duty paid spot \$/tonne	110.00	123.89
Alumina		
Index fob Australia	239.91	
Antimony		
MB free market		
Regulus 99.65%, max Se 50ppm, \$/tonne in warehouse	6,716.67	7,100.00
MMTA Standard grade II \$/tonne	6,677.78	7,000.00
Bismuth		
MB free market		
min. 99.99%, \$/lb, tonne lots in warehouse	4.14	4.41
Cadmium		
MB free market		
min 99.95%, cents/lb in warehouse	61.56	66.44
min 99.99%, cents/lb in warehouse	64.33	71.00
Cobalt		
MB free market		
High Grade, \$/lb in warehouse	11.18	11.97
Low Grade, \$/lb in warehouse	11.03	11.56
Copper		
US High-grade cathode premium indicator, \$/tonne		
	132.28	143.30
Germanium Dioxide		
MB free market min 99.99%, \$/kg		
Rotterdam \$/kg	1,122.22	1,322.22
Gold		
London \$/troy oz		
Morning		1,337.43
Afternoon		1,337.33
Morning		1,016.95
Afternoon		1,017.31
Handy/Harman		1,336.66
Indium		
MB free market		
Ingot min 99.97%, \$/kg in warehouse	220.56	265.56
Magnesium		
MB free market		
min 99.8%, \$/tonne	2,035.00	2,132.00
China free market min 99.8%	2,142.50	2,172.50
Mercury		
MB free market		
min 99.99%, \$/flask in warehouse	960.00	1,260.00
Molybdenum		
Free market in warehouse		
Europe drummed molybdic oxide \$/lb Mo	6.66	6.84
US canned molybdic oxide \$/lb Mo	6.63	6.93
Nickel		
Free market in warehouse premium		
uncut cathodes	60.00	125.00
4x4 cathodes	150.00	250.00
briquettes	125.00	200.00
US		
Melting \$/lb	0.18	0.23
Palladium		
Morning \$/troy oz	642.24	
Afternoon \$/troy oz	646.05	
Platinum: per troy oz		
Morning \$/troy oz	1,086.24	
Afternoon \$/troy oz	1,086.48	

	Low	High
Rhodium		
European free market		
min 99.9% in warehouse, \$/troy oz	589.05	689.05
Selenium		
MB free market		
min 99.5% in warehouse \$/lb	9.94	12.17
Silicon		
MB free market €/tonne		
	1,610.00	1,710.00
Silver		
London		
spot pence/troy oz	1,514.30	
spot cents/troy oz	1,992.86	
Handy/Harman cents/troy oz	1,999.18	
Tin		
European free market		
Spot Premium 99.9% \$/tonne	400.00	522.00
Spot premium 99.85% \$/tonne	325.00	350.00
Kuala Lumpur (ex-smelter) \$/tonne	17,800.05	
Titanium		
Ferro-Titanium		
70% (max 4.5% Al), \$/kg d/d Europe	3.38	3.60
Tungsten		
European free market APT \$/mtu		
	182.00	195.00

FOUNDRY INGOTS

	Low	High
Aluminium		
LM24	1,325.00	1,410.00
LM6/LM25	1,567.50	1,610.00
Aluminium Europe €/tonne	1,596.00	1,664.00
Phosphor Bronze		
PBI ex-works £/tonne	5,550.00	
Zinc Alloy		
10 tonne lots Z13 £/tonne	2,176.00	

LONDON METAL EXCHANGE

High, low and average July (21 days)

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

	July 2016	Low	High	July Average
		\$	\$	\$
Copper Grade A (\$)				
Cash	4,310.25	5,102.50	4,855.36	
3 months	4,320.25	5,070.25	4,871.11	
Settlement	4,310.50	5,103.00	4,855.79	
3 months seller	4,320.50	5,070.50	4,871.95	
Copper Grade A (£)				
Settlement	3,005.51	3,778.88	3,689.93	
3 months seller	3,012.06	3,781.89	3,697.64	
Tin (\$)				
Cash	13,225.00	18,197.50	17,827.38	
3 months	13,212.50	18,225.00	17,793.33	
Settlement	13,235.00	18,200.00	17,833.10	
3 months seller	13,225.00	18,250.00	17,808.81	

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	July 2016		July
	Low	High	Average
	\$	\$	\$
Lead (\$)			
Cash	1,596.50	1,900.75	1,834.36
3 months	1,597.50	1,908.00	1,843.18
Settlement	1,597.00	1,901.00	1,834.88
3 months seller	1,598.00	1,909.00	1,843.98
Lead (£)			
Settlement	1,098.84	1,421.84	1,394.33
3 months seller	1,100.75	1,426.44	1,399.52
Zinc (\$)			
Cash	1,453.25	2,262.50	2,184.43
3 months	1,466.50	2,267.00	2,187.96
Settlement	1,453.50	2,263.00	2,184.83
3 months seller	1,467.00	2,268.00	2,188.62
Aluminium (\$)			
Cash	1,452.50	1,681.75	1,629.46
3 months	1,451.25	1,695.25	1,640.65
Settlement	1,453.00	1,682.00	1,629.83
3 months seller	1,451.50	1,695.50	1,640.98
Aluminium Alloy (\$)			
Cash	1,492.50	1,610.00	1,529.33
3 months	1,527.50	1,625.00	1,554.29
Settlement	1,495.00	1,615.00	1,533.90
3 months seller	1,530.00	1,630.00	1,559.05
Nickel (\$)			
Cash	7,705.00	10,662.50	10,248.93
3 months	7,737.50	10,705.00	10,289.88
Settlement	7,710.00	10,665.00	10,251.90
3 months seller	7,750.00	10,710.00	10,295.48
Nasaa (\$)			
Cash	1,650.00	1,739.50	1,708.46
3 months	1,667.50	1,760.00	1,726.31
Settlement	1,651.00	1,740.00	1,710.00
3 months seller	1,670.00	1,765.00	1,729.52
Cobalt (\$)			
Cash	21,702.50	26,200.00	25,089.52
3 months	21,800.00	26,250.00	25,098.81
Settlement	21,705.00	26,250.00	25,244.05
3 months seller	21,850.00	26,500.00	25,333.33
Molybdenum (\$)			
Cash	11,500.00	16,750.00	15,285.71
3 months	11,500.00	16,750.00	15,285.71
Settlement	11,750.00	17,000.00	15,535.71
3 months seller	11,750.00	17,000.00	15,535.71
Steel Billet (\$)			
Cash	75.00	312.50	312.50
3 months	90.00	315.00	312.50
Settlement	100.00	325.00	325.00
3 months seller	115.00	340.00	325.00
LME Settlement Conversion Rates			
\$/£	1.32		
\$/yen	104.12		
\$/€	1.11		

Jim Lennon, managing director, Red Door Research, says that the global stainless industry is in transition

China's ambitious stainless steel industry

World crude stainless steel production was just over 42 million tonnes last year, just 2.5% of global steel output. While stainless is a small segment of the total steel market, it is vitally important for the raw material industries that feed it: stainless accounts for 70% of total nickel use, and 80% of ferro-chrome use.

Like many industries, it received a profound shake-up following the emergence of China (see chart). In 2000, China accounted for just over 3% of world production and by 2015 it accounted for 52%. China swung from a major net importer of stainless (over 3 million tonnes melt equivalent in the middle of the last decade) to a major exporter (over 3.5 million tonnes melt equivalent in 2014). This switch has led to a closure of some non-Chinese output. Non-Chinese output peaked at 23.2 million tonnes and in 2015 was 20.3 million tonnes, 12% lower than in 2006. European and Japanese production last year were both almost a quarter lower than in 2006. The only country outside China to experience significant stainless growth has been India, which now accounts for 7.8% of the world total, up from 4.3% in 2000.

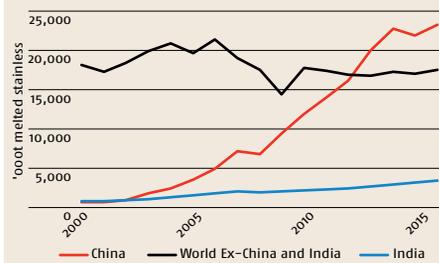
At first, 2015 appeared to be a turning point for the industry as Chinese net exports fell 13% year-on-year and Chinese production fell by around 4%. China's exports were driven back by anti-dumping trade actions and also a loss in competitiveness as Chinese nickel pig iron prices rose to a premium to LME nickel prices, after having traded at a significant discount in previous years.

However, this has proved to be short-lived as exports surged in the first half of 2016: in January to June, Chinese net exports were up 20% year-on-year following a sharp rise in Chinese production. So far in 2016, we can identify over 3 million tpy of new melt capacity coming on stream: at Beihai Chengde, Shangtai, Delong and Jaingsu Baotong.

Of concern to the wider market, a further 5 million tpy of supply is rumoured to be coming on over the next three years, including ramp-ups by the previously mentioned plants plus new capacity from Shengyang and Xinhai. Additionally, the world's largest producer, Tsingshan, is bringing on 1 million tpy of new melt capacity in Indonesia this year with another 1 million tpy planned – fully integrated with its new NPI and new ferro-chrome capacity.

If all of the rumoured capacity came on stream, over 10 million tpy of new melt capacity would hit the market by 2019/20 in

Stainless steel production 2000-2016F



China and Indonesia, adding over 15% to existing global capacity and 25% to Chinese capacity. We project that over the 2015 to 2020 period, global demand should grow by around 7 million tonnes, so capacity growth of 10 million tpy at face value is not that unreasonable. However, this capacity growth comes in an industry with a global capacity utilisation rate of 65-70% in 2015, with existing excess capacity (nominally) of around 20 million tpy.

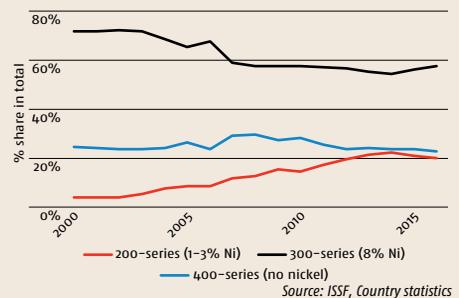
There must therefore be some doubts whether the Chinese mills can achieve their ambitions. First, these expansions would fly in the face of the central government's policies to limit expansions of industrial capacity in industries already beset by severe overcapacity. There are reports that the central government is investigating Delong's recent 2 million tpy expansion.

The more fundamental concern is that the economics of these plants appears to be based on integration with nickel pig iron capacity to capture the cost savings of hot metal transfer of nickel into the stainless furnace. In China, this is reliant on the availability of ever-increasing quantities of nickel ore from the Philippines.

This year has seen a 25% year-on-year fall in exports of ore from the Philippines and the election of a government that describes itself as "anti-mining", which has recently ordered the closure of six nickel mines as part of an environmental audit. The assumption that ore exports from the Philippines will be maintained at recent levels is questionable, but the new capacity being planned in China would require a substantial increase in Philippine ore supply in the coming years.

The new capacity already planned and the rumoured new capacity have cost advantages that derive mainly from the production of 300-series stainless steel (containing 8% nickel). We may well be witnessing the

World stainless production grade share 2000-2016F



renaissance of 300-series share of production, which will greatly benefit nickel usage. Following the great nickel shortage of 2006/7, the global 300-series production share fell from 72% in 2002 to 57% by 2009 (see chart) as producers and consumers shifted to 200-series (where market share went from 4% to over 20% between 2002 and 2014) and 400-series (from 23% in 2003 to a peak of 28% in 2010).

In the first half of 2016, 300-series growth of close to 10% has been recorded in China, compared with little or no growth in 200- and 400-series. It seems likely that a major nickel surplus and low nickel prices have finally reversed the decline in 300-series output, for now. An additional factor has been growing consumer discontent in China against the poor corrosion-resistance qualities of 200-series stainless steel.

The big challenge for Chinese (and Indonesian) producers will be to sell additional tonnages into countries that are erecting higher and higher trade barriers, including Europe, USA, India and Brazil. The major victims of this new capacity surge could in fact be high-cost, non-integrated Chinese producers – at the end of 2015 there was already upwards of 10 million tpy of non-utilised Chinese capacity. We have already witnessed some major capacity reductions in China over the past 12 months, from Baosteel, Southwest, Fujian Wuhang, among others. More are likely to follow.

There may well be Chinese takeovers, mergers or joint ventures with non-Chinese producers in Asia and Europe. This could potentially lead to the closure of melt capacity in the non-Chinese markets to be replaced by imports of slab and/or hot band. Existing cold-rolling capacity would be maintained, thus preserving some jobs in ex-Chinese locations and getting around anti-dumping barriers to a certain extent.



99,99%

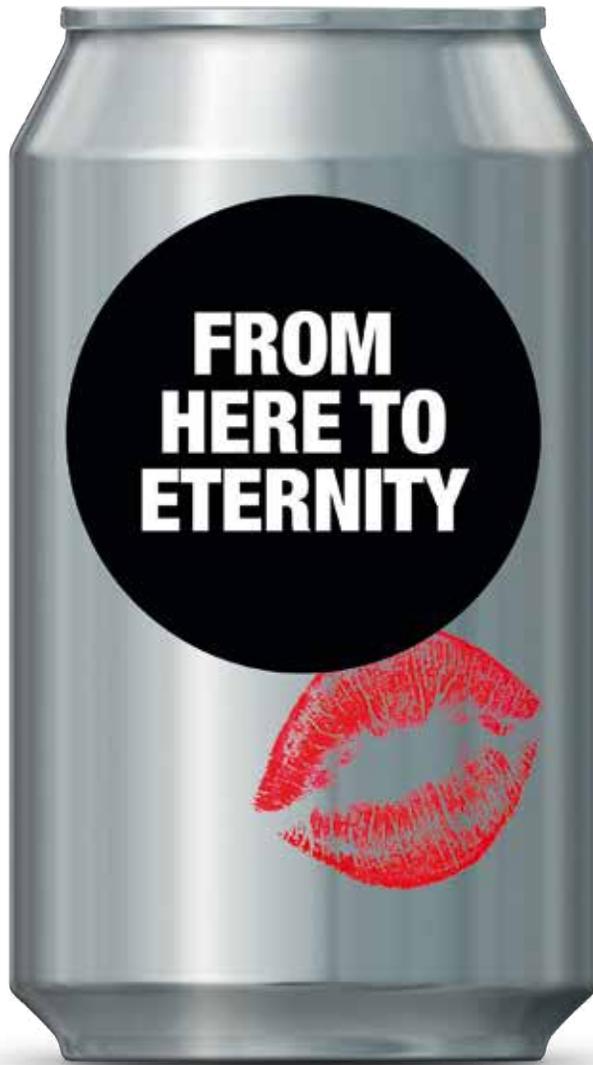
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