March 2011
Vol.35/No.2

Contents

Long products – Page 18

Long products – Page 24

Energy – Page 33

Energy – Page 34

News

News – Teesside TCP sold to Thai group 2
Statistics & Events – World crude steel output increases 15% in 2010 8
USA Update – Steel industry sees better days for 2011 following 2010 losses 10
Latin America Update – Venezuela steel: losing importance in DRI 12
China Update – China’s steel exports likely to drop in 2011 14
Japan Update – Merger of Nippon Steel and Sumitomo Metals under the export dependance of Asian market 16

Long products

Wire mesh in Europe: Its history and impact of Eurocode 2 18
A new generation of blooming breakdown mill for high-quality rod and bar 22
Roll Shop Simulator: For Roll Shop design 24
The Bi Support Stand – An innovation for bar mills 26

Energy

US Steelmakers play down impact of shale gas 27
Shale gas – A renaissance for DRI production in USA? 31
Industry demand for process integration 33
Prisma for a holistic view of green technology 34

Others

OECD Steel Committee pays more attention to fragile growth and climate change 36
ILAFA 2010: Profit margins under pressure 38
The 4th North American CRU Steel Conference 42

History: Industrial might of the USA in 1893 48

Features on the web www.steeltimesint.com
Conference report: 8th European Steel Success Strategies
India’s rapid steel growth
The steel industry in India is growing faster than the country’s economic growth, said a steel minister. Steel industry is growing around 9-10% while economic growth was 8-9%. India had produced 69Mt of steel in 2010 against a targeted capacity of 73Mt. The country has set a target to produce 100Mt of steel by 2012-13 and 200Mt by 2020, emphasising the need to develop technology to improve quality of minerals including iron ore and coal as import costs had been rising.

Danielli acquisition
VWN Steel Solutions has been incorporated into the new Danielli Centro Met Swiss company. It will represent the centre of competence within the Danielli group for the worldwide remanufacturing business in electric steelmaking. Additionally, Danielli Centro Met Swiss, will take care of the German speaking markets in terms of electric steel making projects.

The new company will operate from the existing VWN offices in Rheinfelden, Switzerland.

Jindal to control Ispat
JSW Steel has acquired a 41.29% stake in the ailing Ispat Industries. JSW has acquired 1bn Ispat shares at a price of $1 per share. The company renamed JSW Ispat Steel. The Mittal family in India holds a 26% share in the company. Proceeds from the acquisition will be used to reduce Ispat’s debt. The deal will make JSW the largest steel producer in India with a capacity of 14.3Mt by March 2011.

Baosteel profits up 120%
Baoshan Iron and Steel reported profits of RMB120bn ($18.2bn) for 2010, up 120% y-o-y. Sales income for the year was RMB820.4bn ($130.7bn), up 36.3% y-o-y. Though it did not spell out reasons for substantial increase in profit, insiders disclosed that non steel business contributed a large share.

Source: China Metals
e-mail chinametal@xinhu.org

Wisco to develop iron ore mine
Wuhan Iron and Steel (Wisco) will, in cooperation with Canadian mining company Adriana Resources, develop the Lac Otelnuk iron ore mine in Quebec, Canada, which has reserves of 66Mt of magnetite ore with iron content at just 30%.

VISIT: www.steeltimesint.com
To see a full list of news and features.

ArcelorMittal posts $780M Q4 loss
ArcelorMittal has predicted that 2011 will be a better year for steelmakers than 2010, despite posting a loss in the most recent quarter. The world’s largest steelmaker made a net loss of $780M in the last three months of 2010, compared with a $1.35bn profit a year earlier. Increasing prices for key raw materials such as iron ore and coking coal have hurt the company’s bottom line.

But it said steel prices were adjusting to the rises in raw materials prices. It also said production volumes were expected to increase in the first quarter of 2011 as “the gradual underlying demand recovery continues and market sentiment improves”.

Although 2010 continued to be a challenging year, as anticipated we saw a slow and progressive recovery,” said Chief Executive Lakshmi Mittal. “The gradual underlying demand recovery continues and we expect 2011 to be stronger than 2010.”

Crude steel production for Q4 was 21.6Mt compared to 22.2Mt for Q3. For the full year, production was 90.6Mt compared to 71.6Mt in 2009.

In a drive to increase self-sufficiency in its raw-materials needs, it continues to aim for 100Mt of its own iron-ore production by 2015, excluding output from recently-acquired group Baffinland. Arcelor’s iron-ore output rose 30% in 2011 to 48.9Mt while coal production fell 1.4% to 7Mt.

Arcelor said Q4 earnings before interest, taxes, depreciation and amortisation fell to $1.9bn from $2.13bn a year earlier, and below $2.1bn in Q3. It forecasts Q1 2011 Ebitda of between $2bn and $2.3bn. Q4 steel shipments rose to 21.1Mt from 19.5Mt a year earlier.

Rio breaks records
Mining giant Rio Tinto posted new quarterly and annual iron ore production results.

Rio’s global iron ore operations set a new quarterly production record at 65Mt and a new annual record at 239Mt, the company said in a statement. Of that total, 50Mt and 185Mt were attributable to Rio for the December quarter and full year, respectively.

Rio’s iron ore output increased 6% in the December quarter. Rio’s Australian hard coking coal production was up 8% on the fourth quarter of 2009 to 2.28Mt and rose 20% on full year 2009, following increased investment at the Queensland operations.

Fourth-quarter output of hard coking coal was 2.28Mt, against 2.12Mt a year ago. Thermal coal production in Australia increased to 5.15Mt from 5.02Mt.

The company’s Australian thermal coal production was down 9% overall for the year, mainly due to wet weather in the Hunter Valley.

Reclaimer contract
Tenova Takraf and Brazilian mining giant Vale have a consolidated relationship. Vale (CVRD), a long-standing customer has obtained permission to mine iron ore in Simandou hills of Guinea, Africa where it plans to invest in plant and infrastructure.

The Brazilian group has established a joint venture with the South African mining company BSGR, to handle the initiative.
Liberia ore boost

Russian steelmaker Severstal has estimated a doubling in natural resources at its Putu iron ore project in Liberia, Africa to 2.4bn t.

Severstal is the majority stakeholder in the project with a 61.5% interest and African Aura has 38.5% in project.

The mineral resource NI 43-101 compliant report issued by independent engineers SRK Consulting (SRK) estimated a total of 2.37bnt of iron ore in the existing pit, with an estimated 34% iron concentration. SRK also identified the potential for a further 1bn t to 2.5bn t of iron ore below the project’s existing pit shell.

The Putu iron ore project is a 13km long iron rich ridge, located 130km inland from the deepwater shoreline of western Liberia.

The ore has an estimated 34% total Fe content.

A Mineral Development Agreement detailing the fiscal and legal terms for the development and mining of the Putu iron ore deposit was granted and ratified by the Liberian government in September last year. The agreement term is for 25 years and this can be extended further in line with the life of mine.

Severstal invested $30M in 2008 for a pre-feasibility study and also owns a 2.91% stake in African Aura.

Rio Tinto reports profits triple

Rio Tinto reported a near tripling of annual earnings, rising by $US10bn, due mainly to surging iron ore prices and demand from China.

The Anglo-Australian miner reported net profit for the 2010 calendar year of $US14.3bn, up 194% from $US4.87bn in 2009.

Chairman Jan du Plessis said the company was in a significant growth phase and had multiple opportunities to pursue with its strengthened balance sheet.

It had repaid its mostly A1an acquisition-related debt back to $US4.3bn at December 31, down 77% from $US18.9bn a year before.

Chief executive Tom Albanese said: “Rio Tinto is reinvigorated, running strongly and benefiting from favourable markets.”

“We have embarked on Australia’s largest fully integrated mining project through the expansion of our iron ore business in the Pilbara towards 283Mt/y by 2013, and continue to finalise studies into the phase two expansion to 333Mt/y by 2015.”

The company also announced a $5bn share buyback and a larger-than-expected rise in its dividend.

In a separate statement Rio said it was investing more than $1bn at its iron ore operations in Australia and Canada.

It has approved a $US931M investment to extend the life of the Marandoo iron ore mine by 16 years to 2030 and given a further $US277M to increase the Iron Ore Company (IOC) of Canada’s concentrator production capacity by 40% to 26Mt/y.

The project will extend the Marandoo mine life at its current mining rate of 15Mt/y by developing the adjacent reserves below the water table.

Phase two of the IOC project will increase its spiral concentrate and magnetic concentrate production capacity by 1.3Mt/y to 23.3Mt/y from 2013.

UK Steel president warns of layered costs

Addressing the biennial Forum of UK Steel in London, the President, Mr Tarlock Singh, warned that Russian, Ukrainian and Chinese steelmakers will be the beneficiaries of the many steel-intensive infrastructure projects proposed in UK if the UK government insists on layering more costs on to UK’s steelmakers.

Mr Singh, who is MD of Niagara LaSalle (UK) commented that 2010 had turned out to be better than feared largely thanks to stimulus measures introduced by the then Labour government, and the quantitative easing and low interest rates adopted by the Bank of England. He warned that 2011 would be more difficult as the current Conservative government’s measures to rapidly cut the deficit are causing job losses and hence a reduction in spending power, in addition to inflation and the increase in VAT driving up prices to consumers.

Despite recovery in steel output from operating plants, overall output in the final quarter 2010 was onethird lower than in Q4 2009, largely as a result of the stopping of Tata Steel of iron and steel production on Teesside.

On a more positive note, interest is being shown by Thai steelmaker Sahaviriya Steel Industries, to reopen and expand the 3Mt/y Teesside plant. Mr Singh also regretted the demise of Carrington Wire – at one time one of UK’s largest wire producers.

Raw material prices were also escalating with ore now quoted on a quarterly basis and the recent floods in Queensland, Australia have also pushed up both ore and coking coal costs.

To compound matters, the UK government is introducing Climate Change legislation which will be the most severe across Europe. This, with changes in the way low carbon electricity is subsidised, could increase power prices to industry some 70% by 2020.

News in Brief

Nucor opt for Energiron DRI

US steel producer Nucor has awarded Tenova HYL and Danieli a contract for the world’s largest single DR module.

Nucor will install a 2.5Mt/y Energiron ZR plant using Tenova HYL’s reformerless process design. The plant will be built in Louisiana, and supply high carbon DRI to Nucor steel plants.

The plant will be designed to produce cold-discharge DRI of 96% metallization and 3.0% carbon in the form of iron carbide, which will be shipped to Nucor’s producing facilities that will use the DRI in their steelmaking process. The Energiron ZR process allows the selective capture of CO2. See ‘Shake gas’ feature this issue.

Chinese consumption grows

China’s consumption of steel was 48.53Mt in November, up 5.9% y-o-y. This was mainly because output in 2009 was low.

Crude output in November was roughly the same as in October. Provincial governments’ policy on banning production was still in place during the period but faded out in December. It means steel production will increase in 2011.

Source China Metals

e-mail chinametal@xinhua.org

German 2010 crude steel output

Germany’s crude steel production for the 12 months 2010 was 43.8Mt, up 34% on 2009 – an exceptionally low year with an output of 32.7Mt, the lowest for over 40 years.

Capacity utilisation of plant was 84% compared with a world average of 78%.

For 2011, only a 1.6% growth in crude steel output is forecast by the German Iron & Steel Institute (VDIe) with output forecast at 44.5Mt.

Ferrexpo production rise

Ukrainian iron ore miner Ferrexpo said its overall pellet production rose 14% in 2010 from the previous year to meet stronger demand from steelmakers. Total pellet output, including production from third-party concentrate, rose to 10Mt for the year.

Its own ore output continued at full capacity in December, resulting in 770.4kt of pellets produced for the month.

Overall pellet production in the last month of the year was down 2.9% from November, but was 8.1% higher than December 2009’s figure.

VISIT: www.steeltimesint.com

to see a full list of news and features.

China ore imports fall 6Mt

China’s iron ore import volume in 2010 decreased for the first time in years to 618.6Mt, and the ratio of dependence on foreign iron ore resources is thought to be at 60%, according to reports from the China NewsBusiness.

From January to November, the import volume of iron ore was 560Mt, a decrease of 6Mt compared with the same period in 2009, said Luo Bingsheng, deputy director of the China Iron &Steel Association.

With the continual price rise of the raw materials, China itself is in a difficult position and is forced to fuel up self-production.

In the past 10 months, China’s actual self- yielded iron ore was 870.94Mt, an increase of 24.4% y-o-y basis.
Process software

ThyssenKrupp Steel Europe subsidiary Hoechs Hohenlimburg has contracted QuinLogic to install a Quality Execution System (QES) into the process chain of the works.

Hoechs Hohenlimburg will equip the works - comprising a hot strip mill, two pickling and three slitting lines - with the software. The system combines all available data for evaluation based on a set of rules. The system can make automatic ship or block decisions for each individual coil.

The QES combines data from different sources, such as SAP, process control systems and other databases.

It also integrates data generated by gauges for width, thickness, flatness, profile, temperature or strip wedge measurements.

Director general

The World Steel Association (worldsteel) has appointed Edwin Basson as Director General.

He will succeed Ian Christmas on 1 August 2011. Mr Basson, 50, is currently Vice President, Commercial Co-ordination, Marketing and Trade Policy, ArcelorMittal. He was born in South Africa and received his PhD in economics from Pretoria University. He joined the steel industry in 1994 as Chief Economist at Iscor Ltd.

By 1996 he had become a General Manager for the company, looking after coated steel products, and then later flat steel products. He joined Mittal Steel (now ArcelorMittal) in 2004.

Visit: www.steeltimesint.com to see a full list of news and features.

Nippon in Sumitomo merger plan

Nippon Steel, Japan’s largest steelmaker, is considering a merger with domestic rival Sumitomo Metal Industries next year.

If approved the merger would create the world’s second-largest steel company by output. The deal would rank the new company as the world’s second-largest steel producer after ArcelorMittal.

The new company would have a production capacity of more than 50Mt of crude steel. This would be some way behind ArcelorMittal, which has about 100Mt/y but ahead of Japan’s other major steelmaker, JFE, which has 34Mt/y.

The two companies already hold minority stakes in each other.

Since 2002, they have also had an alliance in the semi-finished steel products business.

In a press release, the companies said the merger would enable them to become more competitive in areas such as developing new products and technology in the energy and environment-related sectors, in addition to helping cut costs and meet rising demand for steel in emerging markets.

The two sides are considering building furnaces and processing plants in emerging economies that could more easily supply Japanese automakers and appliance manufacturers that have shifted production there.

BHP in record profit

Miner BHP Billiton has made record half-year profits thanks to strong demand and high prices.

Net profit jumped 72% to $10.52bn in the six months to the end of December, BHP said.

It also unveiled plans to spend $80bn on new projects worldwide, and buy back $10bn of shares from investors.

BHP said it saw demand growth slowing in 2011, but added that economic conditions should help earnings.

“While we expect a slowdown in the growth rate of global commodity demand in calendar year 2011, the economic environment still underpins a robust near-term outlook for our products,” chief executive Marius Kloppers said.

The company said it plans to spend the $80bn over the next five years as it looks to develop new projects. BHP said that it would use the money to develop projects in Australia, Chile and Canada.

It said iron ore shipments from its Western Australian projects were a record annualised 148Mt/y rate from the December 2010 quarter.

$3.2bn SE Asian steel plant proposal

The Thai government has been urged to construct a steel industrial estate in neighbouring countries.

The THB100bn ($3.2bn) complex would include a deep-sea port, said the Iron and Steel Institute of Thailand, which recommended Myanmar and Cambodia as potential locations for the 24000m² complex.

Koh Kong is considered the most appropriate location in Cambodia for the estate, which will house integrated steel manufacturing including an upstream smelting facility, while Dawei is recommended in Myanmar.

The institute hopes to propose the plan to the Thai government during Q1. It said the development would help strengthen Thailand’s capacity as the centre of ASEAN Economic Community.

BHP in record profit

The institute has pushed for Thailand to establish a steel smelting plant to lower the cost of existing mid- and downstream steel manufacturers but the plan has faced opposition from environmentalists.

This year, conservative demand growth is projected at about 6-8% to 15Mt in Thailand.

The automotive industry, which is expected to produce nearly 2 million cars and pickup trucks, will lead the demand growth in the manufacturing sectors along with electrical appliance and machinery makers.

The construction industry is also forecast to have strong demand for steel, thanks to planned government infrastructure projects and more private-sector work.

Source Bangkok Post

Indian ore exports fall 67%

Iron ore exports from India’s key Karnataka state are likely to fall 67% in the year to end in March 2011.

It is due to the state’s ban on exports that has hit supplies to the global market and hardened prices, a trade body official said.

“We are losing about 2.5Mt of exports every month,” David Pichamuthu, director, southern region of Federation of Indian Mineral Industries (FIMI), said.

“We are losing production too and people might be laid off. Some of the mines are keeping skeletal staff.”

The south-western state that produces about 45Mt of iron ore of which it exports 30Mt, banned exports from 10 ports and stopped its transport to other ports in July, citing a drive against illegal mining and the need to preserve the ore for domestic use.

Miners appealed to the Karnataka High Court against the order, but lost the case in November when the court upheld the state government’s order and observed that it would take six months to root out illegal mining.

UK coater takeover

A UK steel company that went into administration has been taken over by a Newport, UK-based firm.

Coilcolor has bought Falcon Steel which was based at the old Alcoa site in Swansea, Wales.

Thirty five people lost their jobs when the company failed but 16 have been re-employed and Coilcolor hopes to take on more.

Coilcolor, which makes coated steel, said due to the expansion it aimed to grow its workforce across both cities to around 90 by mid-2012. Managing director Dean Proctor said the deal safeguarded the future of the Swansea plant and Coilcolor would begin manufacture at the Westfield Industrial Park site immediately.

Coilcolor makes coated steel in many colours and finishes for the construction industry.

The Swansea site will operate as a separate company to be known as Coilcolor West Ltd but will have mutual shareholders.
Carbon cuts plan

Magnitogorsk Iron & Steel Works has received approval for an emissions reduction project that will allow it to sell about 407 Mt (594 Mt) worth of carbon credits until 2013.

Russia has approved 33 emissions reduction projects since last summer, allowing companies in the world’s third largest polluting nation to earn carbon credits under the Kyoto Protocol.

The approval will allow the company, also known as MMK, to sell emissions reduction units (ERUs) after it replaced its open-hearth production with electric furnace steelmaking. This shift will allow it to reduce CO₂ emissions by 7 Mt from 2008-2012.

The move has also increased high quality output and reduced energy consumption at Russia’s third largest steelmaker.

“By replacing the outdated open-hearth furnace technology the company’s capacity to produce high quality electrical steel (including profiled and slab grades) has increased from 2 Mt to 4 Mt,” it said in a statement.

MMK’s partner in the joint implementation project is the Carbon Trade & Finance joint venture operated by Gazprombank and Germany’s Commerzbank.

Stainless spin-off

Steelmaker ArcelorMittal has approved the spin-off of its stainless steel business.

The world’s largest steelmaker said ‘an overwhelming majority’ of shareholders voted for the spinoff of Aperam, which makes up about 5% of ArcelorMittal’s Ebitda.

ArcelorMittal shareholders will receive one share in Aperam for every 20 ArcelorMittal shares they own. Aperam will be listed on exchanges in Amsterdam, Paris and Luxembourg.

Luxembourg-based ArcelorMittal says that as a separate company the stainless steel business will be in a better position to attract capital and create value for shareholders.

VISIT: www.steeltimesint.com To see a full list of news and features.

TKS Alabama plant opens for business

ThyssenKrupp Steel USA has opened its steel works in Calvert, Alabama, USA.

The main supplier of the plants and equipment is SMS Siemag, Germany.

The supply scope included a 5.3 Mt/y hot-strip rolling mill, a combined picking line and tandem cold rolling mill, a continuous picking line, an acid regeneration plant, four hot-dip galvanizing lines with two furnaces and an offline skin-pass mill.

The plant’s main customers are the domestic appliances, construction and tube-manufacturing industries as well as the automotive industry, in particular the large carmakers in the south of the USA. The rolling mill produces strip of steel grades, including multiphase steels and high-strength grades as well as around 1 Mt/y of stainless steel.

SMS said the picking line/tandem cold mill supplied is the most powerful of its kind, with a capacity of 2.3 Mt/y.

In addition to the picking line/tandem cold mill, 1.1 Mt/y of hot strip can be treated in the continuous picking line.

For carbon steels the plant is to be supplied with 3 Mt/y of slab from Brazil where TKS is opening a manufacturing site to supply its US and European operation. Construction of a stainless steelmaking plant has started at Calvert but currently stainless slab from TKS Europe and later Mexico is being processed.

For the further processing stages, SMS Siemag supplied four hot-dip galvanizing lines. The lines are designed to be flexible, with their annealing furnaces, coating equipment and temper mills.

Corrosion-protected strip products with tailor-made properties are manufactured on the lines.

ArcelorMittal and Nunavut Iron Ore said they have taken up an additional 4.8 million shares of Baffinland Iron Mines, increasing their joint ownership in the iron ore explorer to 62%.

The world’s largest steelmaker and private equity-backed Nunavut, former rivals in a months-long battle to control the company and its Mary River project in the Canadian Arctic, made a joint bid of CANS$1.50 a share for Baffinland last month.

Between them, ArcelorMittal and Nunavut now hold 65% of all outstanding shares and 45% of outstanding 2007 warrants, representing 62% of fully diluted shares.

The joint offer, which values Baffinland at US$390M, is for 100% of the company.

An agreement between ArcelorMittal and Nunavut will see the two parties split their ownership of the company at 70% and 30% respectively.

Baffinland owns the high-grade, Mary River iron ore project in the Canadian territory of Nunavut. The project has nine high-grade deposits and could hold enough iron ore to supply all of Europe for several years.

ArcelorMittal and Nunavut Iron Ore said they have taken up an additional 4.8 million shares of Baffinland Iron Mines, increasing their joint ownership in the iron ore explorer to 62%.

The world’s largest steelmaker and private equity-backed Nunavut, former rivals in a months-long battle to control the company and its Mary River project in the Canadian Arctic, made a joint bid of CANS$1.50 a share for Baffinland last month.

Between them, ArcelorMittal and Nunavut now hold 65% of all outstanding shares and 45% of outstanding 2007 warrants, representing 62% of fully diluted shares.

The joint offer, which values Baffinland at US$390M, is for 100% of the company.

An agreement between ArcelorMittal and Nunavut will see the two parties split their ownership of the company at 70% and 30% respectively.

Baffinland owns the high-grade, Mary River iron ore project in the Canadian territory of Nunavut. The project has nine high-grade deposits and could hold enough iron ore to supply all of Europe for several years.

Krakatau coal deal

Krakatau Steel, Southeast Asia’s largest steelmaker, is in talks with coal miners Borneo Energi and Marunda Graha Mineral to help meet coking coal demand.

It plans to increase iron production using a blast furnace in addition to its existing DRI facility.

This would be the first use of coking coal by Krakatau, which currently uses natural gas to produce DRI.

Armed with $301M from a listing on the Jakarta stock exchange last month, it said it would consider taking equity stakes to secure the coal supply. Krakatau expects to consume 2.65 Mt of coking coal by 2014 to fuel steel mills for its own projects in Cilegon, West Java, as well as its 560 kt joint venture project with South Korea’s Posco. The company expects to produce 2.8 Mt of steel in 2011, including 2.2 Mt of hot-rolled coil, compared to an estimated 2 Mt in 2010. Krakatau is also trying to source more iron ore locally and is in talks with the state government in western Aceh province about developing iron ore.

Krakatau expects to produce 300 kt/y of sponge iron from 2011 from a project in southern Kalimantan together with state miner Aneka Tambang.

Jindal in profit

Indian steelmaker Jindal Steel and Power Ltd (JSPL) reported improved results due to robust demand in the areas of steel and power in Q4 2010 or Q3 ended December 31 of the current Indian financial year.

Net income after tax was INR9.51 bn ($208.05 m) in the three months in question, up 9% y-o-y from INR8.73 bn in the same period of 2009. The company also pointed out that net sales rose by 18% to INR31.74 bn ($694.38 m) in the quarter compared to INR26.98 bn in the corresponding period of 2009.

JSPL said its plant in Oman, Jindal Shadepend, has started trial production almost four months ahead of schedule with first production of HBI on December 5, 2010, before the target date of March 31. It has also agreed to a 1.5 Mt/y gas-based HBI plant in the Sohar Port, Oman.
India to feel flood squeeze

Indian steel companies are facing a 4-5% squeeze in margins in April-June as floods in Australia may limit supplies of coking coal and push up prices of the key raw material, ORISIL Research said.

The effect of rising prices of coking coal will be felt starting April, when steel companies enter into new contracts with miners, the Indian research group said.

The report pegs the price increase for coking coal, which accounts for about 45% of the raw material cost of integrated steel producers in India, at 15-20% sequentially to $260-270/t.

Australia, the world’s largest coal exporter, accounts for about two-thirds of global coking coal trade, with around 90% of that coming from Queensland state.

Rio Tinto’s Hail Creek mine closed ahead of Cyclone Yasi.

Queensland’s coal industry will lose 5% of exports from 2011 due to recent floods.

LA Iron and Steel trends

Targeted at those seeking an insight into the seaborne iron ore and Latin American steel markets, CRU’s Latin American Iron and Steel Trends conference aims to address these issues.

It is the second time CRU has organised such a conference, the previous attracting 150 delegates to Rio de Janeiro last July where iron ore played a dominant role in discussions with delegates being told that China’s share of world traded iron ore will increase nearly 15% from 2008 levels to around 530Mt (Fe content) by 2014.

Latin America has performed well throughout the economic crisis. The level of economic activity is already well above pre-crisis highs, making this once turbulent region among the most dynamic in the world.

The event takes place on 27-29 April at the Sofitel Rio de Janeiro Copacabana Hotel, Brazil.

To receive regular updates about the conference or to register e-mail conferences@crugroup.com.

To register visit www.laironsteeltrends.com or call +44 (0) 20 7903 2167

World crude steel output increases 15% in 2010

World crude steel production reached 1414 million metric tonnes (Mt) for the year 2010, according to the World Steel Association which represents 170 steel producers and accounts for 85% of world steel output.

This is an increase of 15% compared to 2009 and is a new record for global crude steel production.

All the major steel-producing countries and regions showed double-digit growth in 2010. The EU and North America had higher growth rates due to the lower base effect from 2009 while Asia and the CIS recorded relatively lower growth.

Annual production for Asia was 881.2Mt of crude steel in 2010, an increase of 11.8% compared to 2009. Its share of world steel production increased to 65.5% in 2010 from 63.5% in 2009. China’s crude steel production in 2010 reached 626.7Mt, an increase of 9.3% on 2009. Its share of world crude steel production declined from 46.7% in 2009 to 44.3% in 2010. Japan produced 109.6Mt in 2009, 29.2% higher than 2009. In a provisional estimate, India produced 66.8Mt up 6.4% on 2009. South Korea’s crude steel production was 58.5Mt, a 20.3% growth compared to 2009.

The EU recorded an increase of 24.5% compared to 2009, producing 172.9Mt of crude steel in 2010. However, crude steel production in the UK and Greece continued to decline in 2010.

In 2010, crude steel production in North America was 111.8Mt, an increase of 35.7% on 2009. The US produced 80.6Mt of crude steel, 38.5% higher than 2009. The CIS showed an increase of 11.2% in 2010, producing 108.4Mt of crude steel. Russia produced 67.6Mt of this, an 11.7% increase on 2009 and Ukraine recorded an increase of 12.4% with a year-end figure of 33.6Mt.

Malaysian companies face tough outlook

Malaysian steel companies will continue to face tough market conditions in 2011, with increased competition from regional and China-based steel players.

The implementation of the ASEAN Free Trade Area (FTA) and ASEAN-China FTA, which started in January last year, had these other steel players ramping up their capacities to take advantage of the new markets.

Prices of major raw materials including iron ore, coking coal and scrap metal are expected to rise this year, in view of the continued oligopoly by top global iron ore producers as well as the short supply of coking coal and scrap.

The Malaysian Iron and Steel Industry Federation said domestic steel producers as well as the short supply of coking coal and scrap.

Malaysia’s share of global steel market is expected to grow from 3% in 2008 to 5% in 2012.

For full listing of monthly statistics by country visit www.worldsteel.org?action=stats&type=steel&period=latest

Statistics

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>2010 Mt</th>
<th>2009 Mt</th>
<th>2010/09 % change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>626.7</td>
<td>573.6</td>
<td>9.3</td>
</tr>
<tr>
<td>2</td>
<td>Japan</td>
<td>109.6</td>
<td>87.5</td>
<td>25.2</td>
</tr>
<tr>
<td>3</td>
<td>USA</td>
<td>80.6</td>
<td>58.2</td>
<td>38.5</td>
</tr>
<tr>
<td>4</td>
<td>Russia</td>
<td>67.8</td>
<td>60.0</td>
<td>11.7</td>
</tr>
<tr>
<td>5</td>
<td>India</td>
<td>66.8</td>
<td>62.8</td>
<td>6.4</td>
</tr>
<tr>
<td>6</td>
<td>S Korea</td>
<td>58.5</td>
<td>48.6</td>
<td>20.3</td>
</tr>
<tr>
<td>7</td>
<td>Germany</td>
<td>43.8</td>
<td>32.7</td>
<td>34.1</td>
</tr>
<tr>
<td>8</td>
<td>Ukraine</td>
<td>33.6</td>
<td>29.9</td>
<td>12.4</td>
</tr>
<tr>
<td>9</td>
<td>Brazil</td>
<td>32.8</td>
<td>26.5</td>
<td>23.8</td>
</tr>
<tr>
<td>10</td>
<td>Turkey</td>
<td>29.0</td>
<td>25.3</td>
<td>14.6</td>
</tr>
</tbody>
</table>
Steel industry sees better days for 2011 following 2010 losses

The US steel industry, which faced losses that were far above what had been expected for the fourth quarter of last year, remains in an upbeat mood, predicting ‘better days’ in 2011 as the global economy continues its streak of improvement.

By Manik Mehta, New York

US STEEL companies expect the improved global economy to strengthen the overall demand for steel. Although US Steel Corp reported a fourth quarter loss, its seventh in a series of eight quarters, the company’s chairman and CEO, John Surma, claimed that orders from most of his company’s customers had increased. Surma was ‘cautiously optimistic’ that global economic conditions would further improve in the new year.

Indeed, Surma recently said that his company expected to report a modest improvement in the company’s results in the first quarter of 2011 compared to the 2010 quarter. Surma’s cautious optimism also echoed elsewhere. AK Steel, for example, also saw ‘signs of improvement’ after reporting a second consecutive quarterly loss in 2010. AK Steel’s chairman, president and CEO James Wainscott blamed the soaring costs of raw materials and a ‘stubbornly slow economic recovery’ for the dismal result in 2010. Nevertheless, he was confident that AK Steel was on the road to recovery in 2011.

According to company forecast, shipments in the first quarter of 2011 are expected to rise to 1.45Mt (short) tons or roughly 7% higher than the fourth quarter.

While some analysts endorsed US Steel’s forecast, others pointed out that the hefty increases in the coking coal prices could affect US Steel’s overall improvement. Indeed, some even feared that the company could suffer another major loss.

Yet, it is still odd that US Steel, despite having its own iron mines, thus reducing its dependence on outside iron-ore buying prices, is still losing money. US Steel’s fourth-quarter net loss amounted to $249Mt while AK Steel’s is still losing money. US Steel’s fourth-quarter net loss was around $98.3Mt.

Import woes

The US steel industry remains concerned about rising steel imports. January figures did not do much to mitigate this concern. According to the American Iron and Steel Institute (AISI), steel import permit applications for January 2011 totalled 2.01Mton tons (ston). This is first time imports surpassed the 2Mston mark since September 2010. This was an 8.6% increase over the 1.86Mston recorded in December 2010 and an 11% growth over January 2010 imports of 1.811Mton.

In January, the largest supplying nations of finished steel, based on import permit applications, were Korea (213kst, up 22% from December), Japan (134kst up 25%), Germany (94kst up 3%), US Australia (174kst up 48%), and China (54kst down 2%). The estimated overall finished steel import market share in January was 20%.

Finished steel import products included line pipes, oil-country goods, standard pipes, sheets and strip, reinforcing bar, wire rods and plate in coil.

Thomas J Gibson, the AISI president and CEO, assessing the January 2011 import data, said that the ‘domestic steel industry is expecting 2011 to be a period of ongoing, but still fragile and uneven, recovery. The fact that steel import market share is staying in the 20% range is a cause of ongoing concern. As conditions in the US economy and steel market continue to improve, it is especially important (that) dumped and subsidised imports do not undermine the progress that domestic steel companies are making to get back to full recovery’.

According to the World Steel Association, world crude steel production rose 15% in 2010, with some of the biggest increases coming from Europe and the United States, but from a low base in 2009. In 2010, US crude steel production rose 38.5% from the low of 2009 to 86.8Mt (metric tonnes).

Nucor, the nation’s largest steelmaker with state-of-the-art manufacturing processes, still has not recovered from the onslaught of the recession. Its order books are still not full. It blames what it calls ‘predatory competition’ from China.

China trade unfair

Nucor claims China has an unfair advantage over others in the form of an artificially under-valued currency, almost limitless state credit and free land for new factories. It exports surplus products to global markets at very low prices, at times even lower than the cost of the raw materials.

Dan DiMicco, Nucor’s chief executive, criticised Washington for not doing enough to defend US interests by forcing China to play by the rules of the global trading system.

Like Nucor, other US steel producers have also been demanding that the Obama administration take a harder line against China, branding Beijing guilty of manipulating the value of its currency which, they argue, keeps Chinese made products priced unfairly low on world markets.

Worthington jv abroad

But despite all the misgivings about China, Columbus, Ohio-based Worthington Industries Inc, recently announced plans for a joint venture to build plants in China to make lighter, more environment-friendly construction steel for China’s residential construction market.

Worthington formed a joint venture with Huber Modern Urban Construction & Development Group Co, to manufacture light-gauge steel framing products. The Chinese partner company will have a 60% stake and Worthington 40% in the joint venture which is called ‘Worthington Modern Steel Framing System Co’. The joint venture will start with a plant in Xiantao in Hubei province, located near Wuhan.

In India, Worthington’s business segment for compressed gas cylinders has also entered into a joint venture agreement to acquire a 60% stake in Nitin Cylinders Ltd, in Vishakapatnam, to expand its presence in the growing alternative fuels’ cylinder market. NCL, a subsidiary of Nitin Fire Protection Ltd (NFPIL), which belongs to the Nitin Group of Companies, manufactures high pressure, seamless steel cylinders for compressed natural gas storage in motor vehicles, and also cylinders for compressed industrial gases.

Harry Gousses, President of Worthington Cylinders, said that the joint venture would strengthen the company’s product offering in the growing clean power storage market as alternative fuel use gains momentum internationally for economic and environmental reasons.

Meanwhile, the US steel industry is also studying the Indian Government’s ‘behaviour’ towards large investment projects such as Posco’s $12bn greenfield steel plant project in Orissa.

A New York based analyst, speaking on condition of anonymity because of his ties to India’s steel industry, told Steel Times International that the recent approval by the Indian environment ministry for Posco’s steel plant in Orissa state was “well received” by the US steel industry.

The approval is subject to Posco meeting 60 additional environmental requirements. Posco struggled for six years to get the ministry’s clearance after signing an agreement with Orissa on the project which is the largest single foreign direct investment in India.

While Worthington can now expect an upturn in the US steel industry to show a greater interest in India which is urged to heed the international business community’s advice to expeditiously process investment project-related applications. After all, timing is crucial for the steel business, industry experts advise.
Venezuela steel: losing importance in DRI

Venezuela’s share of world DRI/HBI production has declined steadily since its pre-eminence in 1983. Initially this was due to technical problems but since the nationalisation of producers in 2008 & 09 output has further deteriorated.

By Germano Mendes de Paula*

ONCE, Venezuela played a prominent role in the production of DRI and HBI. HBI is hot briquetted DRI better suited for export than DRI which oxidises during storage and transport. The country was considered for decades as one of the best locations to produce these direct reduced iron products in the world. This was due to a combination of factors: – large iron ore reserves in the Guayana region, where direct reduction modules are located; – huge proven reserves of natural gas; – the Guayana region is the centre of hydro electric power generation in Venezuela; – rivers provide ample water supplies and transportation routes.

Unfortunately, starting in 2006, DRI/HBI production in Venezuela has been experiencing a downward trend. The development of direct reduction output in Venezuela can be divided into three phases, as explained below.

**Phase 1: World Leadership**

The first direct reduction module – based on High Iron Briquette (HIB) process developed by US Steel – was installed in Venezuela in 1974 by Minorca, a subsidiary of Ferromineras Orinoco (FMO).

It was the initial attempt of employing a fluid bed direction reduction technology. However, due to a number of operational problems, it was shut down in 1981.

Next, in 1976, FIOR de Venezuela commissioned a process they named FIOR, also using fluid bed technology. It faced various mechanical and process troubles. As a consequence, initial production was quite limited.

Sidor preferred to adopt proven technologies. It brought on stream eight modules (four HyL and four Midrex) between 1976 to 1981.

In the following year, Venezuela surpassed Mexico as the world’s largest DRI/HBI producer.

In 1983, Venezuela produced 2.4Mt of DRI/HBI (Fig 1 left axis), which accounted for 31.2% of the global output (Fig 1 right axis). This was the maximum share of production ever achieved by Venezuela; and can be considered as the final year of this first phase.

**Phase 2: Exported Oriented Growth**

From 1984 to 1989, production growth was derived from higher use of the installed equipment. Two new plants were commissioned in 1990: OPCO and Venprecar.

OPCO was, in fact, a conversion of Minorca’s facility from HIB to the Midrex shaft furnace process. The new player used much of the existing installation. OPCO was a consortium led by Kobe Steel of Japan, the parent company of US based Midrex.

Sivensa – which had acquired FIOR de Venezuela in 1986 – decided to build Venprecar, based on Midrex technology. Venprecar was inaugurated in 1990. Approximately 55% of its DRI/HBI production was consumed by Casima, a Sivensa subsidiary dedicated to making carbon steel long products.

Consiguisa, a consortium of Japanese investors, with FMO, Tamsa and the IFC, started-up a Midrex Megamod in 1998. It was focused on exports. Posven, a consortium led by Posco, commissioned HyL modules in 2000, also looking at the international market. But it experienced technical, labour and market problems, being idle in 2001. It was acquired by Matesi, a joint venture between Tenaris (50.2%) and Sidor (49.8%) in 2004. Orinoco Iron, a 50:50 joint venture between BHP and IBH (controlled by Sivensa and FMO), using Finmet fluid bed technology, began operations in 2000, but faced adverse conditions and operated with large idle capacity initially.

Even with Posven and Orinoco Iron’s hurdles, Venezuela produced 3.6Mt of DRI and 1.2Mt of HBI in 2002. This combined quantity was more than double that produced in 1987. Additionally, it exported 2.9Mt of HBI in 2002, which accounted for 91% of the country’s HBI output. Despite this, Venezuela’s share of DRI/HBI world production decreased to 15.2%, mainly because of the geographical re-localisation of DRI production to India where coal based kilns dominate and the Middle East with its abundant gas.

In 2003, India became the largest DRI/HBI producer in the world. Venezuelan DRI/HBI output increased substantially until 2005, when it reached 8.9Mt (15.6% of world output), of which 4.9Mt was HBI and 4.0Mt was DRI.

HBI exports achieved a peak of 4.0Mt (82% export ratio) that year.

**Phase 3: Temporary Retraction?**

Venezuelan DRI/HBI production dropped to 8.4Mt in 2006, and has since declined steadily – 7.8Mt/2007; 7.1Mt/2008; 5.5Mt/2009 and 3.8Mt/2010. It cannot be due to unfavourable international conditions, as the world steel industry was in good shape up to Q3 2008. Its crisis is more related to domestic factors.

In 2007, FMO, a State-Owned Enterprise (SOE), took over OPCO, because the leasing contract with the consortium led by Kobe Steel expired. This plant became known as FMO. The Venezuelan government decided to renationalise Sidor in 2008 and to nationalise HBI producers, Orinoco Iron, Venprecar, Consiguisa, and Matesi, in 2009. Sidor, which has its own DRI plant and uses the electric furnace route for steel production has seen crude steel production fall steadily from 4.3Mt in 2007 to 3.5Mt in 2008, 3.0Mt in 2009 and roughly 1.8Mt in 2010. To a large extent this is due to a need to rationalise electricity consumption in the country. The lack of electricity and ore pellets has seriously affected these producers. Consiguisa and Venprecar, for instance, has considered importing pellet from Brazil. It is estimated that Consiguisa’s production decreased from 0.7Mt in 2007 to around 0.6Mt in 2010. At the same time, Orinoco Iron’s output more than halved from 1.2Mt to 0.5Mt, while Venprecar fell from 0.53Mt to 0.4Mt. Matesi was shut down in November 2008.

Matesi, renamed Briqueria de Venezuela (Briquen), re-started its activities in December 2010. Its current annualised production will be 0.7Mt, implying a 50% idle capacity. Its second module is expected to recommence operation in July 2011. FMO intends to resume normal deliveries of ore to HBI producers from Q1 2011. Sidor plans to achieve 98% capacity utilisation in 2011, allowing it to more than double its output to 4.3Mt crude steel.

Even accepting that some production recovery should occur, Venezuelan DRI/HBI severely lost momentum and its traditional prominence to other nations. India, Iran and Saudi Arabia all now exceed its output.

---

*Professor in Economics, Federal University of Uberlândia, Brazil. Email germano@ufu.br*
China’s steel exports likely to drop in 2011

Exports of steel from China are forecast to fall in tonnage terms during 2011 as inflationary pressures and the slow appreciation of the currency make export sales less profitable while domestic demand continues to strengthen. By Shi Lili*

According to the Chinese Administration of Customs, imports of iron ore in December 2010 dropped 6.6% to 58.08Mt compared with 2009 and imports of ore for the whole of 2010 reached 620Mt, a small decline of 1.4% year-on-year.

Exports of steel in December fell 22.6% to 1.44Mt but the export total for the whole of 2010 rocketed 73% to 42.56Mt. What is more, since imports fell in 2010, the net export of steel increased 274.8% to 26.13Mt year-on-year.

The financial crisis in 2009 mainly accounts for the large increase in China’s steel exports in 2010 when recovery of the global economy returns. But, 2010 demand did not completely return to the level before the financial crisis. Besides, although China’s purchase of iron ore dropped a little in 2010, this did not indicate that the basic structure of supply and demand of iron ore has fundamentally changed. China’s demand for ore will continue to rise in 2011. But, exports of steel this year are expected to decline based on the current supply and market demand.

Low profitability in exports

Although China’s steel exports have recovered dramatically since the low of 2009 as a result of an improvement in the world economy, and grown at a fast pace, there are still some problems to overcome such as little change in the steel grades and types exported much of which have low added value such as construction products. It is expected that the profit margins of China’s steel exports will be further reduced due to rising inflation and costs and any improvement in these factors are viewed with pessimism.

This pessimistic outlook for exports is driven by five factors.

• The price increases for major commodities will influence China’s steel exports. Although the world economy grew somewhat last year, it will be difficult to totally move from the slackness experienced in demand, at least during the first half of 2011. What is more, after a year of speculation, the prices of major raw commodities have risen to high levels and are under strong inflationary pressures. Along with the release of negative economic policies by China’s central government, such as raising the interest rate and the bank reserve rate, the inflation bubble may burst anytime and this will put pressure on the performance of major commodities. Therefore, the prices of iron ore, ferro-alloys and steel products will be exposed to strong fluctuations and this will have an impact on steel exports.

• Changes in iron ore prices will control China’s steel exports. In November 2010, several factors such as inflation, rising steel prices and complicated iron ore talks pushed up the iron ore prices for delivery still further. There is a widely held view that raw material prices will continue to rise and push steel prices to a high point close to that of the peak reached in Q3 2008, just before the financial crash. The rising cost of transport is another factor driving up ore prices. But due to a tightening of financial policies by the government to avoid an overly heated economy, the demand for steel may slow and there are doubts if such high steel prices can be sustained.

• The poor performance of the world’s economy will influence China’s steel exports. The growing difference in the price of steel sold

*STI correspondent in China
CHINA Update

on the domestic market and prices on international markets is a consequence of the rising value of the Chinese RMB. This will directly drag down steel exports. What is more, the appreciation of the Chinese currency will cripple exports to some extent. In 2011, exports are, nevertheless, expected to grow at 15.5% but this is significantly lower than the 28.5% in 2010. The demand for steel for machinery, household appliances, light industry, hardware, etc will dramatically decrease.

In addition, many of the countries in the region that China has exported to in recent years have increased their own steelmaking capacities and this also further limits China’s steel exports. China’s steel is mainly exported to the surrounding countries such as South Korea, Southeast Asia and the Middle East. The increase in steelmaking capacities in these regions will depress the profit margin for China’s steel exports. Take South Korea for example, its newly added capacity was 1.5 Mt in 2010 alone.

- Pressures from the market and on the environment will influence steel prices. In June 2010, the Chinese government temporarily banned the approval of any steel expansion projects before 2011. In addition, measures to limit power consumption and new generating capacity builds were introduced in August last year and led to a distinct decline in steel output. In particular, stocks of construction steel dropped. The fact that consumption outpaced production markedly but only temporarily, relieved the difficulties faced by the steel market, yet sent the ore price higher and thus stopped final steel output growing. But with the ending of power restrictions, and the lifting of the restriction on steel plant expansion as well as a recovery in the price and output of steel means market pressure will once again play a key role in determining steel prices. It is expected that the Chinese government will foster measures for energy saving and reducing pollution in 2011 as a means to attain sustainable development.

- The government removed the Export Tax Rebate which it had granted to certain steel products in July 2010, which had applied to all types of steel plates and rolled long products. This adversely affected the market as soon as the policy was rescinded, but reduced steel exports in the long run.

Since the price for raw materials remains at a high point, the removal of the Export Tax Rebate will further reduce the profits of Chinese steel companies that export. Most of these may pay greater attention to the domestic market instead. Also, faced by the restriction in exports and declining demand in the international market and the shrinking domestic market, the price of Chinese steel has stabilised since the fourth quarter last year. So this policy is good enabling the general domestic market to return to a normal price level and avoid price volatility.

What traders can do

Faced by so many negative factors, Chinese companies involved in the steel business may need to change their traditional mode of operation to increase their profit making opportunities. Steel trading companies need to move away from simply trading, that is to buy from one party and then sell to another at a profit, thereby earning income, and move to offering extra services to add further value to the business. For example, they could invest in logistics, warehousing, distribution, etc so that larger regional distribution is offered enabling an increase of scale which can foster closer links with steel producers to increase forward planning of the order-book as well as being able to negotiate preferential prices.

Also, Chinese steel companies need to pay greater attention to processing basic steels to develop higher added value products. This will increase the competitiveness of China’s steel products not only on the domestic market but will also aid exports by reducing the risks of anti-dumping lawsuits on exported steel.

<table>
<thead>
<tr>
<th>Product</th>
<th>2010 Imports</th>
<th>2010 Exports</th>
<th>2010/09 % change Imports</th>
<th>2010/09 % change Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolled steel</td>
<td>16,430</td>
<td>43,560</td>
<td>6.5</td>
<td>7.1</td>
</tr>
<tr>
<td>Semis</td>
<td>0.640</td>
<td>0.140</td>
<td>-86.1</td>
<td>229.1</td>
</tr>
<tr>
<td>Iron Ore</td>
<td>818.63</td>
<td>0</td>
<td>-1.4</td>
<td>0</td>
</tr>
</tbody>
</table>

Chinese steel and ore trade in 2010 (Mt)

We exhibit at AISTech 2011 Indianapolis Booth no. 871

www.thermocast.it
Japan’s iron and steel exports marked a record high reaching 43.4Mt in 2010. This was up 26.0% on 2009 in volume and worth 44.85bn an increase of 34.5% in dollar value. In the midst of this export-led recovery for Japanese steel producers, Nippon Steel and Sumitomo Metals announced their intention to merge on 3 February amalgamating Japan’s largest and third-largest steel-makers. The two companies have collaborated for the past nine years. By Nobuhisa Iwase*

AFTER experiencing a difficult 2009 caused by the Lehman Brothers shock, the Japanese steel industry has regained its strength both in production volume and business performance. In 2010, Japanese crude steel production amounted to 109.6Mt, a surprising increase of 22.1% and up 25.2% on 2009. The volume of hot rolled, ordinary carbon steel products amounted to 77.3Mt, an increase of 21.8%. Within this, wide hot rolled strip accounted for the largest share at 39.2% (45.8Mt) with a year-to-year increase of 33.5%. Subsequently, production of wide cold rolled and galvanised steel also increased by 35.7% and 39.7%, respectively. Most of the sharp increase in production of iron and steel went outside the country as exports. After experiencing an almost two-digit percentage decline in 2009, Japan’s iron and steel exports recorded an historical high of 43.4Mt for 2010. In parallel with the trend in production increase, galvanised sheet, cold rolled coil and hot rolled coil led this remarkable increases in exports (Table 1). Exports of lower-value items such as pig iron and semi-products sharply declined as a result of the strong revival in the global steel market which allowed Japanese steel producers to seek the higher value-added markets of strip, whereas in 2009 they had to supply pig iron and semis simply to keep blast furnaces and steel shops working at an acceptable rate.

Of course, the strong revival of the global steel market in particular is from Asian countries. By destination, Japanese exports in 2010 to Thailand recorded the largest increase at 61.1%, followed by China (+16.2%) and the Republic of Korea (+11.5%). Although exports to the USA at 1493kt also rose by +30.4%, the first increase in the past four years, the increased volume was just 598kt.

Demand from China reflects the need for high value added steel products for industries such as automotive. Sales of new cars manufactured in China reached 18.06 million units in 2010, up 32.4% on the previous year. China is already the world’s largest market for automobiles, which is also true not only for domestic Chinese car manufacturers but also global car manufacturers such as GM of USA and Nissan of Japan as well as from Europe.

The value of all exported goods from China also marked a record-high of US$1577.9bn in 2010, a 31.3% increase over 2009. In late 2010, the Chinese government revealed its forecast that the country will experience a further 9% growth in GDP during 2011, which will lead to the continuous inflow of foreign direct investment (FDI) to the country, including from Japan.

Since the majority of steel products processed by Japanese FDI companies are durable goods with a high steel content such as automobiles and electric appliances, continued strong exports of Japanese iron and steel is anticipated to continue for this year too. In contrast, domestic demand for steel products in Japan remains weak for the future. As a result, many Japanese steel experts expect that the country will keep the same level of crude steel production as 2010 at around 110Mt in which weak domestic demand is compensated for by continuous strong demand in major export markets in East and Southeast Asia.

While Japanese large integrated steel companies are heavily dependent on export markets, the merger between Nippon Steel and Sumitomo Metals, will create the second largest crude steel producer in the world with a combined output of 47.7Mt. ArcelorMittal remains the largest producer making 73.2Mt last year. This move will be the largest merger between two Japanese giants since 2002 when NKK (Nippon Kokan) and Kawasaki Steel made the first merger among the so-called ‘Japan’s Big 5’. Although both Nippon Steel and Sumitomo Metals Presidents said at the press conference announcing the plan that going for large-scale is not the first priority for them, the merger will certainly contribute to increasing Japan’s negotiating power for raw-material purchases as well as place them in a stronger position regarding the price of steel to major customers.

However, there are many issues to be discussed and solved before the two companies can realise this major decision. While they have gradually increased their cooperation and collaboration since 2002 in such areas as mutual stock share holding and the merger of stainless steel production and the sales business, making a final agreement including the issue of formulating an effective organisational structure that enhances efficiencies in both management and operations is a difficult task. Also, they will need approval from the Fair Trade Commission of Japan. The two Presidents hold optimistic views on that, saying that the two companies have different product segments, each with its particular specialties. They also remarked that the combined share in the global steel market will only be a little over 3% – although the combined share of crude steel production within Japan will reach around 40%.

While the merger between NKK and Kawasaki is considered a rare successful case of partnership between Japan’s big traditional companies, the process of negotiation between Nippon Steel and Sumitomo Metals from now on will be given careful attention, not only by global steel businesses but also by a wider range of players within the Japanese business community.

**Table 1 Iron and steel exports by Japan 2009 – 2010 (kt)**

<table>
<thead>
<tr>
<th>By product</th>
<th>2009</th>
<th>Change</th>
<th>Share</th>
<th>2010</th>
<th>Change</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig iron</td>
<td>591</td>
<td>-9.7</td>
<td>100.0</td>
<td>34</td>
<td>-94.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Semi products</td>
<td>5828</td>
<td>-3.0</td>
<td>16.9</td>
<td>5191</td>
<td>-10.9</td>
<td>12.6</td>
</tr>
<tr>
<td>Plate</td>
<td>3548</td>
<td>-9.0</td>
<td>16.3</td>
<td>3799</td>
<td>7.1</td>
<td>8.8</td>
</tr>
<tr>
<td>Hot rolled coil</td>
<td>7190</td>
<td>-35.5</td>
<td>20.9</td>
<td>9142</td>
<td>27.1</td>
<td>21.1</td>
</tr>
<tr>
<td>Cold rolled coil</td>
<td>2809</td>
<td>-28.9</td>
<td>8.2</td>
<td>4014</td>
<td>42.9</td>
<td>9.2</td>
</tr>
<tr>
<td>Galvanized sheet</td>
<td>3582</td>
<td>-28.9</td>
<td>10.4</td>
<td>5632</td>
<td>57.2</td>
<td>13.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>By destination</th>
<th>2009</th>
<th>Change</th>
<th>Share</th>
<th>2010</th>
<th>Change</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>to Korea</td>
<td>5610</td>
<td>-5.9</td>
<td>28.5</td>
<td>10963</td>
<td>11.5</td>
<td>25.3</td>
</tr>
<tr>
<td>to China</td>
<td>6467</td>
<td>-3.0</td>
<td>19.8</td>
<td>7513</td>
<td>16.2</td>
<td>17.3</td>
</tr>
<tr>
<td>to Taiwan</td>
<td>3370</td>
<td>-9.0</td>
<td>9.8</td>
<td>3604</td>
<td>9.6</td>
<td>8.5</td>
</tr>
<tr>
<td>to Thailand</td>
<td>2985</td>
<td>-35.5</td>
<td>8.7</td>
<td>4835</td>
<td>61.9</td>
<td>11.1</td>
</tr>
<tr>
<td>to USA</td>
<td>1145</td>
<td>-28.9</td>
<td>3.3</td>
<td>1493</td>
<td>30.4</td>
<td>3.4</td>
</tr>
</tbody>
</table>

*Source: Japan Iron and Steel Federation.

**Table 2 Major indicators for Nippon Steel and Sumitomo Metals**

<table>
<thead>
<tr>
<th>Items</th>
<th>Nippon Steel</th>
<th>Sumitomo Metals</th>
<th>Combined Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Steel Production (2010) (Mt)</td>
<td>34.38</td>
<td>13.32</td>
<td>47.70</td>
</tr>
<tr>
<td>Number of Employees (Mar 31 2010)</td>
<td>52,205</td>
<td>23,674</td>
<td>75,879</td>
</tr>
<tr>
<td>Same above (Apr/2009-Mar/2010) (¥bn)</td>
<td>3487.7</td>
<td>1285.8</td>
<td>4773.5</td>
</tr>
<tr>
<td>Operating Income (Apr/2007-Mar/2008) (¥bn)</td>
<td>545.5</td>
<td>274.3</td>
<td>819.8</td>
</tr>
</tbody>
</table>
Long products

Wire mesh in Europe: Its history and impact of Eurocode 2

With the adoption of Eurocode 2 into the national standards of EU Member countries further limitations have been placed on the manufacture of wire mesh for concrete reinforcement in particular with regards to a demand for greater ductility in certain applications, a property constrained by the fabricated nature of welded mesh.

By Dr.-Ing M Schwarzkopf* & C Laufköttër**

Structural reinforced concrete members

DURING the past 25 years a long and lively discussion has been going on in Europe concerning the ductility of reinforced concrete members and the necessary quality of reinforcing steel to guarantee ductile and durable behaviour of reinforced concrete structures. Even though this discussion is partially ongoing, particularly with regard to seismic behaviour, for most of the reinforced concrete structures there are two ductility classes for which the ‘normal’ reinforcing steel quality of hot rolled rebars and cold rolled wire mesh are sufficient to fulfill the requirements of the design codes.

A summary of these figures – beginning with the history until the application of today – is presented in this paper with the main focus on wire mesh.

The Badische group with its steel production site in Kehl and several wire processing facilities in Germany represents one of the world’s most successful construction steel companies with an annual production of 1.5Mt of wire rod and about 2500 product varieties. Based on this know-how the sister company Badische Stahl-Engineering GmbH offers consulting services to other construction steel companies in order to analyse the market demand of wire mesh. The Badische group of companies, Kehl, Germany.

History

After the first ideas of net-like laying of reinforcing steel to guarantee ductile and durable behaviour of reinforced concrete structures, a technical improvement accompanied this growth with regard to the surface finish of the wires – they were now profiled and/or ribbed – and a definition of ductility ratio Rm/Re and a certain elongation after fracture were established.

Meanwhile, wire mesh was introduced into other European countries as they rebuilt. The share of wire mesh in the total of reinforcing steel in the European countries rose and reached its peak in the middle of the last decade – between 1990 and 2000 – with values between 10% (Spain) and 50% (Germany) of the total reinforcement. The average European value was about 30%. In total, about 5Mt of wire mesh out of 16Mt of total reinforcing steels were used within Europe.

Today the share of wire mesh in construction is slowly decreasing (in Germany the value is presently about 10%) due to cheap semi-skilled workers from Eastern Europe (eg Poland, Romania, Bulgaria & Ukraine) working in Central and Western Europe and laying the reinforcing bars more cheaply than the welded rods making the mesh. Nevertheless, wire mesh in Europe sustains its position particularly with regard to housing and large flat concrete structures such as floors and walls and places with difficult approaches such as the crown and calotte of tunnels (a very important market in modern infrastructure).

Ductility of reinforced concrete structures

After a long period of disputes and discussions during the development of the Eurocode 2 with each EU Member country presenting various arguments concerning the possible and necessary ductility of concrete structures with regard to the different qualities of reinforcing steel, the then existing CEB (comite euro-international du beton, Lausanne) published the available research of the different European countries (Netherlands, Italy, Germany, Spain, UK) in the Bulletin D’Information No 218[1] which formed the basis for a discussion during a meeting in Les Diablerets, Switzerland, in 1993. The results are included in EC2, 1994[2] and are now the background of the three defined ductility classes A, B & C. All the research work was carried out by universities; steel reinforcement producers, such as BSW were involved only as far as defining their opportunity to produce various steel qualities in terms of ductility. The results (three ductility classes) in EC2 are now compulsory in most of the European Union countries with the remainder having to comply this year. Table 1 summarises the required properties for the three classes of increasing ductility, A, B & C.

For the designers there are different possibilities for structural analysis. The importance for wire mesh is the linear analysis with limited redistribution of bending moments. Up to a moment redistribution of 20% (in Germany 15% ductility class A (wire mesh, cold rolled) is possible, in all other cases class B and/or C must be used. This regulation was the result of the above mentioned research work.

The definition of ductility of class A, for example, in terms of the ratio of the maximum stress to yield stress must be equal to or exceed 1.05 (Rm/Re C 1.05) and the percent elongation at maximum stress must be at least 2.5% (Ag ≥ 2.5%). (The suffix gt refers to this symbol’s common use in the three languages, German, French and English). For wire mesh producers using cold rolled wire, this means additional effort is required that was not there before to meet these values.

The moment redistribution M makes sense in heavy reinforced concrete structures such as beams; if there is a lot of reinforcement in the beam-section above a column, it is possible that the infill of concrete will be incomplete. It is possible to reduce this reinforcement by redistributing the moment and relocate the reinforcement to the midspan where there is more space.

In floors and walls, where wire mesh is mostly used, this situation is rare. Otherwise the possibility to redistribute bending moments is limited; in many cases it is impossible to redistribute the moments up to a limit of 15% or 20%. Therefore the M-limit is very often no barrier for a wire mesh (cold rolled) application. Germany introduced this boarder in DIN

*Badische group of companies, Kehl, Germany  **Badische Stahl-Engineering GmbH, Kehl, Germany
break in the wire compared to a bar without vents further deformation and causes an earlier reverse a certain distance. This cross wire pre-welds between the wires cause the wire to traverse a seismic occurrence. Such elongation is necessary due to the great deformation during seismic behaviour. A large elongation of the steel does not make sense in BSW’s opinion: for class C-steel (and also a production route to make class C-steel is possible) its application is necessary. Nevertheless, if it is required, it is possible to make wire meshes with hot rolled wires. Using hot rolled wire it is possible to reach ductility class B.

Annotation: Ductility class C (seismic) and wire mesh

Although it is possible, according to EC2, Appendix C, to design a wire mesh with ductility class C-steel (and also a production route to make class C-steel is possible) its application does not make sense in BSW’s opinion: for seismic behaviour a large elongation of the steel is necessary due to the great deformation during a seismic occurrence. Such elongation is prevented in a wire mesh because the spot welds between the wires cause the wire to traverse a certain distance. This cross wire prevents further deformation and causes an earlier break in the wire compared to a bar without cross welds. Thus the available elongation in the individual wire cannot be capitalised on.

Moreover, for seismic behaviour, the beams and columns (H-beams) in a construction are the main members to dissipate seismic loads. Walls and floors are mostly stiffening elements. Quality and Production

Cold rolled wire mesh (class A)

Until 2005 the performance characteristics and the ductility requirement for cold rolled wires had been:
- Yield stress $R_e = 500$MPa
- Max Stress/Yield Stress $R_m/R_e = 1.03$ when $R_e > 550$MPa
- Elongation at fracture $A_{10} = 8\%$

(suffix 10 refers to a gauge length over which elongation is measured at 10 times wire/bar diameter).

These values had been generally accepted in the European countries. No ductility class had been defined, no difference in structural analysis (moment redistribution) had existed. Bars and meshes had been applied in the same way.

With defining ductility classes – class A for wire mesh, cold rolled – the values changed:
- $R_m/R_e \geq 1.05$
- $A_{10} \geq 2.5\%$ (elongation at maximum load).

This change forced the producers to higher values, particularly for the ratio $R_m/R_e$. The consequences for mesh producers was that there had to be a redefining of:
- wire rod (chemistry, dimensions);
- rib geometry.

Especially wire rod produced from scrap requires a restriction on elements present (micro elements) and a reduction in diameter: eg mesh wire 6mm is cold rolled from wire rod of diameter 6.3mm in order to reduce the cross area reduction (6.3 → 6.0 = 10% cross section area reduction).

An area reduction of more than 15% would be problematic for reaching especially the ratio $R_m/R_e$. To fulfil the requirements of the designers after EC2 was introduced for ductility class A, $R_m/R_e$ is very important and is the most critical parameter, whereas for the production process compliance with the value of elongation at maximum load $A_{10}$ is not a problem.

In the German standard DIN 488 (4) diameters ± 5.5mm are not permitted for use in structural concrete members according to the design standard DIN 1045 (3); when wire rod diameter 5.5mm, without a special definition of chemistry, is cold rolled down to 5.0mm it is not possible to ensure class A requirements especially concerning the ratio $R_m/R_e$. This would only be possible with special wire rod which is not commercially available and more expensive than standard wire rod for the manufacture of wire mesh ductility class A.

Another important aspect is the design of the rib pattern on the surface of the bar. Not only the relative rib area, as defined in EN 10 080 [5], but also the radius of the rib flank inclination (± 45°) to the core of the wire is designed as smooth as possible: the ratio $R_m/R_e$ is controlled very positively by this value. The fillet must not be sharp but requires sufficient radius so that the rupture during tensile testing does not occur at this intersection. These rules generally apply for wire of ductility class B.

Wire mesh ductility class B

If wire mesh should replace reinforcement, eg bars with ductility class B (high ductility), the mesh must be produced with hot rolled and ribbed bars. These bars usually cover the requirements of ductility class B:
- $R_m/R_e \geq 1.08$
- $A_{10} \geq 5\%$

In particular, the welding process must be adjusted to the chemistry of such bars/wire which generally have a higher content of carbon and manganese.

Application

All European countries using wire mesh have a particular system of standard meshes:
- Length;
- Width;
- Diameters;
- Spacing.

These values vary from country to country but they all consider the design standards which are almost the same as in the EC 2. Those for Germany are given in Table 2.

Table 1 Properties of reinforcement bar – Eurocode 2

<table>
<thead>
<tr>
<th>Characteristic yield strength</th>
<th>Bars and de-coiled rod</th>
<th>Wire fabrics</th>
<th>Requirement or quantile value %</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_y$ or $f_{0.2}$ (MPa)</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Minimum value of k = ($f_y/k$)</td>
<td>$\leq 1.05$</td>
<td>$\leq 1.15$</td>
<td>$\leq 1.35$</td>
</tr>
<tr>
<td>Shear strength</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bendability Bend/rebend test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>deviation from bar size (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nominal mass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(individual bar &gt;8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>or wire) (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 German standard mesh dimension specification

<table>
<thead>
<tr>
<th>mesh type</th>
<th>cross section (longitudinal/ transverse)</th>
<th>length</th>
<th>weight</th>
<th>mesh structure (longitudinal/ transverse)</th>
<th>wire distance</th>
<th>no of edge wires</th>
<th>top</th>
<th>right</th>
<th>left</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cm/m</td>
<td>m</td>
<td>per m²</td>
<td>mm</td>
<td>centre</td>
<td>edge</td>
<td>left</td>
<td>right</td>
<td>top</td>
</tr>
<tr>
<td>Q168A</td>
<td>1.88</td>
<td>1.88</td>
<td>4.17</td>
<td>3.02</td>
<td>150</td>
<td>60</td>
<td>75</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Q257A</td>
<td>2.57</td>
<td>2.57</td>
<td>56.8</td>
<td>4.12</td>
<td>150</td>
<td>70</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Q335A</td>
<td>3.35</td>
<td>3.35</td>
<td>74.3</td>
<td>4.30</td>
<td>150</td>
<td>80</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Q424A</td>
<td>4.24</td>
<td>4.24</td>
<td>100.9</td>
<td>4.01</td>
<td>150</td>
<td>70</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Q524A</td>
<td>5.24</td>
<td>5.24</td>
<td>110.9</td>
<td>4.01</td>
<td>150</td>
<td>70</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Q863A</td>
<td>8.63</td>
<td>8.63</td>
<td>120.9</td>
<td>4.01</td>
<td>150</td>
<td>70</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>R188A</td>
<td>1.88</td>
<td>1.88</td>
<td>4.17</td>
<td>3.02</td>
<td>150</td>
<td>60</td>
<td>75</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>R257A</td>
<td>2.57</td>
<td>2.57</td>
<td>56.8</td>
<td>4.12</td>
<td>150</td>
<td>70</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>R335A</td>
<td>3.35</td>
<td>3.35</td>
<td>74.3</td>
<td>4.30</td>
<td>150</td>
<td>80</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>R424A</td>
<td>4.24</td>
<td>4.24</td>
<td>100.9</td>
<td>4.01</td>
<td>150</td>
<td>70</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>R524A</td>
<td>5.24</td>
<td>5.24</td>
<td>110.9</td>
<td>4.01</td>
<td>150</td>
<td>70</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>
In addition to the standard meshes, very often scheduled meshes are used: In this case the dimension (length, width, spacing) can vary within certain limits:
- length up to 14m and width up to 3m (or more) (depending on terms of transport);
- diameter up to 16mm (cold rolled wire) and up to 25mm (hot rolled bar) (spacing according to design code from 50mm up to 350mm or more)

A special design of scheduled mesh is often used: the mesh with only longitudinal wires held together with spot welded cross wires, spaced at 0.80 m – 1.00m in order to fix the longitudinal wires. Such a mesh is called a ‘one axis mesh’ in Germany. For the reinforcing of eg a floor two types of such meshes are needed: one mesh in the x-direction and the other in the y-direction. This form of mesh can also be considered as ‘welded’ or ‘assembled’ bars. In Germany more than 50% of the scheduled meshes are designed and produced according to this system.

Durability of concrete structures
Beside the requirements of serviceability, strength and stability throughout the defined design working life of reinforced concrete construction, the concrete cover of the reinforcement is a very important construction detail. The environmental conditions – chemical and physical conditions to which the structure is exposed – are the main input for defining the concrete cover. The normal reinforcing steel – bar or wire mesh – is a low carbon steel, not stainless steel. Therefore its resistance to corrosion due to carbonation and/or chloride and chemical attack depends on the thickness, density and quality of the concrete cover. Due to frequent defects experienced in reinforced concrete constructions since 1980 the German design code has twice redefined the thickness of the concrete cover to higher values. These values are also given in the Eurocode EC 2 [3].

Depending of the exposure classes the thickness of the concrete covers ranges from the original 10mm to a minimum 15mm extending up to 65mm. Also the quality of the concrete is important: this value is defined by the concrete class (strength class).

The two extreme conditions and the respective concrete cover are:
- XC1 = dry or permanently wet (inside buildings with low air humidity or permanently submerged in water) concrete cover 20mm.
- XD3/XS3 = bridges, pavements, park slabs exposed to containing chlorides or marine structures concrete cover up to 65mm (and more if necessary).

These values are the basis for buildings with a design life of 50 years. If other periods of de-signed lifetime are requested, higher values of concrete cover or a special treatment must be defined.

In all cases, thickness and density of the concrete cover are the basis for a durable reinforced concrete construction. This will become increasingly important if there is an increased impact from CO2 or other chemical elements (eg sulphate) in the air.

References
A new generation of blooming breakdown mill for high-quality rod and bar

As Chinese steelmakers increasingly move to the production of higher quality long products it has become necessary to cast larger section bloom rather than smaller section billet both to reduce centre segregation and enable large reductions in the mill to be made. This has necessitated the reintroduction of the blooming breakdown mill, a new generation of which has been built by CISDI Engineering. By Min Jianjun, Ma Jinjiang & Zhang Yan

WITH the rapid introduction of continuous casting in China the need for blooming mills to roll ingot receded from the 1970s. Across the world, by the 1980s, continuous casting of billet was so common that most blooming/breakdown mills were phased out of steel plants. In China, breakdown mills remained only in a few special steel plants such as Fushun, Benxi and Changcheng Special Steel[1].

China’s steel industry has progressed to increasingly make high-added-value quality alloy steels downstream of the now largely adopted continuous caster. To produce quality alloy steels such as special quality bar (SQB) requires a large reduction ratio during rolling. This demands the casting of larger cross-section blooms rather than billet. Besides enabling a greater rolling reduction casting larger-section blooms can provide remarkably better product quality as a result of fewer inclusions in the product and improved internal grain morphology. But the need to give heavy reductions of larger blooms requires a revival of the breakdown (or blooming) mill.

Since 2000, a number of steel companies have upgraded or built new 2-high reversible breakdown mills followed by continuous rolling lines to produce a semi-continuous rolling line capable of producing premium billet and heavy and medium diameter bar. Such lines have been installed at Xiangtan Steel, Daye Steel, Suzhou Steel, Baosteel Blooming Steel Plant, Jiangyin Xingcheng Steel, Huaqin Steel, Dalian Special Steel, and NISCO Medium Section Steel Plant, and others. Some of these companies installed a new type of breakdown mill to produce high-quality billet to target high-value-added bar and wire rod markets. This paper describes the technology and equipment required for a new breakdown mill known as the BDCD mill (Break Down mill from CISDI).

This new type of mill provides improved product quality, and widens the product range. It is China’s first specialised mill of its kind. By applying CISDI’s patented new breakdown mill, the production line can supply quality rolled billet to feed high-speed wire rod lines in such steel grades as cold-heading steel, cord wire, pre-stressed steel stranded wire, high-quality spring steel, bearing steel and pinion steel with the final product aimed at the high-end and premium wire rod market. This locally produced BDCD breakdown mill is characterised by fully automatic rolling, advanced mill and auxiliary equipment and is configurated to feed suitable billet stock for top-quality wire coil.

Process Arrangement and Flow

The construction of the BDCD breakdown mill was contracted to CISDI for the engineering design of the stand and all auxiliary equipment for the line except the reheating furnace. The mill has a capacity of 800kt/y to produce billet of dimension 160x160mm up to 11.6m long from bloom of dimensions 280mm x 325mm and 5.2 to 6.0m long. The whole rolling line from charging stand to cooling bed is placed at an elevated level and is connected to the existing high-speed wire rod mill. The cast bloom is rolled by the breakdown mill to billet and then generally directly hot charged to the downstream wire rod mill.

The process flow is illustrated in Fig 1. The line includes length-measurement and weighing of the bloom, a 2-high reversing breakdown mill, a hot-shear for cropping and cutting billet to length and a cooling bed or alternative route for direct charging of hot billet to the high-speed wire rod line without the need to pass through the reheate furnace.

Any steel grade which is to be slow-cooled passes through the cooling bed rapidly and is then stacked at the end of the cooling bed for removal by crane to the slow cooling pits. Once cool, the billet is given a downstream heat treatment and finishing, and finally collected for storage.

Reheat Furnace

The reheating furnace is a walking beam type with side-charging and side-discharging. It is fuelled by blast furnace gas (BFG) without the need to blend with coke-oven or other process gas, and fired with regenerative burners capable of heating the furnace to 1050-1200°C. It employs two-strand charging and has a rated capacity 160t/h. The furnace is designed for uniform reheating, a short reheating time and low oxidation and decarburisation of the billet.

It offers flexible control to cope with the heating profiles of various steel grades and provide easy operation and minimum maintenance work. It produces a high yield, premium quality billet using low fuel consumption, good energy conservation, and a high degree of safety through using a high degree of automation.

Water Descaling

A high-pressure water descaler is installed at the furnace delivery table to ensure a good product surface. Consumption of the descaling water is about 40m³/h, at a pressure at the descaling point of around 20MPa. The water spray time for descaling is about 12 seconds continuously. The descaling pump station is equipped with three electrically driven reciprocating pumps (two in use and one on standby) each with a flow rate of 32m³/h. There are also two self-cleaning filters (one in use and one on standby) each with a flow rate of 90m³/h and capable of filtering out particles down to 0.1mm in size.
Breakdown Mill
The 2-high reversing BDCD breakdown mill is automated and set up by the operator using a mouse control. The mill block is set up by this reliable control system based on the rolling schedule.

The BDCD breakdown mill has a maximum roll diameter of 850mm, and barrel length of 1900mm. The maximum rolling speed is 4.5m/s. It has front and rear manipulators and tilting gear. The mill frame is a heavy-duty closed housing, of high strength and rigidity, and of high reliability and safety. The upper roll screw-down device is fitted with an automatic anti-clog device, overload protection and rolling force measurement. The upper roll can be hydraulically balanced and electrically screwed-down. The rolls are fitted with axial hydraulic locking and are adjustable along the roll axis. A quick roll change device provides easy access to changing the roll cassette containing the two rolls in a short time for higher productivity.

The bearings for the rolls are 4-column cone roller bearings to provide high rigidity, a small friction coefficient, ease of operation and maintenance. The bearings withstand radial loads and friction coefficient, ease of operation and maintenance. The design avoids stress on the rollerway by the top-bottom blade carriers and a hydraulically operated press plate prevents the sheared billet from impacting the rollerway once sheared. Swing cutting can be performed on billet of lower sectional height to speed up the shearing cycle.

The hot-cut crops are disposed of via a guide chute which discharges into one of two baskets. The guide chute contains a hydraulically-driven diverting gate to switch between the two baskets.

The cut-to-length shear is mated with the hot shear for cutting billet to the required length. It comprises a portal frame, guide rail, rack-and-pinion positioned electric car and clamping. The car is driven through a speed reducer, and its position set and adjusted by an encoder. The cut-to-length stop plate is connected via a swing link to the car which is better for work-piece running and buffering.

Cooling Bed
A walking rack cooling bed with billet tilting is used to achieve fast uniform cooling so as to ensure good straightness and surface quality of the billet. There are 60 teeth of 220mm pitch. It contains a Swiden lever, cooling bed and buffer collecting stand.

The Swiden lever is fitted with a position detector to control the billet loading and unloading speeds and ensures fewer impacts between discharging billets. The cooling bed includes V/U carry-over toothed plates and is of welded construction.

The motor drives two eccentric mechanisms which actuate a further two 4-bar linkages so that the V/U carry-over toothed plates are lifted or fall. The work-piece traverses the V/U toothed plates in an alternate tilting motion until the far side of the cooling bed is reached when the billets are discharged at the collecting stand where they are stacked using a collecting chain conveyor or which dampens vibrations and carries the billet away.

Finishing Facility
Eight slow-cooling pits are present to meet the requirements of some higher quality products in the mix. Rolled billet to be slowly cooled passes through the cooling bed rapidly and is stacked at the end of the cooling bed before being lifted by a crane to a cooling pit. The temperature at the top of the pit is over 650ºC.

Reference
Roll Shop Simulator: For Roll Shop design

A roll shop simulation tool to analyse roll throughput can increase the precision and consistency of roll shop design to guarantee best performance. The change is in the philosophy behind the design which examines the shop as a whole rather than the performance of each individual machine.

By *G Angelo & T Claudio

**Roll Shop Design**

Roll Shop Design methods so far implemented have been static analyses to decide on the number of machines and transporters needed in a roll shop, but that did not take into account the interactions between the different resources.

The new method considers design in a dynamic way taking into account the entire roll shop and the interactions between resources – mainly the grinding machines and the transporters – but also chocking devices, the roll cooling area and human resources. The idea behind this approach is that a simple evaluation of the world of roll grinding machines and transporters is not enough to accurately dimension the roll shop. Considering the different resources in isolation provides no information on their interactions and their influence on the performance of the roll shop as a whole and, consequently, on the performance of the rolling mill.

**Roll Shop Simulator**

The Roll Shop Simulator is a reconfigurable simulator of the entire roll shop. The aim is to consider an aggregate system and not individual resources during the process of roll shop design.

Two concepts are very important in the definition of the simulator: for the first time the entire roll shop is considered during the design process analysing how auxiliary equipment interacts with the main machines and how they impact on the performance of the roll shop.

This is truly a new philosophy in the design of a roll shop: roll grinding machines, the core of a roll shop, are not considered as individual resources but as part of a more complex system where the interaction between components influences the performance of the entire roll shop.

The second important point is that the RSS is a reconfigurable simulator. It is not a ‘movie’ that shows the general running of a roll shop, but rather it is a tool which can be adjusted to model alternative roll shop designs.

A roll shop is composed of a large number of different resources: roll grinding machines, transporters, and a range of auxiliary assets such as buffer areas, choking/de-chocking devices, surface texturing machines, and the human operators. Not all the resources may be installed in the system and also management rules may change with time. The RSS allows analysis of all the possible configurations considering which resources and how many of them are installed.

In addition, with the simulator it is possible to study how the roll shop and the rolling mill interact. The rolling mill is the source of rolls and the roll shop has to give these back as soon as it can. Each year a certain number of rolls are used by the mill and these have to be reground and surfaced in the roll shop. The interaction between rolls arriving from the mill to the roll shop is variable and consequently complex to study. Production through the mill is not a steady state process; different problems, on the line and management rules impact on the throughput and consequently on the frequency with which rolls are changed.

Under such conditions a static analysis of the roll grinders’ performances is too poor, and normally leaves out waiting times or wasted time.

The roll shop must answer to the variability of the system, and the RSS is able to consider stochastic parameters and to give output statistics predicting the performances of the roll shop under such variable conditions. The simulator describes the behaviour of the mill and its variability taking into account how the rolls are changed in the mill and the variability of rolls arriving at the roll shop. The output provides not only average statistics but also how the roll shop performs in extreme conditions.

Other sources of variability are considered in the model. The quality of the rolls in terms of probability of cracks and bruises and the needs of the regrinding process on the machines. Machine availability is considered by estimating Mean Time to Failure and Mean Time to Repair.

A very precise model of the roll shop stands behind the simulator. Much time was spent in modelling roll shop processes, roll flow, and management rules implemented. Different phases of validation were effected to be sure that the model was accurate and took into account all the activities in the roll shop and the resources involved guaranteeing the accuracy of the simulation to how the roll shop really works.

**Using Roll Shop Simulator**

Some specific information is necessary to initialise the simulator: the flow chart in Fig 1 shows how to use the simulator and to exploit its output.

The user is required to draw an initial design, indicating the number of each components present in the system, the rolls that have to be ground, and the time to process rolls on each piece of equipment. The RSS will complete the job, simulating in a few minutes years of roll shop experience, combining all the information to take into account all possible interactions.

---

*The authors are with Pomini Tenova*
At first, this new method can appear more complex and require more time than personal intuition but it allows the designer to understand more precisely the correct resources and to accurately predict roll shop performance using these. Of course, not all the information is always available. The mill is unlikely to be able to decide, months in advance, how often the rolls will be changed because it is very difficult to predict orders and so correct roll consumption. Thus, sometimes some approximations have to be made during the first stages of the design in order to start a simulation. Later, the simulation can be improved from the initial knowledge gained.

At the completion of the simulation the RSS will present output statistics showing the presence of bottlenecks or resource limitations. The waiting time on the different resources and their saturation will indicate where it should be appropriate to increase the roll shop capacity and where it should be decreased. The mill is unlikely to be able to decide, months in advance, how often the rolls will be changed because it is very difficult to predict orders and so correct roll consumption. Thus, sometimes some approximations have to be made during the first stages of the design in order to start a simulation. Later, the simulation can be improved from the initial knowledge gained.

Fig 2 shows one of the output reports provided by the simulator. The total working time of the machine is divided into:

- grinding time;
- time for auxiliary activities;
- loading and unloading time;
- scheduled maintenance time;
- down time for failure;
- waiting times for operators or transporters;
- available time.

Fig 3 shows the statistics calculated for each type of roll in the table on the left general information, process performance and waiting times are available. The pie chart shows how the total cycle time for a roll travelling through the shop was allocated. This enables bottlenecks to be identified and also shows the most important stages of processing.

It is important to note that the confidence interval is available. Ready Time is displayed and represents the time necessary to process the roll from the time of arrival in the roll shop to when it is ready to be installed again in the mill. In this example the average for Ready Time is 4.97 hours, but it is also calculated that 95% of the rolls were processed in times between 4.83 and 5.10 hours. All this information is important in order to analyse and improve the performance of the roll shop.

Fig 4 shows the use of a transporter vehicle. The pie chart indicates the percentages of time used by the loader for roll transport; for lifting; and for maintenance. Average mission time and a statistic about the number of mission per day are also available to complete the analysis shown in the pie chart.

As indicated at the branch in Fig 1 – where the output statistics are analysed – it is possible to modify some input parameters to adjust the output statistics to match the best configuration. Of course, commercial and technical considerations have to be included with the simulated output with the aim at choosing the best solution for the customer.

Conclusion
While the simulation method is more complex than an intuitive manual one, its benefits outweigh its greater complexity.

Various configurations can be simulated and thus different scenarios compared. By considering these analyses with the commercial and technical requirements it is easier to find the best solution for customers.

It must not be forgotten that the Roll Shop Simulator has great potential because it provides the opportunity to study and research the impact of the numerous variables on the performance of the roll shop.

For instance, it is possible to investigate the total number of rolls necessary to guarantee a particular service level at the mill, or on the best way to change the rolls in the mill. The analysis, considering system variability, can suggest innovative solutions to improve the performance of the roll shop under differing running environments.

Contact
Pomini Tenova, Tenova Spa, Via Leonardo da Vinci, 20, 21053 Castellanza (VA), Italy
Tel: +39 0331 444 356
E-mail: grinders@it.tenovagroup.com
Web: www.tenovagroup.com
The Bi Support Stand – An innovation for bar mills

A new design of bar mill stand which uses tungsten carbide rings instead of grooved rolls offers a low cost, low maintenance stand of high stiffness suitable for rolling both carbon and alloy steels. By M Zuccato* & M Tomba**

A NEW design of mill stand has been developed by the Italian engineering company Pert Srl to achieve higher yields and more flexible solutions for bar mills but at a lower investment cost than conventional stands.

The goal of the new stand design compared with a conventional stand is a dramatic increase in rolling load, faster production programme changes, significant productivity improvement, lower operating costs, and lower inventory and tool cost of spares.

The new stand, called the ‘Bi Support Stand’ (BS Stand) represent a formidable innovation in long product technology, thanks to its concept born from Pert’s experience in supplying new rolling mills and revamping existing ones. Experience has shown that the main requests from mill operators are for a mill which will improve product quality and yield, increase the mill available time and to significantly reduce delivery time to install the new stands.

Mechanical Properties
The mechanical properties of the new BS Stand are summarised as:
– Compact and rigid construction of the housing, the result is an extremely stiff stand deforming little as the rod passes through (Fig 1);
– Absence of chocks;
– Use of rings mounted on a shaft to make up the roll instead of a conventional cast iron grooved roll. The shaft is of alloy steel running in multiroller bearings. For the intermediate and finishing stands tungsten carbide rings are used.
– The use of tungsten carbide rings, instead of traditional cast iron grooved rolls, provides high wear resistance. The goal is to achieve better mill performance with a more wear resistant material.
– The radius of the ‘roll’ neck is increased to minimise stress concentrations.
– The rolling stands facilitate roll changes in 2-3 minutes, minimising changeover time helps boost productivity.
– The rolling stands are built to a common design. All stands with the same ring diameter are identical.
– Due to the fact that horizontal and vertical stands have the same design, the number of spare parts is minimised.
– The BS stands are especially designed for also rolling high alloyed steel grades to very close tolerances, this requires stiff rolling stands with minimum elongation under the roll separating forces.
– Adjustment of the ring centre distance is by means of simultaneous opening/closing of both shafts by screw down gears which directly act on eccentric sleeves. The ring centre distance is controlled by an encoder and displayed at the main control pulpit.

Fig 1 Comparison of stand stiffness for various stand designs

Advantages of BS Stands
The smaller overall dimensions of the stands reduces investment costs to build the necessary foundations and requires extreme compactness of the technology (Fig 2). There is also a reduction in the height of overhead cranes (level of rails), the crane capacity needed is less, a shorter installation time can be achieved and a reduction in plant delivery time.

In conclusion, the BS stand introduces a new concept of mill equipment for the long product sector. It provides an answer to new and existing mills to reduce production costs and supply to the market a high quality finish product. The stand increases productivity, has rapid set up time, greatly reduced maintenance, cuts workshop activity and number of machines as the use of rolling rings means smaller tools can machine the grooves compared with a grooved roll and also rings reduce the space required in storage.

The BS mill stand
All stands are supplied ready to use. That means they are ready to be installed on the foundations. All the assembly work is done in the Pert workshops together with the necessary on board equipment. This philosophy considerably reduces the construction time in the mill.

The new stand design provides an operator-friendly arrangement. Automation of the mill reduces the number of operators needed per shift thus saving labour costs.

In conclusion, the BS stand introduces a new concept of mill equipment for the long product sector. It provides an answer to new and existing mills to reduce production costs and supply to the market a high quality finish product. The stand increases productivity, has rapid set up time, greatly reduced maintenance, cuts workshop activity and number of machines as the use of rolling rings means smaller tools can machine the grooves compared with a grooved roll and also rings reduce the space required in storage.

Contact
Pert srl, Via Palladio,17, 33010 Tavagnacco (Udine) Italy
Tel +39 0432 575258, +39 0432 575268
Fax +39 0432 575035
e-mail info@pertengineering.com
www.pertengineering.com

Fig 2 Differences between the BS type and conventional stands in vertical configuration

* Long Product Division Manager, ** Technical Department Manager

26 – March 2011 – Steel Times International
US steelmakers play down benefit of shale gas

WHILE the Marcellus Shale and a number of other natural gas shale ‘plays’ in USA have, and will continue to have, a large impact on natural gas pricing, it is uncertain how much that will affect domestic steelmakers who may be planning to produce alternative iron products such as direct reduced iron (DRI) as a feedstock to their steelmaking activities.

Much of this is due to the double edged sword of natural gas pricing. The increased supply of natural gas from shale plays have, among other factors, kept prices of natural gas down but the cost of extraction from shale is higher than from conventional fields.

Some steelmakers, however, say the gas price is not so significant. “While an important input cost, natural gas does not have a significant impact on our profitability,” Dick Teets, president and chief operating officer of steel operations for Steel Dynamics Inc, Fort Wayne, Ind, maintains. “It represents about 1% of the cost of making a cast or hot-rolled product, so even when natural gas prices got high prior to the economic downturn, it was more of an inconvenience than a major problem.”

Teets says that even for the energy intensive alternative iron products, such as direct reduced iron (DRI), hot briquetted iron (HBI) and iron nuggets, such as those being produced by SDI’s coal based Mesabi Nugget and Iron Dynamics projects, the larger cost is iron ore or pig iron as opposed to the cost of natural gas.

Christopher Plummer, managing director of Metal Strategies Inc, West Chester, Pa, notes that the Henry Hub natural gas price peaked in July 2008 at $10.82 per thousand cubic foot (Mcf = 1.027 million BTU) but then fell as low as $3 a Mcf after the financial crisis and has been generally hovering between $3 and $5 a Mcf for the past 18 months. The current turmoil in the Middle East is not expected to substantially affect gas prices as the USA is now largely free of imports of LPG from the region.

At the beginning of March, spot natural gas prices were about $4 a Mcf, which, by some estimations, is the absolute lowest breakeven point for energy companies to economically drill in the shale plays, even with improvements in drilling technologies. The consensus of analysts is around $5.50 as the minimum gas price for shale gas exploitation.

“The shale plays have arrived, and they have birthed a new day for natural gas supply,” Paul Vivian, a partner at Preston Pipe Report, Ballwin, Mo, declares. There is no question that the reserves of the natural gas shale plays are absolutely huge.

Resources

The Marcellus shale play – the shale formation that is currently receiving the most press – which stretches from New York to Pennsylvania and West Virginia, contains over 500 trillion cubic feet of natural gas reserves. Stephanie Meadows, senior policy advisor for the American Petroleum Institute (API) says that this is the second largest reserve in the world – second only to gas fields in the Middle East.

And the Marcellus is certainly not the only shale play in the United States. Tim Considine, managing director of Metal Strategies Inc, notes that the Henry Hub natural gas price peaked in July 2008 at $10.82 per thousand cubic foot (Mcf = 1.027 million BTU) but then fell as low as $3 a Mcf after the financial crisis and has been generally hovering between $3 and $5 a Mcf for the past 18 months. The current turmoil in the Middle East is not expected to substantially affect gas prices as the USA is now largely free of imports of LPG from the region.

At the beginning of March, spot natural gas prices were about $4 a Mcf, which, by some estimations, is the absolute lowest breakeven point for energy companies to economically drill in the shale plays, even with improvements in drilling technologies. The consensus of analysts is around $5.50 as the minimum gas price for shale gas exploitation.

“The shale plays have arrived, and they have birthed a new day for natural gas supply,” Paul Vivian, a partner at Preston Pipe Report, Ballwin, Mo, declares. There is no question that the reserves of the natural gas shale plays are absolutely huge.

Resources

The Marcellus shale play – the shale formation that is currently receiving the most press – which stretches from New York to Pennsylvania and West Virginia, contains over 500 trillion cubic feet of natural gas reserves. Stephanie Meadows, senior policy advisor for the American Petroleum Institute (API) says that this is the second largest reserve in the world – second only to gas fields in the Middle East.

And the Marcellus is certainly not the only shale play in the United States.
analyses of the shale plays, including how much gas will come from each well and what it will cost to drill and develop profitably. “If it should prove that some of these shale basins are not as profitable as previously assumed, drilling will stop,” Brooks says.

Already, according to Tim Considine, some exploration companies have pulled back drilling for natural gas and have taken some drill rigs to the oily shales, which are seen, at current oil prices, to be more profitable.

Environmental Concerns

In addition, concerns about the effect hydraulic fracturing, or ‘fracking’, of the shale – which is necessary to extract the natural gas from the shale – on the groundwater could have a dampening effect on the amount of drilling. This, Considine says, has resulted in a de facto moratorium on drilling in the New York state section of the Marcellus shale play, at least until legislation comes up with an adequate plan for regulating natural gas drilling there.

API’s Felmy, however, calls such concerns unfounded. “We’ve never seen such a misinformation campaign as the one regarding hydraulic fracturing,” he says, adding that the television documentary Gasland, which he says is part of this campaign, totally misrepresents the process. “Hydraulic fracturing has never resulted in the contamination of water supplies as the drilling is miles away from the aquifer,” he maintains. He does, however, admit, that there could be problems if the drilling is done incorrectly. “That is why there should be careful regulation of the process. But the problem is that as things stand there could be bad decisions made because of bad facts,” he says.

However, Preston’s Vivian states, “As long as it comes down to such worries versus reality, fracking will win, especially with energy consumers being faced with the question of whether they can turn their lights on or if they have to wait until energy is imported from the Middle East”.

According to Baker Hughes Inc’s US drill rig statistics that show that about 53% of the rigs operating in the United States at the end of February were drilling for natural gas compared with about 65% a year earlier and 80-85% historically.

Plummer says the number of rigs currently drilling for natural gas could also be artificially propped up as a number of energy companies owning drilling rights were forced to do some drilling on those properties by the end of 2010 or else face the possibility of losing their leases and have the property rights revert back to the landowners. “This means that they might have drilled for natural gas despite the economics of doing so,” he says, which placed them ‘between a rock and a hard place’ as, “No one wants to contribute to further natural gas price erosion.”

“Natural gas prices will continue to creep up as the economy improves, but probably not as much as many would like or had expected,” Vivian say, estimating that natural gas prices could get back to $6.50 or so, although they would probably have crept higher – to about 38-39 without the shale plays.

Geochemist David Hughes, a Fellow of the Post Carbon Institute, USA, warns that another important point defusing the basic argument of the gas lobby is the full cycle GHG emissions if the fuel used in upstream development and fugitive methane emissions are taken into account.

Bob Howarth at Cornell has suggested that shale gas may be equal to or even substantially worse than full cycle coal emissions. Also, the US EPA has recently raised its estimates of fugitive methane emissions and has embarked on a major study on the environmental impacts of hydrofracking.

He also says people like Art Berman, a petroleum geologist and consultant to the energy sector, who has studied the Barnett shale in Texas and other shale plays, say the marginal cost of shale gas is around $7.50 per Mcf, (although most industry analysts consider a break even cost of around $5.50). David Hughes believes that the chances of gas-fired power generation being ramped up to replace coal at current rates of US power demand are nil.

He also points out that natural gas is a high value fuel given its suitability for various end uses – only about 30% of US gas consumption is currently used for electricity generation – coal is a much lower value fuel from an end use point of view unless it undergoes costly and energy wasting conversions to gas or liquids which is why more than 90% of consumption is used for generation of electricity.

DRI for security

But even if natural gas continues to trade between $3 and $5 a Mcf, many industry observers do not believe that it will prop up the economics of DRI, HBI, iron nuggets and other iron substitutes. Even at current pricing levels, many question whether some of these technologies make economic sense. “There has been talk about DRI production for a while and it could potentially come back at some point,” Vivian says. “But I don’t see it continuing to be a focus in the United States long term.”

Mark Millett, SDI’s executive vice president for recycling and ferrous resources, said during the company’s recent fourth quarter earnings conference call that DRI pellet raw materials are very expensive and will continue to be so for the next two, three or even four years, “So I don’t foresee a prolific increase in HBI or DRI type facilities anytime soon.”

Plummer says that what is driving steelmakers to get involved with projects to bring production of alternative iron products in-house is raw material independence. “Big players need to control their raw materials in order to give them more medium- and long-term security,” he explains, noting that the steelmakers are looking much further out than just the current spot natural gas pricing.

John Ferriola, president and chief operating officer of Nucor Corp, Charlotte, NC, says this has been particularly true of his company, which has been operating a DRI facility in Trinidad for several years and has recently secured the final permit to build two 2.5M ton a year DRI plants in St James Parish, Louisiana, which will use the Tenaris HYD-Danieli Energetics process that provides low plant operating costs and allows the selective capture of carbon dioxide.

This, Daniel DiMicco, Nucor’s chairman and chief executive officer, says, is just the first phase of a three phase capital investment programme.

After those two plant are up and running in mid-2013, Nucor is still considering building a blast furnace – coke oven operation followed by the addition of steelmaking, and rolling, depending on how the market develops over the next several years.

Ferriola says that for the Trinidad facility, natural gas price is not an issue, as natural gas is, and has been, very affordable there. Also, as far as the US facility is concerned, Nucor has an arrangement that has secured natural gas pricing for the next 20 years.

David Hughes says Louisiana does have substantial shale gas potential in the Haynesville – although much less than was thought a couple of years ago. It also borders Texas, which currently has the USA’s largest exploited shale gas play.

Nucor had originally planned to build a blast furnace with coke ovens in Louisiana, but one of the reasons why it decided to go the DRI route instead, DiMicco says, was because of uncertainty over what the US government, and other governments in the world, are going to do in respect to carbon dioxide emissions. “The amount of carbon given off in a DRI plant is significantly less than the blast furnace,” he says. “So as we see how this develops with respect to carbon issues in Washington and around the world, that will have a lot to do with if we build a blast furnace – coke oven in the second phase or build more DRI facilities,” he says.

While SDI’s Mesabi Nugget facility has had some production problems following start-up in January 2010, Millett says they are still working on the process itself and we believe significant progress is going to be made in the very near future; noting that its iron ore mine permit is still pending and expectations are for the steelmaker to receive the permit either later this year or early in 2012.
Shale gas – A renaissance for DRI production in USA?

The past decade of high gas prices has seen a migration of DRI plants from USA to regions where gas prices are lower. However, in a surprise announcement last Autumn Nucor says it has changed its mind about building a blast furnace at its intended plant in Pennsylvania and instead will build a 2.5Mt/y Energiron DRI module as it offers two-thirds less CO₂ emissions and half the capital costs. But can Nucor rely on the growing exploitation of shale gas deposits to once again make DRI production economic in USA?  

By Tim Smith, Editor STI

IN the past decade, high natural gas prices in USA have seen the dismantling of its few DRI modules to be reassembled in regions of lower gas prices or shut down. In 2004, Nucor purchased the defunct American Iron Reduction plant in Convent, Louisiana and shipped it to Trinidad where it was upgraded from 1.2Mt/y to 1.6Mt/y by Midrex and restarted production in 2007 under the name Nu-iron. It now ships cold DRI back to USA to supply Nucor’s US plants. Likewise, the former British Steel DRI plant in Mobile Alabama – which started life at Hunterston in Scotland in 1980 but was never started up as the anticipated price drop from exploiting gas from the North Sea never materialised, was dismantled and shipped to Mobile, Alabama in 1997. The two 400kt/y Midrex modules operated for less than two years supplying DRI to Corus’ Tuscaloosa strip plate mill until October 2000. It then remained mothballed for four years before being dismantled again in 2005 and shipped to Saudi Arabia by Al Tawairqi Steel for their plant in Dammam where they were each upgraded to 500kt/y and restarted operations in 2007.

The decline of DRI production in USA has been steady. From a high of 1.56Mt in 2000, US production was just 260kt in 2008 and this was from Iron Dynamics’ coal based rotary hearth unit, not from gas shaft furnaces. In fact, Georgetown Steel was the last plant to operate a natural gas DRI unit in USA and that closed in 2003. Plans by the then Minnesota Steel to build a DRI plant using imported gas from the Canada and the local Taconite ore from the Mesabi ore range, were put on hold when the company was bought by Essar Steel in 2008, the new owners deciding to instead develop the mining rights that came with the plant to supply their integrated mill, Essar Algoma in Canada.

Shale Gas for DRI?

Around 29 deposits containing shale gas have been identified in USA with reserves estimated in 2008 by the Potential Gas Committee at 2445T cf (69Tm³) of recoverable gas out of a total reserve of 1836T cf (52Tm³) of gas, and this figure in 2008 by the Potential Gas Committee at 2445T cf (69Tm³) of recoverable gas out of a total reserve of 1836T cf (52Tm³) of gas, and this figure. (1) A report (1) published for The American Petroleum Institute (API) in July 2010 examines the economic impacts of this deposit, one of the largest in USA. The Report takes a positive stance of the potential of shale gas reserves, not only as an energy source but also regarding their economic benefit in terms of expenditure, taxes and employment in a region.

The Marcellus deposit, if developed at a high rate for the next nine years, will require 4800 wells to be drilled, is calculated to provide a $2.4bn economic benefit to the region, will provide $6bn to state and Federal revenues as taxes and could create 280 000 jobs.

The report says 57 000 new jobs, mostly in Pennsylvania and West Virginia, has already been created thanks to increased natural gas production from the Marcellus in 2009. Various scenarios are examined for developing at high, medium and low rates from 2011 to 2020 (Table 1).

The study also examines factors that could limit the benefits of natural gas development in the region, including: a possible severance tax in Pennsylvania; the current de facto moratorium on horizontal drilling in New York – estimated at $11bn in lost economic output – and the effects of a challenging tax and regulatory climate in West Virginia.

The study finds that natural gas development stimulates the economy through business-to-business spending and via payments to land owners. The process involves exploration, drilling, building gas processing plants, and pipeline construction. These activities require goods and services from many sectors of the economy, in particular steel, construction, transportation, and engineering services. Natural gas companies also pay lease and royalty payments to land owners, who in turn pay taxes and spend income on goods and services.

The Report also points out that while most attention is drawn to exploring and drilling for natural gas, a crucial dimension is the development of a network of thousands of miles of gathering lines and pipelines to carry this gas to consumers. Currently there is considerable investment supporting several pipelines to tie these gathering systems to major interstate pipelines.

Gas for DRI in USA?

The change of plan by Nucor announced last September that it now intends to base its proposed 2.5Mt DRI ironmaking plant in South-East Louisiana on 100% DRI production rather than a blast furnace as originally announced, is

![Image](shale_gas_Layout 1 3/8/11 4:17 PM Page 1)

Table 1 Estimated economic impacts of developing the Marcellus Shale (1)

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Low Development(1) (E = 0.5, R/W = 1.5 bcf)</th>
<th>High Development(1) (E = 2.7, R/W = 2.8 bcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wells Drilled</td>
<td>1447</td>
<td>1605</td>
</tr>
<tr>
<td>Output (Mct)</td>
<td>1581</td>
<td>2734</td>
</tr>
<tr>
<td>Value (E$)</td>
<td>6329</td>
<td>7835</td>
</tr>
<tr>
<td>Employment</td>
<td>72.2</td>
<td>90.1</td>
</tr>
<tr>
<td></td>
<td>135.9</td>
<td>211.7</td>
</tr>
</tbody>
</table>

* $ Prices at 2010 E = price elasticity of drilling, R/W = reserves per well, bcf = billion cubic ft

(1) Assumes 30% fall in drilling in Pennsylvania & West Virginia in 2011 from 2010 levels

(2) States survey estimate for planned spending in Pennsylvania in 2011

(3) Estimates for the API report:


Steel Times International – March 2011 – 31
shale gas in the state was 293 billion cubic feet (8.3 billion cubic meters) in 2007. Production of shale gas has increased ten-fold on the 85.8 billion cubic feet reported in 2008. Just south of Fort Worth lies the Barnett field in the Fort Worth Basin, Dallas, which has been producing for 17 years, and is currently the largest exploited shale gas producer in the USA with reserves estimated at 28.167 trillion cubic feet (797.6 billion cubic meters) at the close of 2009. Production that year was 1.789 billion cubic feet (50.6 billion cubic meters). A pipeline network links Texas’ Barnett field to Louisiana.

**Gas Price**

The cost of extracting gas from shale is generally higher than from conventional gas reservoirs using vertical drilling, although technological advances in recent years have decreased the difference. Drilling costs are largely a function of depth. The deeper the well the higher the cost, but the relationship is not linear but geometric. In the case of the Marcellus field the shale occurs at depths of 5000-8000 feet (1500-2400 meters). Economics also depend on the thickness of the shale which governs the rate of decline of output. The maximum thickness of the Marcellus deposit is 100 feet (30.5 meters). The estimated cost for a horizontal well in West Virginia is $3.8 million while a vertical well costs $1.2 million. This includes land leasing costs assuming each well requires 40 acres and each acre has a lease price of $2500.

The price of City Gate gas (the price gas vendors pay to the pipeline supplier) fell $2.2 per thousand cubic feet to around $6.1 per thousand cubic feet between 2008 and 2009. While this may partly be due to the recession in 2009, present gas futures are showing a 43% fall of $1.5 per million BTU to $2.0 per million BTU.

**Opposition**

One criticism of exploiting shale gas is the rapid decline in output with time. **Fig 2** illustrates the steep production decline typical of most shale gas wells and is the reason why large-scale shale gas production requires ongoing drilling. To maintain or increase production, companies need to drill additional wells each year to offset the rapid depletion of the inventory of existing wells. This feature may be one reason why some states have adopted incentives, such as severance tax holidays, to maintain or increase production, companies rather than industry-wide problems and regulations governing the disposal of the used water. Economics also depend on the thickness of the shale which governs the rate of decline of output. The maximum thickness of the Marcellus deposit is 100 feet (30.5 meters). The estimated cost for a horizontal well in West Virginia is $3.8 million while a vertical well costs $1.2 million. This includes land leasing costs assuming each well requires 40 acres and each acre has a lease price of $2500.

The price of City Gate gas (the price gas vendors pay to the pipeline supplier) fell $2.2 per thousand cubic feet to around $6.1 per thousand cubic feet between 2008 and 2009. While this may partly be due to the recession in 2009, present gas futures are showing a 43% fall of $1.5 per million BTU to $2.0 per million BTU.

**Shale Gas Plays, Lower 48 States**

Typically 100 new wells need to be drilled per field each year to keep the gas flowing.
Industry demand for process integration

Process Integration is becoming firmly established as a tool for improving efficiency in the steel and other industries. Industries must, together, continue to strive to develop the methods, communicate and implement the results to achieve even greater potential for improvement.

THE 3rd Process Integration forum hosted by the Scandinavian research organisation, Swera Mefos and the Centre for Process Integration in Steelmaking (PRISMA), was held in Luleå, Northern Sweden on the 5th and 6th of September 2010.

The event was well attended with over 50 participants including from the United Kingdom, France and Italy. There was a very good blend of academics and industrial participants. Presentations went beyond the Iron and Steel industry to include power generation and petrochemical industries.

There were four major themes – CO₂ reduction; Energy recovery and optimisation; Material efficiency; and Methods. The session on Methods was particularly interesting for those new to Process Integration and was helpful in describing the mathematical methods required to analyse Process Integration.

Process integration connects and optimises multiple processes. In an integrated steel plant, for example, it could collect process gases from the coke ovens, blast furnace and converters for distribution around the plant as a fuel and, most importantly, find an external outlet for any surplus – such as electricity generation – rather than flaring this off. Also, low grade heat can be recovered such as from the caster cooling beds or hot rolling mill and used, for example, for a district heating scheme or to generate electricity using an ORC (Organic Rankine Cycle) generator.

The Forum expanded well beyond the border of a steel plant. There were presentations about, for example, opportunities for energy optimisation of industrial clusters, the relation between Carbon Capture and Storage (CCS) as applied to steel plants and electricity production, and how the recycling of materials impacts energy efficiency.

Many benefits of Process Integration were discussed including energy efficiency and recovery; material recycling and the recovery of valuable by-products. Several individual technologies were presented including the ORC process for electricity generation from low grade heat and the oxy-fuel hot stoke concept for blast furnaces which improves the energy efficiency and fuel selection. Development programmes and studies from Sweden and Finland in the mining, steelmaking, chemical and power industries were presented.

Presentations about methods and approaches used for Process Integration showed that there are continual developments and further possibilities for expanding the systems to be integrated with added complexity. The wider the system to be integrated the greater the benefit that can be realised.

ORC Generators

The Organic Rankine Cycle (ORC) generator provides an alternative to the Heat Pump as a means of using low-grade heat. The maximum operating temperature of a heat pump is below 150°C, where as the ORC operates well where the available heat is in the range 70-500°C.

Conventional power stations use superheated steam for the Rankine cycle – a thermodynamic cycle used to produce electricity, which is the practical approach to the ideal Carnot cycle. Superheated steam is generated in a boiler, and then expanded in a steam turbine. The turbine drives a generator, to convert the work into electricity. The remaining steam is then condensed and recycled as feedwater to the boiler. A disadvantage of using the water-steam cycle is that superheated steam has to be used, otherwise the moisture content after expansion may erode the turbine blades.

In the ORC, instead of water, an organic fluid is used in a closed circuit. The major advantage is that these fluids can be used below a temperature of 400°C and do not need to be superheated, resulting in a higher efficiency of the cycle and no risk of condensation eroding the turbine blades.

Dependent on the type of organic fluid used, waste heat temperatures as low as 70-80°C can be used in an ORC to generate electricity. At these low temperatures a steam cycle would be inefficient, due to the need to superheat, resulting in a higher efficiency of the cycle and no risk of condensation eroding the turbine blades.

In Austria is generating 1MW a day from its 5000t/day plant by capturing exhaust heat at 500°C and expelling it at 150°C. At a cement works under construction at Ait Baha in Morocco, 2MW is anticipated to be generated from the 5000t/day plant which will have an exhaust gas temperature of 330°C cooled to 220°C through the ORC. The remaining heat is used to preheat the raw material charge for the cement kiln.

Abstracted from www.stowa-selectedtechnologies.nl

ORC generators can capture low grade heat and turn it into electricity
Pic courtesy Turboden, Italy
Energy

What will happen when tomorrow’s green technology takes over ore-based steel production? CO₂-saving technologies will not necessarily lead to lower total emissions unless the entire process and environmental puzzle is laid out well in advance. By Mauritz Magnusson*

THE Centre for Process Integration in Steelmaking (PRISMA) at Swerea Mefos in Luleå, Sweden, has received grants of SEK 30M ($4.5M) to continue its R&D activities in Process Integration and System Optimisation within the steel and mining sectors. The new injection of funds is for Phase 2 and will continue through 2012.

Prisma estimates the outcome of partial improvements in production systems and the environment by taking a holistic view of the entire process and general picture in society.

Holistic view

“A partial improvement does not always lead to improvements throughout the entire chain,” explains Doctor Mikael Larsson, Deputy director of Prisma.

One of the projects looks into optimised iron and steel production. The blast furnace at SSAB in Luleå is a major supplier of excess gas to energy producer Lukab, providing 60% of the total energy supply. Lukab is one of the country’s most successful partnerships between a process industry and society.

The blast furnace produces gas that contains carbon monoxide, an energy source. A large part of the furnace gas is used as fuel in the hot stoves which produce the preheated air blast for the furnace. The excess gas is delivered to Lukab’s power plant which is joint-owned in equal part by the Luleå Municipality and SSAB. Lukab also receives all the gas from the steel shop, a high-energy gas rich in CO from the converters and also coke oven gas, which has the highest heat value of all these gases and contains carbon monoxide, hydrogen and methane. Most of the coke oven gas is used in the firing of the coke oven battery for the coking process, which completely self-generates heat energy and also provides excess energy. Some of the excess coke oven gas goes to the blast furnace hot stoves and some is delivered to Lukab.

At Lukab the gas is blended and burnt to raise steam to produce electricity via the steam turbines connected to the electrical power generators. The heat remaining in the spent steam is not wasted but used for district heating. The system is very successful. District heating heats around 27,000 homes and a large number of municipal properties in Luleå which is in the far north of Sweden, not far below the Arctic circle. It has replaced the oil-fired heating system that was previously (pre-1980) the main energy source for heating homes in Luleå. The amount of district heating corresponds to 750GWh energy; the system is so successful that Luleå has for many years been able to offer households the lowest district heating and electricity prices in Sweden.

The electricity production at around 630GWh is more than sufficient to meet the entire needs of SSAB’s steelworks in Luleå. In fact, excess energy is distributed to SSAB’s partners’ networks and equipment.

Using excess process gas for power generation can be regarded as a means of reducing CO₂ emissions since the CO₂ previously produced by oil-firing has been replaced by the furnace gas that previously went straight up the chimney before Lukab was established. In addition, electrical power previously purchased from the generating company, Vattenfall can now be put to better use in the region and so helps to reduce Sweden’s oil-dependency. The system also helps SSAB’s Luleå steelworks to keep its carbon emissions at a lower level than many of its competitors. This is achieved through the clever integration between industry and society.

Top gas recycling

A proposed new green blast furnace technology presently being developed at LKAB’s experimental ‘mini’ blast furnace at Swerea Mefos as part of the European Union ULCOS project has the potential to cut ore-based steelmaking’s carbon emissions by half, something the sector’s critics have long advocated.

This technology recycles the blast furnace top-gas back to the tuyeres of the furnace after removal of CO₂. But with this new technology the blast furnace will use all the top gas itself. Replacing the furnace gas now sent to Lukab is a major issue, using the ‘wrong’ fuel in the generator plant could very well result in increased emissions.

Carbon has been the dominating reducing agent ever since iron production began and the blast furnace is still the most competitive method by far, economically and technologically. In geographical regions with a large surplus of natural gas this can be ‘reformed’ to H₂ and CO and used as the reducing agent in the direct reduction processes (DRI).

Blast furnaces give rise to greater carbon dioxide emissions than the DRI methods. Various oxygen enriched blasts tested in the ULCOS project have shown a significant lowering of carbon dioxide emissions is possible. The CO₂ produced is collected for storing in geological formations such as depleted oil wells. By this method, zero carbon emissions from blast furnaces could be set as an environmental goal.

Hydrogen as Reductant

Crude iron or DRI could also be produced using pure hydrogen as a reducing agent. Hydrogen can be produced in bulk from natural gas or from coal to produce a gas rich in H₂ and hydro-carbons, the latter can be ‘cracked’ to form additional hydrogen.

*Freelance writer
However, even this requires a holistic approach, as Prisma always advocates. Hydrogen production will consume a lot of electricity and how this power is generated is decisive in the amount of environmental gain. How residual energies are used is also key. “We have a very broad operations sphere at Prisma. Our task is to conduct analyses using a holistic approach for our clients to ensure they make the right decisions prior to making large investments,” explains Dr Larsson. 

Dr Larsson does not see oil as an alternative in any circumstances when green technology is introduced. “Instead we should endeavour to rationalise the sub-processes throughout the process chain to provide energy users such as Luleå with sufficient energy carriers. The main product, the end product/by-products, public interests and environmental interests must all be accommodated. Process integration is really all about having a holistic perspective.”

Prisma is a centre of excellence that has been built up at Swerea Mefos over three and a half years so far. One significant achievement is the mathematical calculation models that were developed to look into process integration. “It’s vitally important for us to have developed a theoretically well-substantiated instrument for making holistic calculations prior to strategic investments. My hope is for Prisma to become a self-sustaining research centre in the long-term,” adds Margareta Rönqvist, SSAB, chairperson of the centre board.

Subprojects

The Phase 2 project period will include several subprojects.

One example is Lean Material Use, the more effective use of materials, where the chemical composition of the raw material is assessed in order to optimise both the main product and the entire process chain.

Another project is Zero Waste. The perfect scenario would be for 100% of a raw material to be used in making both main products and by-products. This would ensure no waste residual products – a huge environmental gain.

There are also several energy projects. One is on alternative energy carriers, for example, hydrogen gas or other forms of energy with a low CO₂ impact. Another is on energy optimised industrial system based on a holistic perspective.

Should the supply of primary residual energies, such as high grade industrial gases, fall, then it will become increasingly lucrative to investigate the extraction of secondary residual energies. One example is radiant heat from the continuous caster cooling beds, slag, heated cooling water, etc.

“New opportunities arise when old routes are closed,” says Dr Larsson.

There are several exciting examples from the research fields. One research project at mining company LKAB is looking into a joint solution for a joint plant. The iron in the dust and sludge will be used as a joint raw material for the process. The two largest steel communities Brahestad and Luleå are high on the list. A holistic perspective paves the way for new opportunities,” concludes Margareta Rönqvist.

Based on an article which first appeared in Swerea/Mefos News December 2010

Energy

32 Shale gas – A renaissance for DRI production in USA?

Responding to a New York Times article that argued that the USA was on its way to becoming self sufficient in oil and gas supply by exploiting such resources as shale gas and shale oil and deep sea wells, geoscientist David Hughes, a Fellow of the Post Carbon Institute, disputes this saying no nation on earth is more dependent on imported oil than the USA.

He argues that although consumption declined somewhat during the recent recession, imports accounted for more than 61% of US oil consumption in 2009. Net 2009 US imports alone of 11.5M barrels per day exceeded China’s total oil consumption of 8.6M barrels per day by a third. Americans, with a population of 310M, consumed 18.7M barrels a day in 2009. US gas production in 2009 was still 4% below net gas importer via a pipeline from Canada and upon which shale gas production depends.

Regarding the exploitation of shale gas reserves, he believes their potential for economic recovery is greatly hyped. Along with LNG, US gas production in 2009 was still 4% below the 1975 gas production peak. The US is still a net gas importer via a pipeline from Canada and via LNG shipped from many countries. He claims that some CEOs of shale exploiting companies who recently testified before Congress that US gas production could increase by 50% or more in the next decade, are exaggerating the realities of shale gas exploitation.

Shale gas wells have very high decline rates, between 65 and 85% in the first year, he states, they are high tech and hence expensive, require large amounts of water, and have environmental costs that are now becoming evident. The EPA has begun an extensive investigation of the environmental issues surrounding ‘fracking’, upon which shale gas production depends.

However, asked by Steel Times International to comment on the merits of DRI production as a means of reducing CO₂ emissions, the Post Carbon Institute remained silent.

33 Industry demand for process integration

Apart from the detailed technical information, recurring themes were brought to light including people, ideas and how to communicate the results of process integration studies to various stakeholders. One of the major challenges in Process Integration is to communicate and apply the information produced from highly complex system modelling such as pinch analysis and optimisation studies. It was noted by several participants that industry is now recognising the value of process integration.

Both new and old ideas that have gone unrecognised before are crucial to Process Integration.

Several conclusions can be drawn from the conference. First, Process Integration is becoming firmly established as a tool for improving efficiency in the steel industry as well as other industries. Second, interest in process integration between industries and companies is growing even greater potential for improvement. Third, we must continue to strive to develop the methods, communicate and implement the results. Last but certainly not least, as one presenter stated, we should set aside time to think creatively and be positive in our thinking.

Another Process Integration Forum will almost certainly be planned for the upcoming year. www.swerea.se/mefos

Based on an article which first appeared in Swerea/Mefos News December 2010
OECD Steel Committee pays more attention to fragile growth and climate change

Senior government officials and industry representatives from major steel-producing countries met in Paris on 2-3 December 2010 to attend the 69th OECD Steel Committee. The meeting focused on the market situation, trade and government policies, and environmental issues in the area of steel.

Alex Gurov, STI representative in CIS, reports from Paris.

According to the Statement from Risaburo Nezu, Chairman of the 69th OECD Steel Committee, the world steel market is in recovery but the situation remains fluid and challenging. Production, demand from end user industries such as automotive, construction and consumer goods, and trade dropped drastically in 2008/2009, together with lower steel prices, reductions in workforce and curtailed expansion plans.

By the close of 2010 the situation had improved with steel demand, production and prices showing various degrees of upward trends. There is strong growth in emerging markets and significantly lower growth in developed markets. However, industry and governments are still facing challenges regarding the well being of the industry.

The World Steel Association (worldsteel) gave its outlook for steel demand. Global steel demand during the third quarter of 2010 reached an annualised rate of 1.4bnt – 6% higher than the pre-recession level seen during the second quarter of 2008. Production amounted to around 1.046bnt during the first nine months of 2010, up by almost 20% compared to the same period in 2009.

Asian countries, particularly India and China, emerged quicker from the recession due to infrastructure oriented stimulus packages and strong internal demand, whereas the effect of the crisis was more adverse on the European and the NAFTA steel industries and as a result these economies took longer to recover.

Prospects for economic activity in general and steel demand in particular, remain uncertain, even in the short term. Global economic recovery continues, but downside risks to the global economy remain substantial with fragile financial markets, ongoing household balance sheet deleveraging, sovereign debt problems and tensions in foreign exchange markets.

According to worldsteel, apparent steel use will increase by 13.1% in 2010 compared with 6.6% in 2009. The OECD believe that global steel demand increased more in 2010 than could be expected from its historical link to industrial output. Global steel demand is expected to rise by 5.3% in 2011 according to worldsteel, 9.6% higher than the pre-crisis peak of 2007, implying a further rise in steel output. The highest growth rates are expected in CIS economies (11.1%), followed by the Americas (9.0%) and Europe (5.7%). In Asia, steel demand is expected to increase by 4.1% in 2011, with the highest growth rates for India (13.5%) followed by South-East Asia (7.4%). In China, steel demand is expected to slow to just 3.5% growth compared to its previous average growth rate of 13.5% during the period 2005-2010. Due to the increase in demand for steel and continued strong raw material prices, steel prices to the consumer could well be on an upward trend.

World Capacity

World steelmaking capacity is projected to reach from 1.792bnt in 2009 to 2.027bnt in 2012, according to the OECD (Fig 1). Most of the capacity additions will take place in non OECD countries, particularly in China and India. Some growth is also expected for Iran, Brazil and Russia. Steel capacities increased during the past decade by 814Mt resulting in a world capacity close to an estimated 1.893bnt in 2010, of which over 300Mt was in excess of demand. In light of this, steel companies are paying continued attention to their production costs and are improving operating efficiencies via up and downstream integration as well as increased globalisation.

The global steel capacity utilisation ratio fell to 67% in 2009 compared to an average of 83% in 2001-2007. The utilisation ratio recovered to a 20-month high of 82.3% in April 2010, then declined to a year-low level of 73.1% in August 2010.

Trade

A significant challenge facing the steel industry today relates to the situation in the raw material markets. The global surge in steel production has resulted in a significant tightening in the markets for steelmaking raw materials, sending prices of some key materials to historically high levels.

Steel trade has recovered some of the ground lost during the financial and economic crisis. The pace of recovery in trade has been most pronounced, with the top ten steel producing countries accounting for 94% of emissions.

Trade has returned and the market situation is strong. Production, demand from end user industries and exports have recovered, resulting in a return to pre-crisis levels.

Prospects for the steel industry during the second half of 2011 and 2012 are cautious. The upturn in the global economy is expected to continue at a moderate pace.

The steel industry is expected to grow at a rate of 3.5% in 2011 and 4.1% in 2012. The OECD forecasts world steelmaking capacity to reach a record 2.027bnt in 2012.
The international effort to mitigate and adapt to climate change is co-ordinated through the UN Framework Convention on Climate Change, signed in 1972 in Rio de Janeiro.

The Kyoto Protocol is the principal mechanism to advance the goals and provides international emissions trading as one way for countries with emissions reduction commitments. Currently there are six active GHG Emissions Trading Schemes, including those introduced in the EU, Switzerland and New Zealand.

The EU Emissions Trading System (EU ETS) goal is for a 21% reduction in emissions within the sectors covered by 2020, compared with 2005 levels. The EU mandate to the Comité Européen de Normalisation (CEN) is to develop a technical standard to harmonise methods for measuring, testing and quantifying GHG emissions as well as assessing performance of production processes. Other trading systems under implementation are in Australia, Brazil, Chile, China, Japan, Korea, Mexico, Turkey, Russia, Ukraine, UK, USA and Canada.

Under the Clean Development Mechanism (CDM) and Joint Implementation (JI) programmes, governments, investors and private companies in industrialised countries receive credits for projects that reduce emissions in ‘host/seller’ countries.

For example, at present, in the Russian Federation there are ten joint initiative (JI) projects in metallurgy. Important steel sector projects are operating at NLMK, Severstal and the ChTPZ Group funded by the EBRD through its Sustainable Energy Initiative. An important question is the issue of border carbon adjustments (a tax on steel imports and/or rebate on steel exports).

There are some research and development programmes covering new technologies for steel manufacture. These include the ULCOS programme in the EU, the COURSE 50 in Japan and in the USA steel industry Energy programmes and many others.

Christopher Beauman of the European Bank for Reconstruction and Development (EBRD) noted that the steel industry’s special characteristic is that no other industry is both so carbon and trade intensive. This means that any climate change policies based on substantially increasing the price of carbon in some countries or regions, but not others, could create distortions in steel trade, unless mitigated by some form of border carbon adjustment (for example a tax on steel imports and/or rebate on steel exports).

And since it would be hard without carbon pricing to develop the framework for breakthrough technologies, such as under the ULCOS programme in the EU and COURSE 50 in Japan, this has become an important issue for governments to address. The EBRD is active in major steel industry projects through its Sustainable Energy Initiative (eg with major Russian steel companies), but like other lenders and investors seeking to support medium- and long-term investment it would value greater certainty about the longer-term outlook for policies towards carbon-intensive companies.

Contact
www.oecd.org/findDocument/0,3770,en_2649_34221_1_119681_1_1_1,00.html
ILAPA 2010: Profit margins under pressure

There was a consensus among speakers that in Latin America higher input costs are leading to increasing vulnerability for the steel industry. Also, growing imports have resulted in lowering the pricing power for steel products in the region.

By Germano Mendes de Paula*

THE 51st ILAPA Conference was held in late-October 2010 in Buenos Aires, Argentina. Approximately 1300 delegates attended the event, of which 800 were foreigners. Indeed, the Latin American Iron and Steel Institute (ILAFA) has ratified its role of promoting ‘the’ steel conference in the region.

As a general conclusion, it can be argued that steel companies’ profit margins in Latin America – and elsewhere – have been increasingly under pressure; not only because of macroeconomic issues, but also as a consequence of sectorial ones (cost escalation and high idle capacity, in particular).

The World Economy

Nouriel Roubini, Professor of Economics at the Stern School of Business, New York University, delivered an outstanding presentation, speaking for almost an hour without the use of slides or notes. People may disagree with Roubini’s ideas, but certainly not over his memory and capability to organise a speech.

Prof Roubini is renowned for having forecast the 2008 financial crisis. In his current analyses of the global economic situation he stressed the danger of becoming W. This outcome is derived from two factors:– the growth of public debt, due to high governmental expenditure and lower tax revenues;– the private sector’s high leverage and the difficulties to reduce it.

As a consequence, it was possible to prevent the ‘recession’ being transformed into a ‘depression’. Prof Roubini summarised the different forms of economic recovery by the shape of alphabet letters: V (intense and rapid recovery), U (longer recession and slow recovery), W (double dip recession) or L (economic stagnation).

According to him, in countries such as the United States, the European Union, and Japan, the recovery is following a ‘U’ shape, but with a danger of becoming W. This outcome is derived from two factors:– the private sector’s high leverage and the difficulties to reduce it;– the growth of public debt, due to high governmental expenditure and lower tax revenues. Consumers have seen their wealth fall sharply (due to the bursting of the real estate bubble), which imposed additional barriers to the resurgence of consumption.

Thus, an anaemic growth in GDP is expected for these mature economies, and the possibility that recovery becomes a ‘W’ should be considered.

For non-developed nations, Prof Roubini differentiated two groups. Some countries – such as Russia, Ukraine, the Baltic, Central Europe (Hungary and Romania), and Pakistan – because of unsatisfactory economic fundamentals, also tend to experience a ‘U’ shaped recovery. However, for other emerging nations – China, India, part of Asia and part of Latin America – the recovery has a propensity to be a ‘V’ shape. This hurried revitalisation is a consequence of better fundamentals, including: a) lower levels of debt; b) better fiscal conditions; c) a healthier bank system; d) higher foreign reserves. Because of this, there is a possibility that some of these countries need to deal with an economy which is overheating.

He also paid attention to the global economic imbalances related to large trade surpluses for selected countries (China, Japan, and Germany) and large trade deficits for other nations (the USA and United Kingdom). Bearing in mind that the US and British populations need to reduce their consumption and their debt, maintenance of the previous lifestyle is unsustainable. Furthermore, in many sectors, the crisis resulted in excess capacity. In this context, trade wars tend to happen more frequently.

For 2011, Prof Roubini forecasts that the second half will be worse than the first half. The Eurozone is expected to have a very poor economic performance as well as Japan. He stated that there is a 33% likelihood of a double dip recession in the USA, Eurozone and Japan. For these nations, the key economic problem will not be inflation, but on the contrary: deflation. Accordingly, the companies are going to lose their pricing power.

Concerning the de-coupling of the economies of mature nations with those of emerging nations, he declared this impossible as emerging countries are not able to offset all the negative impacts from the low GDP growth of the mature. In a way, ‘all countries are in the same boat’, he said. He concluded by stressing that the world economy is in an era of uncertainties, being very vulnerable to other adverse shocks.

Prof Roubini sometimes is called ‘Mr Catastrophe’ by the media. For that reason, an extremely pessimist presentation was expected by the audience. His speech can be considered as moderately worrying, highlighting the differences and connections among developed and emerging countries.

Steel Trade & Excess Capacity

Two interesting presentations focused on steel trade. Mr Sigurd Mareels, from McKinsey, scrutinised the steel products trade as a whole (with some comments on flat products), whereas Mr Joachim Schröder, from the Research & Consulting Group (RGCG), investigated the long products market trade.

Mr Mareels stressed at the start that in the period 2003-2008, the share of national supply in the global steel market in Latin America has remained at the 63%-65% plateau.

Conversely, international trade flow has retained a 35%-37% share, almost equally distributed between intra- and inter-regional sales. Nonetheless, during the economic crisis, inter-regional steel trade dropped from 19% in 2008 to 15% in 2009 of demand and intra-regional trade, from 17% to 13%, that year.

McKinsey’s consultant observed that throughout the crisis China balanced the global steel market, cutting back on exports and maintaining imports. Indeed, its steel exports fell from 66Mt in 2007 to 24Mt in 2009, while imports changed from 18Mt to 22Mt in this period. Its net exports plummeted from 49Mt to 2Mt (Fig 1). However, Developed Asia (essentially Japan) increased its net exports

Fig 1 Regional import-export balance, 2005-2009 (Mt)
Source: McKinsey/SSB

Fig 2 Regional demand-supply balance, 2009-2015 (crude steel equivalent Mt) Source: McKinsey

*Professor in Economics, Federal University of Uberlândia, Brazil. E-mail: germano@ufu.br
from 27Mt to 34Mt. Additionally, Europe has moved from an 18Mt net importer position to a 6Mt net exporter. These figures relate only to extra-regional trade.

Mr. Mareels showed data on effective capacity – defined as nominal capacity adjusted for ramp-up during the first two years of production – and for equipment availability (on average 97% of nameplate capacity), assuming 85% capacity utilization.

In 2005, effective capacity was very similar to the apparent consumption. But in 2009, the situation was quite different because a 291Mt excess effective capacity occurred (Fig 2). China, for instance, changed from a 15Mt deficit position in 2005 to a 47Mt surplus position in 2009. Among the analysed regions/countries, only India registered a short fall in capacity in 2009.

McKinsey forecasts that the excess effective global capacity will drop to 181Mt in 2015, of which China will contribute 118Mt. India will increase it scarcity position by 2Mt, and North America (USA and Canada) will come back to a deficit position. Looking for the period 2005-2015 as whole, China, as expected, will be the deficit position. Looking at the long steel international market share. Turkey, followed by China, Spain, USA and Mexico, was the leader for extra-regional exports to South America for long steel products.

However, in China and Asia, the intra-regional proportion has increased. Looking at 2010H1, exports to countries that are part of the same region were: North America (81%), South America (77%), Europe (65%), Asia excluding China (62%) and CIS (33%).

Paying attention to extra-regional international export markets for long steel products, RCG stressed that Brazil was the 16th largest exporter in 2010H1, holding 1% of the global market.

In contrast, Brazil’s participation in extra-regional imports of longs grew from 1% in 2008 to 2% in 2009 and to 4% in 2010H1, reaching 7th place globally. Chile occupied the 16th position in the same ranking in 2010H1, with a 2% market share. Turkey, followed by China, Spain, USA and Mexico, was the leader for extra-regional exports to South America for long steel products.

After discussing the global picture, Mr. Schröder scrutinised the South American long product market. Regional consumption is growing from 15Mt in 2009 to roughly 18Mt in 2010, whilst net imports will reach 1Mt in 2010. He affirmed that the South American steel market has performed better than in other economies (mature markets in particular). This situation makes South America an attractive target for exporters.

Conversely, the current market conditions and growing value of the Brazilian Reais limit South America’s export potential to developed nations. Thus the region’s exports should be addressed to intra-regional sales and to other emerging markets.

Another way to compare the different steel markets is shown in Fig 5. It combines a macro-
economic variable (GDP growth in 2011) and a sectorial variable (steel consumption as a proportion of GDP in US dollar constant 1990).

The world average is 2% of GDP and 0.02kg per GDP respectively. Some South American countries are very well positioned for these criteria, specifically Peru and Chile. In an intermediate position there are Argentina, Colombia and Brazil. Ecuador is in a disappointing situation, but definitely the worst case is Venezuela.

RCG also stated that South American long steelmakers will experience higher competition and, consequently, the domestic prices will remain under pressure.

In reality, this outcome is derived from macroeconomic (such as faster GDP growth compared to mature economies and the weak US dollar against Latin American currencies) and sectorial factors (new capacities for long steel production to be commissioned within the next few months, increasing idle plant capacity). Thus, cost optimisation is becoming a crucial success factor.

**Latin American Steel Market**

According to André Gerdau Johannpeter, CEO of Gerdau, Latin America has obtained a good economic recovery. After a 1.9% GDP fall in 2009, a 5.9% resumption is expected for 2010. For the period 2011-2015, the International Monetary Fund (IMF) forecast that the region’s GDP will expand by 4.0%-4.1%.

Concerning crude steel production per se, Latin American output in the first nine months changed from 53Mt in 2008 to 37Mt in 2009 and to 46Mt in 2010.

Thus the region has so far been unable to surpass the peak of 2008. In addition, the region’s steel imports have recovered quicker than expected.

Fig 6 demonstrates that Brazilian steel imports increased 250% in 2010 in comparison with the same period 2008, while exports increased by some 70%. In contrast, Argentinean exports have risen roughly 80% against a 60% imports growth.

Fig 6 also shows that imports made up 19% of Brazilian steel consumption in 2010. This ratio was higher in the cases of Chile (71%), Peru (60%), Colombia (52%), and Mexico (37%). In this context, it is quite understandable why Latin America’s idle steel capacity is greater than the world average (Fig 7).

Mr Johannpeter declared that Latin American steel consumption dropped 20.6% in 2009 y-o-y. However, a 23.5% recovery is anticipated for 2010 and 8.4% y-o-y growth in 2011.

This should increase steel consumption per capita in the region to around 93kg per person but this is still little over half that of the global average of 181kg.

This index has a wide variation within the region: Mexico (125kg), Chile (103kg), Brazil (93kg), Argentina (79kg), Colombia (60kg), Peru (53kg), and others (45kg).

Mr Johannpeter concluded his remarks underlining that the economic crisis in Latin America was less severe than in developed countries. The anti-cyclical measures adopted by governments helped promote local consumption of steel.

However, import flows have been in general unfavourable for the region. Moreover, steel production capacity is expected to expand faster than consumption in Latin America requiring even higher volumes to be exported in the future. The prices of input and steel products will continue to be volatile.

**The Audience’s View**

For the third consecutive year, Daniel Noveglio, CEO of Ternium, conducted an instant poll with the audience about selected issues. This is good instrument to verify the delegates’ mood.

Question # 1: What will world steel consumption be in 2011 compared to 2010?

In answer, 59% of the delegates said that it will increase between 5% and 10%; 25% that it will be similar (less than 5% variation); 16% opted for other alternatives. The respective figures from the previous year were 54%, 36% and 10%. The pattern of answers in the 2009 and 2010 Conferences were reasonably similar, even though the business environment has changed.

42% of the audience expect that it will be similar; 39% that it will increase (by at least $50/t), 19% preferred other possibilities. One year ago, the respective numbers were 55%, 25% and 20%. Thus, the audience has become more pessimist on prices.

Question # 3: What will be China’s international trade situation for steel in 2011?

72% of the people opted for a large net exporter position, while 25% believed that it will register a null net performance, and 3% that it will be a big net importer. This was radically different from the previous year, when 54% expected a null net situation and 41% selected a high net exporter possibility.

Question # 4: What are the greatest risks for the Latin American steel market?

45% of the audience voted for Chinese indirect steel trade, 24% for high costs due to the currency, 22% for the Chinese direct steel trade, and 9% for other issues. In 2009, Chinese indirect steel trade and Chinese direct steel trade received 42% and 25% of the votes, respectively. Hence, higher costs have gained greater importance this year.

---

**LA consumption**

Latin American steel consumption was nearly 60Mt in 2010, ahead of initial expectations, said ILAFA. 2010 consumption was up by 33.3% from 2009. Ilafa said that steel consumption in Latin America (including Mexico) has grown, together with socioeconomic development, going from almost 60Mt in 1960 to 2010’s estimated 60Mt. This is partly due to growing regional industrialisation. However, the institute says the situation could reverse if Chinese indirect steel exports to the regions and the impact of the appreciation of regional currencies continue affecting the local industry and competitiveness.

![Steel Times International – March 2011 – 41](image-url)
The 4th North American CRU Steel Conference

The 2010 North American Steel conference, organised by CRU and held in Chicago November 1-3, attracted 119 delegates from many companies and several countries. A total of 21 speakers appeared on the podium, 16 representing steel producers, banks and institutions (including the World Bank) and five CRU officers. Among delegates from nations outside USA, 11 came from Canada, three each from Mexico, Turkey and the UK (excluding CRU officials) and one each from Austria, Belgium and Switzerland. A report by Dr Hans Mueller*

If steel conferences were ranked as to the relevance of topics, the knowledge and skill of the speakers and the flawlessness of organisation, the CRU team would earn excellent marks. They would score even better, if they geared their events to a strictly professional and well-informed audience expecting to take home new knowledge and insights. Because the number of such persons might not be sufficient to ensure the commercial success of a conference, a common practice to attract a wider audience is to have high-ranking steel company executives give keynote presentations. At this conference four such personalities took on this role. Two were the CEOs of US steel companies, J Wainscott of AK Steel and D DiMicco of Nucor. Two represented foreign steelmakers operating numerous plants in North America (NA). M Longhi of Gerdau Ameristeel, a Brazilian-owned company, and M Rehwinkel, CEO (NA) of the Russian Evraz company.

The first three trod a similar path. They began by talking about their companies, then served up the political views formulated by the US steel industry’s trade association, essentially a long complaint about the US government’s lack of a pro-manufacturing policy regarding taxation, environmental protection, infrastructure upkeep, and trade relations with China. Prior to voicing that refrain, Wainscott expressed optimism about future opportunities for AK’s large electrical steel division. Longhi discussed Gerdau’s far-flung minimill empire comprising 53 plants in the Americas and Europe while DiMicco lamented the stubbornly high rate of unemployment and the under-utilisation of Nucor’s efficient mills. Except for a difference in style, the political talk inevitably had repetitious elements. Whereas Wainscott and Longhi calmly made their points in the form of neatly organised lists, DiMicco unfurled homespun economic theories with the pathos and fervor of an evangelist, his main point consisting of assigning blame for the loss of six million US manufacturing jobs during the past 12 years on a lenient US trade policy that failed to counter ‘China’s illegal trade practices’. Rehwinkel stayed out of this debate and instead emphasised his company’s efforts to anticipate the needs of their ‘ultimate customers’ (manufacturers supplied by first-line customers), offering them collaborative assistance in the development of new technologies and advanced types of steel.

Steel Mill Competitiveness

This session featured only two speakers. T Danjczek heads the Steel Manufacturers Association, a group representing US EAF mills that now accounts for two thirds of US crude steel output. He continued the theme that US producers are put at a disadvantage by US government inaction in the face of foreign illegitimate trade policies. He singled out tariffs imposed on the export of scrap by certain countries – the principal EAF-mill input – including China, India, Russia and several other nations during the 2005-2009 period, adding that this practice impairs global competition because it lowers their domestic price for scrap and raises international prices.

However, several of the countries on his list import large quantities of scrap and would have little or nothing available for export anyway. For example, Russia, sharply cut its exports in the period due to a 50% increase in its own EAF capacity.

Danjczek’s proposal to put a tariff on US scrap exports could backfire. US minimills, especially those producing quality sheet products, are obliged to feed considerable quantities of direct-reduced iron (DRI) and pig iron (from blast furnaces) into their furnaces. Two of the countries on the list, Russia and Ukraine, have been major exporters of pig iron to US mills. Besides, in the highest scrap grades, the USA has long recorded a negative trade balance. In fact, for the entire sum of minimill ferrous inputs – scrap, DRI/HBI and pig iron – the US trade balance has been negative during much of this decade. An industry leader proposing penalty tariffs should have the foresight to assess the impact that retaliatory responses by the targeted countries might have on US mills.

From this point onwards, the presentations were of customary professional quality, ie, factual, rational and, when appropriate, scientific. Delegates with little interest in the US industry’s political agenda might as well have joined the conference at this time.

CRU Group member F Campbell focused mainly on the future cost of primary steelmaking materials – iron ore, coking coal and scrap (Fig 1). These formerly cheap inputs have become very costly as a result of China’s huge industrial growth as well as tight consolidation (except for scrap) on the supply side. They are now key determinants of steelmaking costs and prices. China’s success in the removal of outdated capacities and in applying the brakes on vehicle and appliance production has made a dent in the prices of ferrous materials and steel mill products. The effects of these measures spread as far as the US market, but Campbell expects the decline to be of limited duration. It was his view that over the medium term, say 18 months, global steel demand would resume its upwards march, taking with it the prices of steelmaking materials and steel itself.

Steel’s Economic Challenges

According to H Timmer of the World Bank, global economic activity and trade were in an expansion mode. But many developed nations...
still faced problems with idle capacity, lagging industrial output, and lending by banks struggling with mountains on non-performing loans. Their corrective policies should be aimed at the increasingly structural rather than cyclical nature of these problems. The ongoing boom in commodities was caused by China’s unrelenting growth and the incipient inflation of global food prices by increased biofuel production, which swallows up large amounts of grain and oilseed.

Without mentioning names, Timmer made no bones about his disagreement with DiMicco’s interpretation of the world’s problems, pointing out that the recent crisis, with its derivatives scandals and the Lehman collapse, clearly had its origin in the USA. He emphasized that China’s astounding growth was propelled by the country’s tremendous internal dynamics rather than government interventions such as subsidies and currency manipulation. In the Q&A, he noted that, unlike trade, such interventions amount to a zero-sum exercise.

M. Parr, a financial analyst with KeyBanc Capital Markets, blamed excessive reactivation of idle capacity for the recent weakness of US steel prices. Other than some inventory recovery there was little genuine demand expansion. A drop in the trade-weighted US-dollar index triggered a rise in US steel exports and kept imports at moderate levels. He agreed with other speakers at this conference that the future will be marked by further cost-push pricing in the US steel market.

I. Lazar of CRU Strategies said that Chinese M&A activity in North and South American raw material and steel markets had only limited success so far, outside of the acquisition of a coal mine in Canada and several iron-ore mines in Latin America. Several attempted forays into US industrial markets were denied for national security reasons. A mixed reaction was displayed by US steel producers. They had no objections to Tianjin Pipe investing $1bn in a new Texas OCTG mill, but they raised a furor, when Anshan invested $400M (equal to a 14% stake) in SDC Amory, a rebar mill in Mississippi, never mind that the continuous casting – rolling technology that they said they wanted to protect is freely available ‘off the shelf’ from at least one plant builder, and already in operation in one US mill (CMC in Arizona).

Outlook for raw materials

D. Gallagher of Cliffs Natural Resources described how his company, upon consolidating the NA iron ore industry, achieved a fourfold sales growth since 2004, mostly through acquisitions of iron ore mines in NA, Australia and Brazil as well as metcoal mines in NA. The company’s objective was to develop ‘multiple revenue streams’ by means of product-line and geological diversification. Rising costs are a problem. In Australia, iron ore mining is moving farther inland which means higher freight costs to ocean shipping points.

In the US, coalmining in Appalachia requires larger investments because new seams are thinner and farther below ground. Operating costs are also raised by ever more stringent environmental regulations. Nevertheless, the future looks bright. Gallagher expects global steel demand to expand at an annual rate of 3.4% and output via the BF method by 2.6%. On the supply side, the pricing power of the world’s dominant miners is likely to remain intact through most of the next decade. It takes a long time for new mines to come on stream. Regions that hold large unexploited deposits, like Mongolia and Mozambique, are beset by legal uncertainties or political instability.

L. Pinate of Mundas USA warned that DRI/HBI capacity now under construction would fall far short of global needs by 2020. Besides, 80% of this new capacity will be located in the Middle East, mostly DRI for internal consumption. It is unlikely therefore that direct-reduced iron will in a meaningful way alleviate the growing shortage of ferrous material required by EAFs producing high-grade steels. This verdict also applies to pig iron production which is being subjected to stricter environmental rules and labour laws. Pinate noted that improvements in efficiency should reduce the generation of both home and processing scrap per ton of crude steel. But his projections do not corroborate such a trend. Instead they show generation for both types of scrap to rise from 2010 to 2020.

The third major raw material, coking or metallurgical coal, was discussed by J. Porco of Xcoal who vividly examined recent changes in the US market and at the global level, summarising his findings as follows: First, against the wishes of many customers, a quarterly contract and pricing system was imposed by dominant producers in Australia. Second, although Europe is still the largest buyer of US metcoal, demand from Asian countries, including India, is rapidly increasing. Third, at the global level, US miners are no longer considered swing producers who only enter the export market when prices are unusually high; they are now recognised as reliable long-term suppliers offering metcoal of the highest quality. Fourth, China is the cause not only of sharp price increases but also of the supply tightness in the higher met coal grades (Fig 2).

Consequently, processes have been developed to adapt some types of thermal coal for use in coke ovens. Fifth, strong US exports, estimated to reach 30–35Mt in 2010, have begun to ‘stretch’ the available infrastructure, especially of railways. The main shipping ports at Norfolk, Baltimore and Mobile have so far been able to cope with the larger volume. Because of the relatively shallow American coastline, Xcoal adopted a method that is also
used in Northern Brazil) to reduce freight costs to Asia by loading capesize 180-210kt/dwt carriers only partially in port, then topping them up out at sea with self-unloading 55-75kt/dwt carriers.

Special Topics

Chinese steel & raw materials

J Johnson of CRU China pointed to overcapacity, especially in HRC and plate, as a source of worries in China because it might intensify exports and provoke additional trade friction (Fig 3). Excessive inventories, of HRC in particular, are another source of concern. However, these are not long-term conditions and can probably be resolved in some degree by the Chinese government’s programme to build a large number of low-cost apartments for worker families. Government directives to reduce electric power consumption and take obsolete steel plants out of operation have caused some price destabilisation. There are also fears that appreciation of the Yuen and US dollar will reduce inflationary pressures across a broad spectrum of products. Nevertheless, Johnson has no doubt that industrial production and steel consumption will remain on a rising path in China. But questions about availability and prices of materials, not only of iron ore and coking coal but also of such commodities as Ni and Cu, will preoccupy China’s planners for years to come (Fig 4).

Contracting tactics & hedging

It was already mentioned that powerful mining companies prodded steel producers to switch from annual to quarterly contracting and price negotiations. J Kabel of JP Morgan noted in his presentation that one-month price arrangements may not be far off. Because many large steel users, such as automotive and white-goods producers, are firmly entrenched in annual planning and scheduling, different rhythms will be forced upon steelmakers at the purchasing and selling end. Hedging may provide some relief from the resulting internal pressures. According to Kabel, several Asian mills have opted for hedging in collaboration with their trading companies.

Construction & automotive steel

Construction long products

G Heasley, VP with Steel Dynamics, now a major US steel producer, foresaw continued slow growth of the US construction sector, although there were a few encouraging signs. Non-residential investment is expected to rise and vacancy rates of commercial buildings are stabilising or slowly improving in some regions. Like others speaking at this session, Heasley expected the residential sector to remain weak in 2011 but slow improvement in 2012 (Fig 5). Many building contractors will face tough times, in large part due to the banks’ continued reluctance to make loans to small businesses. Whereas others tossed about total employment numbers, A Khan of Wells Fargo Securities took the trouble to look into the link between educational levels and unemployment. Evidently, a mismatch exists between tougher skill demands by the current labour market and lax preparation of large numbers in the jobless category. Thus the current unemployment of persons with a college degree is a mere 4%, far less than average unemployment before the crisis (Fig 6). Khan’s findings concerning the construction sector are not encouraging. Housing starts remain at a very low level, apartments suffer from oversupply, contracts hold on to their cash rather than invest in plant and equipment while many state and local governments are too deeply in financial straits to fund large infrastructure projects.

According to L Brooks of CRU Analysis focused on the US steel long products markets, some overlap with previously-discussed subject matter was unavoidable. Nonetheless, her illustrations added useful specifics as, for example, the widening gap between better-performing industrial production and lagging construction. She saw only modest demand growth for long products in 2011 due to limited private fixed asset investment. But none of this would restrain the cost-push pressure on prices.

Automotive demand for sheet

K Korth of IRN Inc www.think-irn.com

Fig 7 North American light vehicle production (million units)

Korth anticipated, considering that the US economy – especially its financial sector – is still diggin itself out of the rubble left by the recession. For lack of time, new developments in automotive technology were omitted from the discussion, but in her written presentation Korth included an excellent summary of this subject.

R Edwards of CRU Analysis talked about the NA steel sheet market, placing much emphasis on the market softness in September 2010. There are signs, however, that US steelmakers have taken steps to restore the upward price trend in most major product lines, although impatience on the part of TKS and Severstal sales personnel may trip them up temporarily.

N Vasconcellos of Benteler Automotive NAO provided insights into the collaboration model developed by his company. This model has led to joint investigations and investments with both suppliers and customers in new processes ranging from the development of high-strength material to new roll-forming concepts and solutions to environmental problems.

And, finally, R Platz of ArcelorMittal (AM) analysed in some depth the progressive use of high-strength steels for increasing the strength and reducing the mass of vehicles, the ultimate goal being of course achieving reductions in fuel consumption and GHG emissions (Fig 8). The audience was told that AM employs 1400 full-time researchers on several continents and spends $255/M on R&D, with 46% of this amount budgeted to the automotive sector.

The primary metallurgical objective is extending the elongation boundaries of current leading-edge advanced high-strength steels (AHSS) such as TRIP, DP, CP and MART. A high AHSS content in a vehicle would achieve almost the same weight reductions as a vehicle made of aluminium components, he believes. However, the speaker’s response to this writer’s question about the effect of high vehicle AHSS content on major repair costs and about adequate worker training was less than satisfactory. The internet literature on this subject by AISI and others is enlightening but needs updating.

Contact

CRU Events. CRU International, 31 Mount Pleasant, London, WC1X 9AD, UK
Tel: +44 (0)207 7903 2403 Fax: +44 (0)207 7903 2432
e-mail conferences@crugroup.com
web: www.crugroup.com/events
IN the last decade of the 19th century Great Britain, France, Germany and Belgium, were the leaders of industry throughout the world, but this was about to change. Among these European nations, Britain, France, and Germany were evenly matched with populations of about 40 million each, but Belgium had a population of only about 5 million. These countries represented the industrialised world.

By the end of the American Civil War in 1865, the population of the United States had exceeded most of the European Nations, but the USA was still not considered to be a world power. During the next 30 years America concentrated on uniting itself to become a nation of equal opportunity based on innovation and technology. Consequently, it became a land of mass immigration. Most of the immigrants came from the European industrial nations, now joined by Italy with its burgeoning electronics and communications industries bringing with them, the latest in science, technology, and engineering.

Armed with this great influx of population and knowledge, the USA decided to present itself on the world stage in 1893. It did this by arranging an exhibition on the outskirts of Chicago inviting the nations of the world to come and display their manufactured goods and technology. Exhibitions like this were nothing new, the trend had started in 1851 with the Great Exhibition in London, the most recent being the Paris Exhibition of 1889. The Chicago Exhibition was intended to upstage them all, and probably succeeded in doing so, before or since.

The site chosen was Jackson Park, a huge 650 acre estate quite close to Lake Michigan. The expected number of visitors meant that the whole rail network would have to be improved to cope. This included freight lines for the transportation of machinery, building materials, and exhibits, in all, 42 extra sidings were set up in around Chicago. Railway enthusiasts will be interested to know how the system operated, in all, 42 extra sidings were set up in and around Chicago. Railway enthusiasts will be interested to know how the system operated, in all, 42 extra sidings were set up in and around Chicago. Railway enthusiasts will be interested to know how the system operated, in all, 42 extra sidings were set up in and around Chicago. Railway enthusiasts will be interested to know how the system operated, in all, 42 extra sidings were set up in and around Chicago.

The 'Machinery Hall' needed to supply the power for the exhibition was 1400 feet (427m) in length and 492 feet (150m) wide. Exhibitors in this building provided the power for the whole site.

The 'Machinery Hall' needed to supply the power for the exhibition was 1400 feet (427m) in length and 492 feet (150m) wide. Exhibitors in this building provided the power for the whole site.

The largest machine was a quadruple expansion engine of 2000HP built by Allis & Co of Milwaukee. This engine drove a dynamo made by Thompson-Houston to supply the power for 20,000 light bulbs.

Exhibitors included Edison-Bell, Ferranti Bros, Westinghouse, The General Electric Co. Carnegie-Phipps, and the Bethlehem Ironworks. From Europe, well-known names included Siemens and Krupp from Germany, le Creusot from France and Sir W A Armstrong, and Woolwich Arsenal from Great Britain. An interesting point to note, was one of the exhibitors in the Machinery Hall was Fraser & Chalmers of Erith, Kent. This well known company manufactured colliery winding engines for the British coal industry and had established a factory in Chicago.

The largest building was the Manufacturers Hall at 1687x787 feet (514 x 240m) which was equipped with three overhead travelling cranes, each with a span of 75 feet (22.8m). The cranes had been put there to erect the machinery, but they were also fitted out with platforms and seating accommodation, and for a few dollars the public could enjoy a birds-eye view of the exhibits travelling in comfort over almost the entire length of the building. 6000 tons of steel, and 2000 tons of wrought and cast iron went into the roof construction which had a height of 204 feet (62.2m).

The building was divided into three sections, each housing almost every kind of manufactured goods ranging from heavy industrial machinery to the smallest of electrical domestic gadgets. Military equipment on display included heavy armour plate, of which a Russian delegation had been recently competing against, but the Russians had good relations with the US at that time and were more concerned in keeping an eye on their European neighbours. People from all walks of life were catered for at the exhibition which included fun fairs for the children, the latest in fabrics and fashions for the ladies, whilst the menfolk discussed the latest innovations over beer and cigars.

The Chicago Exhibition was a huge success which put the USA at the forefront of the industrial world. Such fairs are not a thing of the past as demonstrated by the recent World Fair held in Shanghai in 2010 which attracted 2.79M visitors in six months, and addressed the theme ‘Better City – Better Life’ to signify Shanghai’s new status in the 21st century as the ‘next great world city’.