

US and global mining conferences

The costs of raw materials has increased once again after showing a downward blip during the financial crisis of 2009, to the extent that steelmakers are seeking self sufficiency through joint ventures with mining companies, while ore supplies are pressing to move to quarterly rather than annual contract pricing. **A report by J J Poveromo***

TWO conferences important to the supply of iron ore took place this Spring; the Annual Meeting of the Society for Mining, Metallurgy & Exploration (SME) and Metal Bulletin's biennial International Iron Ore Symposium.

The 83rd Annual Meeting of the Society for Mining, Metallurgy & Exploration (SME) Minnesota Section, a member organisation of AIME (The American Institute of Mining, Metallurgical, and Petroleum Engineers) combined with the 71st meeting of the University of Minnesota Mining Symposium, took place in Duluth, Minnesota USA 20-21 April. Duluth is a port city on the most western tip of Lake Superior and is located south of the Minnesota Mesabi iron formation making it an ideal centre for a mining conference.

This meeting attracts the taconite mine/pellet plants in Minnesota and Michigan and the vendor base which supplies these plants. This meeting is the only international meeting held annually which addresses iron ore pelletizing – necessary for the concentrates of these low grade taconite ores – so it attracts participants from outside the USA.

A short course: 'Globetrotting: International Perspectives on Iron Ore Mining' preceded the conference.

Some highlights from the SME conference in Duluth were:

- The U S Geological Survey author presented an overview of global iron ore production, imports, exports, etc; to 2008; the annual trend plots dramatise the meteoric rise of China as a leading iron ore producer – all be it substantially reduced when corrected for iron content (Fig 1 right) – as well as being the lead importer of iron ore (Fig 2).

- Cliffs Natural Resources focused on Cliffs operations in Australia: the wholly owned 8.5Mt/y operation formerly called Portmann and the Cockatoo Island mine (50% owned by Cliffs). The current ore bodies (3:1 stripping

ratio) have reserves lasting through 2018 in the Koolyanobbing area. The Cockatoo Island operation produces 1.5Mt/y, but with a mine life only through 2012. The only product is high quality (69.5%Fe) premium hematite fines. Mining and camp conditions are very challenging with mining actually conducted 50 meters below sea level.

- Noramco Engineering outlined experiences in Venezuela where they mine three types of ore: the current high grade direct shipping ore (DSO), a friable ore and a hard hematite ore. So far all production has been from the DSO featuring low (1-2%) SiO₂ but with P levels approaching 0.1%. A pilot plant was built in 1997 to develop a flow sheet for an 8Mt/y concentrator plant to process the friable ores. This plant will supposedly start up next year but delegates have heard 'next year' for the past five years. Noramco are now building a pilot plant to study upgrading of the hard hematite ores.

University of Minnesota Mining Symposium

This conference is organised jointly with the University of Minnesota Continuing Education Department and SME and takes place concurrently in Duluth with the SME Annual Meeting.

The *Environmental Joint Session* featured 'A Primer on Environmental Review and Environmental Permitting Requirements' which outlined the many steps and many permits required in Minnesota thus underscoring how difficult and time consuming it is to launch projects here.

Parallel sessions focusing on environmental topics included papers on mine water quality, tailings disposal, global acid rock drainage and sulphate removal. Of general interest was a paper entitled: 'Can We Talk? Engaging Critical Constituencies in Constructive Dialogues to Support Mineral Development' where a former

regulator and a public relations specialist emphasised the importance of proactive rather than reactive dialogue with stakeholders (both real and self professed) in any project or current mine situation.

The *Mining Session* included papers on drilling and blasting technology and lightweight haul truck boxes at taconite mines and also a discussion on non-ferrous mining strategies.

The *Processing Session* featured a paper on control of iron ore pellet size distribution at a pelletizing plant where the Metso particle size measurement system combined with their control software has tightened the pellet size range at Vale (Brazil) pellet plants. Barr Engineering and CVG (Venezuela) outlined development of a flowsheet for hard hematite ores.

Issues with renewable energy were well described in a Minnesota Power Company presentation that included interesting maps that highlight the best regions in USA for each type of renewable energy. These are for wind, biomass & solar from the US Dept of Energy and are downloadable from the National Renewable Energy Laboratory website www.nrel.gov/rredc/ and for Hydropower from US Dept Energy, Energy Efficiency & Renewable Energy department's report DOE/AD – 1111 of 2004 (Fig 11 p28). <http://hydropower.id.doe.gov/resourceassessment/pdfs/03-11111.pdf>

Another paper introduced a venture of Cliffs and *Renewa Fuel* that is commercialising biomass fuel (mainly wood products) in Michigan and elsewhere.

Keynote Sessions

A presentation by SDI (Steel Dynamics International) entitled 'A Long Road to Iron Independence', reviewed the history of SDI that started with a greenfield EAF flat rolled minimill in Butler Indiana in the late 1990s and now consists of five EAF steel plants making a full range of long and flat products, some fin-

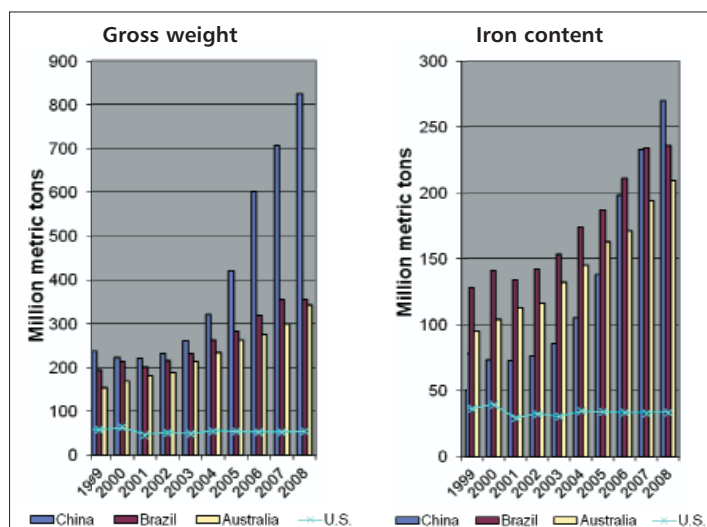


Fig 1 Major iron ore producing countries 1990-2008 (Mt)

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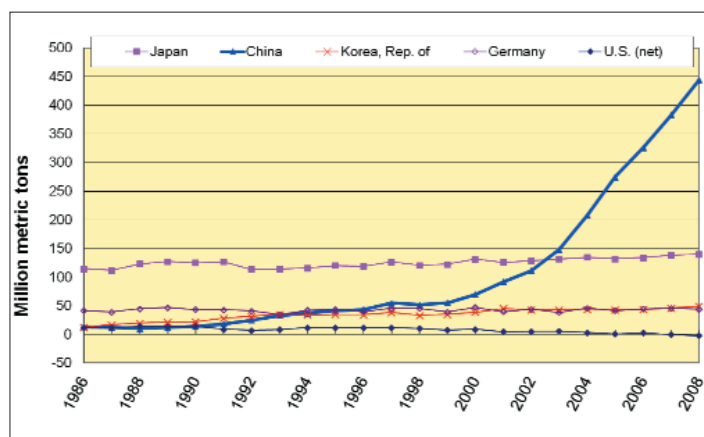


Fig 2 Leading iron ore importing countries 1986 – 2008 (Mt)

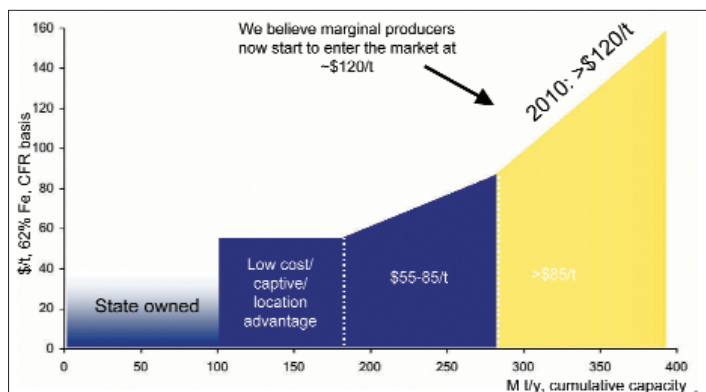


Fig 3 Cost of Chinese iron ore production Source SBB

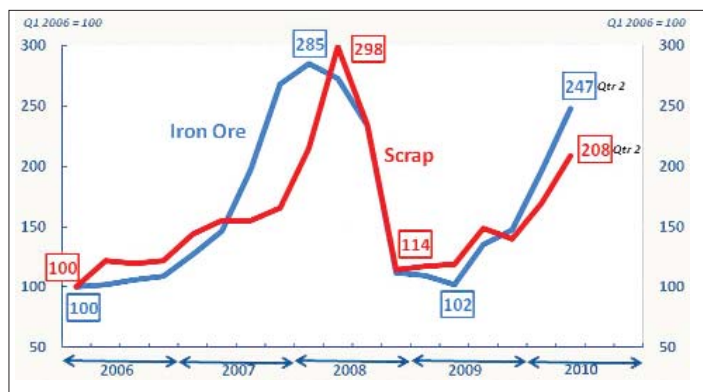


Fig 4 Correlation between spot iron ore and scrap prices in Asia

% EAF Feed by product	Virgin Metallics	Prompt Industrial Scrap	Obsolete Scrap
Flats	10-30	55-75	15
Rail, SBQ	5-10	25-30	65
Beams, Rebar	0	0	100

ishing facilities and a metallics business to supply the EAFs. The metallics business includes scrap yards, the IDI (Iron Dynamics International) plant at Butler which now produces about 300kt/y hot metal by melting DRI (produced in a rotary hearth furnace) in a submerged arc furnace; and its latest venture, the Mesabi Nugget plant which is in the process of starting up (now at 45% of capacity) at Hoyte Lakes, Minnesota. **Table 1** summarises SDI's use of metallics.

SDI plans to replace all currently purchased pig iron with Mesabi Nuggets (using the Kobe/Midrex ITmk3 rotary hearth technology) and increased input of liquid hot metal from IDI at Butler. This will also enable them to also reduce the purchase of prompt industrial scrap.

The metallics segment also includes the reopening of the Erie mine to provide concentrate for Mesabi Nugget but the project has been badly delayed by environmental permitting issues. In the interim, Mesabi Nugget is being supplied with Cliffs Northshore and Magnetation (reclaimed hematite) concentrates.

The meeting, as expected, paid little attention to the global iron ore pricing controversy that dominated Metal Bulletin's event to be described next. The North American steel and iron ore sectors have been more insulated from global iron ore price developments for two reasons: the iron ore/pellet plant equity positions of major steel producers such as US Steel and ArcelorMittal and the more gradual changes in pellet pricing enacted by the major merchant pellet supplier, Cliffs, whose long standing pricing formula includes world pellet prices as only one-third of its annual adjustments. Cliffs may be reconsidering this policy.

Unfortunately, copies of the proceedings have not been made available to non attendees.

Metal Bulletin's Ore Symposium

Metal Bulletin's 16th International Iron Ore Symposium was held in Prague, Czech Republic, May 4-6th.

Metal Bulletin has been organising this iron ore symposium every second year for the past three decades; the last symposium was in Monaco in May 2008. The meeting is usually well attended by nearly all iron ore producers worldwide (38% of all attendees), traders (18%) shipping companies (7%), and steel company commercial personnel (19%) from nearly

all of the European integrated steel companies. Other attendees included financial (8%) and others (engineering companies, consultants, press). Attendance exceeded 220 people, although this was down somewhat from nearly 300 that attended in Monaco in May 2008, just before the onset of the fiscal crisis. This year, numbers were down from the Asia-Pacific region and most companies sent fewer people.

The year ahead for Global Steel

A paper by Sinosteel Trading predicted China's iron ore imports will reach 660Mt in 2010, up 5.2% over 2009 and up 100% in four years. Over 80% of imports are from Australia, Brazil and India. They expect domestic run of mine (ROM) production (of <30% Fe content) to increase to 960Mt in 2010 from 880Mt in 2009. Sinosteel expects steel production to increase to 610Mt in 2010, up from 568Mt in 2009. China has 47% of total world steel production. They expect a continued shortage of iron ore supply along with price volatility.

ArcelorMittal noted that from 2003 to 2010 the proportion of hot rolled coil costs attributed to raw materials has increased from 40% to 65%. They observed that the iron ore cost curve becomes very steep at the margin (**Fig 3**), thus price volatility increases. ArcelorMittal has a three pronged strategy: geographic, products and value chain; the geographic focus is on steel plant expansion in Latin America, MENA region and Asia while the value chain goal is to increase iron ore self sufficiency from 50 to 75% by 2015.

Consolidation and growth

Vale and LKAB were the only two major miners to participate; notable non presenters were Rio Tinto, BHP Billiton, Anglo American, FMG and others.

State owned LKAB in Sweden showed

Table 1 Use of metallics according to product type in SDI's EAF steel plants

capacity increases from 19.5Mt in 2001 to 23.3Mt by 2006 and 28.0Mt by 2010; their product mix is 88% pellets, 7% fines and 5% special products. LKAB is planning mine improvements to reach 30Mt/y and then new mines to reach 37Mt/y by 2015; these expansions will enable LKAB to continue to offer 5Mt/y of sintering ore fines; they had earlier planned to abandon this market.

Vale (formerly CVRD) contrasted the 'old order', pre 2003 associated with slow demand growth and idle iron ore capacity with the period since then led by rapid growth demand from China. Prior to this, spot iron ore pricing accounted for less than 10% of the market against over 50% now. The Vale presenter expressed bitterness over failure of (mainly Chinese) customers to honour benchmark contract prices during the late 2008 and early 2009 downturn; these buyers turning to the spot market. Accordingly Vale, he said, has no choice but to adopt quarterly pricing, updated using Platt's index based on spot ore transactions. The presenter antagonised the major European buyers by listing the profitability of steel companies by name, stating that they could easily afford the higher ore prices.

An introduction to Northland Resources, a 5Mt/y pellet feed project due to start up in 2014 was given. It is located at Kaunisvaara on the border between Sweden and Finland. The product will be a high quality (69% Fe) pellet feed that could be used in DR pellet plants. Northland is also planning a smaller (2Mt/y) project in Finland at Hannukainen where an ITmk3 iron nugget plant is being considered.

ENRC (Eurasian Natural Resources Corp) has operated mainly in Kazakhstan and is a leading producer of ferroalloys including FeCr, iron ore, etc. The ENRC SSGPO (Sokolov-Sarbai) iron ore mine produced 15 and 7Mt/y, respectively of concentrates and pellets in 2009 with most going to MMK in Russia. The latest ENRC acquisition is a 50% holding in the Bahia project in Brazil where they plan to produce 20Mt/y of pellet feed by 2015.

A presentation by miner MMX outlined their main project in the Sudeste system (Serra Azul and Bom Sucesso projects) where Wuhan Steel has purchased a 21% interest (with off take

Table 2 Iron ore trade outlook (Seaborne supply Mt)

	2009	2010	2011	2012	2013
Australia	381	420	462	470	470
Brazil	266	340	390	425	420
India	107	100	110	120	100
S Africa	45	46	49	52	50
CIS	30	30	30	50	50
Other	110	110	120	130	130
Total	939	1046	1161	1247	1220

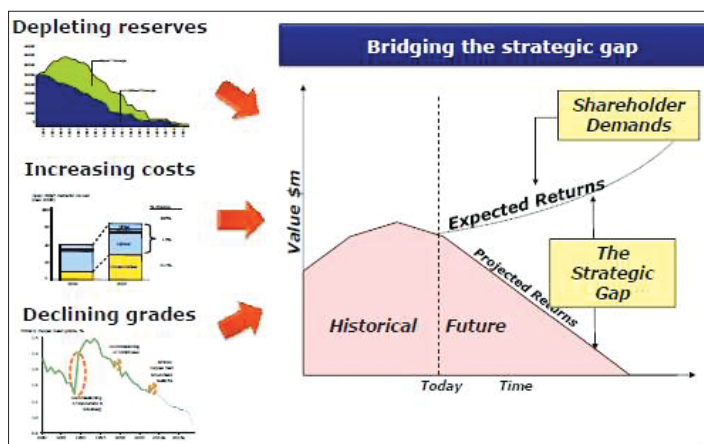


Fig 5 Mining differs from manufacturing in key regards, mineral resources are non-renewable, site specific and depleted over time (Source: Extrata)

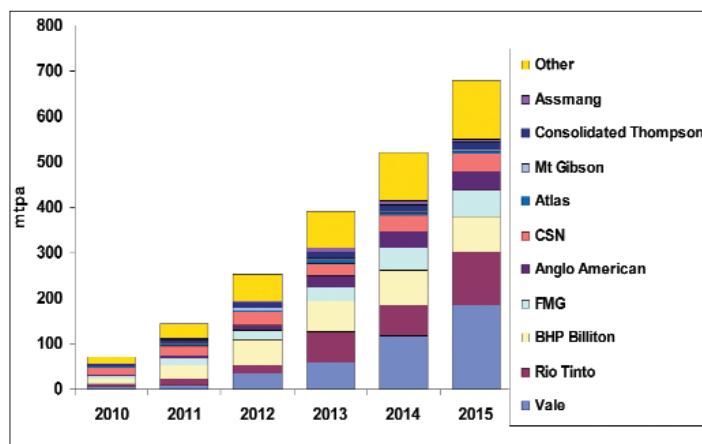


Fig 6 Additions to iron ore supply in 2010 - 2012

agreement to 50%). Production is currently at 8.7Mt/y at Serra Azul with plans for 33.7Mt/y (total for Serra Azul and Bom Sucesso, a magnetite project) by 2015. The Corumba operation (70% MMX) shipped 2.1Mt of lump ore in 2009. Other MMX projects include the Port of Acu in Brazil and iron ore in Chile (potential 10Mt/y).

Dynamics of ore supply as steel moves to developing countries

The presentation from ArcelorMittal Mineração Serra Azul, Brazil was disappointing as it did not discuss that operation at all but only rehashed Vale's iron ore trade statistics. ISSB (UK's Iron & Steel Statistics Bureau) gave a statistical overview of global steel production by process noting that the BF/BOF role is growing mainly due to nearly exclusive use of this process route in China. They forecast global steel production of 1390Mt in 2010 that will exceed the record level of 1346Mt in 2007. The ISSB, using figures from Steel Business Briefing, demonstrated the close correlation between iron ore and scrap pricing (Fig 4).

David Tucker of Hatch Beddows provided insight into the long term differences between mining and manufacturing operations, as a particular mining operation is characterised by depleting reserves, declining quality and increased costs over time (Fig 5). He showed that lump ore production, as a percent of total, has declined from 12% in the mid-1990s to about 6% today while pellet feed has overtaken sinter fines at near the 50% level.

The future of ore pricing

The Deutsche Bank presenter pronounced the 'death' of benchmark iron ore pricing and noted that iron ore swaps volume moved from 161kt in April 2009 to 2200kt in April 2010, however iron ore swaps volume is still only 1-2% of total transaction volume whereas other commodities (such as oil, power, coal) have swap volumes up to 10 times the physical traded volume.

London Dry Bulk provided specific examples of the role that swaps can play to help iron ore consumer hedge against increasing ore prices and then went further to explain how a steel producer can also hedge against changes in realized steel product prices.

Credit Suisse observed that indexes for other routes (besides India-China) require actual volumes of both spot transactions and freight auctions; neither which really exist at present.

Instead they portrayed how a synthetic Rotterdam cfr (cost including freight) iron ore index could be developed: cfr China - freight from Brazil to China to get fob (freight on board) Brazil; then add freight from Brazil to Rotterdam to get cfr Rotterdam. (Here cfr is defined as delivered cost including freight, insurance, etc while fob refers to the price of ore loaded at the shipping port.)

The MBIO (Metals Bulletin Iron Ore Index) presentation provided the following outlook for seaborne iron ore supply (Table 2).

Regional view of ore production

Magnus Ericsson of the Raw Materials Group focused on mining in the Nordic region noting the limited iron ore mining elsewhere in Europe: 1.8Mt/y at Erzberg in Austria; 1.1Mt/y at ArcelorMittal mine in Bosnia; and 0.6Mt/y at Rana Gruber in Norway. Ericsson listed four new Nordic projects:

- Northern Iron (former Sydvaranger) now producing 0.8Mt/y with a target of 2.8Mt/y;
- Dannemora (reopening old mine) with the aim of 2.0Mt/y;
- Northland Resources projects (described earlier);
- Expansion at Rana Gruber.

Dr Neil Bristow of H&W Worldwide Consulting, focused on opportunities with Australia magnetite ores. Currently nearly all production is hematite; the first two big magnetite projects now moving forward with Chinese steel plants equity are with Anshan Steel in Gindalbie and Sino Iron with Citic Resources; both are over 10Mt/y projects for pellet feed going to China. Bristow listed quality attributes of Australian magnetites: >68% Fe; <4% SiO₂; very low Al₂O₃ and P. They are exothermic in the indurating processes and grind to a fine size (good for pelletizing), but not so good for sintering. He speculated that magnetite capacity could reach 200Mt/y with the major push coming after 2014.

Jim Lennon of Macquarie Bank observed that China was actually a net steel importer for much of 2009. He confirmed other speakers observations that high cost Chinese mine production is becoming even higher cost (see Fig 3). In Fig 6 he showed limited growth in iron ore supply in the 2010-2012 period. All of this points to increased Chinese imported iron ore demand; it could reach 1bnt by 2015.

Managing risk

Another Deutsche Bank presentation observed

that the lending activity by banks is still slow even with the economic recovery. They noted that lenders are focusing on strong names with whom they have established relationships; accordingly newcomers such as junior miners really do not have access to lending; they need to raise equity, IPO's, etc.

The SMBC Europe presentation defended both the steel sector and the banking sector in the recent fiscal crisis by observing how few steel and steel related firms became casualties even with very poor business conditions.

The UniCredit Bank presenter advised those seeking funds to: 'start early, offer site visits, present results of financial modelling to cover the full range of business conditions and to be transparent'.

Efficient technology & freight

Efficiencies in technology and freight logistics can be used to manage risk in troubled times.

- Dr Rod Dry of Hismelt listed three variants of the Hismelt iron production process route:
- direct charging of magnetite fines into the bath smelter;
 - using Outotec's ore preheater to preheat and pre-reduce sintering ore fines;
 - within the low carbon footprint ULCOS project to use a CCF cyclone to preheat and pre-reduce any fines.

He noted the first route is certain to succeed if magnetite fines are available, while the second route is still not fully demonstrated even after 1 - 2 years of effort while the third route goes back to a pilot plant step so full commercialisation (demo plant and commercial plant) is years away.

The presentation by Midrex demonstrated green (low CO₂) benefits of reduction of iron ore with natural gas but with a twist: the use of HBI as a part of the blast furnace charge to increase hot metal production while reducing the coke rate. The blast furnace merely melts the already reduced HBI. A prominent example is AK Steel Middletown BF 3 where 200kg/t of HBI has been used to achieve specific productivities of over 4 tons/m³/day. However, the economics only work if the plant is consistently short of hot metal. ■

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