Developments in production costs and competitiveness in ferrochrome

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Structure

1. Overview of FeCr production costs

2. Country focus:
   - Kazakhstan
   - India
   - China
   - South Africa

3. Conclusions
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90% of global FeCr production is accounted for by four countries – China, South Africa, Kazakhstan and India

**World HC/charge FeCr production, 2012**

China 35%
South Africa 32%
Kazakhstan 12%
India 11%
Others 10%

Total ~9 million tonnes
50-80% of ex-plant FeCr cash costs are typically denominated in local currency, making exchange rates important drivers of the market.

**HC/charge FeCr cash cost, global average ex-plant, 2013**

- **Labour**: 22% Local
- **Reductant***: 17% Mostly US dollar
- **Chrome ore**: 32% Local – most captive production
  - US dollar – purchased ore
- **Electricity**: 29% Local
  - (some link to world energy prices)

50-80% of cash costs denominated in local currency**

* Also includes other raw material costs eg. electrode paste, flux  **excludes Zimbabwe
The South African rand and Indian rupee have both depreciated significantly in 2013, with implications for FeCr production costs.
Global average FeCr cash costs declined slightly in both 2012 and 2013. Electricity is now close to becoming the largest cost component.
South African cash costs have now increased to the level of the global average, whilst Chinese and Indian cash costs have fallen since 2011.
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Kazakhstan – FeCr industry characteristics

- Single major producer (ENRC) – 2 large smelters
- Fully integrated; large reserves of domestic high-grade ore, facilitating output of high-grade HC FeCr
- Low electricity costs; competitive labour and reductant costs
- Transport – long distances over land
- Subject to significant mineral extraction tax
- Overall production costs low – most competitive major FeCr producer
- Gradually increasing production; entirely export-focused
- Major corporate changes at ENRC in 2013
Kazakhstan has the lowest cost FeCr plants in the world
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India – FeCr industry characteristics

- Many small players, but larger producers dominate (Jindal, IMFA, Facor, Tata..)
- Increasingly integrated, through consolidation of assets; 60-70% of Indian FeCr output now integrated, including most major producers
- Ore and alloy quality mixed: average FeCr grade ~60% Cr
- High and increasing electricity costs – producers increasingly building captive power stations – however, captive power not necessarily cheap power (often need to purchase coal or oil to generate it)
- Low labour costs, but mining restrictions becoming strict
- Average production costs quite high, but integrated players competitive, greatly assisted by weak rupee in 2013
- Rising production, driven by exports; increasing interest from Indian players in new overseas FeCr capacity and ore sources (eg. Oman)
Indian FeCr plants with captive ore and energy rank quite competitively; most non-integrated producers are right at the top of the cost curve.
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China – FeCr industry characteristics

- Large number of small producers, focused on domestic market
- Most producers non-integrated – domestic ore production very low (~98% of chrome ore imported)
- Mix of ores used – balance shifting towards lower grades from S.Africa
- High and increasing electricity costs
- “North-south divide” with respect to electricity prices
- Low labour, reductant and interest/depreciation costs
- Overall production costs high, but falling since 2011
- Rapidly increasing production; net importer, but FeCr imports declining
Chinese FeCr capacity clusters around Sichuan and Inner Mongolia – quite evenly on either side of the country’s north-south power divide.

Coal-based power – 46% of Chinese FeCr capacity

Hydro-based power – 54% of Chinese FeCr capacity
Power in northern China, predominantly generated from coal, is 20% cheaper than in the hydro-powered provinces of the south.

Source: MySteel
Chinese FeCr producers have benefitted from falling chrome ore prices since 2011, and from increasingly purchasing cheaper South African ores.

* annualised data from Jan-Jul 2013
Chinese FeCr plants, on average, remain at the top end of the cost curve. Lower power costs make costs in the north lower than the south.
On a “full cost” comparison (includes depreciation, interest etc), Chinese FeCr plants are slightly more competitive on the global cost curve.

Global average HC/charge FeCr full costs, 2013 (FOB basis, US cents per lb FeCr)
Chinese domestic FeCr prices (basis 50-55% Cr) have been 2-8 cents/lb below average Chinese cash production costs year-to-date in 2013.

Global average HC/charge FeCr cash costs, 2013 (FOB basis, US cents per lb FeCr)
Published Chinese FeCr prices are generally basis 50-55% Cr charge chrome and include VAT.

Excluding VAT, Chinese charge chrome prices are substantially lower than spot prices in the west (current difference ~10%) and often below calculated average Chinese production cost.

Average grade of FeCr produced in China is somewhat higher than 50-55% Cr (but now perhaps <60% Cr due to increased use of South African ore).

Therefore it is possible that average prices in China are slightly understated by using just reported charge chrome prices, which represents a lower grade product than the Chinese average.

Perhaps it is more useful to view the economics of Chinese FeCr output as part of the total competitiveness of the Chinese stainless steel value chain.
China’s cost position and export tax ensures that the country cannot be sustainably competitive as an exporter of FeCr.
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South Africa – FeCr industry characteristics

• Two large players dominate (Glencore-Xstrata, Samancor), six other producers of a medium size

• Almost entirely integrated; rising exports of ore

• Ore low grade, suitable for charge chrome only – increasing proportion of UG2

• Electricity costs have increased rapidly, though stabilised in 2013 due to weak rand and buy-back agreements; further significant increases seem inevitable

• Production costs very varied between plants – driven by technology and capacity utilisation

• Depressed production and low capacity utilisation in 2012 and 2013 due to poor market fundamentals – this has impacted on unit costs
South African FeCr plants range widely from low to quite high cost – key factors are furnace technology and capacity utilisation.

Global average HC/charge FeCr cash costs, 2013 (FOB basis, US cents per lb FeCr)
On average, South African FeCr plants should have been cash profitable in 2013. Current prices are below cash cost for the highest cost plants.
On a “full cost” comparison (includes depreciation, interest etc), South African plants range even more widely across the cost spectrum.
About half of South African FeCr production does not cover “full costs” at current price levels.

Global average HC/charge FeCr full costs, 2013 (FOB basis, US cents per lb FeCr)

Western FeCr 50-55 spot price (FOB South Africa basis) - avg 2013

South African plants

- Sep 2013

Global FeCr production (Mt)
Average capacity utilisation at South African FeCr plants has been only 70-75% in 2012 and 2013, impacting on unit costs at affected plants.
The weaker rand and power buy-back agreements have stabilised power prices in USD terms for South African FeCr producers in 2013.
There are wide variations in electricity and reductant consumption at South African FeCr plants, driven by furnace technology.

Electricity consumption in South African FeCr production:

- 2,000 kWh/t
- 4,500 kWh/t

Pre-reduction (Premus)
Sintering & pelletising (Outotec)
DC arc

Reducant consumption in South African FeCr production:

- Pre-reduction and DC arc processes can use cheaper reductants
- Significant substitution out of coke and into coal/anthracite across the South African FeCr industry in recent years
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Conclusions

• China remains, on average, a higher cost FeCr producer than South Africa, though the gap has narrowed (partly due to falling ore prices)

• The competitiveness of China’s FeCr industry within the stainless steel value chain may be greater than implied by a FeCr cost curve. China can be expected to continue to increase FeCr output in the foreseeable future

• The position of South African FeCr plants on the cost curve varies significantly, based on technology and capacity utilisation

• The South African FeCr industry has an over-capacity problem….utilisation stuck at 70-75% in a poor market. Capacity still scheduled to increase (eg. Lion Phase II project). An eventual shake-out seems inevitable

• Future outlook: much depends on power prices and availability, and whether rising chrome ore exports are allowed to continue – exchange rates also very important
Thank you for your attention