Robert Cartman, Consultant, Hatch

A look at nickel price bubbles and ferronickel pricing
Hatch and Hatch Beddows

- Should we be expecting another nickel bubble?
- Conclusions
- A brief look at ferronickel pricing
Hatch services and sectors

Consulting
- Process consulting
- Technologies
- Business consulting

Capital Projects and Construction
- Engineering
- Project management
- Construction management

Operations Support
- In-house engineering services for operations
HATCH

Global reach and resources

Canada
- Calgary, Alberta
- Hamilton, Ontario
- Montreal, Quebec
- Sorel-Tracy, Quebec
- Sudbury, Ontario
- Mississauga, Ontario
- Niagara Falls, Ontario
- Sorel-Tracy, Quebec
- Sorel-Tracy, Quebec

USA
- Boston, Massachusetts
- Buffalo, New York
- Millburn, New Jersey
- Monroeville, Pennsylvania
- New York, New York
- Pittsburgh, Pennsylvania
- Pleasanton, California
- San Francisco, California
- Seattle, Washington

South America
- Antofagasta, Chile
- Santiago, Chile
- Lima, Peru
- Sao Paulo, Brazil
- Belo Horizonte, Brazil
- Vitoria, Brazil

South Africa
- Johannesburg
- Richards Bay

Europe
- London, England
- Moscow, Russia

China
- Beijing
- Shanghai

India
- Delhi

Australia
- Brisbane
- Gladstone
- Mackay
- Melbourne
- Newcastle
- Perth
- Sydney
- Townsville
- Whyalla
- Wollongong

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Hatch counts many of the world’s major mining and steelmaking companies and financial institutions among its core client base

<table>
<thead>
<tr>
<th>Mining</th>
<th>Steel</th>
<th>Financial institutions</th>
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<tr>
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<td>Gerdau Group</td>
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<td>World Bank</td>
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Two price bubbles in Ni stand out from recent times – that of the late 1980s and that of a couple of years ago.

Source: MB, Wood Mackenzie, Hatch Beddows
The Ni bubble of 2007 was fuelled by a number of factors though the bubble itself was a result of speculative buying and ‘herd mentality’

Drivers of short-term Ni price

- Supply / Demand balance
  - Stockpiles, strikes, natural disasters
  - Stainless production, financial crises / recession

- Expectations
  - Alloy surcharge mechanism
  - Speculation

- Dollar weakness
  - Against Ni-producing countries

- Input costs
  - Oil price, sulphuric acid

Source: MB, Hatch Beddows
The supply / demand balance for nickel has an effect on nickel prices, although recent years show that other factors matter.
The weakening of the US dollar also pushes Ni prices higher

Indexed dollar value vs. LME Ni price

Effect of $ weakness on Ni prices

- Priced in dollars
  - No US production of Ni
  - Ni Production in non-$ countries
  - Ni Production in countries with ‘floating’ FX rate

- Dollar weakness
  - Falling revenues for Ni producers
  - Need to increase $ price of Ni to compensate

- Conclusion
  - Visible correlation, $r = -0.6$
  - Large movements driven more by short-term market conditions

Source: Oanda, Hatch Beddows
As a major component of production costs, the rise in oil prices over recent years has also fed through to Ni prices.

Ni mining and processing costs, 2009

Ni and oil price

Source: Company reports, EIA, Hatch Beddows

* via EAF
Long-term stainless steel production will move toward 40Mt by 2020. Further substitution is possible but most of this has already taken place.

Source: ISSF, Hatch Beddows
The next wave of investment could add more than 500kt of capacity

<table>
<thead>
<tr>
<th>Ore type</th>
<th>Capacity</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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Source: Company reports, Hatch Beddows
A small nickel supply deficit is expected for 2010 before a return to surplus, assuming certain projects finally arrive.

Supply and demand of finished Ni

Supply / Demand balance for finished Ni

Source: Hatch Beddows
Nickel is increasingly being extracted from lateritic ores

**Nickel production by ore type**

- Sulphides
- Laterites

**Nickel resources by ore type**

- Sulphides 27%
- Laterites 73%

Source: Vale, Xstrata, Hatch Beddows
Laterite resources are mainly found in countries that require large spending on infrastructure...
...and this drives up the cost of developing these deposits

**Infrastructure**

- Power / Acid / Lime plants
- Transportation
  - Road / Sea / Air
- Conveyors / Pipelines
- Difficulty of terrain / climate
- Accommodation
- Permits / Compensation
Summary of nickel ores and their pros and cons

Source: Hatch Beddows

- **Nickel ore**
  - **Sulphides**
    - High mining costs
      - Underground mining
    - Low processing costs
      - Proven technology
      - Often associated with valuable by-products (Cu / Pd / Pt)
  - **Limonites**
    - Low mining costs
      - Surface mining
    - High processing costs
      - Unproven technology
      - Protracted startup
      - Expensive materials of construction
      - High acid consumption
  - **Laterites**
    - Low mining costs
      - Surface mining
    - Falling processing costs
      - Proven technology
      - Large-scale operations
      - Vulnerable to energy costs
      - Slag disposal
  - **Saprolites**
    - Low mining costs
      - Surface mining
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Conclusions from 2009

- **Short-term – Higher Ni prices through 2010, falling thereafter**
  - Supply deficits for 2009 / 2010
  - Stainless production to begin rebound in 2010
  - New supplies to arrive, mainly from 2011

- **Long-term – Rise in real prices but will it be temporary?**
  - Greater importance of laterites
  - Rise in production costs
  - Need for technological developments in processing limonites
Conclusions for 2010

- **Nickel prices driven by a variety of factors**
  - Supply / Demand balance to become positive into 2011, assuming projects arrive
  - The market is heavily driven by expectations
  - Dollar weakness likely to persist or get worse = support for Ni prices
  - Oil prices likely to increase = support for Ni prices

- **Outlook**
  - Short-term – support for prices to remain above LT real average of $14-15k/tonne
  - Possible impact from physically-backed ETFs
  - Any bubble likely to be fuelled by new projects failing to meet expectations
  - Long-term – Greater importance of laterites
  - Rise in production costs
  - Need for technological developments in processing limonites
  - Need for different pricing of laterite-based products (e.g. FeNi) and scrap???
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Do FeNi and scrap suppliers need to push for more transparent pricing on Fe units in their products?

Content of Ni-bearing materials by value*

- Ni metal
- Ferronickel
- Stainless scrap

Typical percentage payable of different metals in Ni-bearing materials

- Ni metal
- Stainless scrap
- Ferronickel

Source: Hatch Beddows

*Based on a Ni price of $20k/t, an Fe price of $300/t and a Cr price of $2250/t
Scrap is supplied at a typical discount of 15% over equivalent primary materials due to a variety of reasons:

- Stainless steel scrap appears to be sold at a discount to the equivalent primary materials.
- Average discount of ~16% since January 2004.

Why is scrap sold at a discount?
- Presence of residuals
- Not a homogenous product
- Can be awkward to handle and store
- Can damage EAF electrodes
- Can increase melting time
- Highly competitive industry
- Suppliers are price takers, not makers
Ferronickel is supplied at a typical discount of 5% on the equivalent primary raw materials.

Ferronickel prices

- Ferronickel prices understood to be sold at a discount to price of the equivalent primary materials.
- Ni units understood to be fully payable although not Fe units.
- Fe not priced specifically – but how to price it?
- Instead, a premium is added onto the payable Ni, typically to cover transport costs.
- Results in ferronickel producers supplying their products at a 2-8% discount to primary materials.

Calculated ferronickel price vs. price of component metals

Source: Company reports, EIA, Hatch Beddows
*Based on Pamco FeNi (18.5% Ni, 75.5% Fe), Ni at 100% payable, Fe at 15% payable
**Component prices are LME Ni and shredded scrap price (Rotterdam fob)
Scrap is sold at a discount for a variety of reasons, yet these reasons do not generally apply to FeNi – so why the discount?

**Reasons for discount on scrap prices and their applicability to FeNi**

- Presence of residuals – **FeNi can contain Phosphorous/Sulphur/Silicon that may need to be reduced**
- Not a homogenous product – **FeNi supplied under guaranteed specifications**
- Can be awkward to handle and store – **FeNi a compact product**
- Can damage EAF electrodes – **FeNi has less risk of EAF damage**
- Can increase melting time – **FeNi a compact product**
- Highly competitive industry – **FeNi supply dominated by 7-8 global suppliers**
- Suppliers are price takers, not makers – **FeNi supply shocks do affect Ni price**
- Does the discount exist because of uncertainty on how to price the Fe units? Iron ore, scrap, pig iron?
Your contacts for further information

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