Overview of the Global Manganese Industry

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Introduction

I – Stainless Steel

II – EMD & EMM

III – Manganese Ore

Conclusion
Macro-economic outlook:

- **Global GDP growth is slowing**: disappointing economic recovery despite low oil prices (structural problems in several advanced and emerging economies, geopolitical conflicts)
- **China’s slowing growth**: weaker domestic demand and weaker growth in industrial production
- **falling oil prices**: support the recovery in the USA and the EU by reducing manufacturing costs and boosting consumer spending power
- **currencies**: weak € supports the eurozone’s economy, while strong US dollar hurts the competitiveness of US exports
- **BRIC countries under pressure**: lower demand from China, low energy prices and trade sanctions against Russia, electricity supply issues in Brazil
Outline

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Conclusion
In 2014, global SS production reached 41.7 million mt (new record high) up 8.3% YoY

Global SS production expected to keep growing at a sustained growth rate of 5% CAGR from 2015 to 2020
I – Stainless Steel Production Change

Between 2001 and 2014, **global additional stainless steel production** = 22.5 million mt
- China +20.9 million mt
- rest of Asia +1.7 million mt
- Americas +500,000 mt
- CIS stable
- EU & Africa -640,000 mt

**Growth in global stainless steel production mostly driven by China, and to a lesser extent by India**
Global production of 200 series stainless steel has grown faster than 300s or 400s since 2000, driven by China’s SS industry

Because of high price of nickel in the mid-2000s

Stainless steel 200 series
→ contains less nickel than other SS series
→ 6-15%Mn (vs. 1%Mn for 300 and 400s)
uses Mn as a partial replacement for Ni

200s now accounts for 72% of global Mn consumption in stainless steel

But 200s less resistant to corrosion than 300s (which contains more chrome and nickel)
→ 200s limited mostly to indoor uses

The rise in 200s production in China has increased Mn consumption in SS over the last few years
But production of 200s capped by its limited indoor use compared with 300s
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Production of **EMM** consumes 4.9 million mtpy of Mn ore
= 9% of global Mn ore consumption

Production of **EMD** consumes 1.09 million mtpy of Mn ore
= 2% of global Mn ore consumption

**EMM** and **EMD** are important markets for the Mn industry
China is the world’s greatest producer and exporter of EMD
Other EMD producers include Belgium (Erachem), India (MOIL), Japan (Tosoh), and Quintal (Colombia) and until recently South Africa (Delta EMD)

The USA imports EMD from South Africa and Japan (decreasing imports since 2011)
China ships EMD mostly to Indonesia & India (growing exports since 2013)

More batteries are produced in Asia (China, Indonesia, India)

New EMD project in Minnesota, USA: Emily project (JV of Cooperative Mineral Resources, Star Minerals and Octopus Technologies)
Demand for EMD is growing because of:

- **development of battery-powered products: transports, appliances, electronics, automotive**
  
  Demand for hybrid and electric vehicles in Europe +29% YoY to 144,421 new alternative fuel vehicles (AFV: including electric and hybrid cars and those powered by natural gas or LPG) registered in Q1 2015. Hybrid and electric vehicles now account for 60% of the European AFV market, with cars fuelled by natural gas or LPG accounting for 40% - a year ago this ratio was 56% to 44%.

  UK manufacturer Aston Martin Lagonda recently announced investment in a new all-electric luxury vehicle

  In May 2015 Tesla entered the stationary battery storage sector with the offer of its first household lithium-ion storage battery. It is targeting the stationary storage sector for 30% of sales from its upcoming giant Gigawatt battery factory.

  **this trend will continue in the future due to heavy investments in research & development**

- **Nickel-manganese-cobalt (NMC) batteries are progressively replacing lead acid batteries (which use more cobalt) because of the higher cost of cobalt**

Forecasts point to the battery sector growing by 370% by 2025 (Recharge industry association)
China is by far the world’s greatest producer and exporter of manganese metal

China’s EMM exports have accelerated after the removal of the 20% export tax at the start of 2013
Low domestic demand in 2015 pushing for higher exports

China = 52% of global stainless steel production, but 95% of global EMM production

The rest of the world depends on China’s EMM exports for stainless steel production

Source: GTIS, IMnI
Eramet Moanda started EMM production in December 2014 in Gabon.

Europe, South Korea and Japan rely on China’s EMM exports for stainless steel production.
Chinese demand for EMM is very weak in 2015, because of high inventories, low stainless steel prices, low demand from Europe and stricter environmental regulations in China.

Price for EMM flake dropped by 15% in 2015 (Metal Bulletin)

Some traders are suffering from illegal EMM exports via Vietnam (to avoid the domestic 17% value added tax).

Some EMM producers have halted production recently, especially in Hunan:
- Ningxia Tianyuan Manganese, one of the biggest producers in China, has cut production in April/May.
- Tycoon Group, has halted a 20,000t/yr plant in Chongqing province for equipment maintenance.

These production cuts reduce China’s EMM overcapacity.
Stainless steel demand expected to grow over the next few years, adding 400,000 Mn dry mt to global demand by 2019

Contributing to reduce China’s EMM overcapacity
Two EMM projects to ramp up production in China in 2015

The manganese metal industry is likely to see additional capacity of more than 200,000 mtpy in 2015 (Metal Bulletin Research)
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Mn ore (wet) in 2014:
supply: 61 million mt, up 3% from 2013
demand: 56 million mt down 1% from 2013

New Mn ore miners in South Africa ramped up production in 2014
→ United Manganese of Kalahari (UMK),
→ Tshipi Borwa,
III - Mn Ore S&D Balance

Mn ore (wet) 2014

Supply

Asia 44%
Africa 33%
Oceania 13%
EU28 0%
Middle East 0%
Other Europe 0%
North America 1%
South America 4%
C.I.S. 5%

Demand

Asia 82%
C.I.S. 9%
Other Europe 2%
North America 2%
EU28 2%
South America 1%
Africa 1%
Middle East 1%
Oceania 0%

Supply/Demand Balance 2014 (in '000 mt)

<table>
<thead>
<tr>
<th>Region</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>-19,434</td>
</tr>
<tr>
<td>C.I.S.</td>
<td>-2,094</td>
</tr>
<tr>
<td>European Union (28)</td>
<td>-994</td>
</tr>
<tr>
<td>Other Europe</td>
<td>-962</td>
</tr>
<tr>
<td>North America</td>
<td>-427</td>
</tr>
<tr>
<td>Middle East</td>
<td>-310</td>
</tr>
<tr>
<td>South America</td>
<td>1,820</td>
</tr>
<tr>
<td>Oceania</td>
<td>7,686</td>
</tr>
<tr>
<td>Africa</td>
<td>19,803</td>
</tr>
<tr>
<td>World</td>
<td>5,089</td>
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</tbody>
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Mn ore supply
Asia, CIS, Europe, N. America & ME in deficit
Africa, Oceania and S. America in surplus
China is the greatest producer of low-grade ore
South Africa produces most of mid-grade ore
High-grade ore is mostly produced by Gabon, South Africa, Australia and to a lesser extent Brazil

High-grade manganese ore production has been growing over the last few years due to increased demand
Gabon produces high grade (~46%Mn) ore that can be used to manufacture EMM and EMD:
- Eramet operates Gabon’s largest mine (capacity ~4.5 million mtpy) and started production of EMM at its Moanda Metallurgical Complex in Gabon in 2015
- CITIC Dameng produces EMM and EMD in China, and operates the M’Bembele mine in Gabon (capacity ~1.15 million mtpy)

China mostly has low grade ore reserves (18-20%Mn)
China’s manganese ore production has stabilised at around 4.14 million mt Mn units Equivalent to around 40% of its needs in 2014 The gap is filled by imports (mostly from South Africa, Australia, Gabon and Ghana)

China has the potential to produce more manganese ore, but at the moment, given the low price of imported ore, there is no incentive
China imported 16.2 million wet mt of manganese ore in 2014, representing 60% of global trade. China drives global manganese ore trade and price.

Mn ore inventory at China’s ports has increased since 2013, to reach 3.5 million wet mt at the beginning of 2015. Until these stocks are run down, Mn ore price will remain under pressure.
Most new manganese ore projects located in Asia

But in Africa, investments in **transportation system and port terminals** to increase export capacity:

- **South Africa**: rail-freight state-owned Transnet is investing in a **new manganese terminal at Ngqura port** (expected capacity: 12 million mt/yr by February 2019 and 16 million mt/yr by October 2020)

- **Congo/Angola**: investment in the rail network, to link the Kisenge manganese mine owned by Entreprise Minière de Kisenge-Manganese (EMK-Mn), and the port of Lobito on the Atlantic coast of Angola

Global Mn mine output expected to grow by 1% CAGR by 2020 (Macquarie)

### III – Manganese Ore – New Projects

<table>
<thead>
<tr>
<th>Country</th>
<th>Company/Project</th>
<th>Capacity (in '000 mt/yr)</th>
<th>Launch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>Pertama Ferroalloys (JV of Asia Minerals, Nippon Denko, Shinsho Corp.)</td>
<td>200 (sintered Mn ore)</td>
<td>H2 2015</td>
</tr>
<tr>
<td>Togo</td>
<td>Ferrex - Nayega project</td>
<td>60 (first phase), ramping up to 250</td>
<td>2016</td>
</tr>
<tr>
<td>India</td>
<td>Rungta Mines</td>
<td>161</td>
<td>2016</td>
</tr>
<tr>
<td>India</td>
<td>MOIL - Kandi project</td>
<td>57</td>
<td>2018</td>
</tr>
<tr>
<td>Indonesia</td>
<td>MOIL - Ukwa project</td>
<td>105</td>
<td>2019</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Gulf Minerals/Asia Minerals</td>
<td>180</td>
<td>2018</td>
</tr>
</tbody>
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Conclusions – Key Drivers for EMD & EMM in 2015

**China’s economy**
- Domestic stainless steel production
- Environmental regulations
- EMM producers cutting production, reducing EMM overcapacity

**Demand for EMM in Europe**
- High EMM inventories in Europe
- Weak € supporting European steel producers (and EMM demand)

**Electricity supply & prices**
- Energy crisis in Brazil & South Africa
- Rising electricity tariffs in India
- Changing electricity regulation in China (more and more Chinese producers are trying to negotiate directly with energy providers to get cheaper electricity tariffs and avoid paying fees to the grid companies)
- Liberalisation of the power market in Ukraine → higher electricity prices

**Manganese Ore Price**
- Manganese ore supply expected to keep growing in the near future
- Persistent oversupply
- High stocks of Mn ore in China
- Prices under pressure