The Copper Market From a Fabricating Viewpoint

ICSG, Lisbon, Portugal
Paul Dewison, Director SNL Metals & Mining
13th – 15th October 2014
IMPORTANT COPYRIGHT NOTICE

The information in this document is subject to SNL Metals & Mining’s full copyright and entitlements as defined and protected by international law. All other rights are exclusively reserved to SNL Metals & Mining.

All information in this file is owned by SNL Metals & Mining, and the copying or distribution of this information is strictly prohibited without the prior written permission and consent of SNL Metals & Mining. Unauthorized reproduction or distribution may result in severe civil or criminal sanctions pursuant to Canada, United States and other law.

If you wish to distribute this information, contact Christina Twomey at ctwomey@snl.com. © Copyright by SNL Metals & Mining 2014. All rights reserved.

SNL Metals & Mining represents the information obtained in this document has been collected and compiled in good faith from a variety of sources but makes no warranty as to the accuracy of the information from these sources.
Recent market trends and future developments:
  • Balance, stocks and prices
  • Mined and refined output, and refined use

Deconstructing the copper supply chain:
  • The copper supply chain
  • Implications of a multi-stage process

Copper demand structure and its relation to mine output:
  • Surplus of mined material and China’s increasing deficit

Can a mined copper producer become a world class fabricator?:
  • Issues a would-be fabricator faces

Today’s dominant fabricators are not necessarily tomorrows........
  • Is the boom over in China?
  • What can we learn from already industrialised nations?
Recent market trends and future developments
Liquid stocks fall since Q2 ‘13 hasn’t arrested price fall

Impending increased market surplus...

...already being factored into prices
Scrap and process stock rise may buffer refined supply in 2015

Mine & refined output relationship…

...should limit impact of mining on prices

Refined Cu Consumption
Refined Cu Output
LME Cash Price
Market Balance
% Y-o-Y Ch Output / Use / Price Mkt Bal (kt)
Deconstructing the copper supply chain
Deconstructing the market elements

Stock levels / balances change along the chain, affecting prices

Concentrate and blister stocks can be just as important as refined metal output
Supply chain sector development

Global balances

Mine supply balance

Blister & Concentrates Stocks

Refined copper balance

Fabricated products balance

kt Cu

- SxEw
- Concentrates

- Blister - Non Pipeline
- Blister - Pipeline
- Concs - Non Pipeline
- Concs - Pipeline

kt Cu

- Direct Melt Scrap
- Refined Copper Use
Supply chain elements and balance

Annual changes in copper use and stocks in all forms

kt Cu

-5,000
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000

Balance
Direct Melt Scrap in Fabricating
SxEw Refined Copper
Electrolytic - Scrap Based
Electrolytic - Primary
Copper demand structure and its relation to mine output
## Cu products / applications matrix

### WIRE, CABLE AND LEADS

<table>
<thead>
<tr>
<th>LV Energy</th>
<th>Power</th>
<th>Comms</th>
<th>Winding &amp; Bare</th>
<th>ALL WIRE, CABLE &amp; LEADS</th>
<th>MILL &amp; OTHER</th>
<th>ALL MILL &amp; OTHER</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>Other</td>
<td>Cable</td>
<td>Cable &amp; Bare</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONSTRUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>3,830</td>
<td>99</td>
<td>1,807</td>
<td>14</td>
<td>5,749</td>
<td>35</td>
<td>6,062</td>
</tr>
<tr>
<td>Plumbing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>528</td>
<td>48</td>
<td>1,236</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>161</td>
<td>226</td>
<td>612</td>
</tr>
<tr>
<td>Segment Total</td>
<td>3,830</td>
<td>99</td>
<td>1,807</td>
<td>208</td>
<td>219</td>
<td>723</td>
<td>2,161</td>
</tr>
</tbody>
</table>

### INFRASTRUCTURE

<table>
<thead>
<tr>
<th>Power</th>
<th>Other</th>
<th>Cable</th>
<th>Cable &amp; Bare</th>
<th>ALL WIRE, CABLE &amp; LEADS</th>
<th>MILL &amp; OTHER</th>
<th>ALL MILL &amp; OTHER</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1,353</td>
<td>739</td>
<td>387</td>
<td>1,273</td>
<td>107</td>
<td>643</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>139</td>
<td>739</td>
<td></td>
<td>76</td>
<td>89</td>
<td>447</td>
</tr>
<tr>
<td>Segment Total</td>
<td>7</td>
<td>1,493</td>
<td>739</td>
<td>1,236</td>
<td>3,475</td>
<td>107</td>
<td>447</td>
</tr>
</tbody>
</table>

### OEM & GENERAL

<table>
<thead>
<tr>
<th>Industrial</th>
<th>Transport</th>
<th>Aircon &amp; Refrig.</th>
<th>Electrical/Electronic</th>
<th>General Market</th>
<th>Segment Total</th>
<th>ALL MILL &amp; OTHER</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>283</td>
<td>228</td>
<td>48</td>
<td>779</td>
<td>319</td>
<td>2,624</td>
<td>1,900</td>
<td>3,237</td>
</tr>
<tr>
<td>1,158</td>
<td>95</td>
<td>48</td>
<td>481</td>
<td>319</td>
<td>1,014</td>
<td>1,594</td>
<td>1,964</td>
</tr>
<tr>
<td>1,094</td>
<td>63</td>
<td>319</td>
<td>853</td>
<td>1,518</td>
<td>1,058</td>
<td>1,628</td>
<td>2,791</td>
</tr>
<tr>
<td>109</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,720</td>
<td>1,508</td>
<td>3,650</td>
</tr>
<tr>
<td>Segment Total</td>
<td>2,624</td>
<td>323</td>
<td>111</td>
<td>2,708</td>
<td>7,813</td>
<td>13,579</td>
<td></td>
</tr>
</tbody>
</table>

### TOTAL

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>Power</th>
<th>Comms</th>
<th>Winding &amp; Bare</th>
<th>ALL WIRE, CABLE &amp; LEADS</th>
<th>MILL &amp; OTHER</th>
<th>ALL MILL &amp; OTHER</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,830</td>
<td>2,730</td>
<td>3,622</td>
<td>1,059</td>
<td>3,969</td>
<td>15,210</td>
<td>2,511</td>
<td>10,618</td>
</tr>
<tr>
<td>3,622</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,059</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,969</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15,210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,511</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,890</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,734</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,483</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10,618</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25,827</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Copper demand drivers & detractors

Lower use of scrap and presence in growth markets help copper

Refined copper to outperform IP... ...despite substitution / miniaturisation
Refined copper use share by region

Chinese copper consumption approaching half of the global total

2003

Europe/FSU | Africa/M.East/S.Asia | China | NAFTA | Latin America

2014

Europe/FSU | Africa/M.East/S.Asia | China | NAFTA | Latin America
China supply chain
Poor in resources, rich in industry

Mine supply balance

- Net Concs Imports
- SxEw
- Concentrates

Blister & Concentrates Stocks

- Blister - Non Pipeline
- Blister - Pipeline
- Concs - Non Pipeline
- Concs - Pipeline

Refined copper balance

- Net Refined Imports
- Refinery - Scrap Based
- Refinery - Blister Based

Fabricated products balance

- Net Mill / Cable Imports
- Net Wirerod Imports
- Direct Melt Scrap
- Refined Copper Use
Mine supply vs refined copper use

Mine output has not changed in line with consumption

Supply vs usage 2014

- Europe/FSU
- Africa/MEG/S.Asia
- China
- Other Asia/Austr'
- NAFTA
- Latin America

Mine output vs Refined Cu use, kt

- 2003
- 2014

China

Europe/FSU

Other Asia/Australasia

Africa/M.East/S.Asia

Latin America

NAFTA
Regional deficits continue to grow

Mine supply vs refined use

Mine Output

Refined Consumption

China
Europe/FSU
Africa/M.East/S.Asia
Other Asia/Australasia
NAFTA
Latin America
Can a mined copper producer become a world class fabricator?
Issues in creating a fabricator

Outline Principles and Considerations
- Supply chain elements
- Factors of production
- Availability and competitiveness

A Worked Example
- A 10 ktpy copper building wire plant *(one of the best options)*

Some Inferences
- All elements of the supply chain need to be in place
- Industrial production is a multi-stage process
- All factors of production need to be present: Not just metal ore
- Production (at all stages) needs to be competitive with imports
- Ideally, economic scale (at all stages) should match market need
An industrial supply chain illustrated

Converting mined ore to products is a multi-stage process

At least 2 industrial process stages

Ore → Metal → Product → Market
The factors of production

All factors of production are needed, for all production stages

Capital

Materials

Energy

Labour

INDUSTRY
Each factor must be competitive

Just ‘available’ is not enough to compete with imports
Some inferences

- Competitive and available resource needed for all factors of production
  - Not just materials

- Competitive and available resource needed for all production stages
  - Both refined metal and industrial products

- Other than materials, the factors needed are:
  - Capital
  - Labour
  - Energy
Implications for industry choice

- It has to be competitive to translate ore to metal domestically
  - Otherwise, there is no logic for a metals-based industry

- Downstream industry should:
  - Need low capital input / be attractive to investors
  - Be low technology, accessing available labour pool
  - Be able to operate within the existing energy infrastructure
  - Be materials intensive, utilising available domestic resource
  - Have access to materials not available domestically
  - Have a domestic market
A cable plant example

A 10ktpy building wire plant could be a best options based on the above

Plastics also need to be sourced for this process

- Refined Copper
- Plastic
- Wirerod Line / Wire Drawing
- Insulation with Plastic
- Finishing & Packaging
Is refined copper available as the key resource?
  • An SxEw mine may provide a key resource for refined copper
  • Most refined copper will need to be smelted and refined

Can other materials be accessed?
  • Where will the country get its plastics?

Does the country have other available and competitive production factors?
  • Is power supply sufficiently reliable?
  • Is labour productivity likely to be sufficient?

An outside partner is likely to be needed
  • To provide capital, and know-how
Copper refining operations are naturally larger than cable plants.

May need to export refined copper.
Economic size of cable plant may be too large for home market

Domestic Market

May need to export cable
**Considering scale: a discussion**

- **Ideally, industrial plant needs to match the available market**
  - This applies to each stage in the process chain
  - The match is needed to avoid competing in difficult export markets
  - For each process stage, there is a preferred economic size range

- **A copper refinery and the cable plant**
  - Ideally, copper refining and smelting capacity should match (c. 100 ktpy)
  - Copper wirerod and cable can go down to 10 ktpy, but can be larger

- **The cable plant and its market**
  - Available domestic market may be smaller than minimum cable plant size (10 ktpy)
  - This restricts cable plant size to its minimum, so it will not absorb all domestic copper
  - Available cable market could be restricted – electrification? logistics? existing competitors?

- **Some implications**
  - To use all available copper multiple industrial developments may be needed
  - Available market needs developing - by being competitive, through economic growth
Today’s dominant fabricators are not necessarily tomorrows........
Will history repeat itself?

Japan & Korea grew as fabricators – then declined

Japan

Korea
Countries change position on the copper use ‘S curve’

Per capita copper consumption v GDP
Conclusion
Recent market trends and future developments:
- The copper market is tight, but heading for surplus
- An increase in stock is seen, along copper’s supply chain
- We expect to see lower prices, and lower margins, in years to come

Deconstructing the copper supply chain:
- From mine to fabricated product is a long, multi-product supply chain

Copper demand structure and its relation to mine output:
- Copper use is deeply imbedded in the global economy
- .... and focused on high growth areas
- The geographical disparity between copper use and mining is widening

Can a mined copper producer become a world class fabricator?:
- There are major hurdles to overcome to translate mine output to industry
- ....presence of factors of production and scale are key issues
- But, today’s dominant fabricators are not necessarily tomorrows......