Global Copper Scrap Flows: Where From, Where To, and How Much?

A presentation prepared for the Metal Bulletin Copper Recycling Conference.

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ICSG Membership

- Membership open to any country involved in copper production, use or international trade of copper raw materials and products.
- 23 member countries + the EU in 2012. 4 recent member states.
- Non-member countries can attend as observers.

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- China
- European Community
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- France
- Germany
- Greece
- India
- Italy
- Iran
- Japan
- Luxembourg
- Mexico
- Peru
- Poland
- Portugal
- Russia
- Sweden
- Serbia
- Spain
- United States
- Zambia 2012
Global Copper Scrap Flows: Contents

1. When Will New Copper Mines Output Affect the Copper Scrap Recycling Business?

2. World Industrial Use of Copper and Use of Scrap: In and Out of China

3. Global and Regional Trends Observed in Copper Scrap Use

4. Models and Surveys to Measure Copper Scrap Supply: NAFTA and China

5. What Changes Are We Seeing in the Trade of Copper and Copper Alloy Scrap?

6. Conclusions, Research Needs and Future ICSG Sessions
When Will New Copper Mine Supply Affect The Copper Scrap Recycling Business?
China is critically exposed to imports of copper concentrate, and copper scrap is a substitute material...

...this is why refined copper from scrap has been growing faster than refined copper from mining in 2010-2011.
World copper mine output is struggling below 16 Mt-Cu...

...and new capacity plans from miners are delayed again:
+1.5 Mt-Cu of new capacity in 2012-2013. +4 Mt-Cu new mine capacity in 2014-2015!
Mine capacity utilization down: 94% in 2000 to just 79% % in October 2011.

Over 1.4 Mt-Cu of planned new mine capacity delayed or canceled in 2011, more in 2012?

Only half of new copper mine capacity 2000-2010 became output in the market.
Significant mine capacity increases in the pipeline. But when? Post

Mine supply constraints:

- declining ore grades and labour unrest,
- mine expansions behind schedule,
- new mines late coming on stream,
- doubts on new projects: high costs and high risk.

Miners curbing CAPEX plans in top capital intensive mining projects (2012).
World Industrial Use of Refined Copper and Scrap: In and Out of China
World copper and copper alloy semifabrication: long term trends

- World wire rod output up.
- Volatile in 2000-2010 with output moving to China.
- Brass mill output: slow long term growth.
- Alloy bars output flat last two decades.

Increasing global overcapacity in fabrication:

1.8 times more than the industrial use of copper.
Industrial use of refined copper below Chinese copper demand.

- Difference 2006-2011: > 2.15 million tonnes of copper cathode.

Industrial use of copper up modestly in China (1.9%), USA and Russia in 2011.
Less industrial copper use in Europe and North Asia.
ICSG China Fabrication Survey to 43% of fabrication output = 20% of plants:
slower growth in use of scrap and refined copper expected for 2012-2015.

China 2011: Refined and Scrap Copper Use in Rods/bars Plants Surveyed, Kt-Cu:
- High shares of scrap use in rods/bars and flat products.

China 2011: Reported Copper Use in Surveyed Plants Producing Plate, Sheet and Strips Products, Thousand tonnes of Copper Kt-Cu:


copper production and use analysis.
Chinese wire rod plants using mainly refined Cu now. Scrap important in copper alloy wire. Some scrap use in copper alloy tube plants.

Wire Rod Plants Included in the Survey: Refined and Scrap Copper Use in 2010 Kt-Cu

China 2011: Refined and Scrap Copper Reported in 2010 by Alloy Wire Plants Surveyed, Kt-Cu

![Chart showing copper use in Chinese wire rod plants in 2010](chart.png)
Scrap-intensive copper alloys foundry global output: production of copper alloy ingots also in a downtrend ex-China.

Russian Federation: refined copper export tax changes driving fabrication and scrap use.

Global copper and copper alloys semifabrication outside China not recovering.
Adding China, global fabrication remains at 25mt (gross weight)...

...so the global industrial use of copper remains below 2008 levels.
Copper and Copper Alloy Scrap Use: Global and Regional Trends Observed
Global Use of Copper and Copper Alloy Scrap: via Smelters/Refineries or Directly Melted to Semi-fabricated Products

Scrap Direct Melted by Semis 2011: 5.1 Mt-Cu

Cathode from Scrap 2011: 3.3 Mt-Cu
Record global scrap use in 2011, driven by secondary refined output
Fabricators’ use of scrap in direct melt remains stagnant

World Copper Scrap Use: 2002 to 2011
in Copper Content Kt-Cu

Copper Scrap Use Trends by Region 2002 to 2011, Copper Content, Kt-Cu (2011 Preliminary)

World scrap use trends: China leading by far. Rest of Asia & Middle East stable.
Europe and Americas using much less scrap. Stable use in Russia and Rest of Europe. Africa & Oceania lagging.
The world is struggling to use more than 8mt Cu scrap. China is driving up scrap use, but the rest of the world is using less scrap.
Refined Cu output from scrap is growing rapidly in China: more than the output of all the rest of the world now!

More future demand for scrap or more smelter overcapacity?

New scrap smelter capacity in China = +600 Kt-Cu/year in 2011 +200 Kt-Cu in 2012.
Chinese scrap refineries are using more scrap to produce cathode...

...but Chinese fabricators are not increasing their melting of scrap directly now.
So refined copper output from scrap is growing fast globally...

Data: ICSG database

.. but scrap directly melted by fabricators has stagnated worldwide.

World top five producers in 2010 ‘000 tonnes Cu

- China 1,619
- Germany 302
- Russian Federation 240
- Japan 215
- Belgium 165

Top five direct melt users in 2010 ‘000 tonnes Cu

- China 1200
- United States 780
- Japan 510
- Italy 410
- Korean Republic 390
Future scrap use will evolve with LME refined copper price change: it has been the best indicator of global use of copper scrap.
Measuring Copper Scrap Supply: Surveys to Recyclers and Copper Flow Models
The recycling input rate (scrap use/copper use) is globally useful, but can be misleading regionally.

RIR = Recycling Input Rate
= Scrap use/ Total usage
= Scrap use/(Direct melt + refined use)

World avg. RIR (2002 - 2010) = 34.4%
2010 World RIR = 33.9%

2009-2010: Russian copper first use fell as refined copper was exported, so their RIR achieved historic records!
Recycling Efficiency Rate (RER): how much of the copper available for recycling is used? No statistics for scrap supply, so models and assumptions based on:
how much copper recovered from waste streams, lifetime of each product and fabrication losses.

To be more realistic, copper scrap supply estimates should include expert opinion (recyclers and scrap traders) and also economic variables.
ICSG 2011 Survey to Copper Scrap Recycling Industry in NAFTA Region:
high industrial concentration observed in USA scrap recycling industry!

We identified >500 recycling plants.

- 90 in Canada,
- 450 in USA,
- 203 in Mexico

*Very small scrap stocks reported.*

USA Non Ferrous Metals Recyclers:
- Ownership highly concentrated

- 28.9%
- 71.1%

Canadian Recyclers: concentrated ownership, less than in the USA

- 52.9%
- 47.1%

USA Non Ferrous Metals Recyclers:
- Significant Foreign Ownership in USA Recycling Industry

- 33.4%
- 66.6%

*Locations of top five companies (10.4% of all companies)*
*Locations of all other companies*
But still many “mom-and-pop” operations:
• small & independent
• less sophisticated, technology
• successful focus on specific scrap products
• control of specific geographic markets.

SA RECYCLING
SA Recycling from California, operates locations throughout the southwest. Acquired seven additional yards, total now 47 yards.

SIMS METAL MANAGEMENT
leading global company operating at 73 U.S. locations.
In early 2011, Sims acquired Crash’s Scrap Metals, recycling center located in central upstate New York.

AIM
Canadian, 116.7 Kt recycled (2008) mainly copper.
Recent acquisitions: SNF Inc., historic main competitor.
AIM + SNF: main nonferrous scrap recovery corp in Canada

THE DAVID J. JOSEPH COMPANY (DJJ)

Leading USA recycling companies acquiring more scrapyard capacity and expanding geographically in 2011-2012.

### Copper Scraps Flows and Stocks in 20 Sampled Recyclers/Importers in China

<table>
<thead>
<tr>
<th>Category</th>
<th>Copper Scrap Flows</th>
<th>Stock % Cu</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Survey 2011</strong></td>
<td>1027.5</td>
<td>5356</td>
<td>33.4</td>
</tr>
<tr>
<td><strong>Trading Companies</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>MEC</td>
<td>20</td>
<td>13.2</td>
<td>56%</td>
</tr>
<tr>
<td>Partners Metal</td>
<td>3</td>
<td>2.9</td>
<td>56%</td>
</tr>
<tr>
<td>Minitai</td>
<td>2.2</td>
<td>2.0</td>
<td>58%</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>25.2</td>
<td>24.1</td>
<td>56%</td>
</tr>
<tr>
<td><strong>Import Scraps for their internal usage</strong></td>
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<tr>
<td>Ningbo Liaon</td>
<td>47</td>
<td>28.9</td>
<td>52%</td>
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<tr>
<td>Jinning</td>
<td>35</td>
<td>21.5</td>
<td>52%</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>82</td>
<td>30.4</td>
<td>52%</td>
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<td><strong>Only disassemble imported EOL</strong></td>
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<tr>
<td>Shandong Zhangji</td>
<td>6</td>
<td>6.0</td>
<td>10%</td>
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<td>Jiangxi Recycling</td>
<td>1.6</td>
<td>0.2</td>
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<td>Jiangxi Dowa</td>
<td>0</td>
<td>0.0</td>
<td>10%</td>
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<tr>
<td>Beijing Huaxing</td>
<td>6.8</td>
<td>6.6</td>
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<tr>
<td>Tianjin Dowa</td>
<td>0</td>
<td>0.0</td>
<td>10%</td>
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<tr>
<td>Wannan</td>
<td>3.5</td>
<td>0.3</td>
<td>10%</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>17.9</td>
<td>1.7</td>
<td>10%</td>
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<tr>
<td><strong>Only disassemble domestic EOL</strong></td>
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<tr>
<td><strong>Subtotal</strong></td>
<td></td>
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<tr>
<td><strong>Total Survey 2011</strong></td>
<td>1027.5</td>
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<td>33.4</td>
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#### Graph:
- **Scrap handled by the sample plants**
- **Stocks held by the sample plants**
- **Stocks in terms of days**

- **Very low scrap stocks reported:**
  - high cost of capital, volatile copper prices.
  - foreign merchants more cautious now
  - 50~70% down payments for new customers.
  - Since 1st January 2011: finished VAT refund
  - New smelting capacity = +demand.
  - Up-casting wire rod output down in 2011.
  - Reportedly because of lack of scrap.
Regulations to Radioactive Scrap Trade Risks to Affect Scrap Supply?
International Atomic Energy Agency (IAEA) Code of Conduct Proposal

- Is a proposal on trade of scrap and semis that “inadvertently contain radioactive material”.
- Every international trade of scrap or semis to be monitored for radiation, a report provided for each cargo (BIR).

Impacts:
- Large scrap yards, smelters, fabricators and foundries to invest in radiation monitors.
- What will happen to small recyclers and traders upstream in the scrap food chain?
- Implementation in developing and developed countries will be interesting to see.

Copper Semis Global Trade: ~5.5 Mt
Copper Scrap Global Trade:
5.5 Mt? (exporters), 7.5 Mt? (importers)

Reported Global Trade 2010 and 2011
Copper and Copper Alloy Scrap and Semifabricated Products,
Gross Weight, Kt
What Changes Are We Seeing in Reported Copper and Copper Alloy Scrap Trade Statistics?
Significant improvement in Chinese official reports of scrap imports. China scrap import data converging to exports reported by Japan and USA.
Net scrap import flows: most of the scrap traded ends in China now, marginal net inflows to the rest.

Net scrap export outflows increasing globally. But only just <300 Kt/month are reported.

Mainly from USA, UK, EU. Many small sources from the Rest of the World.
Even when improved Chinese data, scrap importers still reporting more volume than scrap exporters. Chinese imports from EU > EU exports reported. Global scrap import volume reported <700 Kt/month – China: > 400kt/month now.
Boom in EU-27 scrap exports cash revenues in 2010-2011: ~ 8 billion Euro/year! (EUROSTAT).

Most of the EU reported scrap export revenues to Germany, United Kingdom and France. Netherland ports, Italy and many others reporting higher revenues from scrap exports.
But China reported twice more scrap imported from EU-27 than all EU-27 official scrap export volumes to all countries!

<table>
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<tr>
<th>Volume, Tonnes</th>
<th>Value: USD Millions</th>
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</thead>
<tbody>
<tr>
<td>Scrap</td>
<td>1,999,521</td>
</tr>
<tr>
<td>Refined Copper</td>
<td>197,294</td>
</tr>
<tr>
<td>Anode</td>
<td>9,335</td>
</tr>
<tr>
<td>Ingots</td>
<td>3,619</td>
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<tr>
<td><strong>Reported</strong></td>
<td><strong>2,209,769</strong></td>
</tr>
</tbody>
</table>

China Annual Gross Weight Cu Scrap Import Values 2011, Millions USD

- **HK**: 1,087
- **Asean**: 1,554
- **Australia**: 1,284
- **USA**: 2,749
- **Rest of the World**: 2,913
- **European Union**: 6,345

China 2011: Official Copper and Copper Alloy Scrap Import Volume, tonnes gross weight by source:

- **HK**: 300,000
- **Asean**: 384,669
- **Australia**: 470,334
- **EU**: 1,999,521
- **Rest of the World**: 655,176

China 2011 Copper Commodities Import Value, millions USD and %

- **Scrap**: 16,350,3, 24%
- **Concentrate**: 15,518,1, 23%
- **Anode**: 3,780,6, 4%
- **Semi**: 7,628,4, 11%
- **Refined copper**: 24,917,5, 30%
China reported less imports of concs and refined copper in 2011, but much more imports of copper scraps and blister.

China paid more for all copper commodities in 2011, and much more for scrap imports.
Chinese copper and copper alloy scrap import dependency to continue: 2/3 of China scrap supply from scrap imports.

Chinese domestic supply limited by: slower demolition growth and slower manufacturing in 2011, not enough old scrap stock, copper exported in manufactured exports.
Times have never been so good for US scrap exporters as in 2009-2011. European Union alloy scrap export driven boom: > 1 Mt in 2011.
We observed a scrap export supply response in 2009-2011, but mainly in copper scrap alloys: are we reaching a copper scrap supply constraint in USA/EU-27? or is business as usual for Chinese scrap dismantlers?
Global Copper Scrap Flows: Conclusions and Research Needs

1. Scrap use kept the global copper market in balance in 2010-2011.
2. Delays in copper mine capacity plans for 2015+ may keep recyclers busy.
3. More scrap smelters in China = more future scrap demand or smelter overcapacity?
6. Growing global overcapacity in copper and copper alloy semifabrication.
7. Fabrication and direct melt scrap use growth slow in Asia,
8. Fabrication and direct melt down in EU-27, recovery in USA/Russia, Middle East hopes.
9. Less manufacturing and fabrication in EU27 = less new scrap supply?
10. Strong refined copper demand in China, main destination of most of scrap trade.
11. Scrap smelters output up worldwide. China scrap smelters busy, same as scrap smelters ex-China.
13. Replacement of concentrate by scrap in smelters.
14. Replacement of scrap by refined copper cathode in fabrication.
15. Low copper scrap stocks in Chinese and USA scrapyards.
16. ICSG starting a EU-27 copper scrap supply survey in 2012. ASEAN and Australia also targeted.
17. More surveys to Chinese smelters and fabricators in 2012: >500 fabricators identified by ICSG in China.
18. More active role on copper scrap generation research needed from scrap traders/recyclers/dismantlers.
19. Economic variables and public end use data needed to improve scrap analysis and forecasts.
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<td>Survey on Non Ferrous Metal Scrap and Refined Inputs &amp; Production in</td>
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<td>Chinese Copper &amp; Copper Alloy Semis Manufacturing Plants (2012)</td>
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Next ICSG Member countries Meeting:
8-9 October 2012
Lisbon, Portugal

Joint Study Groups Seminar:
"The growing importance of mining and metals in India"
10 October 2012
Lisbon, Portugal

ICSG Industry advisory panel
LME week 2012
London, UK

risopatron@icsg.org