The Changing Nature of Steel Excess Capacity

GFSEC Workshop with Stakeholders

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Disclaimer

• This presentation was prepared by Marcel Genet, founder of Laplace Conseil, to illustrate the changing nature of the steel industry “excess capacity” as a result of global changes and energy transition.

• All primary data used in this presentation are publicly available:
  • Worldsteel is the main source for production data by Country.
  • Capacity data by Plant is obtained by aggregating various sources:
    • Industry associations (EUROFR, AISI, CISA, JISF, ILAFA,…)
    • Commercial data providers (Platts, Kallanish, Fastmarkets, J King,…)
    • Technology providers (Midrex, Danieli, Primetal,…)
    • NGO (Global Energy monitor, Global Steel Plant tracker)
    • Around 600 steel company web sites, all BOF plants, most EAFs

• Laplace Conseil has checked the consistency of the aggregated country data with the OECD capacity data base.

• All errors and omissions are the sole responsibility of Laplace Conseil.
We have built a tool to collect, aggregate, and analyze capacity and production of steel, broken down by country, process, product, trade and CO₂ impact.

**STEEL CAPACITY**
- 1005 plants

**STEEL PRODUCTION**
- 103 countries

**Excess Capacity:**
- Where?
- Process?
- Product?
- Impact?
- Trade?
- CO₂?
We are collecting capacity data by plants*, broken down by status: operating, construction, announced or retiring over the next 10 years and retired in the past 10 years.

* We collect data for plants with crude steel and or iron capacity. Rerollers of semi are not included.
Excess Capacity varies among countries as a result of market and non-market supply / demand forces.

Production: 1885 Mt (Worldsteel)
Capacity: 2460 Mt (OCDE)
Excess: 575 Mt
2022 production was reduced in several countries by high energy prices.

2022 weighted average capacity utilization 77%

Excess Capacity 2022: 23%
The industry uses three main processes. The BF/BOF route is the largest, but also the highest CO₂ emitter.

**Capacity and production of crude steel by process route (Mt)**

- **Integrated BOF**: 1585 Mt, 71% of capacity
- **Scrap in EAF**: 630 Mt, 22% of capacity
- **DRI in EAF**: 165 Mt, 7% of capacity
Long products capacity represents 57% of world total, but Flat products are expected to grow faster in the future.
Integrated plants represent 55% of total capacity, EAF 31%, mostly long products, and mixed plants 14%
Blast-Furnace capacity is expected to increase by 15% despite significant past and future retirements.
By 2030, the steel industry anticipate to increase DRI capacity by 80%
Europe produces very little DRI but will see the largest increase in DRI capacity, followed by Asia and Middle East.

Current Capacity: 127 Mt

Construction and Announced: 132 Mt

Future Capacity: 259 Mt
To feed the actual and future crude steel capacity, BF will increase by 15%, DRI by 80% and Scrap by 42%.
86% of the CO2 emitted by the steel industry originates from blast furnaces in 370 plants within 41 countries.

CO2 per tonne of crude steel in each country (t/t)

- CO2 : 3618 Mt in 2022
- 9.83% of world total 36.8 Gt (IEA)
- 1.92 t CO2/t crude steel
- BF : 86% (2.39 t CO2/tonne Pig Iron; 2.32 t/tonne Crude Steel)
- EAF : 10% (0.67 t CO2/tonne of crude steel)
- DRI Gas : 2% (0.98 t CO2/tonne crude steel +0.67 for EAF)
- DRI Coal : 2% (2.60 t CO2/tonne crude steel +0.67 for EAF)

CO2 savings
Scrap and DRI
Our approach precisely quantify the magnitude of changes needed to reach Net-Zero in each segment

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Products</th>
<th>Flat Products Capacity</th>
<th>Long Products Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Integrated</td>
<td><strong>893 Mt</strong> (49% China)</td>
<td></td>
<td><strong>758 Mt</strong> (76% China) Progressively move to scrap based EAF</td>
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<tr>
<td>BF/BOF</td>
<td>Most expensive problem</td>
<td></td>
<td></td>
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<td></td>
<td>Hydrogen + EAF ???</td>
<td></td>
<td></td>
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<tr>
<td>Midsized gas</td>
<td><strong>76 Mt</strong> (mostly in MENA,</td>
<td></td>
<td><strong>89 Mt</strong> (mostly in MENA and India with coal) Mostly use</td>
</tr>
<tr>
<td>based DRI + EAF</td>
<td>Russia and Americas)</td>
<td></td>
<td>DRI for Flat</td>
</tr>
<tr>
<td></td>
<td>Prepare conversion to H2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small scrap</td>
<td><strong>59 Mt</strong> Lowest CO2</td>
<td></td>
<td><strong>714 Mt</strong> Lowest CO2</td>
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<tr>
<td>based mini-mill</td>
<td>Need clean scrap or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAF</td>
<td>substitutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>New</strong> technologies</td>
<td></td>
<td></td>
<td><strong>Clean</strong> electricity needed. Open markets for scrap</td>
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<tr>
<td>Hydrogen</td>
<td>R&amp;D necessary</td>
<td></td>
<td>Facilitate collection</td>
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<tr>
<td>Electro-</td>
<td>Clean electricity needed</td>
<td></td>
<td></td>
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<tr>
<td>metallurgy</td>
<td>Upscaling process</td>
<td></td>
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</tbody>
</table>

Source: OECD
Asia and CIS are the two regions that are net exporters to the rest of the world for all products.
Net trade is dominated by flat products and semis (mostly slabs). Asia is largest exporter except for semis.
New capacities in construction or announced (± 700 Mt) will profoundly impact future trade flows

- Europe is already a large importer of slabs and flat products and may increase its deficit. Europe will face difficulties to find natural gas cheap enough to operate its planned DRI facilities. Scandinavia buck the trend.

- America is already well advanced to replace its aging BF/BOF plants. With relatively cheap gas, and adequate financing options, the region can accelerate its transition. High steel prices will always act as a magnet for importers worldwide.

- Japan and Korea may choose to reduce their net export position, given the high cost of replacing BF/BOF and limited clean energy supply.

- China demand is peaking and excess capacity will grow, while scrap availability will slowly increase to allow for long product transition to EAF.

- MENA countries can leverage their favorable energy position to build export for DRI and construction steel for Africa and Europe

- Developing countries should refrain from building obsolete technologies BF/BOF and leapfrog to new technologies, DRI and electro-metallurgy
Conclusions

• Careful monitoring of steel industry announcements together with production report and statistics are essential to properly assess the building of excess capacity and its impact on trade and CO₂ emissions.

• In an era of accelerating technological transition away from coal and in favor of natural gas, hydrogen and clean electricity, it is important to break down the total excess capacity by products and processes so as to adapt recommended policy action for maximum efficiency:
  • By far, the main problem is with the Flat sector produced with BF and BOF. It is the most expensive sector to decarbonize and the most subject to trade distortion.
  • In most countries, Long products are produced by small, often family owned firms, with recycled scrap melted in EAF. This industry is much more local and international trade is less frequent and less distorted.
  • Only in China, which grew so fast in recent years that the country did not have time to accumulate much post-consumer scrap, are still long products made with the `BF/BOF technology, Soon, China will experiment the same technology transition that occurred in OECD countries.
  • In most countries with large BF/BOF capacity, gas based DRI is the best intermediate solution and it will pave the way for Hydrogen and perhaps later on electro-metallurgy.