Closing the Loop: The Pivotal Role of Ore-Based Metallics and Scrap in Enabling a Sustainable Circular Steel Economy

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Presentation outline

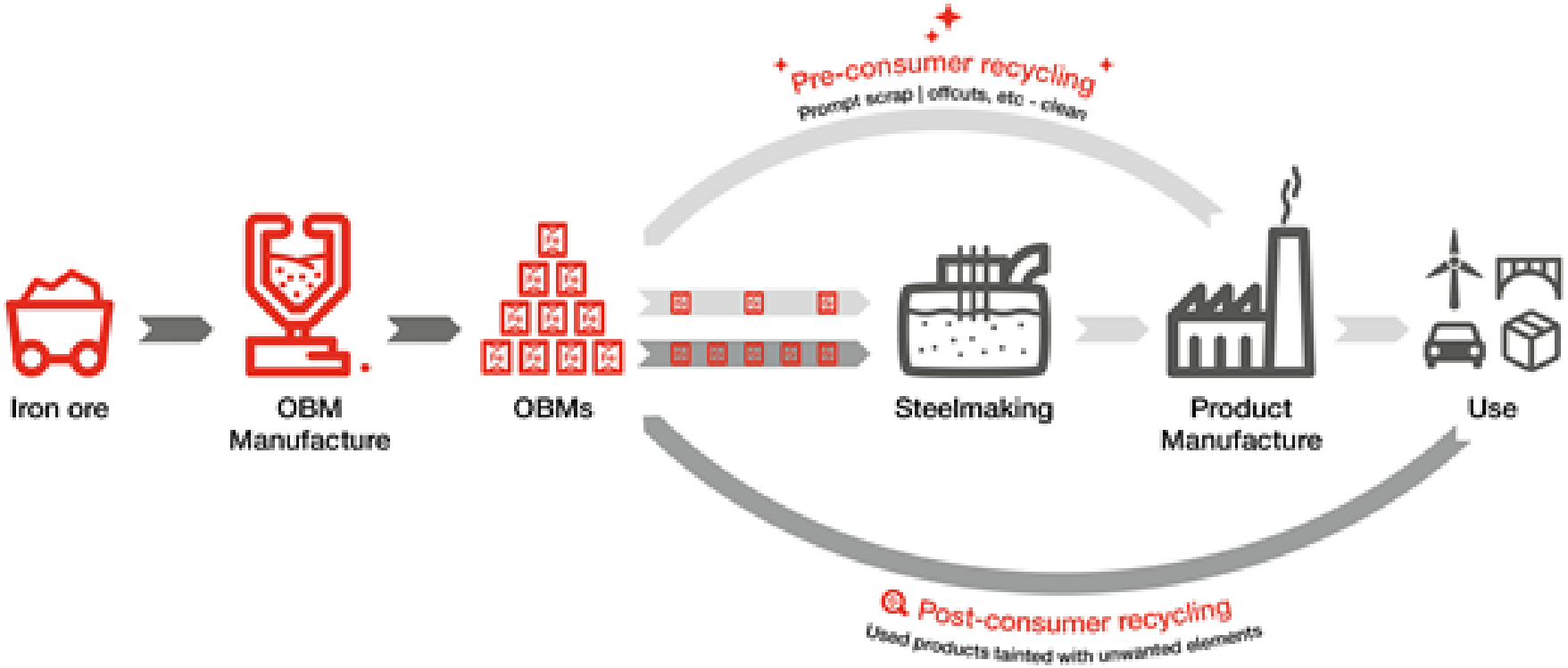
- Introduction to IIMA
- The pivotal role of ore-based metallics and scrap in steel circularity
- Opportunity and challenge in steel circularity
- Conclusions and key takeaways

What is IIMA?

- IIMA is the trade association for the ore-based metallics industry
- Our members account for more than 80% of production and international trade
  - Producers (pig iron, HBI, DRI)
  - Traders
  - Associates (raw materials, steelmakers, technology, plant & equipment, logistics)

- IIMA is an associate member of **worldsteel** and **ICMM**
- We are an NGO with consultative status with **IMO**

OBM Value Chain – A pivotal resource



Circularity Drivers

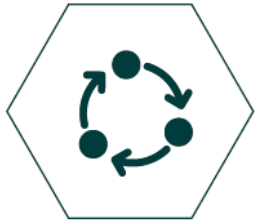
Economic value

Regulatory and reporting requirements

Stakeholder expectations

Climate change

Biodiversity and nature losses



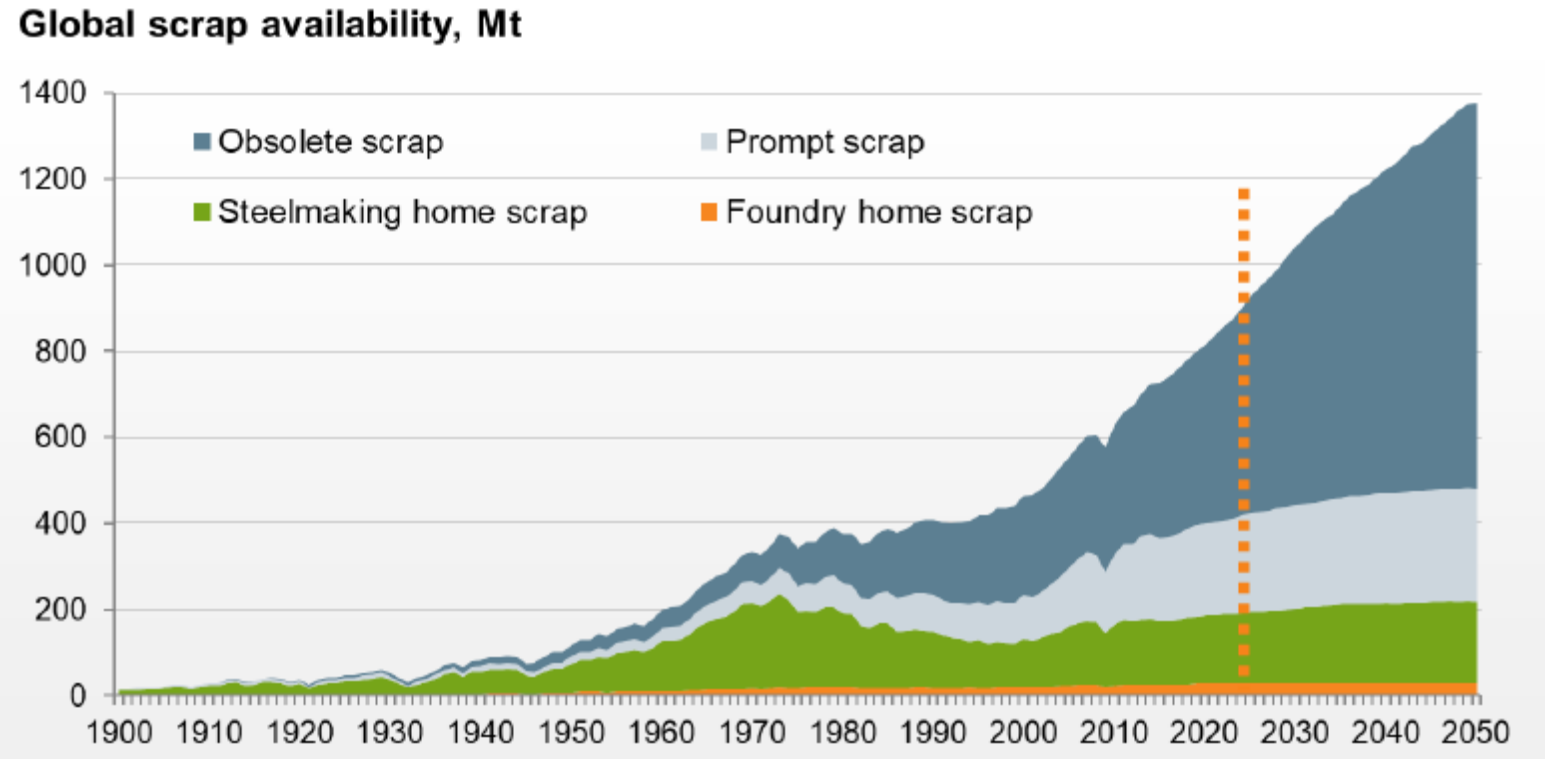
Resource scarcity + supply security and resilience

Scrap as a De-Carbonization Lever

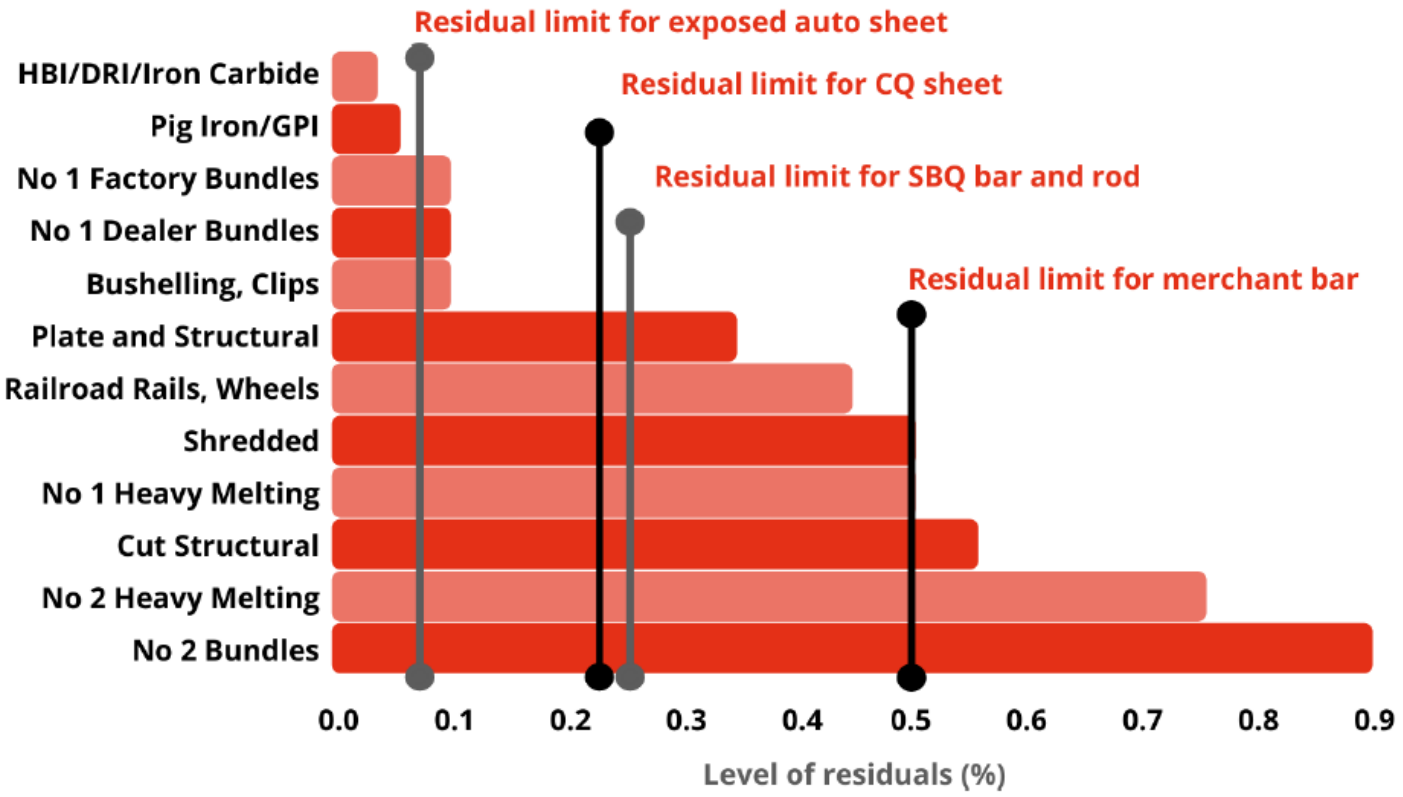
- 100 % scrap-based operations utilizing EAF technology already have a very low CO2 footprint
- Footprint can be lowered through improvements in efficiency and Fe yield
- Must understand the properties of scrap to optimize its' Value-in-use
- Increasing levels of scrap residuals (Cu, Sn, Ni, Mo) are a concern and will require varying amounts of ore-based metallics to allow recycle

Challenges for Steel Recycling

Changing Scrap Availability



Reducing Residuals in Scrap



An Example with Copper Residuals in Scrap

- → Currently, the average copper content of scrap recycled in North America is about 0.25–0.30 weight %
- → Even at this level, to make a product with 0.10 wt. % Cu max, it is necessary to blend around 65% OBM to achieve the targeted chemistry
- → **It is expected by 2050, the average copper content in obsolete scrap could reach 0.50 wt.%**

NECESSARY OBM CONTENT OF THE SCRAP MIX

Desired product maximum copper content (wt.% Cu)

Obsolete scrap copper content (wt. % Cu)	0.10	0.20	0.25	0.30	0.40	0.50
0.10	0%					
0.20	51%	0%				
0.25	61%	20%	0.0%			
0.30	67%	34%	17%	0.0%		
0.40	75%	50%	38%	25%	0.0%	
0.50	**80%**	**60%**	**50%**	**40%**	**20%**	**0.0%**
0.60	84%	67%	59%	50%	33%	17%

Current average North American scrap

2050 expected scrap

By 2050, it may not be possible to produce even basic steel products such as rebar using only obsolete scrap, without the use of OBMs to dilute the scrap residual impurities

- *Source: CIX*

HMS Upgrade Results

- Trials conducted by SICON in Europe. Processed HMS
  - Cu content was reduced by 0.15 wt. %
  - Ni contents was reduced by 0.04 wt. %
  - Cr content was reduced by 0.06 wt. %
  - Pb was reduced by 0.03 wt. %
  - P was reduced by 0.02 wt. %.
- CO2 emissions would have been increased by ~ 200 kg/ton of scrap if the scrap was unprocessed
- Energy savings were projected at ~ 200 kWh/tonne of scrap

Conclusions

Ensuring value in steel circularity

- Must drive towards a “cleaner” raw material input to steelmaking
- Steel scrap plays critical role - Can improve scrap VIU
- Upgrading costs are more than offset by reduction in CO2 footprint/EAF efficiency improvements/Reduced environmental concerns
- Equipment already available to upgrade scrap quality
- Need more involvement from scrap processors/manufacturers
- Need to design for EOL to achieve cleaner recycle streams
- OBMs enable greater scrap recycle and demand will remain high for the foreseeable future

Contact information

Special thanks to Jeremy Jones (CIX) for contributing information

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