A Melter’s Perspective on Developments in Raw Materials

Titanium World Industry Supply Trends Panel
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Henry S. Seiner
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Molybdenum and Vanadium Market Fundamentals

By Terry Perles – MoTiV Metals LLC

• Thorough review of market drivers
• Insights into:
  – Reserves and current sources
  – Production and consumption trends
  – Factors influencing potential change
• Future state
  – Supply / demand balance
  – Implications for titanium industry

• What does this mean to us?
• Inter-relation to sponge and scrap?
Commercial Production of Titanium Sponge in India

By Dr. Nagesh RVS Chaganti – DMRL India

• Informative presentation:
  – Raw material reserves
  – Supply chain capabilities
• Sponge technology
  – Historical perspective
  – Recent developments
• Future possibilities
  – Large scale production

• What will the titanium supply chain look like in India in 10 or 20 years?
Titanium Feedstocks
By Jacko Preyser – Rio Tinto

• Educational
  – Diversity of operations
  – Titanium portfolio
  – Supply-demand imbalance
• Value chain challenges
  – Overcome years of under-investment
  – Economic uncertainty
  – Timing to market
• Commitment to support industry
  – Aggressive investment
  – Growth plans

• Uncertain near-term supply-demand balance?
Titanium Scrap
By Jeff Carpenter – Boeing Commercial Airplanes

• Vision: “Closed loop” Scrap Revert Strategy
• Objectives:
  – Keep aero scrap in the aero market
  – Collect segregated TI scrap from the supply base
  – Supply of key raw material input for the mills
• Benefits:
  – Support long-term Strategy
  – Support capacity and rate increases
  – Help stabilize lead-time and pricing
• Challenges:
  – 100% Participation
  – Competing market for a constrained supply
  – Value of the Scrap

• Will Boeing succeed?
• How will the market react?
• 10-Year view of scrap market shows extreme volatility
• During 2008 GFC, scrap was extremely low
Scrap market recovered from GFC during 2009-2010
Decline beginning 2H-2011 has continued during 2012
• Conversely, ore market exploded in 2011 and 2012
• All commodities and locations have been affected
Scrap and sponge markets have disconnected

- Scrap was extremely attractive in 2009
- Sponge became more desirable during 2010-2011
- Scrap is again attractive in 2012
## Market Drivers

### Sponge
- **Raw Materials**
  - Pigment market
  - New sources
- **Energy**
  - Nuclear power
  - Global economies
- **Other Markets**
  - Alternate materials
  - Sacrificial demand
- **Capacity Balance**
  - Over-supply
  - Under-supply
  - Future investment

### Scrap
- **Generation**
  - Reduced cyclical
  - Buy-to-Fly
- **Control**
  - Closed loop
  - Leakage
- **Other Markets**
  - Super alloys
  - Steel demand
- **Logistics**
  - Global supply chain
  - Economics of recovery
  - Varying circumstance
Steady State Ahead?

- Feedstock market volatility?
  - 2000-2010 or 2012 levels?
- Future energy costs?
- Global economies?
- Future sponge expansions?
- Scrap generation at build rates?
- Improvements in BTF?
- Closed loop success?
- Other markets influences?
- Impact on volatility?
- Supply chain impacts?
Solution?

• Steady state?
  – History as a guide
  – Not likely
• Future volatility?
  – Likely
  – Periodic shortages
• Flexible supply
  – Captive sponge
  – LTA sponge
  – Spot supply
  – VAR
  – CHM
  – Low overhead conversion