Minimizing Dross Generation and Maximizing Dross Value

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Agenda

- Minimising Dross Generation
- The history of Dross Management
- Maximising Dross Value
- The Dross Processor
- Salt Slag and NMP Handling
- Salt Slag Reprocessing
- Conclusions
Dross Reality

- Looked upon as the unfortunate evil of the industry
- Often, dross is at the bottom of the cast house priority list (*LOW PERCEIVED VALUE*)
- The quality and amount of dross generated can be a good indicator of efficiency in the cast house
No Dross Management
Minimising Dross Generation

- Scrap Quality
- Furnace Charging
- Alloying/Fluxes
- Furnace Technology
Poor Scrap Quality
Clean Shredded Material
Light Gauge Scrap

- Need to submerge/melt quickly
- Keep away from the burners
- Solutions
  - Vortex melting
  - TTRF (under salt flux)
Good Quality Baled Material
Furnace Charging
Alloying
Flux Chemistry/Quality
The Temperature of the metal is the single most controllable factor that determines dross generation in a furnace.
Furnace Temperature

- Stirrer Start
- Surface Temperature
- Bottom Temperature

Graph showing temperature changes over time.

Graph detailing temperature changes with time.

Delta de 5°C au bout de 4,5 minutes
Advantages of Stirring

- Reduce Energy Consumption up to 15%
- Increased Productivity up to 25%
- Uniform Composition of Aluminum
- Increased Refractory Life
- Uniform Temperature Distribution
- Dross reduction by up to 25%
Bottom or Side Mounted Stirrer
History of Dross Processing

Metal Recovered from Dross

% AL

NEW TECHNOLOGIES
The Value of Dross

- Maximise in-house metal recovery
- Maximise content of aluminium
- Maximise size of aluminum particles
Floor Cooling & Hand Picking

**Advantages**
Improvement on doing nothing!
Very low tech. No equipment required

**Disadvantages**
A long way from potential recoveries
Dusty & Hazardous to environment
Hazardous to plant personnel
Relies on operators

**Overall Recoveries**
20 – 30 %
Dross Stirrer

1960’s / 70’s Technology

Advantages
- First technology to provide significant in-house recoveries (20 – 30%)
- Agglomerates the drops of aluminum
- Relatively quick cycle times (5 - 10 mins)

Disadvantages
- Promotes oxidation and thermiting
- No cooling action to dross
- Lower secondary recoveries
- Requires air pollution control system
- High maintenance

Overall Recoveries
- 40% range
Advantages
• Produces some in-house drain (10 – 20%)
• Can handle thermiting dross

Disadvantages
• Requires pollution control system
• Requires water
• Requires large capital and real estate investment
• Dross is still dusty after processing
• High Maintenance Costs

Overall Recoveries
50 – 60 % range
Inert Gas Dross Cooling

1990’s Technology

Advantages
• Produces some in-house drain (5 – 10%)
• Will contain fume and smoke
• No pollution control required

Disadvantages
• Long cycle times (often 12 hrs +)
• High operating costs for argon
• Resident air pockets continue to burn
• Dross is still dusty after processing

Recoveries

40 – 50 % range
1990’s / 2000’s Technology

Advantages

• Provides good in-house drain (20 – 30%)
• Agglomerates the drops of aluminum
• Cools quickly

Disadvantages

• One press is not set-up to handle large fluctuations in dross generation
• Difficult to press thermiting dross

 Recoveries

• 60 – 70 % range
The Dross Press

- Separate aluminium from dross - **Metal Drain**
- Stop Oxidation of aluminium - **Quick Cooling**
- Agglomerate aluminium particles for better Recovery - **ALTEK’s Plating Action**

- Cool the Dross for Transport
- Reduce Environmental Impact - **Stops Fuming**
A Study of Dross Recovery

![Graph showing percentage metal recovery for different types of dross cooling technology.]

- **Spreading on Floor**: 30% (30% recovery from cooled dross, 20% recovery from drained metal)
- **Stirring**: 40% (20% recovery from cooled dross, 10% recovery from drained metal)
- **Rotary Cooling**: 52.5% (52.5% recovery from cooled dross)
- **Argon Snuffing**: 52.5% (47.5% recovery from cooled dross, 5% recovery from drained metal)
- **The Press**: 62.5% (37.5% recovery from cooled dross, 25% recovery from drained metal)
Higher combined recovery ~ 3% from press + Tilting Rotary Salt Furnace

Total Recovery - 16 weeks data

- Combined Total In-House & Secondary Recovery
  - Total Recovery: 58.8%
  - Secondary Recovery: 53.4%
  - In-House Recovery: 8.77%
  - Dross Press: 17.76%
Summary Results – Press v Cooler

- Summary of Pennex Tests:
  - Higher recovery with Press + Tilt Rotary Salt Furnace
  - Lower transport and tolling costs due to less shipped weight of dross
  - Less space required at plant (valuable undercover space)
  - Quicker cycle times of dross to secondary processor
  - Less dross pan inventory

SAVINGS from using Dross Press v Dross Cooler > $250,000 per year
Dross Skulls need to be recycled in a Tilt Type Rotary Furnace
Tilt Rotary Furnace (TTRF)

- Low capital cost
- Flexible for wide variety of scrap
- Suitable for dross, Fe scraps and highly contaminated scraps
- Yields depending upon scrap
- Can be operated with Salt, Low Salt or No Salt
Salt Free NMP
Slag Presses
Salt Slag Processing
Development project initiated in 2011

Objective local salt recycling at salt slag generation source

Demonstration small capacity pilot plant to be operational Q4 2014
Conclusions

✓ Significant improvements in aluminum content in dross through better Cooling and external processing.

✓ Significant improvements in melt Loss resulting in lower dross generation through better Scrap preparation, and furnace technology.

✓ Future improvements are imminent through higher degrees of technology in dross placement, skimming and processing systems.

✓ Further recoveries can be expected from new technologies for Salt Slag reprocessing
Dross Mis-management