Improving the System Life of Basic Oxygen and Electric Arc Furnace Hoods, Roofs and Side Vents

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EAF / BOF Project

Funding:
- US DOE via the ODOD-Energy Office
- Participants – EIO, Oak Ridge National Lab, Ohio Steel Cos.

Objective
- Industry Defined Life of Water Cooled Components in Steel Manufacture as a Roadblock to Increased Efficiency/Productivity.

Goal: Improve System Life EAF/BOF Equipment

Targets:
- 2 x Service Life
- 20% Life Cycle Cost Improvement
- 95% Reduction in Routine Maintenance
Work Plan

- Survey of Current Practice
  - Project Participants
  - AI SE 1999 Survey
  - Plant Visits and Interviews

- Results
  - Industry still uses Carbon Steel and Low Alloy Steel
  - Repairs Still done by cutting out damaged sections and welding
Work Plan

Identification of Alternatives

- Coatings
  - Industry View: Too Fragile for This Service

- Weld Overlays
  - Industry View: Proven Options Already Exist

- New Alloys
  - Industry View: Best Solution if Alternatives Can Be Identified
Work Plan

- Performance Modeling by ORNL
  - C.S., CrMo, Selected Alloys
  - Property Measurements (200-1200°F)
- Modeling
  - Heat Transfer
  - Stress
  - Corrosion
  - Thermal Fatigue
Modeling Results

Heat Transfer Modeling
Modeling Results

Thermo-Mechanical Stress Modeling
Modeling Results

Corrosion Modeling
Field Test Candidate Identified

⇒ Aluminum Bronze Alloy - AmeriBronze®

⇒ Composition Similar to C 61300 Series
  ~ 91%Cu, 6.5 Al, 2.5 Fe, 0.25 Sn

⇒ Property / Modeling Results Overview
  ⇒ Acceptable Mechanical Properties
  ⇒ Better Heat Transfer – ~3 x C.S.
  ⇒ Corrosion Resistance – ~6 x C.S.
  ⇒ Lower Thermo-Mechanical Stress in Transient and Steady State Heat Transfer Regimes
  ⇒ Better Thermal Fatigue Resistance Factor

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REP Equipment Schematic

- Fluxes and Coolant
- Skirt
- Tap Hole
- Steel Shell
- Fumes to Environmental Control Water-Cooled Fume Hood
- Water-Cooled Lance
- Refractory Lining
REP Performance History
Carbon Steel

- **Skirt**
  - ~ 20 Month Life
  - ~ 80 Shutdowns for Repairs

- **Flux Chute**
  - ~ 12 Month Life
  - ~ 20 Additional Repairs

- REP was about to order a skirt
  - agreed to order AmeriBronze
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