4 Process Analysis
Initiate Process Audits
  • Furnace Design
  • Installation Requirements
  • Melting Practices
  • Furnace Maintenance
  • Metal Transfer
  • Casting
  • Metal Quality Issues

5 Product Selection
Solutions AWESOMENESS Application
  • Provide a Value Proposition/Solution, Specific to Each Customer and Furnace - Not Every Furnace Is The Same!

Midwest Aluminum Customer A — Identified Audit Issues

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellyband (Upper sidewall)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

URC PRODUCT
- UNI-SHIELD 70A
- UNI-SHIELD 70C

- Due to the ease of pumping, this installation was completed ahead of schedule.
- No corundum build-up issues reported.
- Customer is very happy with the UNI-SHIELD 70A walls, as they are "super easy to clean."

Midwest Aluminum Customer B — Identified Audit Issues

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellyband (Upper sidewall)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

URC PRODUCT
- UNI-PUMP 85 AL
- UNI-PUMP 85 AL

- Due to the ease of pumping, this installation was completed on schedule.
- Customer commented that after many months of production, the UNI-PUMP 85 AL looks "unbelievable", as there is "no corundum build-up that they were experiencing previously."

Product Line Arsenal
- 60% to 90% Alumina, Low Cement With 'AL' Additive Package
  - Andalusite-Containing Mix
- 67% to 92% Fused Silica, Low Cement With 'AL' Additive Package
- 60% to 80% SiC, Low Cement With 'AL' Additive Package
  - Complete Range of Repair Materials
    - Gun Mixes, Plastics, Shotcretes
**1 Strategic Goal**
Satisfy the Aluminum Customer Value Proposition
- Reduce Total Process Costs/MT of Metal Produced
- Improve/Impact Metal Quality
- Improve/Optimize Furnace Availability
  - Superior Service Performance and Lining Life
  - Faster Rebuild Turnaround Time

**2 Customer Challenges**
Identify Critical WEAR Mechanisms
- Aluminum Corrosion Resistance
- Hot Strength Properties
- Mechanical Abuse
  - Impact & Abrasion
  - Thermal Shock Resistance
- Alkali Resistance
- Corundum Resistance

**3 Product Qualification**
Solutions AWEARness Qualification
- Testing Program To Best Simulate WEAR Mechanisms

---

**Testing WEAR Mechanisms**

**Aluminum Corrosion Resistance**
- 72 Hour 7075 Alloy Cup Test at 1500°F

**Mechanical Abuse – Abrasion Resistance**
- C-704 Abrasion Test
- Four Day Immersion Test With 5% Mg at 1562°F

**Alkali Resistance**
- 100% Sodium Carbonate, 100% Potassium Carbonate, 50/50 Blend Cup Tests at 900°C (1652°F)

**Corundum Resistance**
- Chemical Stability With Higher Purity Lower Silica Systems –
  \[(4\text{Al} + 3\text{SiO}_2 = 2\text{Al}_2\text{O}_3 + 3\text{Si})\]

**Hot Strength Properties**
- Hot MOR at 1500°F and 2000°F Tests

---

**WEAR Mechanism By Application**

<table>
<thead>
<tr>
<th>Typical Holder</th>
<th>Aluminum Resistance</th>
<th>Hot Strength</th>
<th>Abrasion Resistance</th>
<th>Thermal Shock Resistance</th>
<th>Alkali Resistance</th>
<th>Corundum Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearth</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ramps/Stills</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Lower Sidewall</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bellyband</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Upper Sidewall</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Roof</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Jamb/Lintel</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>