Submerged Arc Welding
Process Variation

For Corrosion Resistance Overlays
Everyone is looking for:

- Increased production?
- Increased welding speeds?
- Increased deposition rates?
- Reduced base metal dilution?
There are many SAW process variations:

– The size and shape of the part and desired deposition rate will help determine the best process.
Deposition rates for CRO

- GTAW-HW
- SAW Wire
- SAW 30 mm Strip
- ESW 60 mm Strip

Deposition - lbs./hr.
Questions?

• Can your part be positioned to weld in the flat position?
• Can circumferential welds be rotated?
Process variation

- Single wire
- Twin wires/Parallel wires
- Tandem wires
  - DC/AC, AC/AC
- SAW strip welding
- ESW strip welding
### SAW deposition rates

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Wire Configuration</th>
<th>Deposition Rate (kg/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>1 x 4,0 mm DC</td>
<td>8</td>
</tr>
<tr>
<td>Twin</td>
<td>2 x 2,5 mm DC</td>
<td>16</td>
</tr>
<tr>
<td>Tandem</td>
<td>2 x 4,0 mm DC + AC</td>
<td>22</td>
</tr>
<tr>
<td>Tandem Twin</td>
<td>4 x 2,5 mm DC + AC</td>
<td>38</td>
</tr>
</tbody>
</table>

**Graph 1:** Deposition rate Twin-wire vs Single wire DC+

**Graph 2:** Deposition rate DC+/AC/DC-
Single wire

A2S MiniMaster

A6S ArcMaster

A6S ArcMaster Compact for 12”
Twin

A2T Multitrac

A6S Mastertrac
• Single wire
  o 3/32” wire, 350 amps at 85 ipm, 9.9 lbs./hr.
• Twin wire
  o 3/32” wire, 600 amps at 85 ipm, 19.8 lbs./hr.
Tandem Arc

A6 DS Tandem Master

A6 DS Tandem Master
• Higher currents
• More than double the deposition rate
• More penetration & dilution
• More control of the weld puddle
• Twice the travel speed
• Used for joining and would have limited overlay applications
ESW strip
Process characteristics

• High deposition rates
• Low dilution
• Even penetration
• Smooth surface
• High quality deposit
• Limited to flat position
## Required layers to meet chemistry

<table>
<thead>
<tr>
<th>Process</th>
<th>Layers</th>
<th>Dilution</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAW Wire</td>
<td>3</td>
<td>20%</td>
</tr>
<tr>
<td>SAW Strip</td>
<td>2</td>
<td>15%</td>
</tr>
<tr>
<td>ESW Strip</td>
<td>1</td>
<td>10%</td>
</tr>
</tbody>
</table>
The type of welding flux and welding voltage will determine the process.

- **Submerged arc strip overlay**
  - Uses an arc to melt the strip
  - Requires flux on both sides of strip
  - Has more dilution than ESW
  - Requires two passes to meet chemistry
Strip Overlay

- Electroslag strip overlay
  - Welding flux is electrically conductive
  - Low voltage – about 24 volts
  - No welding arc
  - Only requires flux in front of strip
  - Lower dilution
  - Meets chemistry in one pass