Automated Submerged Arc Welding Applications
Pt. 1

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ARC Specialties Applied Automation Workshop – Submerged Arc Welding
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Platforms and Applications

• SAW Manipulator
  Lab Machine

• PLC
  Connector Welding

• Robotics
  BOP Surfacing
  Ring Groves
  Oil Storage Tank Welding
SAW Manipulator

ARC R&D Manipulator
SAW Manipulator

1. Separate controls for welding, boom manipulating and part rotation
2. Welding controller controls manipulator and/or rotary axis

- Simple parts
- Stepover, inconsistent and un-repeatable
  Hand wheel or speed of motor and time
• Seam tracking can be added
• Completely separate from the rest of the machine
• Separate stand alone slide package
• Tactile probe or laser
• Manipulators are simple but completely manual sequencing and motion control
ARC Specialties connector welding
PLC

• Programmable Logic Control
• Solves Process Control Problems
• Controls welding, travel, stepover and more
• Motion controlled in inches, millimeters, degrees
• More complex welds than a manipulator

• Position feedback
• Self centering pipe joint
• PLC Controls the
  • Volts
  • Wire feed speed
  • Travel speed; linear and rotation
  • Crater fill
  • Start delay
  • Bead placement, stepover

• Torch placement, seam tracking
  • Flux system
  • Cart pressure
  • Pipe position
  • Camera
  • Lights
<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
<th>Units</th>
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<tr>
<td>Weld Volts</td>
<td>32</td>
<td>0.0-50.0 Volts</td>
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<tr>
<td>C-Axis Speed</td>
<td>17.5</td>
<td>0-50.0 IPM</td>
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<tr>
<td>Wire Feed Speed</td>
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<td>0-200 IPM</td>
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<tr>
<td>Calculated Amps From Wire Speed</td>
<td>475</td>
<td>0-50.0 IPM</td>
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<tr>
<td>Schedule</td>
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<td>(1-140)</td>
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<tr>
<td>C-Axis On Delay</td>
<td>2.0</td>
<td>0-20.0 secs</td>
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<tr>
<td>C-Axes Off Delay</td>
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<tr>
<td>Flux Vacuum</td>
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## PLC Bead placement

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<th>DEGREES</th>
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<th>OFFSET</th>
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Robotic SAW

BOP Surfacing, Ring Grooves, Tank welding
Robotic SAW

• Complex part geometries
• Excellent repeatability position and parameters
• Very versatile, torch manipulation
• Programming can be complex
  HMI
  Vision
  Touch sensing
  Through the Arc tracking
Robotic SAW BOP Surfacing

• Complex part geometry required touch sensing
• Multiple weld beads required the use of a preprocessor
Robotic SAW BOP Surfacing

• Robot Controls the
  • Volts
  • Wire feed speed
  • Travel speed; linear and Cylindrical
  • Crater fill
  • Start delay
  • Bead placement, stepover

• Torch placement
  • Flux system
  • Robot transport unit
  • Touch sensing
  • Part locating
  • Light curtain
Robotic SAW

Ring Grooves
Robotic SAW Ring Grooves

• Higher deposition rate than other processes
• Robot is able to weld a variety of shapes while maintaining a constant travel speed
• Repeatability of robots is put to good use once the first ring groove is programmed
Robotic SAW Ring Grooves

- Robot Controls the
  - Volts
  - Wire feed speed
  - Travel speed; linear
  - Crater fill
  - Start delay
  - Bead placement, stepover

- Torch placement
Robotic SAW

Tank Welding
Robotic SAW Tank Welding

• Moving the robot required touch sensing to locate the joint
• ARC created an HMI for ease of programming
• Robot completed multiple tasks per weld seam
Robotic SAW Tank Welding

- Robot Controls the
  - Volts
  - Wire feed speed
  - Travel speed; linear
  - Crater fill
  - Start delay
  - Bead placement, stepover
  - Torch placement

- Flux system
- Touch sensing
- Wire brush
- Light curtain
- Stabilizing legs
- Suction cup feet