Modern Concepts for Implementing Robotic Arc Welding

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NRAWC
NATIONAL ROBOTIC ARC WELDING CONFERENCE
Introduction

Terry Merrifield – VP/GM at Midwest Engineered Systems, Inc.
• 27 years of experience integrating robotic automation
• AWS D1.1 CWI, CRAW-T
• RIA Certified Expert Robotic Technician
  • Welding – thin gauge through heavy welding applications
  • Machine tending, palletizing, material handling
  • Assembly and deburring

Steve Wise – Lead Project Engineer at Eaton (Cooper Power)
• AWS D1.1 CWI
• B.S. - Mechanical Engineering
• 8 years working at Eaton
What Will We Cover?

- Reasons to automate
- Modern techniques for robotic welding integration
- Common mistakes
- Sensor technology applications
- Vendor selection criteria
- Keys to successful robotic welding implementation
- Real world examples of challenging process applications & how companies worked to overcome them
Manufacturing Considerations

Below are a few of the many reasons manufacturers consider implementing welding automation into their process:

• New product or product mix
• Increased productivity
• Quality improvements and traceability
• Ergonomics/safety/job quality
• Increased throughput with reduced labor content
• Lack of experienced/trained welders
Sustainability

- American companies are bringing manufacturing back to the United States
- Automation is an enabler of this trend
- Boosts sustainability locally & abroad
- Creates long-term employment
- Sense of satisfaction with quality products made Pridefully in the United States
What would you say if your company says they will be introducing welding robots into the operation?
Adopting the Technology

• U.S. manufacturing disappeared because cheaper manufacturing abroad became a competitor

• Many hidden costs due to the lower quality of replacement components we receive from abroad i.e. welding consumables, part handling, extra robot programming, ect.

• The important role automation plays in manufacturing for the U.S.
Integrator Selection Criteria

• Selecting the RIGHT integrator is the most important factor for automation success

• Many robotic welding integrators do not keep up with current technology trends & fall short

• Manufacturing must be aligned with corporate goals

• Manufacturing engineers are often at the forefront of the integrator selection process
Purchasing and Engineering must work together to discover, learn, and understand current technology.
Automation Buying Decision

- Cost
- Quality
- Performance
- Flexibility
- Process Technology
- Capacity
- Quality System
- Production & Inventory Control
- Workforce Management
- Manufacturing Organization
- Management
- Operations
- Purchasing
- Engineering
- Production

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### Weighted vendor selection criteria

<table>
<thead>
<tr>
<th>Commercial</th>
<th>Process</th>
<th>Built Characteristics</th>
<th>Service</th>
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</thead>
<tbody>
<tr>
<td>Machine Price (Complete scope)</td>
<td>Delivery time</td>
<td>Mechanical Expertise</td>
<td>Conveyor Design and Integration</td>
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<tr>
<td>Warranty</td>
<td>Cycle Time</td>
<td>Welding Expertise</td>
<td>HMI</td>
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<td>Payment Terms</td>
<td>Programming</td>
<td>Fixturing</td>
<td>Layout</td>
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<td></td>
<td>Manipulators</td>
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<td>Cell Design</td>
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<tr>
<td></td>
<td>Conveyor Design and Integration</td>
<td>HMI</td>
<td>Spare Parts</td>
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<td>Swimming</td>
<td>Layout</td>
<td>Training</td>
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<td>Cell Design</td>
<td>Programming Assistance</td>
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<td>Swimming</td>
<td>Swimming</td>
<td>Total</td>
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Purchasing & Engineering Process

- Corporate buyers are expected to make sound spending decisions, and often favor the lowest priced vendor.
- Manufacturers often times don’t have exact figures for budgets and are unsure when they will be able to spend.
- Depending on complexity, integrators can assist the manufacturer through process development and developing a RFQ.
- Integrators must work with Engineering & Purchasing to clarify elements detailed in the RFQ.
Identifying the RIGHT Integrator

- Cheaper solutions may look good on paper, but be weary if the integrator cannot explain why this solution will be successful.

- Identify qualified experience in your application. Has this integrator done something similar before?

- Look for experience in hardware, software, and extensive process knowledge.
Identifying the RIGHT Integrator

During the qualification process, make certain the integrator is equip with the minimum capabilities, skills, & experience:

• Design & build capability for robot transport units (RTUs) & multi-axis work-piece positioners

• Familiarity and experience with relevant robot and process technology

• Off-line programming experience starting with full configurations to part programming

• The integrator must have a staff of highly trained and experienced robot and welding experts for your specific application!
Keys to Success

- **Research**
  - Allow time for Process Engineers to research and understand technologies

- **Develop internal robotic / process knowledge**
  - Embrace technology, be involved, and learn from your integrator

- **High Mix / Low Volume**
  - Look beyond high volume automation
Modern Techniques for Robotic Welding

Process Application Toolbox should include:

- Offline Package
- Process component capability and flexibility
- Design and build capability
- Heavy welding package
- Sensor technology
Eaton Power Tank and Corrugate Automated Welding Problem

- **Product Design**
  - Optimize for clearance and ease of manufacturing

- **Materials**
  - Cleaner and better materials for optimal welding (weld wire)

- **Machines**
  - Standardize welding machines (pulse) and lockout settings

- **Personnel**
  - Welding procedures
  - **Experience variation**
Eaton Power Tank and Corrugate
Automated Welding Concepts

- Manual Welder Variation
- Robotics added a way to eliminate the variation between operators
Eaton Power Tank and Corrugate Automated Welding Concepts
Eaton Power Tank Early Fixturing Concepts
Eaton Power Tank Early Fixturing Concepts
Eaton Power Tank Fixture Revised Concept
Eaton Power Tank Fixture Revised Concept
Eaton Power Tank Fixture on 3-Axis Positioner Concept
Eaton Power Tank Cell Concepts
Eaton Power Tank Cell Concepts
Eaton Power Tank Cell Concepts
Eaton Power Tank Cell Concepts
Eaton Power Tank Cell Concepts
Eaton Power Tank and Corrugate Reach Study Analysis
Eaton Power Tank and Corrugate Reach Study Analysis
Eaton Power Tank and Corrugate Reach Study Analysis
Eaton Power Tank and Corrugate Refined Concepts
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Conclusion

- Automation builds manufacturing sustainability in the U.S.

- Learn about new technology and don’t be fooled by the common misconception that robots take jobs away

- Do your homework before hiring an integrator

- Trust your integrator to recommend the best robot brand and combination of sensors for the application
Questions and Answers
Thank you for Coming!