D16 Robotic and Automatic Welding Update

Chair: Darren Pape
Vice Chair: Karen Gilgenbach
• D16 Background
• Document Suite
• CRAW Program
• Future Work
OFFICERS & SUPPORT

Chair: Darren Pape, Wolf Robotics

Vice Chair: Karen Gilgenbach, Airgas

2nd Vice Chair: Jeffrey Noruk, Servo Robot Corp.

Secretary: Peter Portela
BEGINNING
Committee formed in 1985

SPEARHEADED
Foundation for Committee spearheaded by John Hinrichs, Formerly with A. O. Smith Corporation, and Friction Stir Link, Incorporated

DEFINED
Defined as a “D” Committee for Equipment

MEETS
Typically Meets 2-3 Times in person annually

REPORTS
Reports to the AWS Technical Activities Committee (TAC)
Act as the “Go To” committee within AWS responsible for automated arc welding equipment, process, safety, qualification, certification and training issues.

SCOPE

GOAL

Increase the successful number of automated welding systems in industry to promote improved safety, productivity, and quality.
MEMBERSHIP BALANCE

CONSULTANTS 4 - 14%

GI 1 - 3.4%

PRODUCERS 10 - 34.5%

EDUCATORS 4 - 13.8%

USERS 10 - 34.5%

ADVISORS 18

APPLICANTS (LAST 3 YEARS) = 4

Membership application:
2017 COMMITTEE MEETINGS

• March at EWI in Columbus
• June 8th at MATC, in conjunction with National Robotic Arc Welding Conference
• November at FABTECH in Chicago
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>D16.2</td>
<td>Components of Robotic Installation</td>
<td>8/25/2006</td>
<td>Revision needed.</td>
<td>2018</td>
</tr>
<tr>
<td>D16.3</td>
<td>Risk Assessment</td>
<td>11/13/2008</td>
<td>Currently Typesetting/Printing.</td>
<td>2017</td>
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<tr>
<td>D16.4</td>
<td>Specification for Qualification of Personnel</td>
<td>12/12/2014</td>
<td>Up to date. To add: CRAW-E</td>
<td>2020</td>
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<tr>
<td>D16.5</td>
<td>Training guide</td>
<td>NA</td>
<td>Update needed.</td>
<td>2018</td>
</tr>
<tr>
<td>D16.6</td>
<td>CRAW training cell</td>
<td>NA</td>
<td>Current in balloting (TAC/D16)</td>
<td>2017</td>
</tr>
</tbody>
</table>
D16.1 Specification for Robotic Arc Welding Safety

Establishes Safety Requirements in the Following:

– Design
– Manufacturing
– Maintenance
– Operation of Robot Arc Welding Systems and Ancillary Equipment

Helps to Identify and Minimize Hazards Involved in the Following:

– Maintenance
– Integration
– Operations of Robot Arc Welding Systems

• Harmonized with R15.06 Robot Safety Requirements by the RIA
• Harmonized with ISO Standards
• Status: Ballot committee by next meeting
D16.2
Guide for Components of Robotic and Automatic Arc Welding Installations

Provides Performance Recommendations for Evaluating Components of Typical Robotic or Automatic Arc Welding Installations

• Emphasizes the Welding Interface Role
• Identifies Specific Components
• Outlines Electrical Interface Requirements
• Provides Basic Schematic Layout
• Addresses Minimum Safety Requirements
D16.3
Risk Assessment Guide for Robotic Arc Welding

Emphasizes the Protocol Method of Risk Assessment
• Assists in the Design of Risk Assessments for
• Robotic Arc Welding Operations
• Provides Guidance for Field Risk Assessment
• Helps Quantify Risks and Hazards in Operations
• Recently published revision
D16.4 Specification for the Qualification of Robotic Arc Welding Personnel

Provides Requirements for the Qualification of Robotic Arc Welding Support Personnel on Three Levels:

– Level 1: CRAW-O
– Level 2: CRAW-T
– Level 3: CRAW-E

• Conforms to AWS Certification Requirements and Works in Conjunction with AWS QC19 and the Certification Program
• Establishes Minimum Academic and Hands On Robot Welding Acumen
• Describes Testing Requirements
• Assists in Obtaining Credentials for Certification
Robot Arc Welding Training and Testing System

Defines Certified Robotic Arc Welding cell requirements for Authorized Testing Centers (ATC)

• Currently in TAC balloting
D16.5
Training Guide for Robotic Arc Welding Personnel

CRAW Training Manual & Course
This is being developed as a new document, but will use information developed in other AWS documents and training manuals.

Finishing up work and will ballot to committee at next meeting

- Weld equipment setup
- Weld processes
- Weld Examination
- Symbols
- Industrial Safety
- Destructive Testing
- Conversion
- Welding procedures
- Robot Performance issues
- Robot Programming
- Programming Logic
Success factors for robotic welding?

- Application
- Programming
- Safety
- Weld process
- Talent

CRAW-T
Trained / Certified / Credibility / Competence
INDUSTRY DEMAND

Certified Welding Inspectors: Over 42,000


Average age of welder in Manufacturing: ?

Projected shortage of manual welders by 2026: 145,299

A recent White House report said 80% of manufacturers currently claim a moderate or serious shortage of qualified applicants for skilled and highly skilled production positions.
According to the Robotics Industries Association (RIA):

- 2017 Q1: North American Robotics Market Surges 32 Percent in Unit Volume
- The biggest increases were in arc welding (102 percent), coating & dispensing (64 percent), and spot welding (36 percent) applications. RIA estimates that 250,000 robots are now in use in the United States, the third highest in the world behind Japan and China.
ROBOTS IN AUTOMATION

- 2016 Breaks Records for North American Robot Orders and Shipments
- 70% of all robotic sales goes to 5 countries (Japan, US, China, Korea and Germany)
- 2016-2018 projections of estimated total robots in the US 343,000

“We have seen a 72% increase in spot welding robots and a 35% increase in welding robots in 2015.” Alex Shikany RIA Director of Marketing
## ROBOTS IN AUTOMATION

<table>
<thead>
<tr>
<th>USA Application</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>YoY Growth</th>
<th>5-Year CAGR</th>
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<tbody>
<tr>
<td>Palletizing</td>
<td>257</td>
<td>369</td>
<td>506</td>
<td>565</td>
<td>548</td>
<td>637</td>
<td>16%</td>
<td>11.5%</td>
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<tr>
<td>Pick, Pack, Place</td>
<td>914</td>
<td>1,416</td>
<td>1,704</td>
<td>1,970</td>
<td>2,231</td>
<td>2,364</td>
<td>6%</td>
<td>10.8%</td>
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<tr>
<td>Packaging Total</td>
<td>1,171</td>
<td>1,785</td>
<td>2,210</td>
<td>2,535</td>
<td>2,779</td>
<td>3,001</td>
<td>8%</td>
<td>10.9%</td>
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<tr>
<td>Other Material Handling</td>
<td>6,428</td>
<td>6,191</td>
<td>6,835</td>
<td>7,312</td>
<td>8,834</td>
<td>7,698</td>
<td>-13%</td>
<td>4.5%</td>
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<tr>
<td>Welding</td>
<td>6,271</td>
<td>8,876</td>
<td>6,037</td>
<td>9,397</td>
<td>7,669</td>
<td>11,118</td>
<td>45%</td>
<td>4.6%</td>
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<tr>
<td>Cutting</td>
<td>148</td>
<td>175</td>
<td>182</td>
<td>265</td>
<td>245</td>
<td>259</td>
<td>6%</td>
<td>8.2%</td>
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<tr>
<td>Welding &amp; Cutting</td>
<td>6,419</td>
<td>9,051</td>
<td>6,219</td>
<td>9,662</td>
<td>7,914</td>
<td>11,377</td>
<td>44%</td>
<td>4.7%</td>
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<tr>
<td>Assembly</td>
<td>441</td>
<td>718</td>
<td>1,206</td>
<td>1,432</td>
<td>1,031</td>
<td>1,717</td>
<td>67%</td>
<td>19.0%</td>
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<tr>
<td>Dispensing</td>
<td>745</td>
<td>912</td>
<td>871</td>
<td>881</td>
<td>1,098</td>
<td>966</td>
<td>-12%</td>
<td>1.2%</td>
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<tr>
<td>Others</td>
<td>324</td>
<td>303</td>
<td>355</td>
<td>687</td>
<td>750</td>
<td>2,424</td>
<td>223%</td>
<td>51.6%</td>
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<tr>
<td>USA Total</td>
<td>15,528</td>
<td>18,960</td>
<td>17,696</td>
<td>22,509</td>
<td>22,406</td>
<td>27,183</td>
<td>21%</td>
<td>7.5%</td>
</tr>
</tbody>
</table>
ROBOTS IN AUTOMATION

Manufacturing

- Safety
- Quality
- Productivity
- Personnel shortages

Talent

Projected shortage of manual welders by 2026:
145,299 (growth, skilled welders retiring, lack of new entrants)

Skilled Trades Shortage

Even tougher to come by are welders that can program robots

“A Country's economic strength always has depended on the quality of their workers.” (Steve Odland, CEO of the Committee for Economic Development)
CRAW PROGRAM

Certified Welding Inspectors: Over 42,000
CRAW-T: Under 100
Authorized Testing Centers: 7 (10-20 potential to get established as ATCs)
CRAW PROGRAM

Need for CRAW-O,T,E

Lack of skilled workforce

Safer, better, faster

Automation growth

Robot training cells throughout US

16.5 Training document
FUTURE
COMMITTEE ACTIVITIES

• Expand the Scope to Other Welding Processes. TAC has approved the pursuit of Robotic GTAW, Laser, and Resistance welding.
• Expand the Robot Application Base including collaborative robots for welding
• Expand the number of Authorized Testing Centers (ATCs)
• Update the “Do’s and Don’ts” Pamphlet
FUTURE COMMITTEE ACTIVITIES

• Creation of CRAW video
• AWS Welding Handbook New Edition (Ch. 9, currently Ch. 11) Automation Chapter Update-In Process
• Looking at creating a Large Scale Robot Safety Standard
• Provide outreach at the AWS section level to raise awareness of the CRAW program
• CRAW competition at FABTECH 2017 is one prime means to do this
FUTURE COMMITTEE ACTIVITIES

• Continue to work with member companies to incorporate CRAW certification into supplier specifications
• Continue to pursue new D16 Committee members from the user community

Membership application:
WRAP-UP

Questions?

Comments?

Membership link

Thank You