Standardizing and Sensoring of Robotic Weld Operations

Wayne Metals LLC
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- Focus: Sheet Metal Fabrication
- Markets of Interest:
  - Heavy Truck
  - Mining
  - Material Handling
  - Construction
  - Rail industry
- 10 engineers on staff
- 3 quality engineers
- 250-500 manufacturing employees
Certifications

• ISO14001:2004
• ISO 9001:2008
• Caterpillar Seven Steps to Weld Excellence
• Caterpillar Paint Certification
• Miner Enterprises Certified Supplier
• Toyota Certified Supplier / Special Service Awards
• Progress Rail 2016 Award for Quality
Facilities

- **Plant A**
  - Shears, Turrets, Lasers, Plasma
  - Punch Press, Press Brake
  - Spot-welding, Manual welding, Robotic welding, Pre/post paint assembly
  - Manual inspection, CMM, Fab-Vision
  - Warehouse and logistics
  - Tool Room, Prototype department

- **Plant B**
  - Paint-line
  - Post paint Assembly
  - Warehouse and logistics

- **Plant C**
  - CNC lathes, mills, screw machines
  - Manual mills, lathes, saws, shears
  - Heavy Welding
The 5 W’s

• **When:**
  • 2013

• **Where:**
  • Robotic welding department

• **Who:**
  • Customers
  • Wayne Metals Welding

• **What:**
  • Missing Components at Customer and Customers Customer

• **Why:**
  • Process was operator dependent
  • Limited standardization on design techniques
  • Fixtures were over complicated
  • To many components
External incidents

• **2013** (Start of basic sensors)
  • 7 external rejections
• **2014** (Start of upgrading sensors)
  • 14 external rejections
• **2015** (Heavy consideration of sensor program)
  • 11 external rejections
• **2016** (Heavy upgrades in sensor program)
  • 6 external rejections
Course of Action

• Work Instructions
• Design Changes
• Sensor Program
Work Instructions

- Old Work Instructions
- New Work Instruction
- Color coordinate
- Used colored models
- Standardized format
- Called out notes
- Stream lined signed off
- Started producing work instructions prior PPAP
Design Changes

• Rethought design standards
• Limited complexity
• Standardized equipment
• Gave tolerance where needed
• Re-familiarized with skill level
• Tested what was capable
• Collaborated with other disciplines
Gen 1.0 Sensor System

• **Cons**
  • Limited sensored fixtures
  • Dependent on operator
  • No enforcement
  • Sensors were plastic faced
  • No programming

• **Pros**
  • Did solve the problem
  • Inexpensive way to start into sensors
  • No programming
  • Simple design
Sensors

• Supplier Stand Point
  • Found a supplier
  • Built a relationship
  • Trialed different products

• Training Stand Point
  • Training for engineering
  • Training for team leaders, maintenance, and tool room
  • Decided to never be stagnate in our journey

• Sensor Stand Point
  • Found out what could be sensor
  • Decided what should be sensor
Gen 2.0 Sensor System

• **Cons**
  • Takes extra time to change or fix
  • Bugs
  • Cost

• **Pros**
  • Operator Independent
  • Limited bypass
  • Programmable
  • Locks out machine
  • Every component is sensored
  • Standard for new designs
  • Screens
  • Easy to trouble shoot
  • Stainless steel sensor.
Benefits of the New System

- Less operator dependent
- Peace of mind
- Easier to train operators
- Easier to design tooling
- Less inventory since things are standard
- Unlimited sensor capability
Time for the Tour

• Split into 2 groups
  • Everyone needs safety glasses
  • Employees from the same company please split into different groups
• Group 1 will go with Dave Hysong and Skyler Hayes to robot 578
• Group 2 will go with Adam Kennedy to robot 377
• We will return to this room after the tour of robots for any Questions that you may have
The Journey

• **2013**
  • 5 robots
  • 2 robots sensored Gen 1.0

• **2014**
  • Started standardizing design
  • Started working to redesign sensing program
  • 1 robot sensored Gen 2.0
  • 2 robots sensored Gen 1.0

• **2015**
  • We added 6th robot
  • Started with new supplier
  • 3 robots sensored Gen 2.0

• **2016**
  • We added 7th robot
  • 4 robots sensored Gen 2.0

• **2017**
  • We has 7 robots
  • 5 robots sensored Gen 2.0
  • Started with pneumatic fixtures

• **FUTURE**
  • Sensor 6th robot
  • More work with pneumatics
  • Spread sensors to other departments
Junction Box for sensors

PLC

Robot Control system

Visual Screen

Junction Box for sensors

PLC

Robot Control system

Visual Screen