AGI WESTFIELD

A 15-Year Journey into Robotic Welding

How to turn robots into money-making machines

A Bit About Me...

- Civil Engineering Graduate, 2012 – U of M
- MBA Graduate, 2018 – U of M
- Lean Manufacturing Coordinator, 2018
- Continuous Improvement Manager, 2019
- Operations Manager, 2019
- Love the outdoors, fishing, reading
- Powersports
- New dad

Presentation Overview

- Company Background
- Brief History
- Why Robots?
- Getting Started with Robotic Welding
- Challenges to Overcome before Robots will be Successful
- Maximizing Output
- Return on Investment
- Robotic Material Handling

Westfield Background

- Founded in 1950
- World's largest manufacturer of portable grain augers
- 162,000 ft^2 of production space
- 350+ production employees
- Day shift, night shift and weekend shift

The Facility

- CNC Lasers
- CNC Saws
- CNC Lathes & Mills
- CNC Brakes
- Tube Mill
- Manual Welding
- Robotic Welding
- Powder Coat Paint Line
- Assembly
- Packaging
- Shipping

What do we build?

Swing Augers

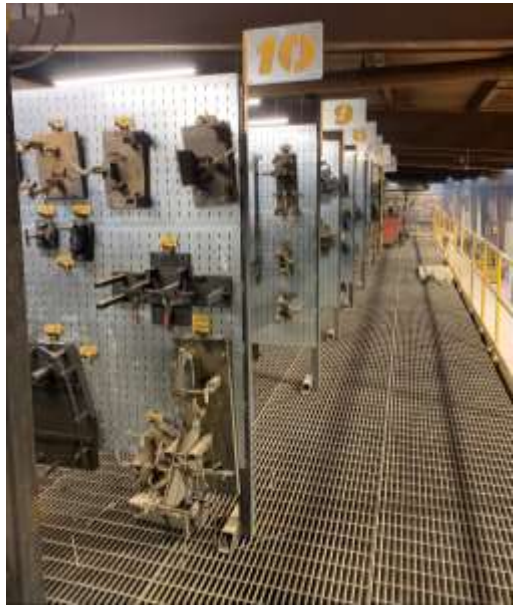
- Used to get grain from a truck to a storage bin

Truck Loading Augers

- Used to get grain from a storage bin to a truck

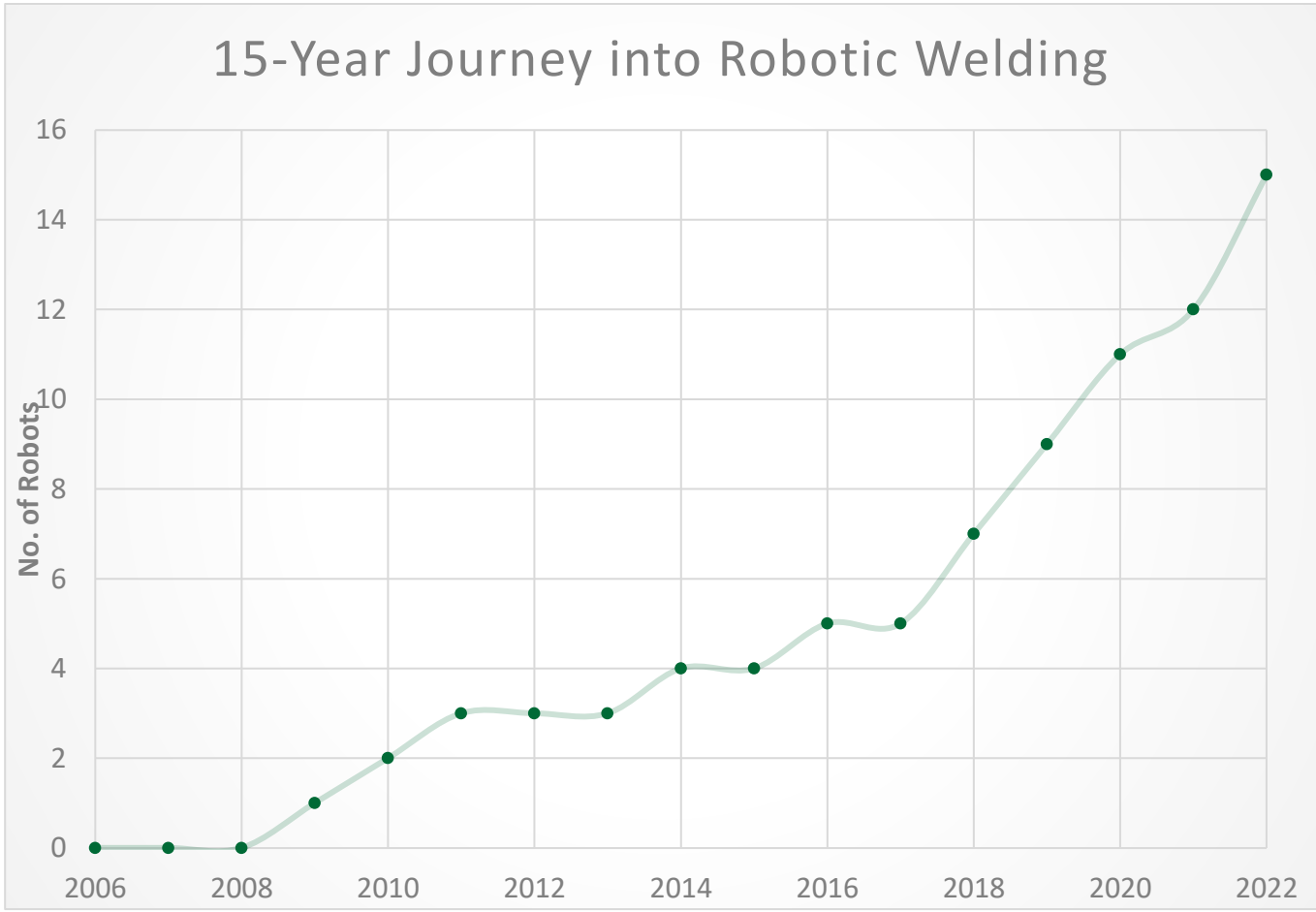
Production Facts

- A typical auger:
  - Assembled from over 600 different manufactured components
  - Built with over 4,200 inches of welding
  - ~40,000,000 inches of welding per year…



Robotic Journey Milestones

- 2006 – Lean Journey Commences
- 2007 – Powder Coat Line Installed
- 2008 – Capacity for more welding
- 2009 – 1st Robotic Welder
- 2014 – Robotic Frame Welding
- 2018 – Fixtures Department is born
- 2021 – Robotic Tube Welding
- 2021 – First Non-Welding Robot
- 2022 – 14th & 15th robots



Why Robots?

- People make mistakes
- People are unpredictable
- People are hard to find

Cold Lap

Burn Through

?

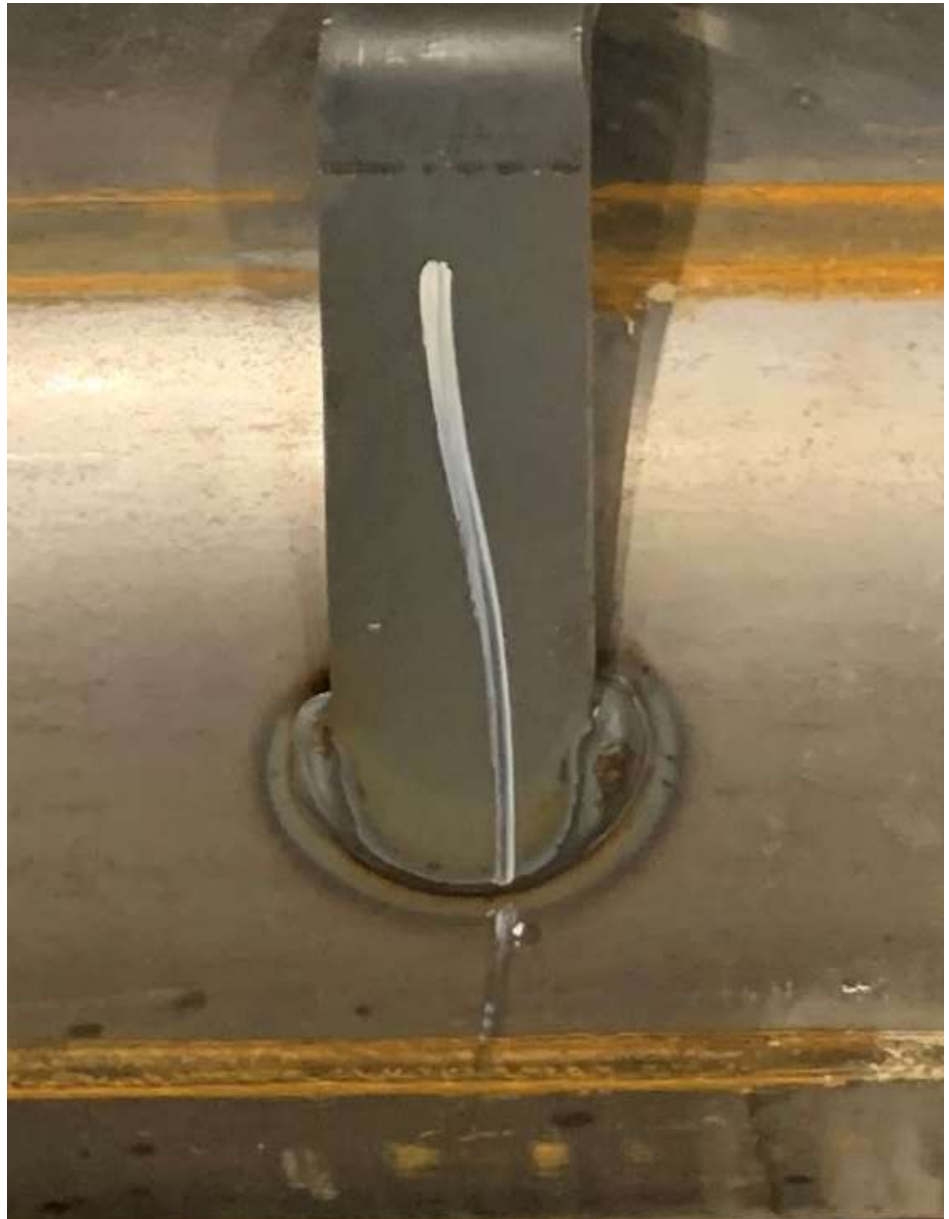
Porosity

Spatter

Why Robots?

- Robots are consistent
- Robots are faster
- Robots produce a higher quality weld

Why Robots?



Why Robots?

- Robots are consistent
- Robots are faster
- Robots produce a higher quality weld
- Robots are easier to staff

Getting Started with Robotic Welding

Step 1: Pick the right part(s)

- Some considerations:
  - Weld length ✗
  - Accessibility ✓
  - Warping ✓
  - Volume ✗
  - Simplicity ✓
  - Input parts ✓

VS

Getting Started with Robotic Welding

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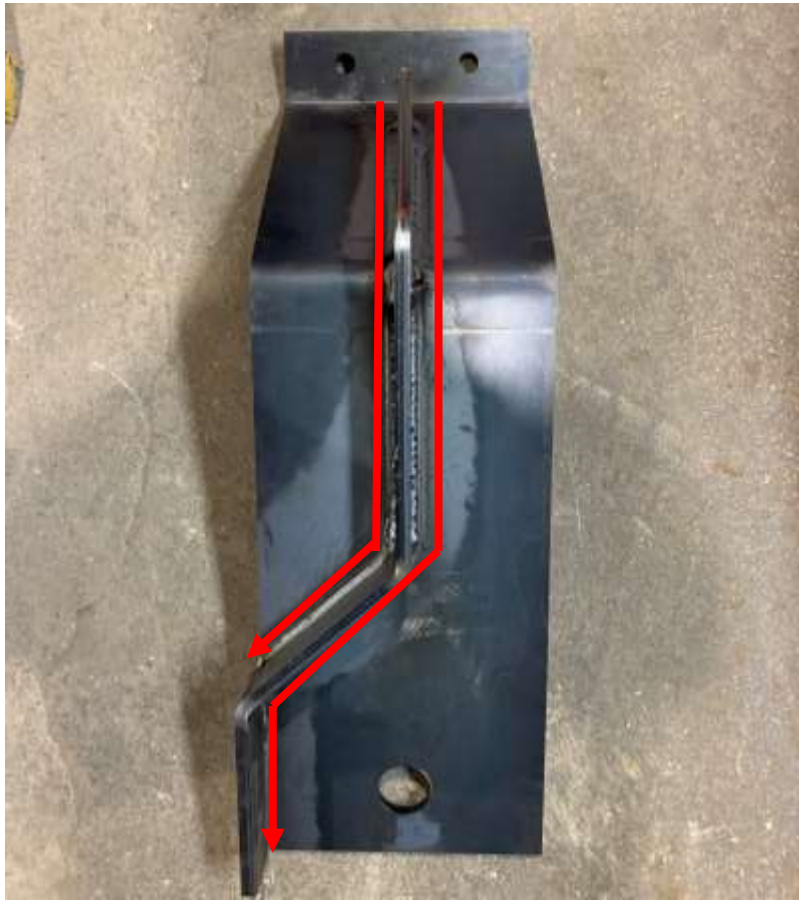


Getting Started with Robotic Welding

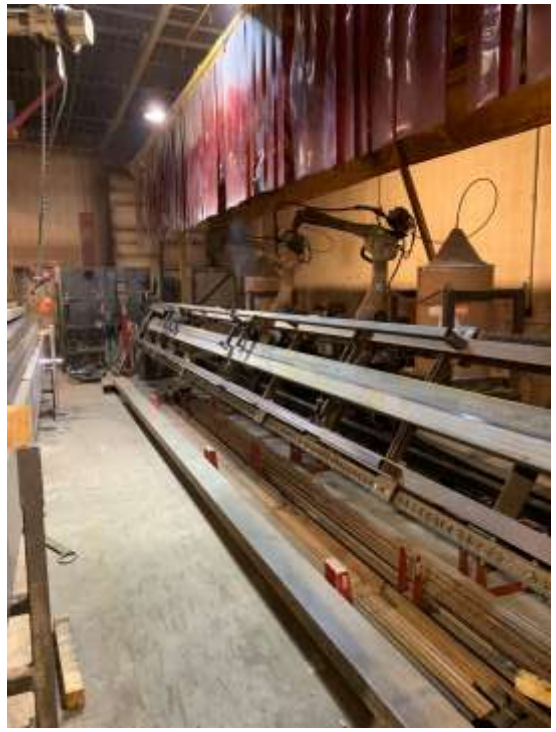
Step 2: Build a fixture and perfect it with manual welding

- Some considerations:
  - Keep it simple
  - If the part warps manually welding, it will warp more on a robot
  - Make sure the designer, fabricator, and welder communicate
  - Watch the welder manually weld it
  - Outsourcing the fixture design/build is expensive and not as iterative

Getting Started with Robotic Welding

Step 3: Buy the right robot

- Some considerations:
  - Setup time is downtime unless the robot can keep welding
  - Footprint
  - Material flow
  - Robot reach
  - Payload
  - # of robots
  - Accessibility
  - Technical support




Panasonic

Getting Started with Robotic Welding

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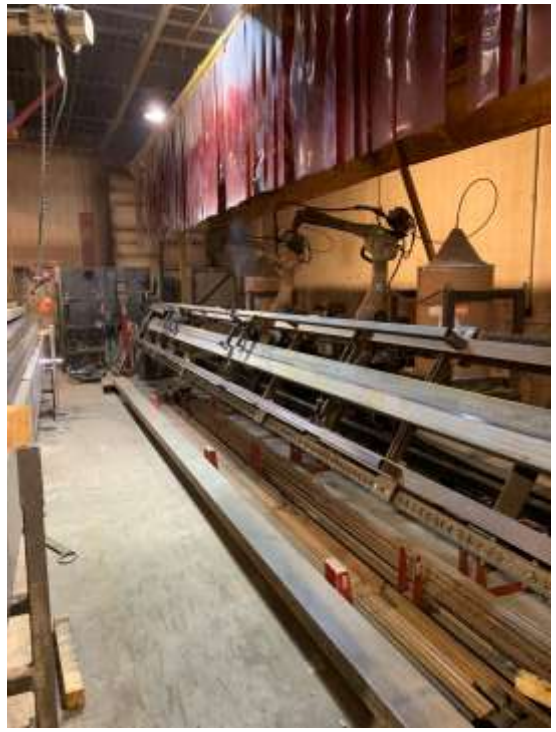

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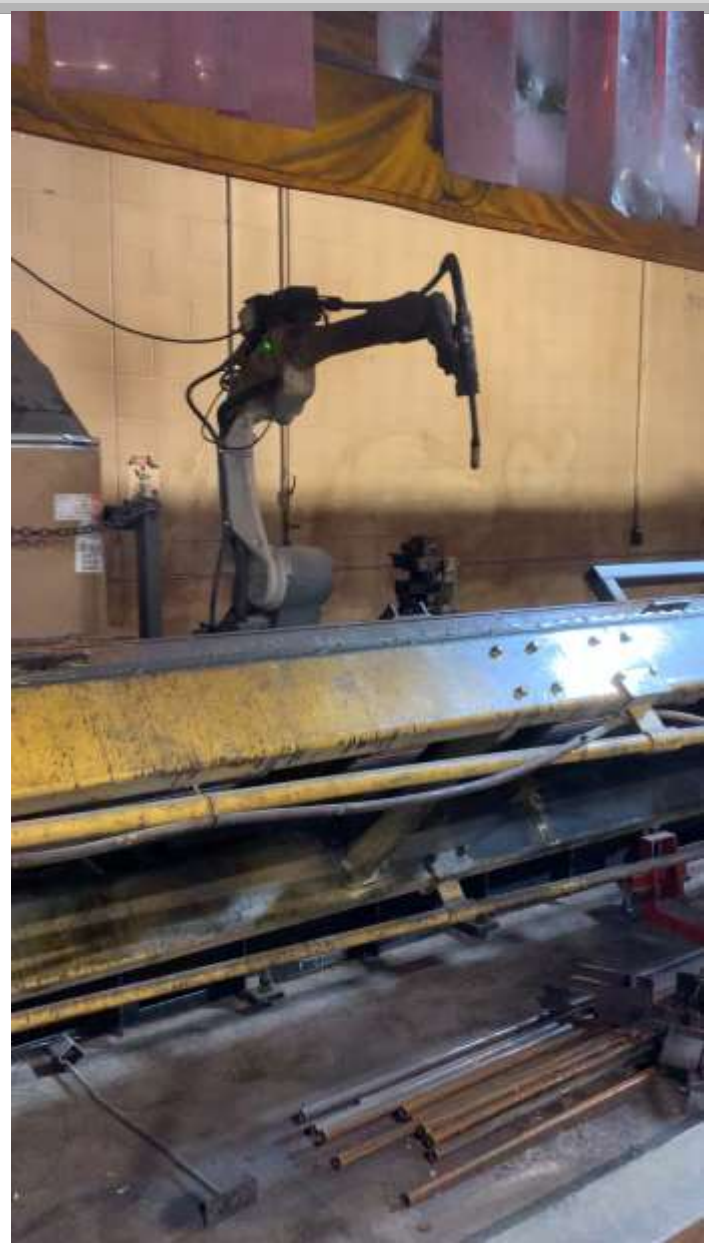

Getting Started with Robotic Welding

- Don’t rely on the robot… yet
- Some considerations:
  - Programming takes time
  - Expect some trial and error
  - Use the robot’s output as supplementary

Challenges to Overcome before Robots will be Successful

- When the first attempt fails
  - Stick with it
- Employee resistance and negativity
  - Need early wins
  - Involve your employees
- Variability
  - Robots hate it so eliminate it

Challenges to Overcome before Robots will be Successful

- Developing inhouse experts
  - Good robots require great people
- Training operators
  - Need internal training
- Troubleshooting
  - Need problem solvers
- Spare parts
  - Wear parts vs “I screwed up” parts

Maximizing Output

- Welding is the only value add process a robotic welder performs so maximize it
- Some considerations:
  - Touch sensing is a waste process, only use it when necessary
  - Perfect upstream processes if incoming parts are varying
  - Build robust fixtures
  - Design for manufacture

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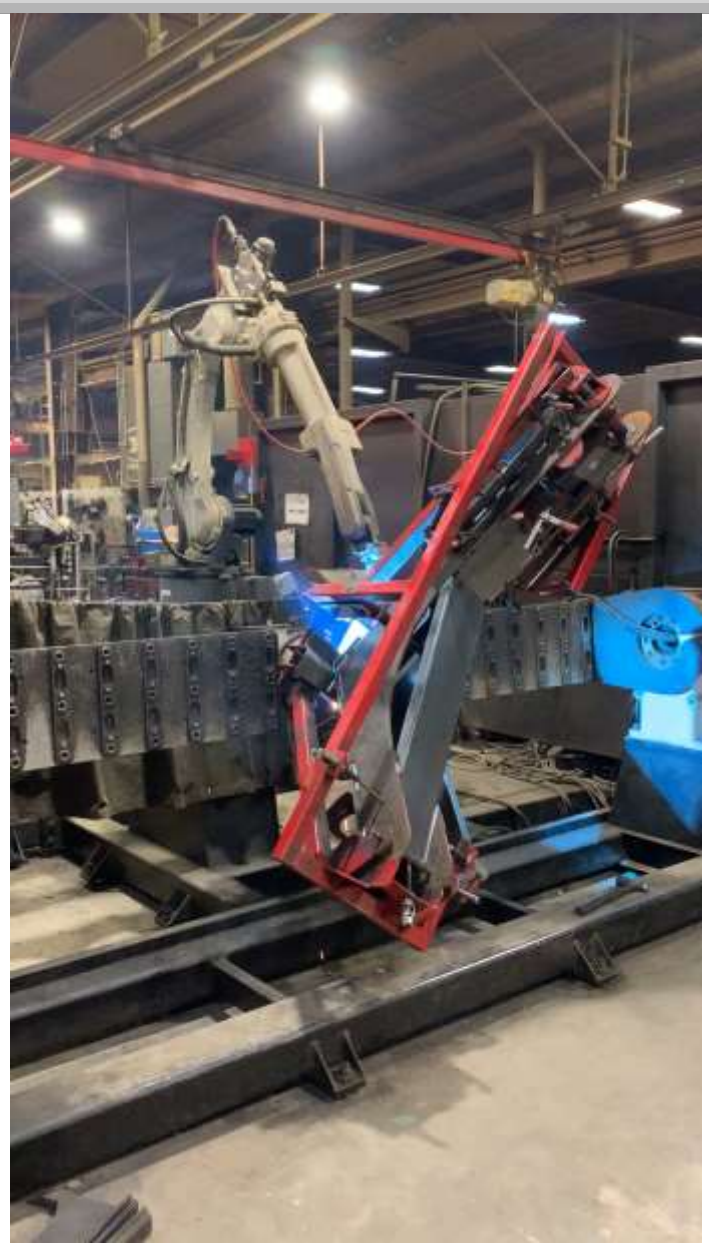

Maximizing Output

- Establish a robust process, train your operators and set a target
- Some considerations:
  - Repeatable work requires a repeatable process
  - Listen to the operators
  - Measure what matters
  - Arc on time vs OEE
  - Celebrate success

STEP 1: Unload Welded Part

STEP 2: Put Parts Into Jig

STEP 3: Clamp the Parts

STEP 4: Press start

Maximizing Output

- Continuously monitor, improve, and train
- Some considerations:
  - Hide the hammers
  - Watch for the grinders
  - Operators like to weld

Maximizing Output

- Part matching is critical

Weld Time of Part A >= Setup Time Part B
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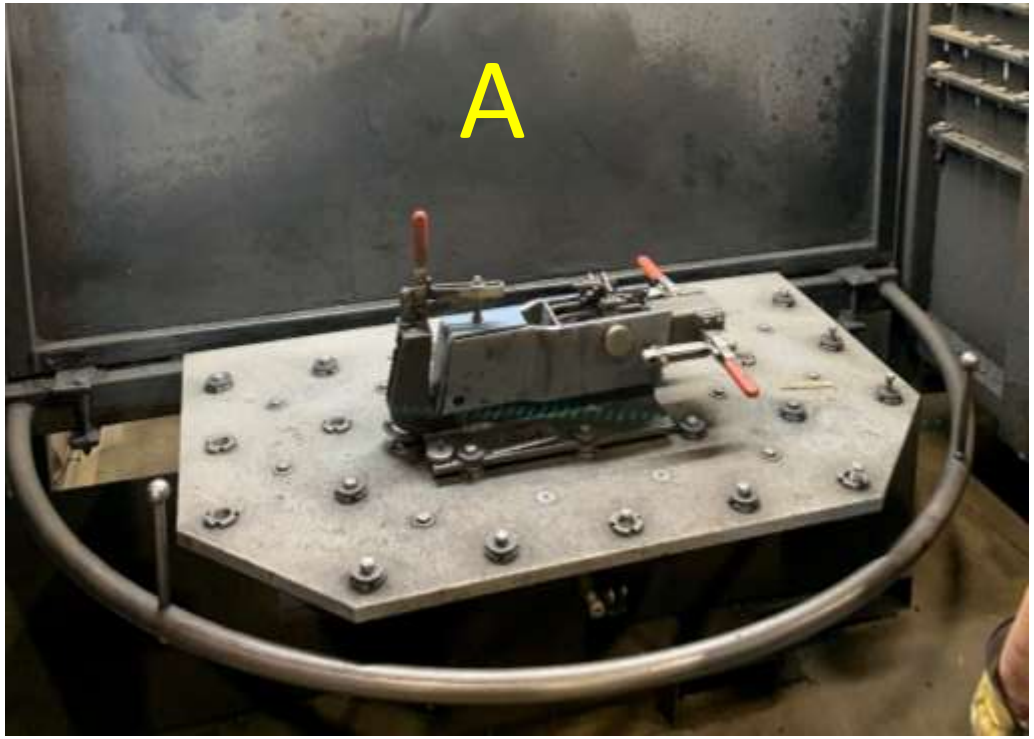
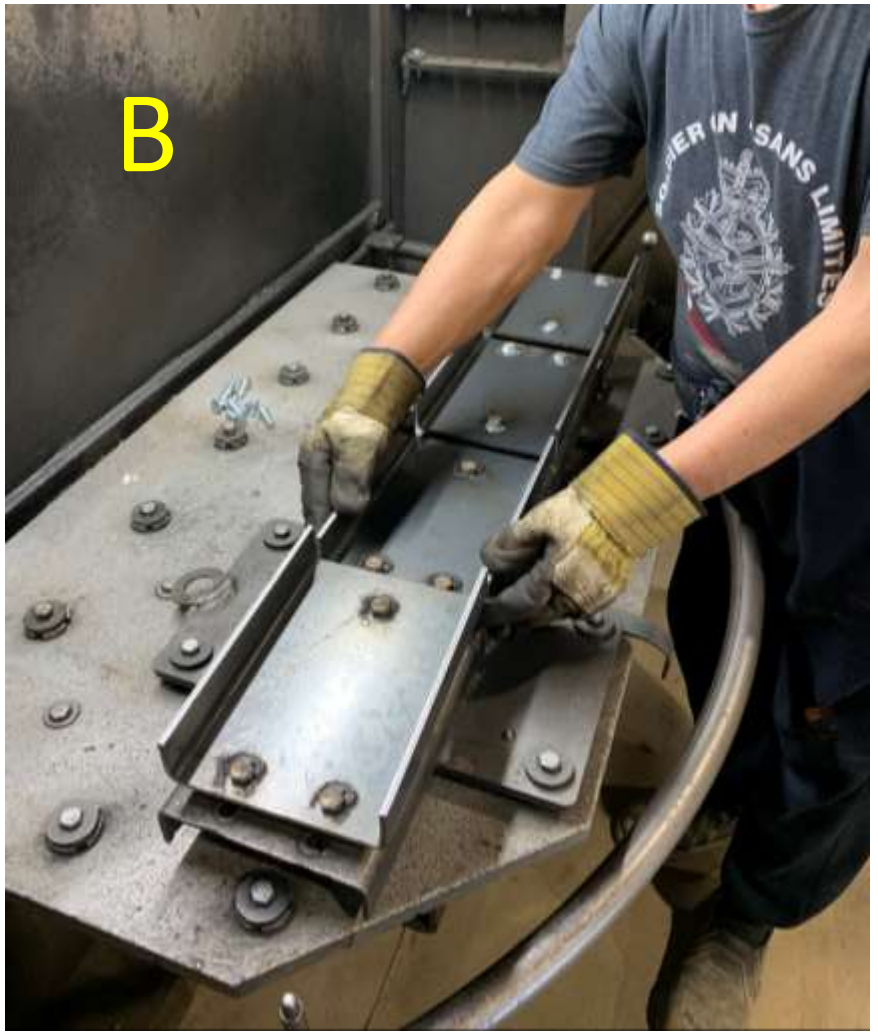




Return on Investment

- MKX 130 Lift Assists: 1 hr 15 min manual to 25 min robotic

Return on Investment

- MKX 10 & 13” Transitions: 45 min manual to 17 min robotic

Return on Investment

- MKX 10 & 13” Spout Heads: 35 min manual to 10 min robotic

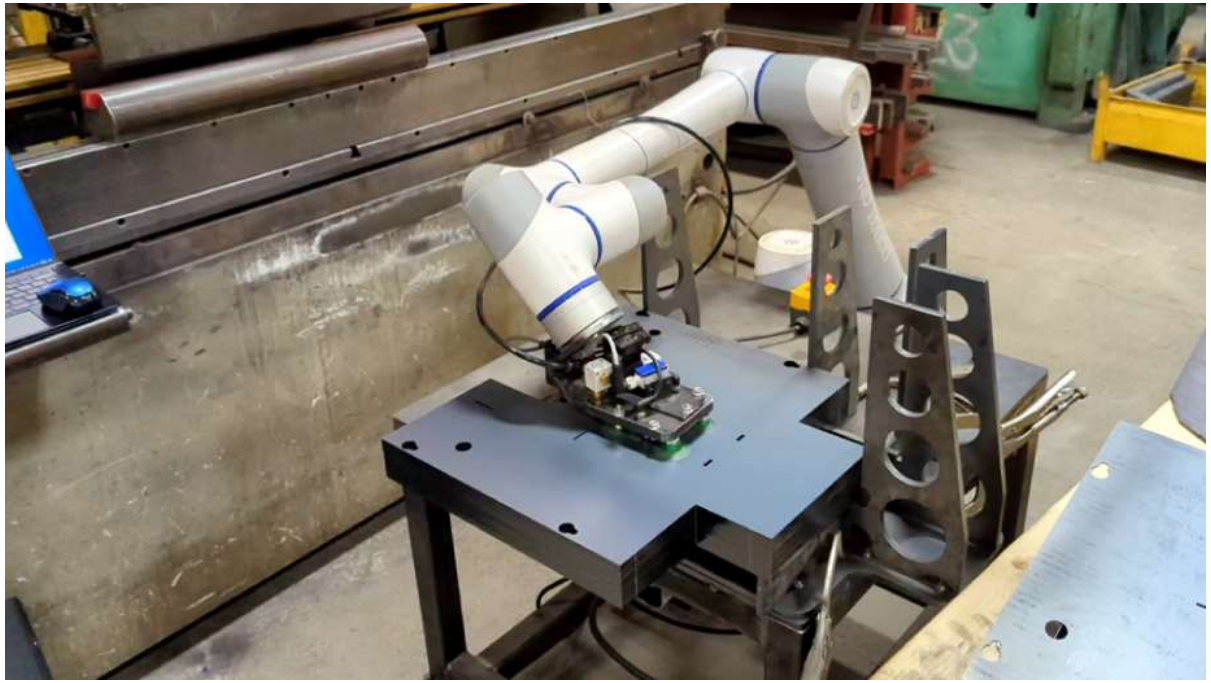
Return on Investment

- Consistent 3:1 return… per shift
- Higher quality
- Easier to staff
- Flexible

Annual salary of a welder: $60k
Cost of a robotic welding cell: $100k to 250k
Annual salary of a GL: $40k
Simple Payback:
100k to 250k/{(60,000x6)-(40,000x2)} = 0.36 to 0.89 years

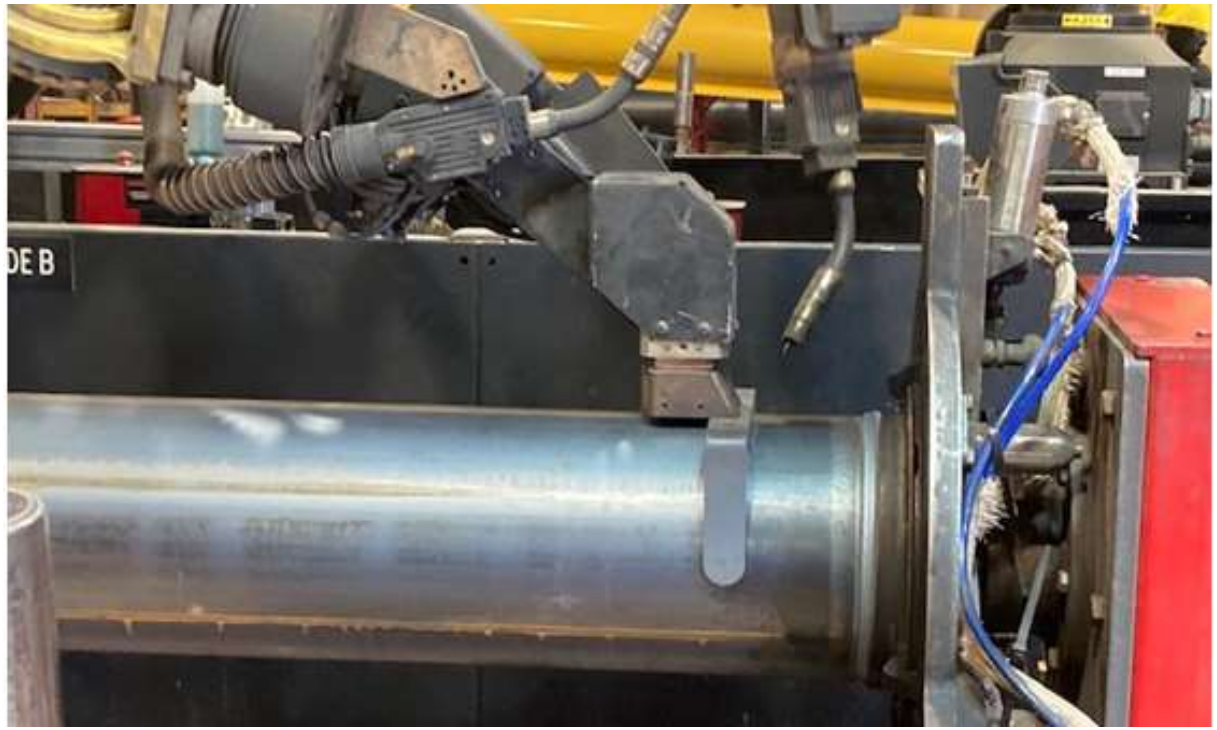
Robotic Material Handling

- The next iteration?
- Removes human error
- Great for high variety, high volume
- Cobots vs Robots

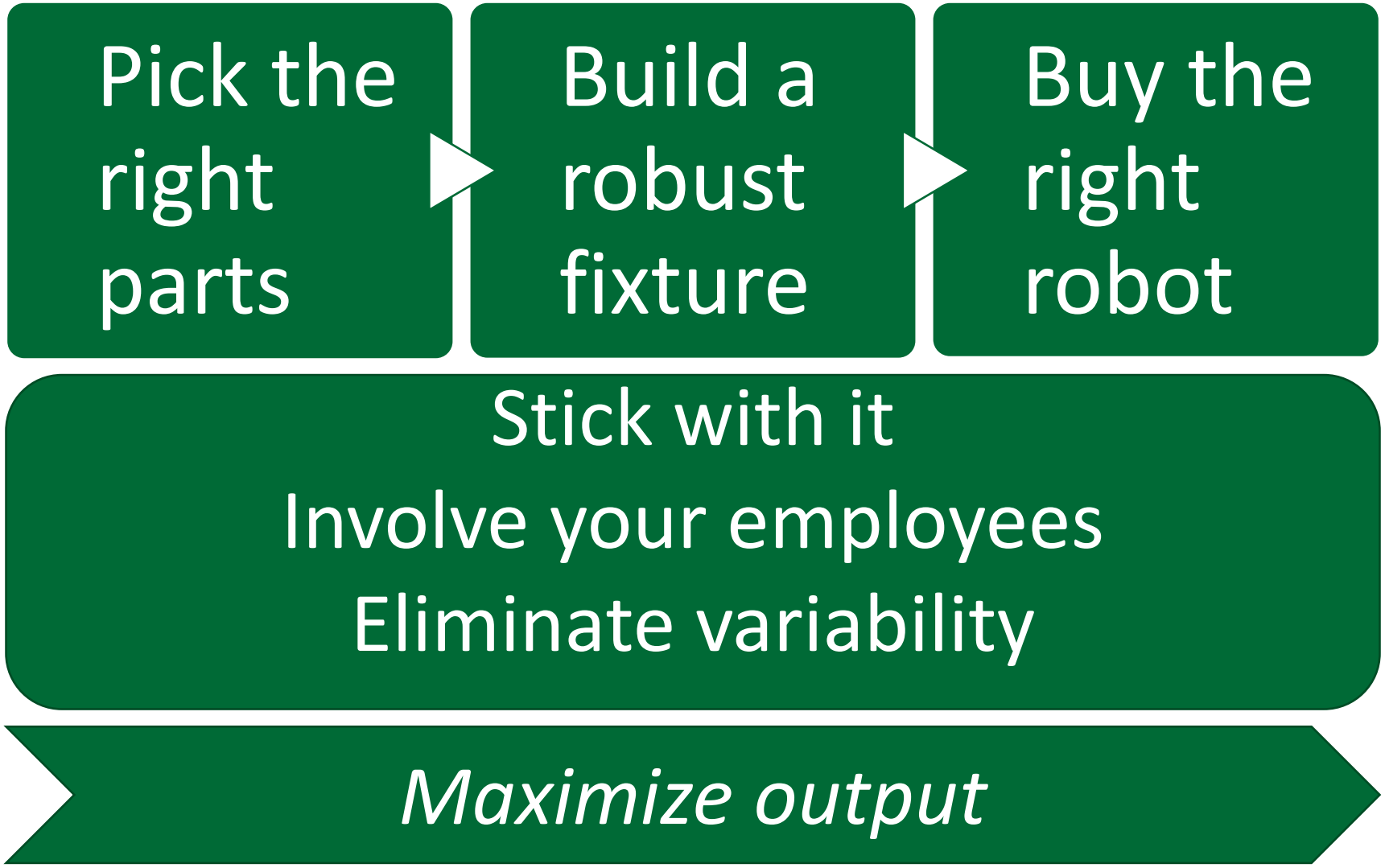


Robotic Material Handling

- Increases programming complexity and processing time
- Fixture it if you can
- General labor is still easy to find



Summary


Pick the right parts
Build a robust fixture
Buy the right robot
Stick with it
Involve your employees
Eliminate variability
Maximize output

Questions?

COMMITTED TO QUALITY

AGI WESTFIELD

The #1 Grain Auger Manufacturer in the World