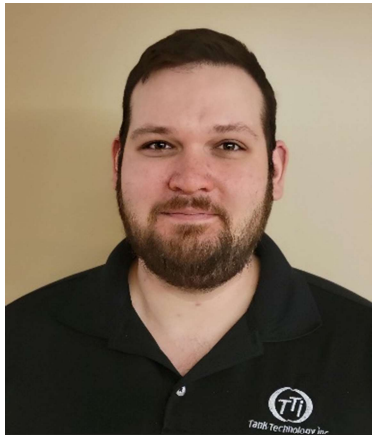
Megan Weber

Production Manager, Sentry Equipment

Megan Weber is the Production Manager at Sentry Equipment. Sentry, an employee-owned company, manufactures sampling equipment for customers all over the world.

Prior to joining Sentry, Megan successfully implemented QRM at two manufacturing companies. Megan has experience in Continuous Improvement with not only QRM, but Lean and Six Sigma principles as well. She recently completed her APICS certification in production and inventory management. Megan obtained a degree in Hotel, Restaurant and Tourism from UW Stout and worked in the hospitality industry for 5 years before finding herself in manufacturing. She loves being part of the challenges involved in manufacturing. She enjoys playing an integral role at an organization with a mission to safeguard people and processes and she finds it rewarding to contribute to the success of a great organization.

Outside of work, you will find Megan behind a camera with her photography business, working out and spending time with her daughter, her husband and their boxer dogs, Valarie & Otis.



Dan Church

Industrial Manufacturing Engineer, Tank Technology Inc.

Dan Church is the Sr. Manufacturing Engineer at Tank Technology Inc. located in Princeton Wisconsin. Dan grew up in a small town in Northern Iowa and attended Iowa State University where he graduated with a Bachelor of Science in Industrial Technology.

Dan is passionate about continuous improvement and strives to get better every day. Working on projects that target improving processes and driving change is a staple of Dan’s daily life. Leading change at all levels in the organization, as well as life outside of work. Dan focuses on asking the right questions in an effort to foster "outside of the box thinking" and forward-thinking minds.

Charlene Yauch

College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

Professor of Practice, Director for Center for Quick Response Manufacturing

Charlene Yauch, PhD, PE is the director of the Center for Quick Response Manufacturing (QRM) and a professor of practice in industrial and systems engineering at the University of Wisconsin-Madison. She conducts industry training workshops on how to implement QRM and how to design cells for production and office operations. Charlene advises student projects for companies that are members of the QRM Center and teaches classes on QRM, manufacturing processes, and manufacturing systems analysis.

Prior to her current job, Dr. Yauch worked at the Milwaukee School of Engineering, Oklahoma State University, Versa Technologies, and McDonnell Douglas. She has a BS in industrial engineering (IE) from Purdue University, as well as MS degrees in sociology and manufacturing systems engineering and a PhD in IE from the University of Wisconsin-Madison.

What does PRODUCTIVITY mean to your business?

Labor

Capital

Material

measure of how much **output** has been generated per unit of **input**

WMEP MANUFACTURING SOLUTIONS

Sentry Equipment at a Glance

196+ Employee Owners

World HQ:
Oconomowoc, WI

Process Monitoring Technology Center:
Houston, TX

Rebuild-it Services:
West Jordan, UT

Serving customers in all 50 states and in 55 countries across 6 continents

98 Years in Business

5 First to Market Industry Innovations

7x Top Workplace Winner

Wisconsin Manufacturer of the Year Award

23 consecutive years without safety incident

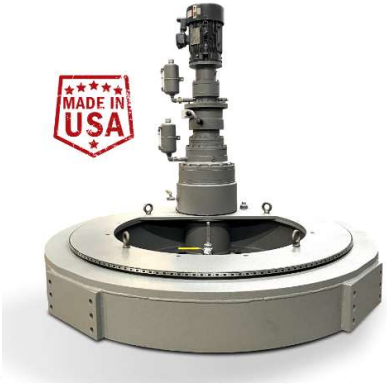
Safeguarding people and processes for a better world.

Protect Workers

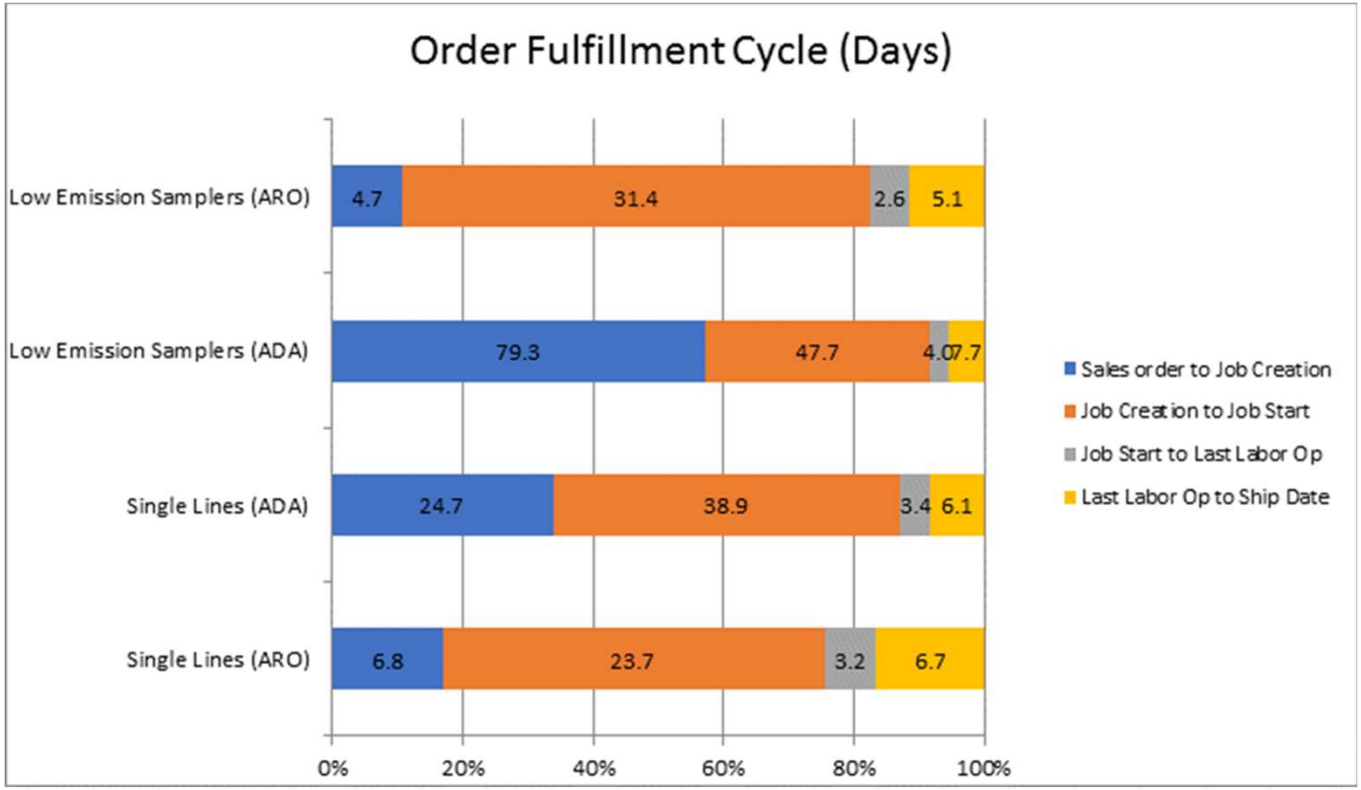
Protect Public Health

Protect the Environment

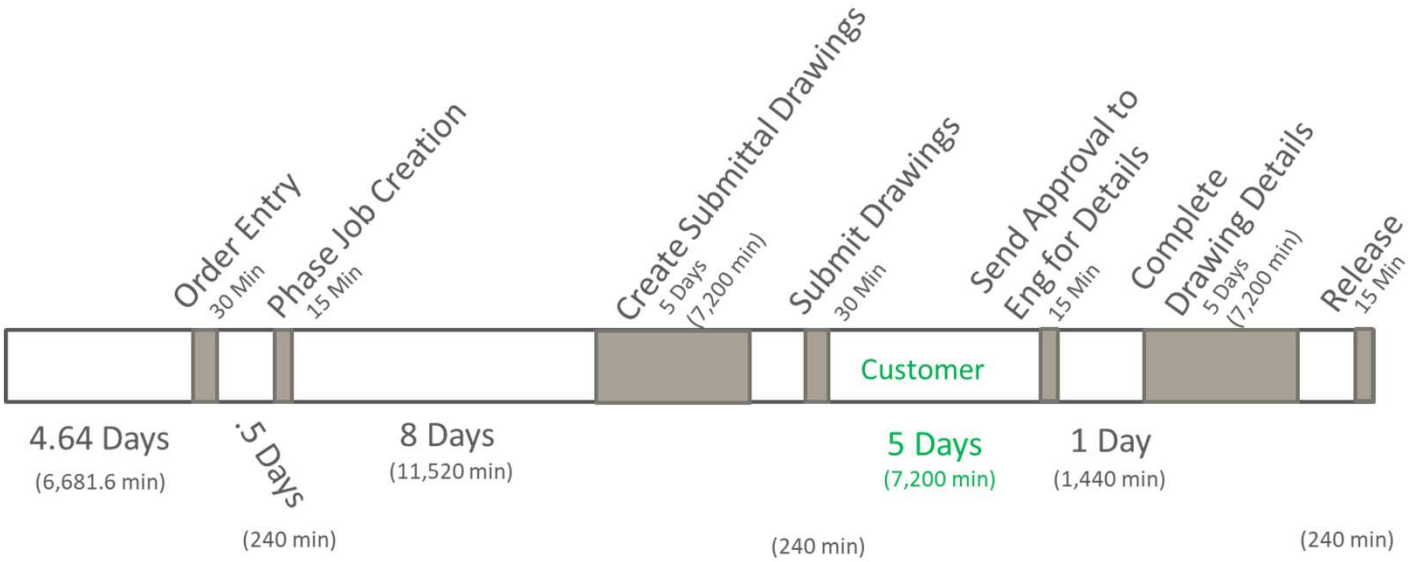
Sentry Products



Lead Time Reduction



The Problem

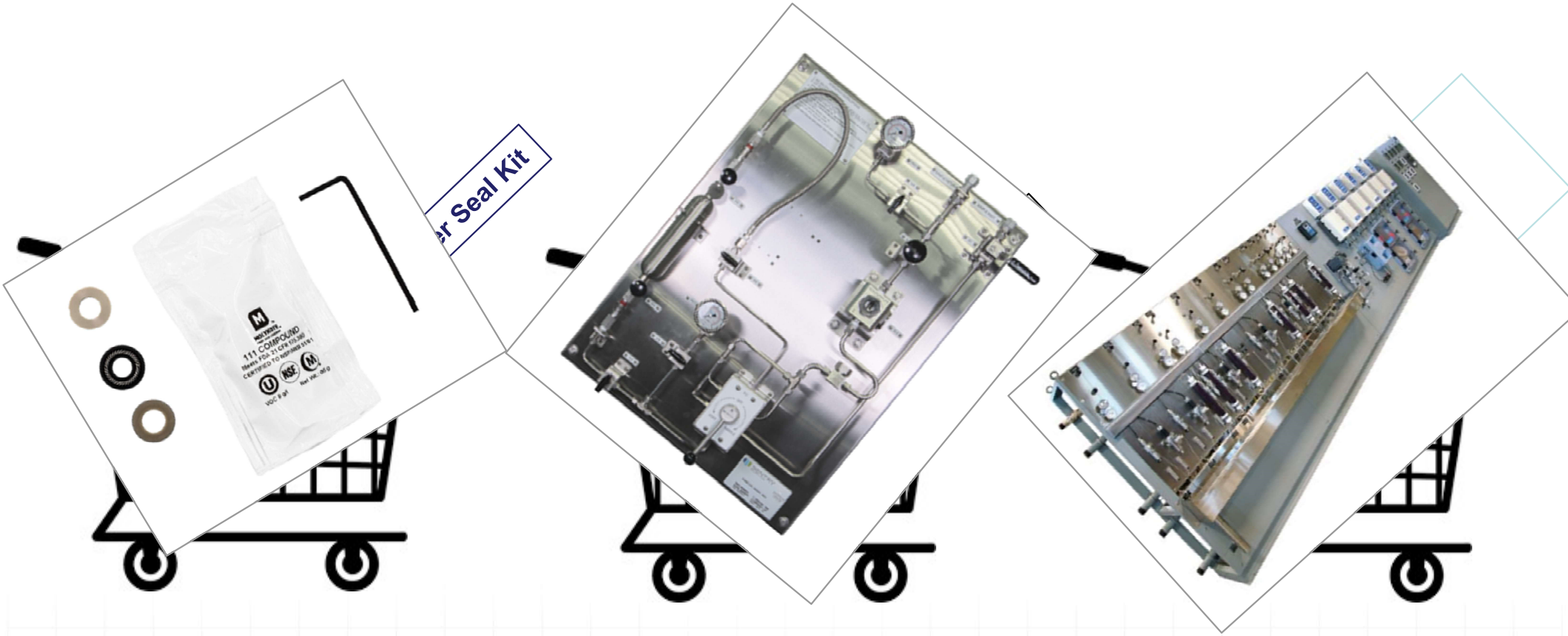


Total Lead time 29.21 days (42,066.6 min)

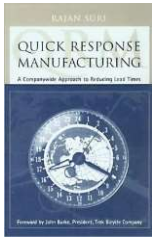
Total Touch Time: 10.07 days (14,505 min)

34.46% is touch time

The Check-out Line



Quick Response Manufacturing



Developed by Professor Rajan Suri, UW-Madison, in the late 1980's.

- A competitive Strategy for *High* mix, low-volume or custom-engineered products.
- QRM is a companywide strategy that pursues the reduction of time in all aspects of a company's operations.
  - *Externally*: responding to customers' needs by rapidly designing and manufacturing products customized to those needs.
  - *Internally*: QRM focuses on reducing the time for all tasks in a company.
- Time-Based Competition: Using speed to gain competitive advantage.

Efficiency vs. Time

Instead of focusing on the gray space, work on eliminating the time in the white space.

More opportunity!

Express Lane Vision

A group of autonomous cell members owning the process of a FOCUSED list of parts (EXPRESS LANE). Streamlining these orders to improve both the employee and customer experiences.

Baseline Metrics for Express Lane Parts

MCT – *Manufacturing Critical Path Time* = Lead Time

Quoting MCT

Parts 0.51 days

Products 17.04 days

Order Entry MCT – 2.80 days

Order to Shipment MCT – 20.92 days

$23,800,000/19 months

- $1.25 mil/month

Roles & Responsibilities

- Enter quotes
- Enter orders
- Manage orders/quotes
- Update & maintain Express Lane list
- Monitor on-time performance

Measure & Monitor SUCCESS

- KPIs
  - Reduce MCT quoting lead time by 40%
  - Reduce MCT order processing by 30%

Quote MCT – 80% reduction

Order MCT – 85% reduction

Lessons Learned

Education Education Education Education Education Education Education

QRM Believers vs. “Have to be here”

Silos

Celebrate

Tank Technology inc.

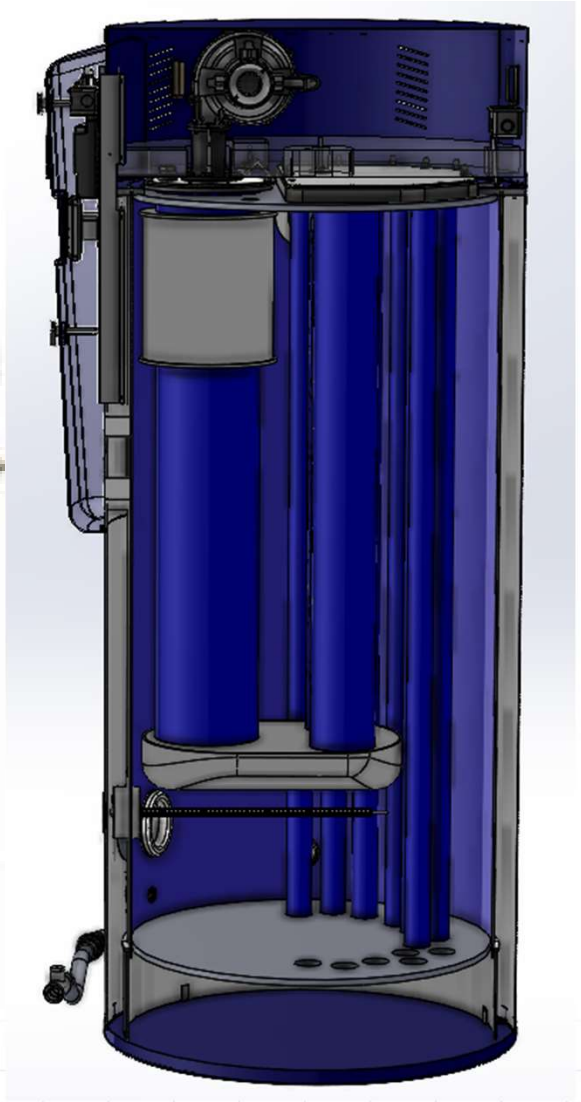
Tank Technology has been in business since 1991.
Became 100% Employee Owned in 2001.
Currently 47 Employee across 4 department

Produces:

- Porcelain enamel lined water tanks
- Porcelain coated Heat exchangers

Markets/Customers:
Commercial Natural Gas, Electric, Oil

- 99% of all Oil-Fired Waters Heaters manufactured in the US get their tanks from TTI



Problems we set out to address

- ❑ Not meeting customer's demand
- ❑ Forcing overtime weekly
- ❑ A Rapidly growing backlog
- ❑ Unable to react to customer change requests
- ❑ Welders spending more time on forklifts than welding
- ❑ Had a rework rate of 80% of unit

Methods Used

- Principles of Lean Training **(8 wastes)**
- Created project charter
- Current state value stream map **(Batch System)**
- Future state value stream map **(Cellular 1 Piece Flow)**
- Divided into 2 teams and created an ideal layout without constraints
- Teams joined layout ideas
- Proposed and Implemented

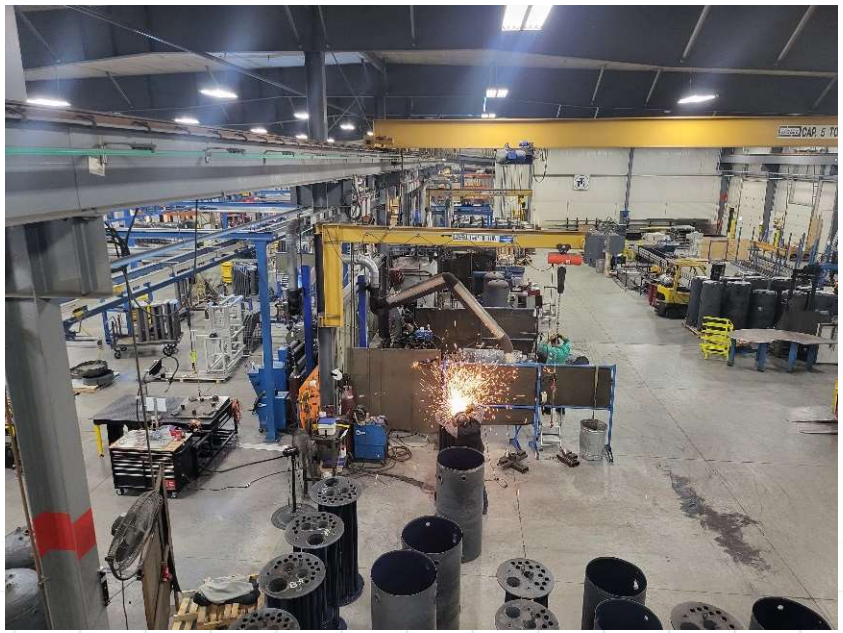
Kotter's 8 Steps of Change Form his Book "The 8 Steps for Leading Change"

ACHIEVEMENTS

- Eliminated the back log
- **Added 2 new unit types** to the department
- Added 1 new customer
- **Opened up 15K Sq-ft** for new fiber laser and automation
- Reduced lead time from **15 days to 3 days**
- Inventory of finished goods on our floor
- **Visibility of the process**
  - Design review to address manufacturability issues
  - Customers can see every step of our process
- Repeatability and constancy for scheduling
- Process allows us to react to changes in customer demands
- **Rework is less than 5%** of units
- Reduced overtime from **45+ days p/y to 5 days** in each of the last 2 years
- Completed 46 action items

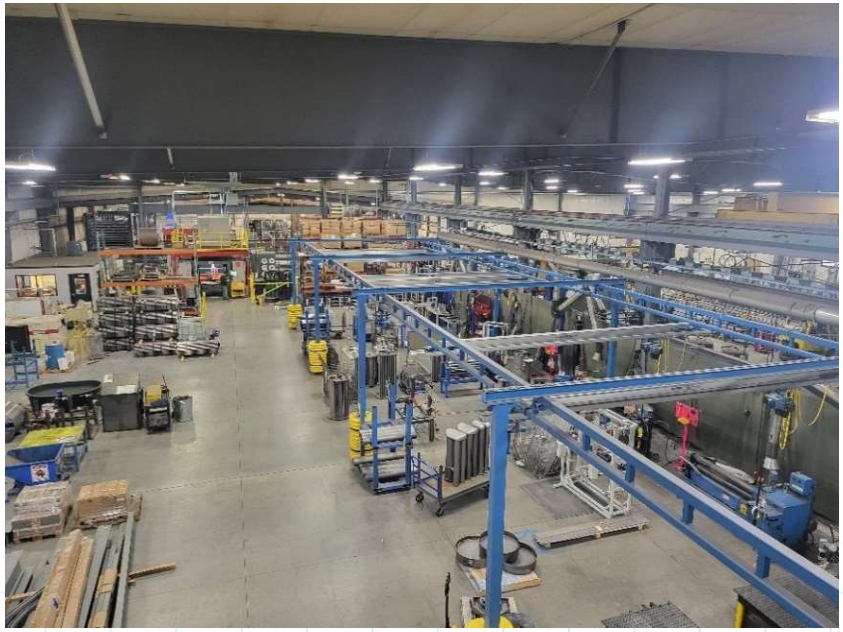
Batch System Layout

Lead Time: 11 Days
Forklift used: 14 location
Operators: 8 + Supervisor
Output: 20 units/wk
Value added time: 8.6hr



Current State Layout

Lead Time: 3 Days
Forklift used :1 location
Operators: 8 + Supervisor
Output: 40+ units/wk
Value Added Time: 8.6hr



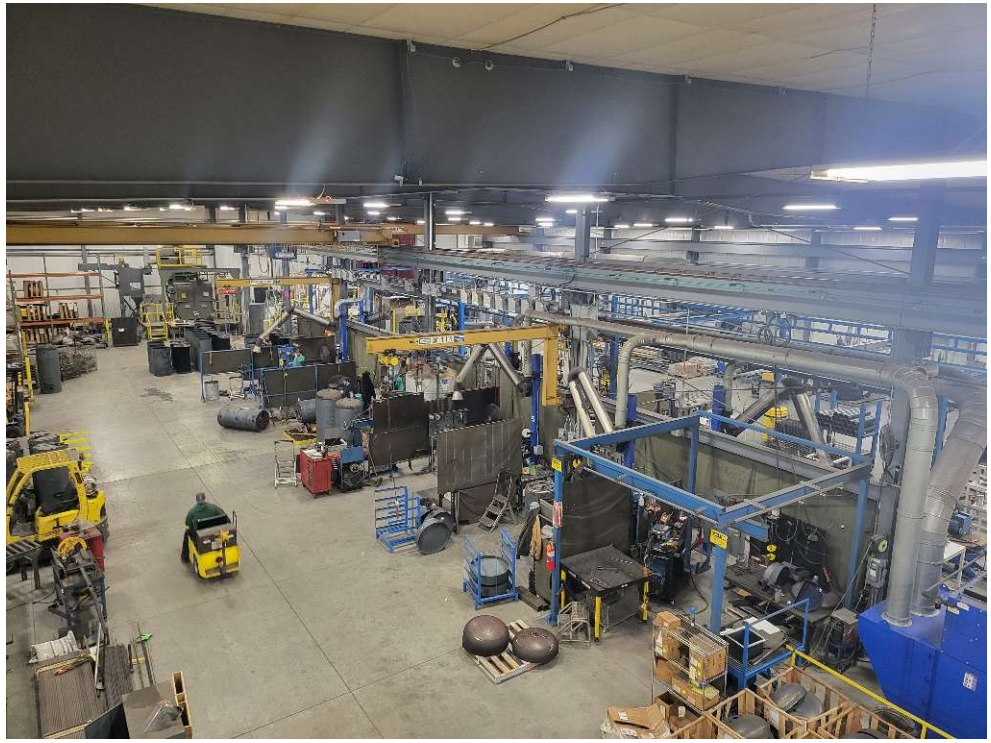
Business as of today

Gained Sales = $1.5 million

Annualized Cost Savings = $600k

Capital Investment = $900k

Jobs Added and Retained = 6



Lesson learned

- This process exposed our short comings in equipment reliability
- This was the first time everyone agreed on the steps for a process
- The importance of KPIs to show progress
- The power of a little win
- What an internal customer
- The importance of planning and communicating vs winging it and expecting everyone to blindly follow.

Center for
Quick Response Manufacturing
UNIVERSITY OF WISCONSIN–MADISON

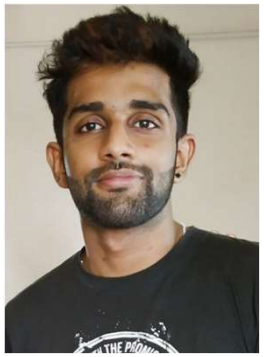
TYRI

Improving Throughput for a Quick Response Assembly Cell

Advised By: Prof. Charlene Yauch

Student Team: Sirin Abraham, Ai Guan, Jiayao Pang, Thomas Paul and Aravind Varathan

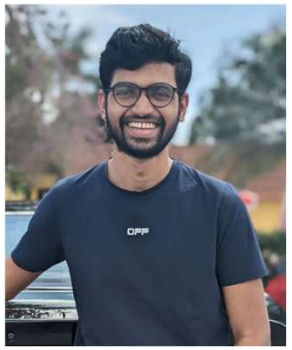
The Student Team



Sirin Abraham

Thomas Paul

Jiayao Pang



Aravind Varathan

Ai Guan

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Jerry VanDecar, Maintenance Manager

Tori Sunderland, Production Assistant

Becki Snider, Production Supervisor

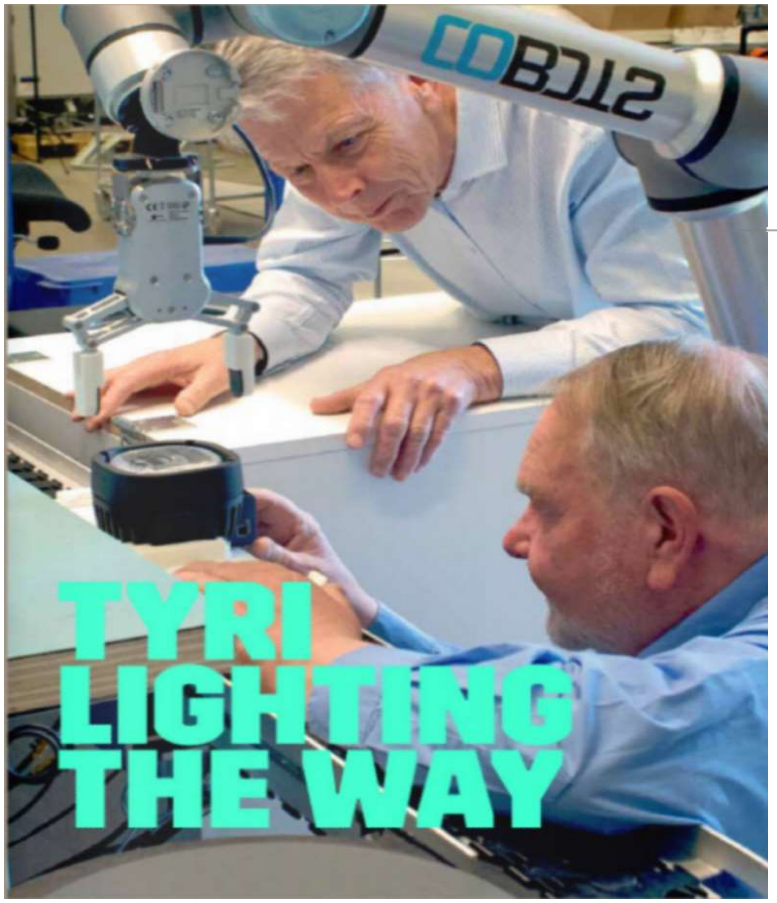
Jenny Lepak, Warehouse Supervisor

Geoff Hull, Quality Manager

Prof. Charlene Yauch, Director

Prof. Rajan Suri, Founding Director

Omir Rosado, Teaching Assistant



Company Background

- Global manufacturer of off-highway lighting
  - Material Handling
  - Agriculture
  - Construction
  - Heavy Vehicles
- Customers include many large OEMs
  - John Deere, Massey Ferguson and Toyota

1010 Repoint warning light

D10 swivel halogen work light

BASEline

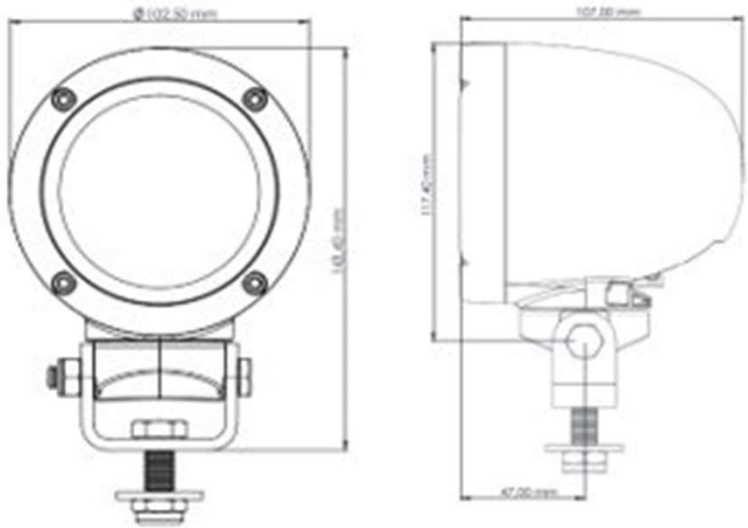
1010 H9 halogen work light

Products

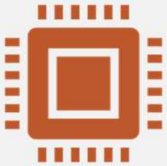
- Halogen work lights
- LED lights
  - Work lights
  - Drive lights
  - Warning lights
  - Marker lights
  - Reverse lights
- Brackets
- Connectors
- Accessories

Project Motivation

- Added automation to the main assembly line and throughput decreased
- Experienced problems with lack of balance and frequency of rework



Project Goal & Approach



Increase throughput by 66% from 900-1,200 **to** 1,500-2,000 units

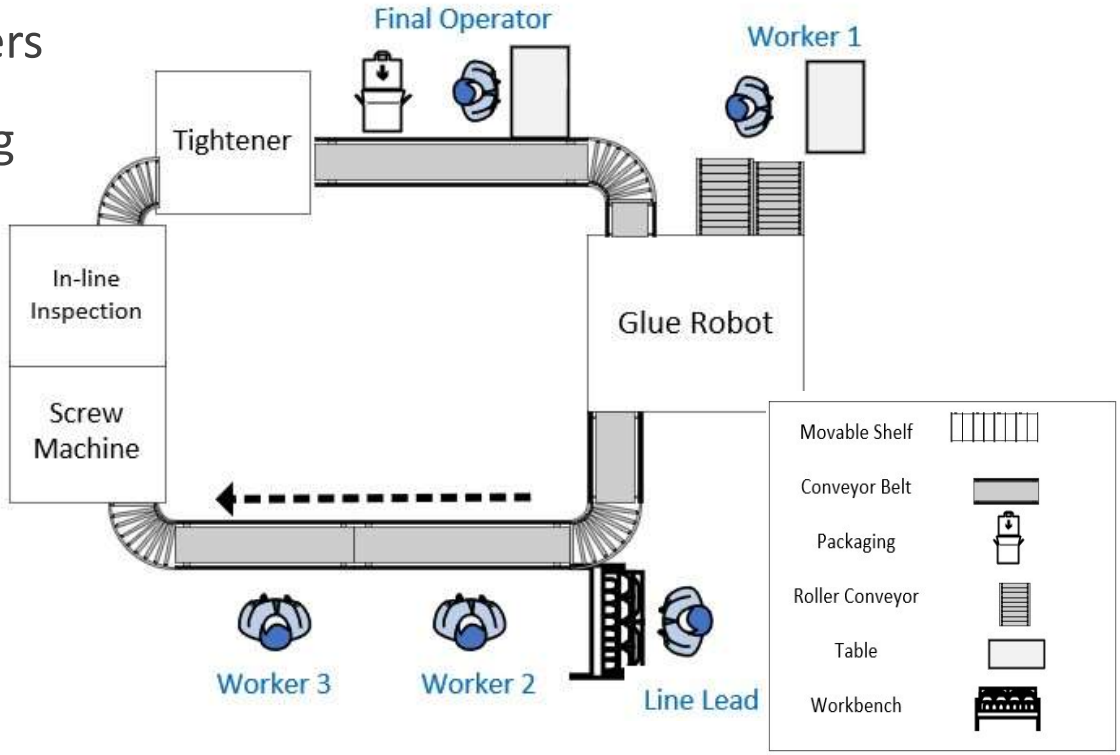
Note: Theoretical maximum throughput of 1,400 units

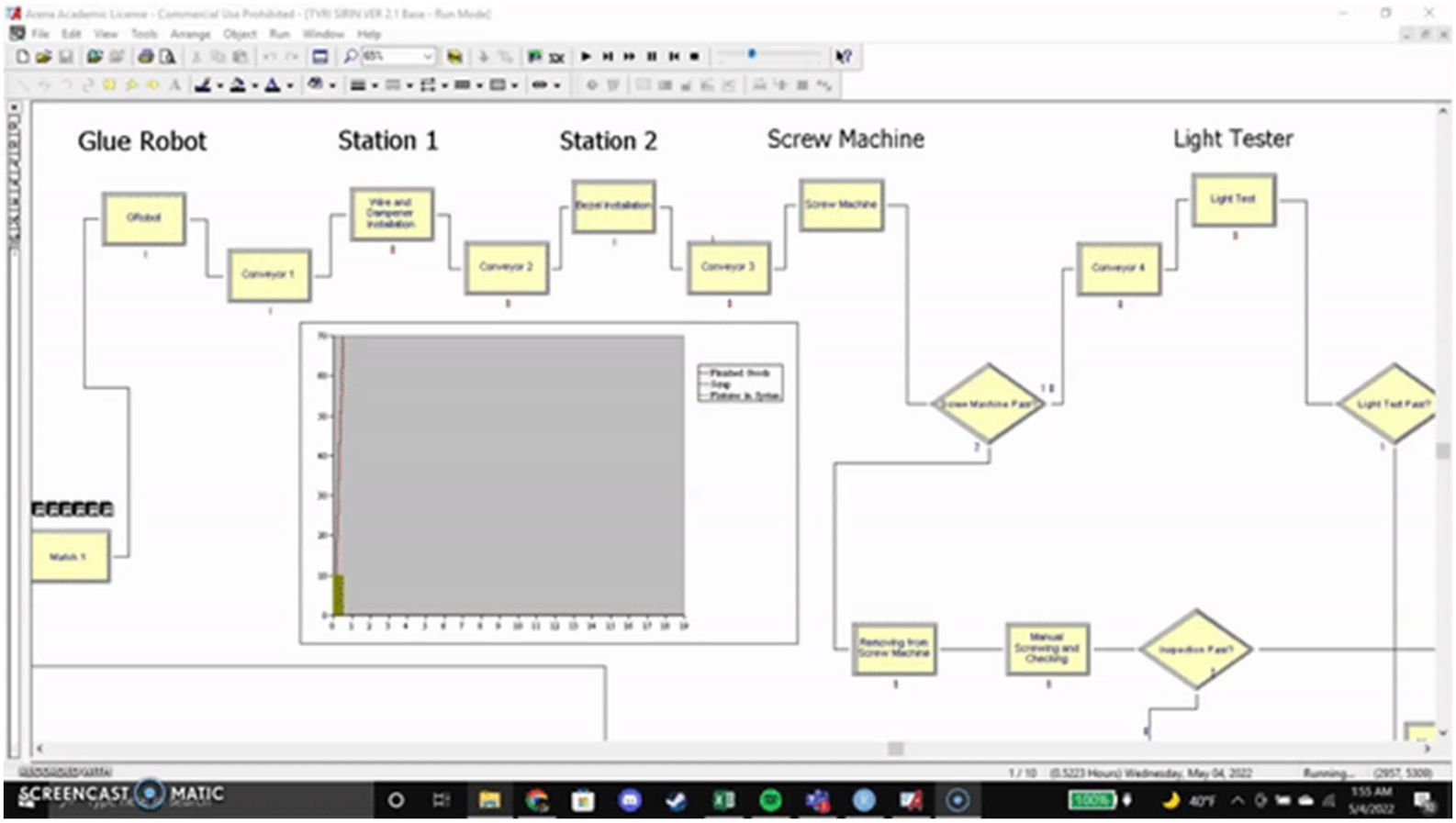
Develop a simulation model to evaluate changes and streamline the process

Current Assembly Process & Simulation Model

Process Overview

- Consists of 9 stations and 5 workers
- System has five fixtures circulating on a conveyor belt
- Four machines
  - Glue robot
  - Screw machine
  - In-line inspection (Tester)
  - Tightener

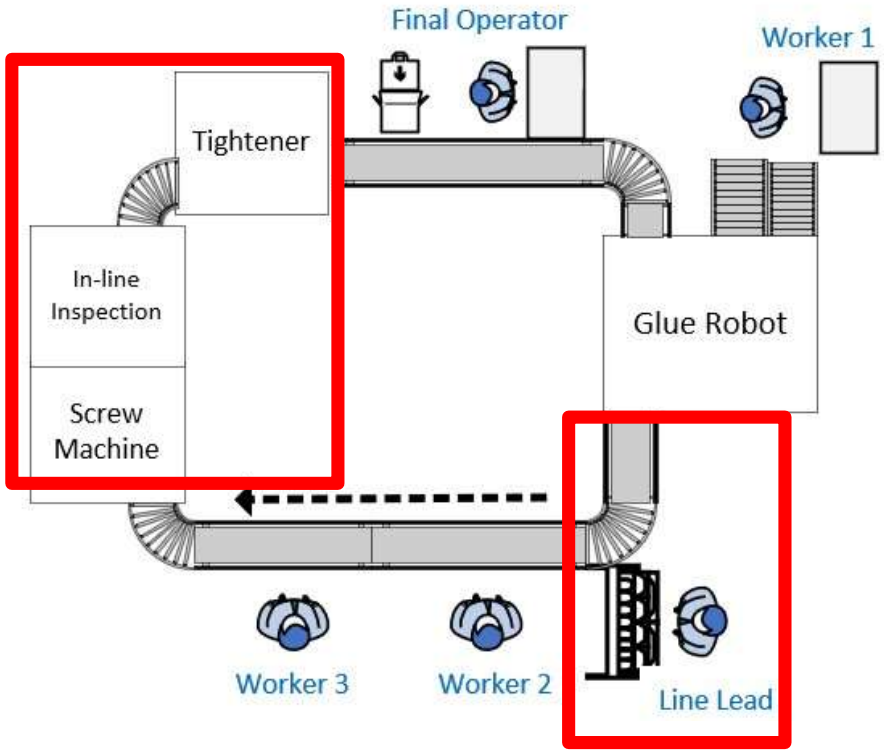




A Glimpse of the Completed Arena Model

Initial Observations

- Long travel time for assembly workpieces
- Unbalanced operator utilization
- Machine cycle times dictate process flow and throughput



Improvements

Low-Effort Improvements (LI)

Demanding Improvement (DI)

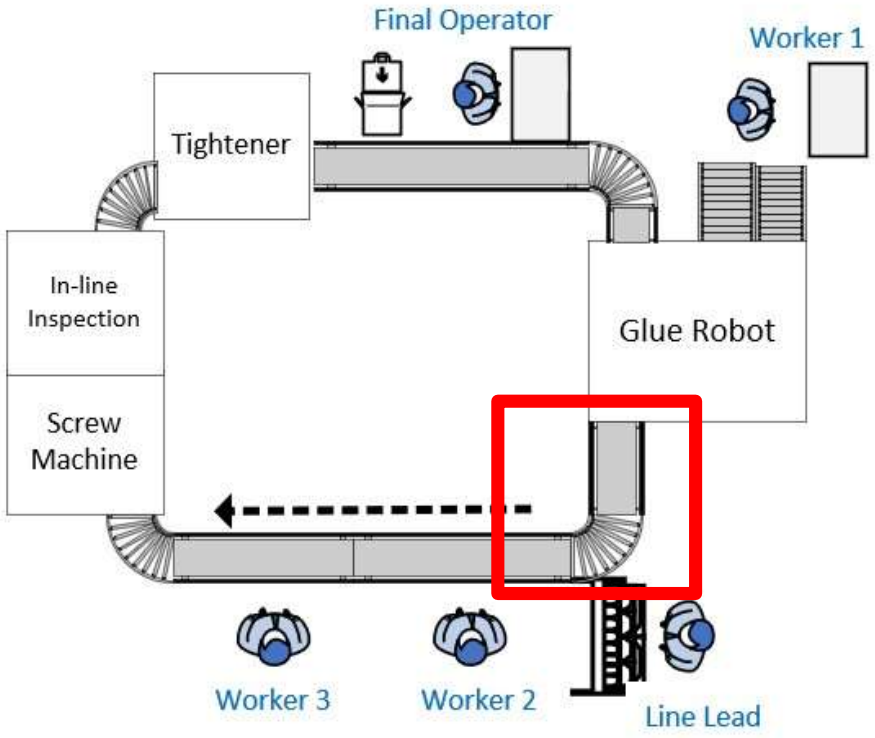
LI 1: Reduce Belt Travel Time

Improvement idea 1: Reduce the conveyor travel time between Glue Robot and Worker 2

Original: **10.4s**

New: **5.2s**

Average Throughput: **1,030**
Improvement: **8.5%**



LI 2: Increasing Number of Fixtures

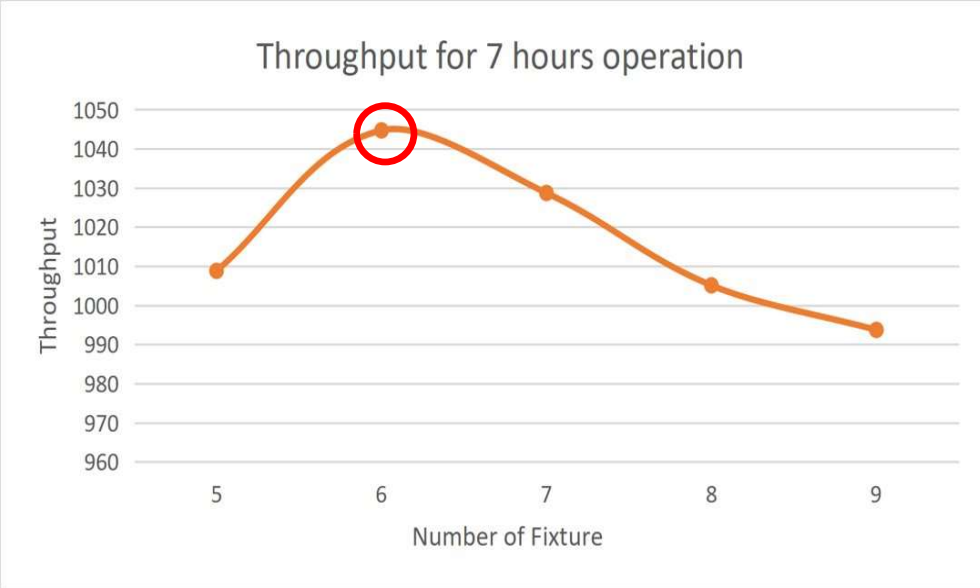
Improvement Idea 2:

Optimum Number of Fixtures

Approach:

- Number of fixtures incremented by 1
- For each increment, throughput was computed
- Optimum number of fixtures was found to be 6

Average Throughput: **1,044**
Improvement: **10%**

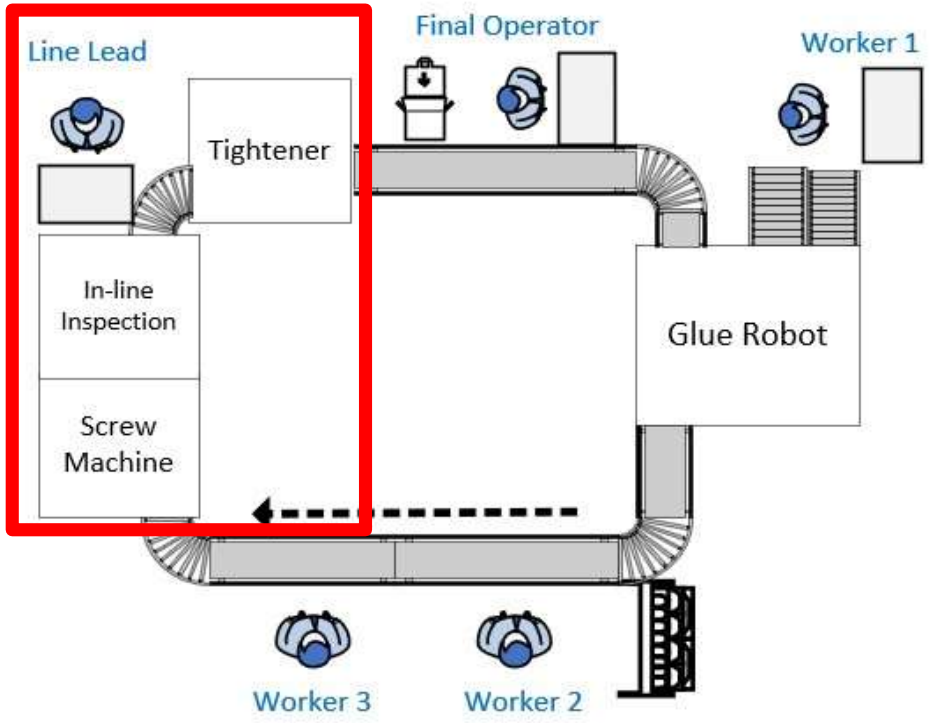


LI 3: Add Floater

Improvement Idea 3: Add a floater (Line Lead) to the system with the following responsibilities:

- Handles all rework on the line
- Attends machine failure

Average Throughput: **1,109**
Improvement: **17%**

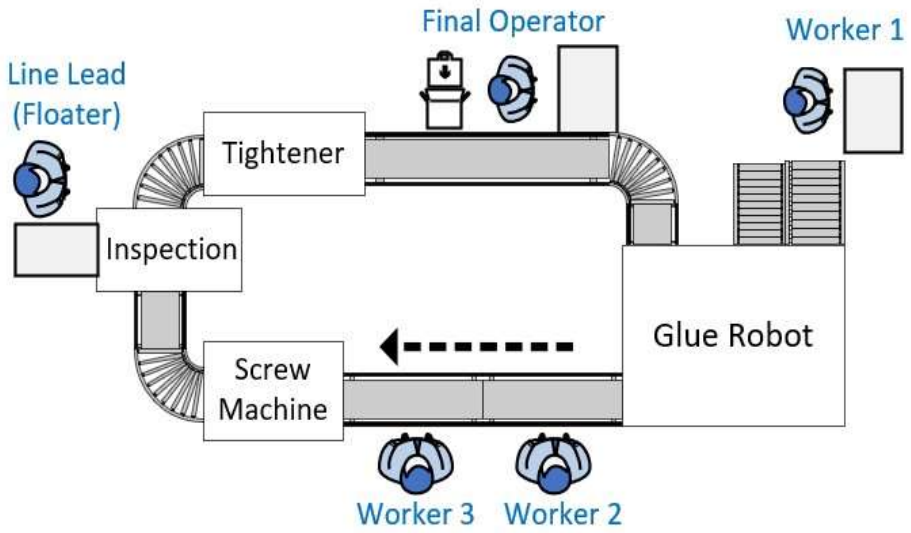


Summary of Low-Effort Improvements

Combining LI 1, 2 & 3

- Belt time reduction
- Running 6 fixtures
- Introduction of floater

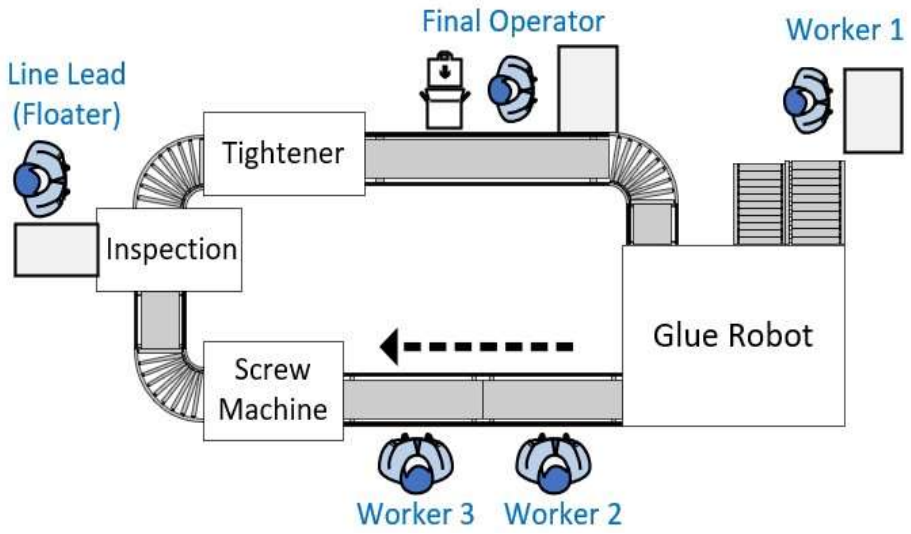
Combined Average Throughput: **1,198**
Combined Improvement: **27%**



DI: Reduction in Glue Robot Cycle Time

Glue Robot Cycle Time reduced by 20%

- Avg cycle time reduced: 17.31s --> 13.85s
- Previous improvements were included
- Running 6 fixtures with floater

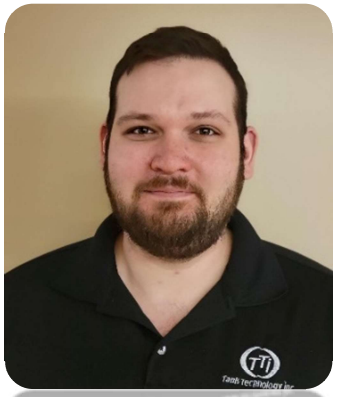


Average Throughput: **1,311**
Combined Improvement (LI + DI): **38%**
Theoretical Maximum Throughput: **1819**

Final Thoughts

- Automation does not necessarily increase throughput
  - Machine cycle times may be longer than manual ones
  - Machines not as flexible as humans (not as easily "helped")
  - Other benefits may accrue: quality, consistency, ergonomics,…
- Simulation modeling helpful in analyzing the system dynamics
  - Determining number of fixtures (rule of thumb is 2 per station)
  - Balancing workload between operators

-Ask the Experts-



Thank You for Participating

Please complete the brief session survey to provide feedback to the presenter(s) and in put to future editions of Manufacturing Matters!

MANUFACTURING MATTERS!

WMEP MANUFACTURING SOLUTIONS

RISING TO THE CHALLENGE