

Ametek_SxS – Phase 2 – Senior Design 2(Spring 2019)

Team Members: Brandon Cash, Ryan Fitzgerald, Jordan Pierce, Joseph Pena, Albert Sanchez, Jared Thompson, Bipin Tripathi, Justin Williams

Supporters: Mike Shamp, Samuel Houff

Mentor: Jim Hartman

University of North Carolina at Charlotte



Project Overview

The objective of this project was to perform a comprehensive engineering analysis of the Ametek CSI SxSeal production and to develop, recommend, and implement process and product changes that this will address.

Deliverables

Main Deliverable:

To reduce the lead time of Ametek-CSI's SxSeal line by at least 20%

Other Deliverables:

- 5% cycle time reduction in PM, Design, and Shop
- Implementation and design of 5+ fixtures to improve these cycle times and increase safety and ergonomics
- Evaluate and recommend any changes to the product/process that allow for improved quality and improved manufacturability of the SxSeal

Value Added

Original lead time - 136 days

New lead time - 77 days = 43% Overall Lead Time Reduction

Money saved - \$309,000 over 8 years

#	Process Improvement Item	\$ Savings (NPV)	Time Savings
1	Lag Time Between Handoffs	Not Relevant	Not Relevant
2	Overall Schedule	Not Relevant	Not Relevant
3	Customer Contract	Not Relevant	5 days
4	Gantt Chart/Project Schedules	Not Relevant	19 Days
5	Early Release Drawings w/ Long Lead time	\$79,000	1.5 Hrs/Order
6	Weld Tags added on Assembly Drawings	\$3,120	Not Relevant
7	Production Floor Schedule	Not Relevant	5 Days/Order
8	Production Floor Layout	Not Relevant	Not Relevant
9	Walkie Talkie System	\$8,320 reallocated towards production	104 Hrs/YR
10	Flag System for Communication	\$8,188 reallocated towards production	2,080 Hrs/YR
11	3D Model for Insulation Services	\$1,386 reallocated towards production	2 Days/YR
12	Float Installation Process Redesign	\$2,080 reallocated towards production	26 Days/YR
13	Redesign of Davit Rib	\$2,080 reallocated towards production	3.33 Days/YR
14	Awning for Shipping Crates	\$60,270(8 year)	1.5 Hrs/ Order
15	Laser Engraver	\$37,320(5Year)	26 Days/YR
16	Awning for Trace Install	\$54,380.88(8Year)	1.5 Hrs/ Order
17	Mag Pad	\$95	7 days/Order
18	Nameplate Redesign	\$1000 per Seal	1hr/YR
19	Gas Shield Cutting	\$2080 per year	2 Days/YR

Implementations and Designs

1

Problem: 14 days of total lag time found in Made2Manage when orders are being passed between departments
Process Improvement: Personal interviews backed up by emails with dates found that this lag time was due to incorrect data
Value added: Attention being brought to a data entering problem which causes bad data for future inquiries

DST Times			
Min of JobReleaseDate	Min of StartTime	Lag time	
6/29/2016	7/6/2016	5	
7/14/2016	7/20/2016	4	
10/13/2016	10/17/2016	2	
11/28/2016	11/28/2016	0	
1/5/2017	1/5/2017	0	
4/19/2017	4/19/2017	0	
7/11/2017	7/11/2017	0	
12/13/2017	12/14/2017	1	
2/5/2018	2/6/2018	1	
6/4/2018	6/4/2018	0	
Average:			1

Shop Floor			
SO	Min of JobReleaseDate	Min of StartTime	Lag
035852	8/19/2016	9/5/2016	14
035869	10/21/2016	10/26/2016	3
036194	12/16/2016	1/4/2017	13
036378	3/16/2017	3/29/2017	9
036517	2/14/2017	3/11/2017	19
036947	4/20/2017	5/8/2017	12
037202	11/28/2017	1/8/2018	29
037731	3/8/2018	3/12/2018	2
037908	3/23/2018	4/6/2018	8
038417	7/12/2018	7/18/2018	4
Average:			11

2

Problem: Currently, there is not a document that defines all of the steps required for the SxSeal process. Without a defined overall process it feels as if the SxSeal flow was not as efficient as it could be.
Process Improvement: VSM data was analyzed and interviews with employees were conducted to confirm/deny steps within the process. The team believes this would be able to increase efficiency and keep the SxSeal process crisp and smooth as it flows through with every employee knowing exactly how it should flow.
Value added: In Progress

Task Name	Original Start	Final	Precedence
Letter of Offer and Acceptance Receipt from customer	06/01/19	01/01/19	
Heat project lock-off	14/01/19	01/01/19	2
Submit vendor drawings and documentation schedule	14/01/19	01/01/19	3
Customer approves vendor drawings and documentation schedule	26/01/19	01/01/19	4
Submit Fabrication and Production schedule	14/01/19	01/01/19	5
Customer approves fabrication and production schedule	26/01/19	01/01/19	6
Submit Material Review Board (MRB) notes	14/01/19	01/11/19	7
Customer approves MRB	26/01/19	01/15/19	8
Submit install invoice	26/01/19	01/15/19	9
Project Management sends data sheet to Tech Services for re	26/01/19	01/15/19	
Design Sheet is created			
Design and Data Sheets are emailed to Design Team			

3

Problem: Customers don't respect the 24-48 hour response time as they should. Current wait time is an average of 10 days.
Process Improvement: Recommended Ametek use a 5 day response time with more emphasis in the contract and consequences if not followed.
Value added: If successful, when combined with the next process improvement these will reduce the average wait time from 10 days to 5 days.

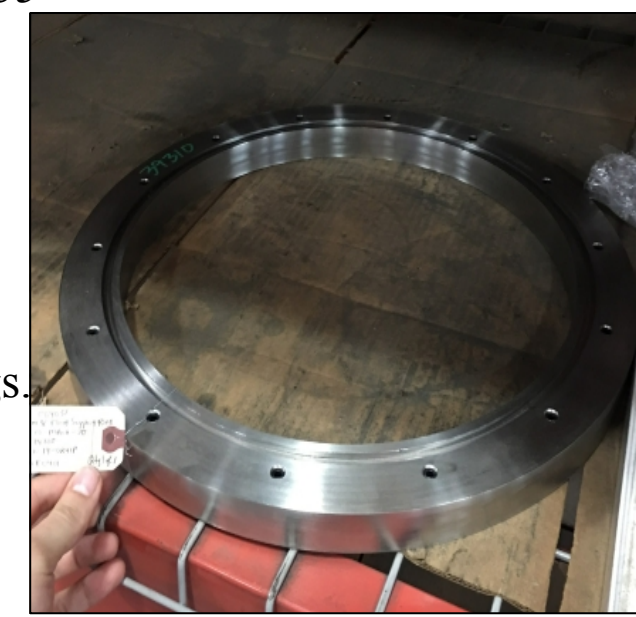
4

Problem: Customers are taking an average of 10 days to respond to PM department for review on items.
Process Improvement: A Gantt chart was created to be given to client as an educational tool to tell them in a visual way, how the schedule dates are formed and what the clients role is in ensuring schedules are met.
Value added: Estimated to save 5 days when having customers respond to Ametek.

Design	32 days	Mon 3/25/19	Tue 5/7/19
Submit TOI, QA req, and	4 days	Mon 4/1/19	Fri 4/19/19
Procedures	5 days	Mon 4/6/19	Fri 4/12/19
Customer Approval TOI, QA	5 days	Mon 4/1/19	Fri 4/12/19
QA Review, Procedure			
Submit Change Order	2 days	Mon 4/15/19 <td>Tue 4/16/19</td>	Tue 4/16/19
Request for Customer			
Customer Approval	3 days	Wed 4/17/19	Fri 4/19/19
Change Order Request	15 days	Mon 4/1/19	Fri 4/19/19
Order long lead materials	14 days	Mon 4/1/19	Thu 4/25/19
Submit FAB/ASSEMBLY drawings	14 days	Mon 4/1/19	Wed 5/1/19
Customer Approval FAB/ASSEMBLY drawings	5 days	Thu 4/25/19	Wed 5/2/19
Submit Change Order	2 days	Wed 5/2/19	Thu 5/2/19
Request for Customer			

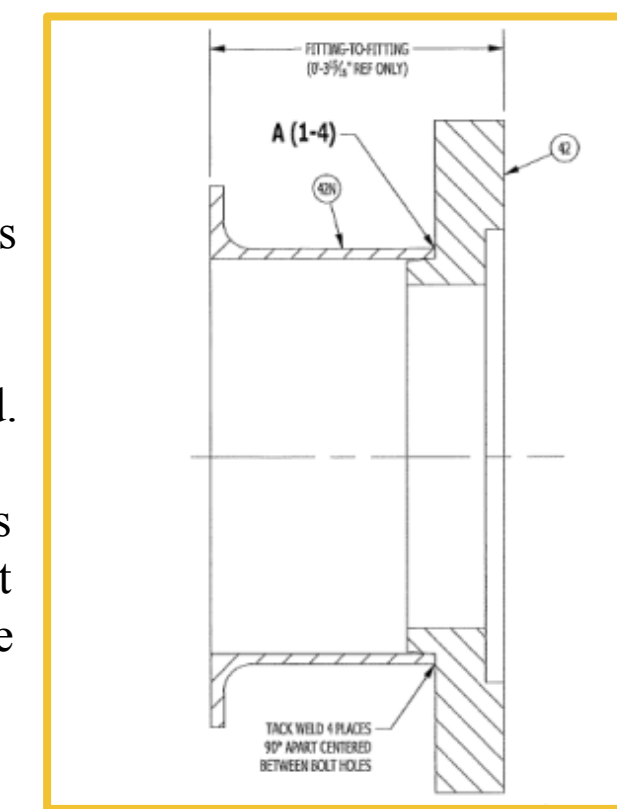
5

Problem: Certain materials have long lead times and are ordered when the Final Design Package is complete which may result in an average of 35 days delay on the shop floor.
Process Improvement: Coordinated with departments to release selected low risk drawings early so Material Control can order early. Note: Only when customer has approved Preliminary Drawings
Value added: This will save an average of 19 days by minimizing the lead time for these items and eliminating any wait time on the shop floor.



6

Problem: Current process is to have Shop Floor supervisors manually enter weld tag information onto Assembly Drawings
Process Improvement: Coordinated with Shop floor Supervisors and the Design Team to have standard templates made for future projects, so manual entry on shop floor is eliminated.
Value added: This will save an average of 0.0625 days (1.5 hrs) of manual labor on each project that can be redistributed elsewhere in the process. Money saved will be (1.5 x Employee Pay Rate).



7

Problem: There is currently downtime on the shop floor where a Sulfur Seal is not being worked on.
Process Improvement: Developed a detailed process and created a schedule with expected completion dates for each step to push work forward. Intent is to create an expectation for each sub-process step to keep the execution on track.
Value added: If expected completion dates are met an average of 5 days can be saved.

STEP	Process 2	Work Description	Estimated Time
Cutting	Low used to cut sheet of sulfur seal and half pipe to length in building C		2:00
QC Layer	Length of sulfur seal shell is measured. Layer for holes are checked there. QC signs off (Program, 0.50, 180, 270)		1:00
Drill 1	Holes are drilled where the stored assembly holes to be		0:15
Grinding 1	Any grooves the holes may have are then ground away		0:33
Filing 1	Fit Flanges, Ring, Lower Head, Half pipe and buffer clip		1:33
Welding 1	Weld Flanges, Ring, Upper Head, Half pipe and buffer clip		1:33
QC 1	QC checks flanges rings and buffer clip before it can be installed within sulfur seal shell		1:00
Testing 1	Half pipe is then X-rayed. (For see details of how long X-ray takes see notes)		1:00
Finishing 1	15, 30, 45, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330, 360, 390, 420, 450, 480, 510, 540, 570, 600, 630, 660, 690, 720, 750, 780, 810, 840, 870, 900, 930, 960, 990, 1020, 1050, 1080, 1110, 1140, 1170, 1200, 1230, 1260, 1290, 1320, 1350, 1380, 1410, 1440, 1470, 1500, 1530, 1560, 1590, 1620, 1650, 1680, 1710, 1740, 1770, 1800, 1830, 1860, 1890, 1920, 1950, 1980, 2010, 2040, 2070, 2100, 2130, 2160, 2190, 2220, 2250, 2280, 2310, 2340, 2370, 2400, 2430, 2460, 2490, 2520, 2550, 2580, 2610, 2640, 2670, 2700, 2730, 2760, 2790, 2820, 2850, 2880, 2910, 2940, 2970, 3000, 3030, 3060, 3090, 3120, 3150, 3180, 3210, 3240, 3270, 3300, 3330, 3360, 3390, 3420, 3450, 3480, 3510, 3540, 3570, 3600, 3630, 3660, 3690, 3720, 3750, 3780, 3810, 3840, 3870, 3900, 3930, 3960, 3990, 4020, 4050, 4080, 4110, 4140, 4170, 4200, 4230, 4260, 4290, 4320, 4350, 4380, 4410, 4440, 4470, 4500, 4530, 4560, 4590, 4620, 4650, 4680, 4710, 4740, 4770, 4800, 4830, 4860, 4890, 4920, 4950, 4980, 5010, 5040, 5070, 5100, 5130, 5160, 5190, 5220, 5250, 5280, 5310, 5340, 5370, 5400, 5430, 5460, 5490, 5520, 5550, 5580, 5610, 5640, 5670, 5700, 5730, 5760, 5790, 5820, 5850, 5880, 5910, 5940, 5970, 6000, 6030, 6060, 6090, 6120, 6150, 6180, 6210, 6240, 6270, 6300, 6330, 6360, 6390, 6420, 6450, 6480, 6510, 6540, 6570, 6600, 6630, 6660, 6690, 6720, 6750, 6780, 6810, 6840, 6870, 6900, 6930, 6960, 6990, 7020, 7050, 7080, 7110, 7140, 7170, 7200, 7230, 7260, 7290, 7320, 7350, 7380, 7410, 7440, 7470, 7500, 7530, 7560, 7590, 7620, 7650, 7680, 7710, 7740, 7770, 7800, 7830, 7860, 7890, 7920, 7950, 7980, 8010, 8040, 8070, 8100, 8130, 8160, 8190, 8220, 8250, 8280, 8310, 8340, 8370, 8400, 8430, 8460, 8490, 8520, 8550, 8580, 8610, 8640, 8670, 8700, 8730, 8760, 8790, 8820, 8850, 8880, 8910, 8940, 8970, 9000, 9030, 9060, 9090, 9120, 9150, 9180, 9210, 9240, 9270, 9300, 9330, 9360, 9390, 9420, 9450, 9480, 9510, 9540, 9570, 9600, 9630, 9660, 9690, 9720, 9750, 9780, 9810, 9840, 9870, 9900, 9930, 9960, 9990		

8

Problem: We believe that improvements in the SxSeal production layout could be improved to make the operation more Lean.
Process Improvement: Recommend a new layout through the use of a spaghetti diagram and find job task minimization for employees.
Value added: 5 days saved when combined with Number 7



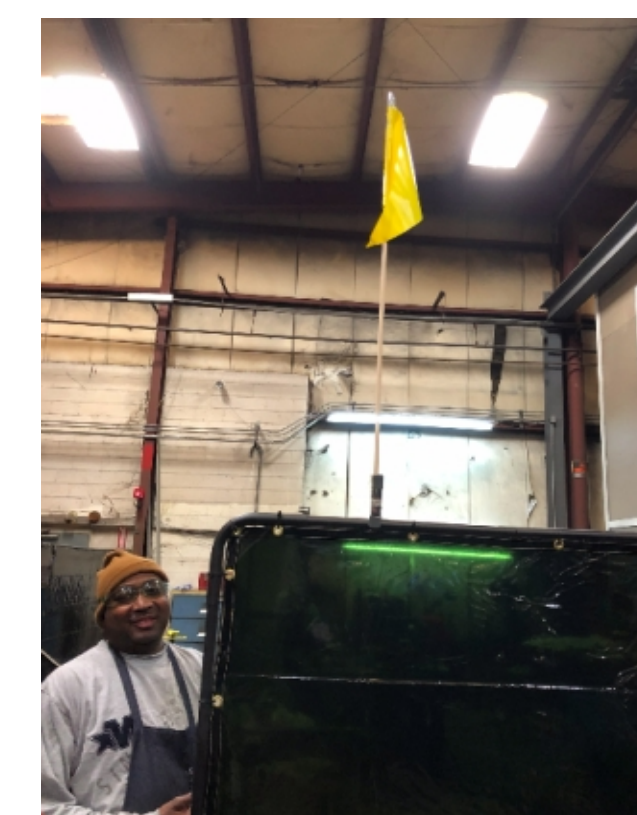
9

Problem: Data from employee interviews show that some delays occur due to communication lags between supervisors/QC and the operator during the production process.
Process Improvement: Implemented the "Lead Man System" in each bay. 1 Lead man per bay with a walkie talkie for direct access to supervisors and QC.
Value added: 104 hours per year combined with number 10



10

Problem: Lack of Communication with supervisors and QC. This is used for employees without a walkie talkie so that any miscommunication or lack of communication can be eliminated.
Process Improvement: Flag system with colors used to catch the attention of those needed. 2 flag systems in every bay.
Value added: 104 hours per year combined with Number 9.



11

Problem: Insulation services only have less than 2 days to make Contra Covers once on site. They need to physically see the Seal once 90% complete to get dimensions.
Process Improvement: Have Design create a file with dimensions early so that the Insulation team doesn't have to spend time at Ametek to gather this data, they will already have them made and can just install.
Value added: We estimate this would save 2,080 Hours if done correctly.

12

Problem: Floats tend to have a waiting period before installation. Travel time for Floats is an average of 27 minutes for each Sulfur Seal.
Process Improvement: Recommend a process improvement by reducing travel time.
Value added: Idea was not accepted by management but would have saved 2 days per year.



13

Problem: 100% of Davit Ribs are not ready to be fit the pipe upon arrival at Ametek. Prefabrication is having to be done to correct this issue. This amounts to an average of 1 hour per Sulfur Seal for Prefabrication.
Process Improvement: Redesign the Davit Rib so that the pipe fits the Davit Rib hole before arriving to Ametek.
Value added: The elimination of Prefabrication for this process saves an average of 1 hour per seal.



14

Problem: Shipping crates can arrive 2-3 days later than expected.
Process Improvement: Install an awning in the area where crates are stored to allow for possible stocking and protection of crates.
Value added: Will save an average of 2-3 days.



15

Problem: Currently paying a 3rd party to engrave nameplates. A "runner" has to pick them up. These are not always correct when received. This is costing Ametek 90 minutes every time the runner has to pick these up.
Process Improvement: Purchase an engraver for in-house creation. (BOSS Laser LS-2440)
Value added: Allows the runner to better utilize that employees time. Eliminates incorrect nameplates and an average of 3-4 days and \$100 per seal. 5 Year NPV of \$37,320 with an initial investment of \$15,975



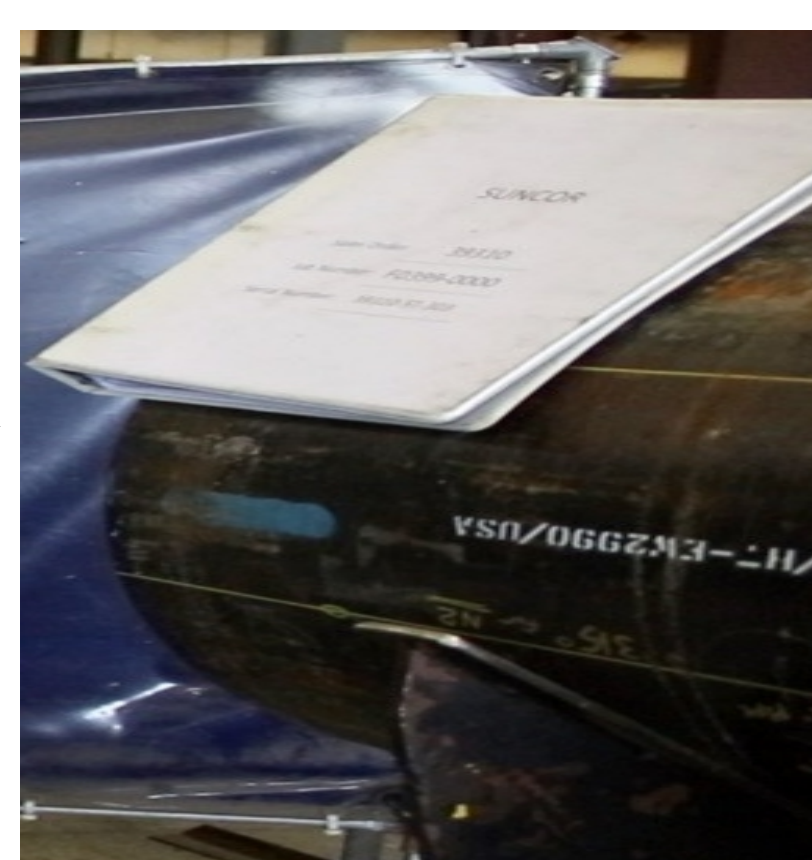
16

Problem: With inclement weather, Sulfur Seals are being transported across the venue in order to not get wet during trace install. Transportation costs an average of 10 minutes per seal and 50 minutes per order. 80 labor hours a year are lost due to inclement weather.
Process Improvement: Install an awning in trace install area that is (37 ft x 16 ft) This will allow for 6-8 Sulfur Seals to fit under and be worked on during inclement weather.
Value added: Has an 8 year NPV of \$54,380.88



17

Problem: Design Packages are getting lost, dirty, or torn
Process Improvement: Ordered a Mag Pad which is used to stick the design packages to the Sulfur Seal while being worked on
Value added: In Progress estimated savings of \$95 a year and 1 hr a year.



18

Problem: 2 inspections were needed for individual Sulfur Seals (after Hydrostatic testing and nameplate installation). This was costing \$1000 per inspection and an average of 7 days of wait time
Process Improvement: Redesigned the Davit Rib and other parts in order for paint to be able to get behind the nameplate for correct paint thickness after installation
Value added: Estimated to save \$1000 per seal and 7 days of wait time



19

Problem: Pipe is currently being cut in half by hand. This is neither safe nor efficient
Process Improvement: Currently talking to Supervisors on how changing the half pipe safer for shop floor workers.
Value added: Estimated to save an average of 30 minutes to 1 hour per 2 seals, PLUS SAFETY

