



Manufacturers Alliance Seminar

Process Mapping for Improvement

Hear what local manufacturing leaders have done map a process so that everyone can be on the same page, discuss issues, and work together to improve.

Welcome



Kirby Sneen, Vice President
Manufacturers Alliance

Please silence your phones during the presentations and discussion.

A PDF of today's presentation will be available in our Archive.

Thank you to our sponsors

Jane Paulson
MnTAP

Sara Dado
MPS

MnTAP Overview



Minnesota Technical
Assistance Program
UNIVERSITY OF MINNESOTA

- Environmental technical assistance to Minnesota businesses
- Site visits and team facilitation
- Technical staff with backgrounds in engineering, science and industry with a passion for efficiency and the environment
- State-wide, non-regulatory, no-cost, confidential
 - **Evaluate chemicals**
 - Greener/safer options
 - Reduction in use
 - Lower cost
 - **Assess waste**
 - Eliminate
 - Reuse
 - Recycling
 - **Save water**
 - Eliminate waste
 - Reuse opportunities
 - Avoid SAC charges
 - **Reduce energy use**
 - Fans & motors
 - Ventilation
 - Lighting



UNIVERSITY OF MINNESOTA

Intern Program

- Highly qualified, upper level engineering and science students.
- MnTAP staff works with businesses to scope the project and provides support throughout.
- MnTAP handles hiring, training, and payroll.
- Host companies provide an on-site supervisor and cost sharing contribution.

2017 Interns worked w/35 companies identifying opportunities that could save:

- | | |
|--------------------------------|---------------------------------------|
| • 300,000,000 gallons of Water | • 8,300,000 kWh Electricity |
| • 1,000,000 lbs Waste | • 85,082 therms Gas |
| • 4,600 lbs VOC's | • \$1,050,000 first year cost savings |
| • 780 lbs HAP's | |



UNIVERSITY OF MINNESOTA

Minnesota Materials Exchange

- Reuse generates *at least \$4 billion in gross sales annually in MN**
- Free service that connects businesses with reusable materials
- Wood pallets to industrial adhesives to motors
- Benefits:
 - Avoid disposal costs
 - Free up space
 - Keep goods out of the landfills!



www.mnexchange.org



*<https://www.pca.state.mn.us/quick-links/reuse-and-economic-activity>

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mntap@umn.edu
612-624-1300


Strengthening Minnesota's economy



279 small and large companies




14 engineering interns at 20 companies




\$1.38 million to the bottom line of 56 businesses

Preserving Minnesota's environment



1.7 million kWh & 42,000 Therms



1.4 million pounds of waste



45.3 million gallons of water



UNIVERSITY OF MINNESOTA



Twenty five years experience
Providing quality human resources
For precision manufacturers

The deeper end of the talent pool™

4

Local Market Expertise

Services

- Contract
- Contract-to-hire
- Direct placement
- On-site Programs

Industry Specialization

- Medical Device
- Plastics
- Electro-Mechanical
- Precision Machining
- Administrative

The deeper end of the talent pool



Finding You the Best Candidates Quickly

- Experts in the local candidate market
- Industry specialization
- Customized solutions
- Continuous improvement approach
- MPS internal process
- Sophisticated and in depth screening tools

The deeper end of the talent pool



Thank you members

Activar, Inc.	JEM Technical
AP Engineering	LASX Industries Inc.
Bolger	MacDermid Enthone America
CDI Curbs	Mikros Engineering Inc.
Cell Culture Company	Milestone AV Technologies
Clothier Design Source	Minco
Crown Fixtures Inc.	Nordic Ware
Data Panel	Precision Associates Inc.
DDL Inc.	Preferred Sands
Exlar Corporation	Radius Track Corp.
Gemini Inc.	Smiths Medical
General Label Inc.	UMC
Hawkins Inc.	Wagner Spray Tech
Independent Packing Services	Wurth Adams Nut & Bolt

*Member companies may send employees to
Educational Seminars at no cost.*

Featured Member Resource

Scholarship Program

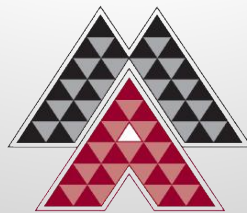
Awarded every Fall valued at \$2,400 and redeemable for leadership and continuous improvement training or certification.

Deadline to submit to Sue Moldenhauer is October 6th
Email: suem@mfrall.com

Manufacturers Alliance

Tammi Dorion

Peer Group Director



Process Mapping for Improvement

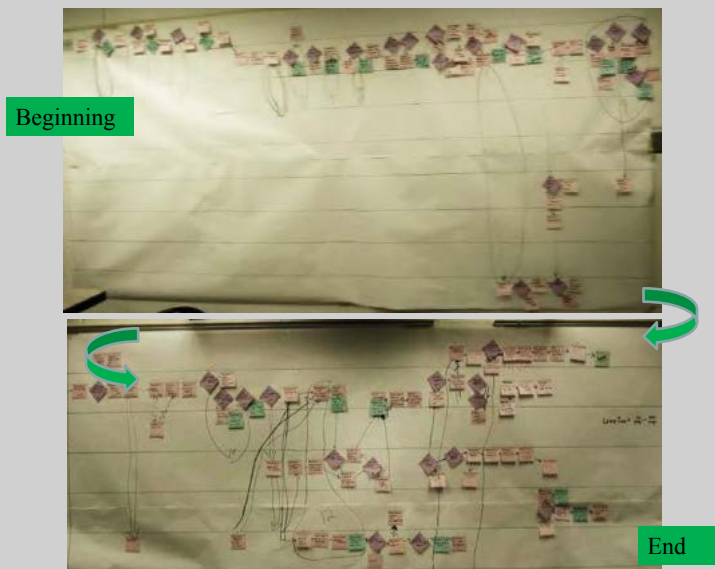
Tammi Dorion

Why?

- Provides the **baseline** for improvements
- Gets the **“voice”** of all those involved
- Shows **reality**



Warranty Process Map (Current State)



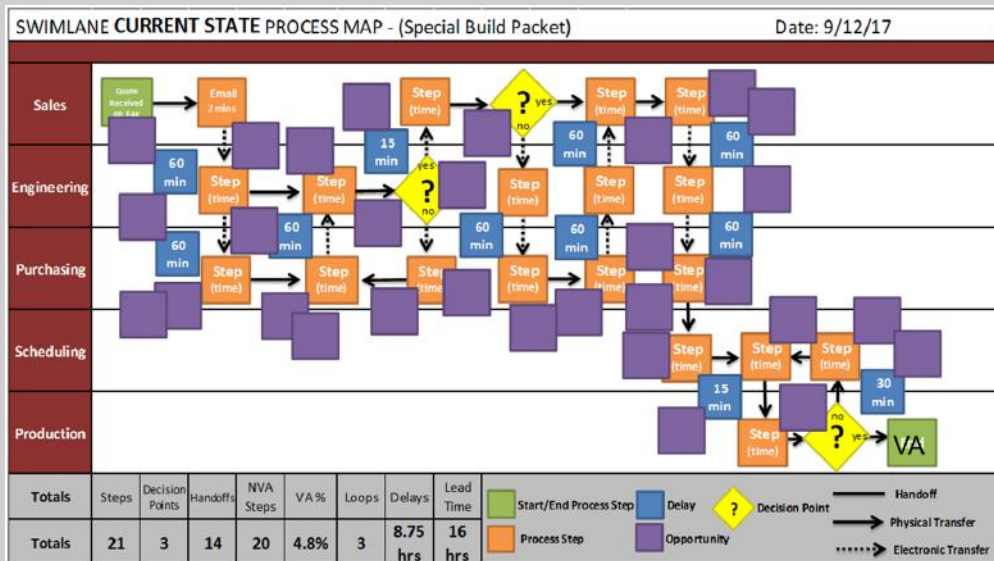
- 105 process steps
- 20 delays
- 35 decisions
- 12 loopbacks
- 65 NVA steps
- Delay Time
- 17 – 260 days
- Lead Time
- 32 – 491 days

Custom Line – Shipments 24hrs

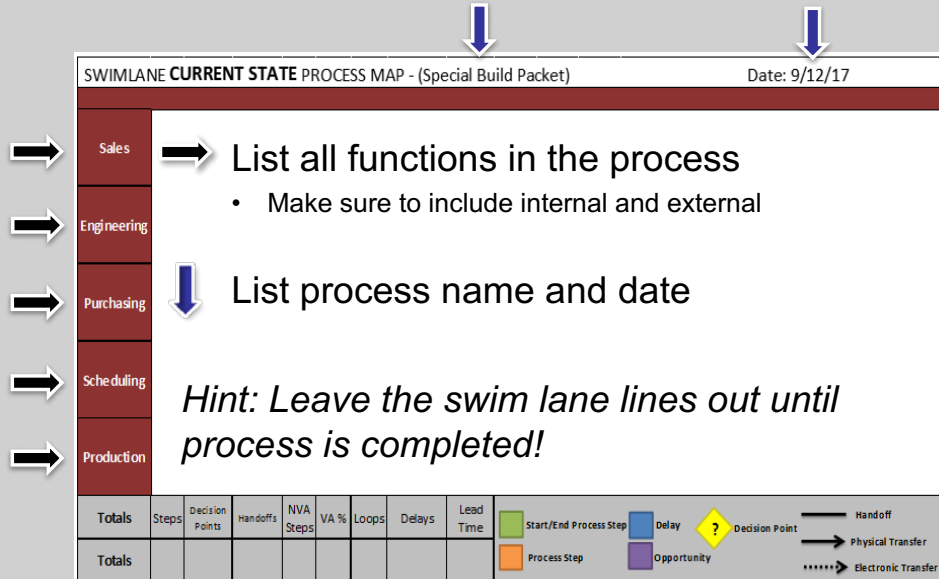


Process flow map: 113 process steps, 30 decision points, 34 delays

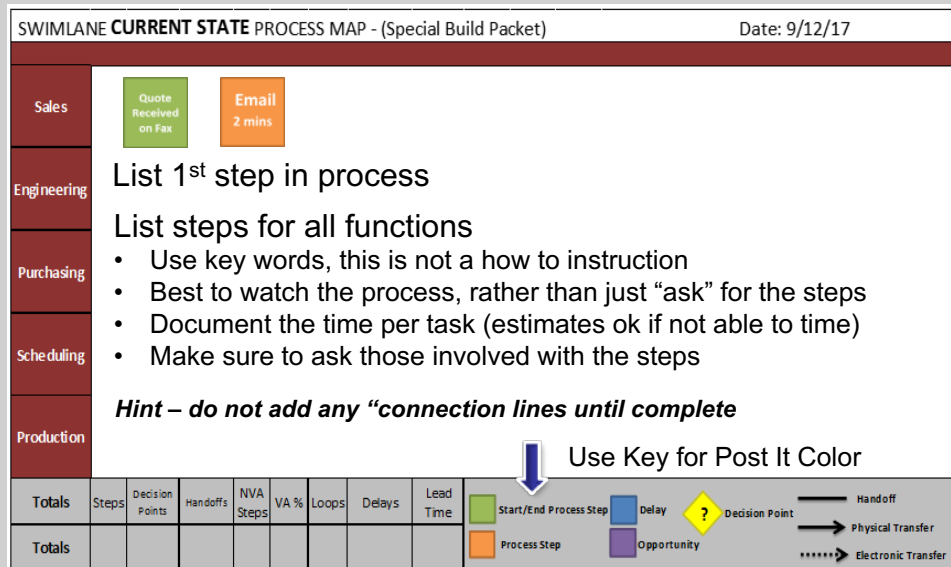
Current State Process Map



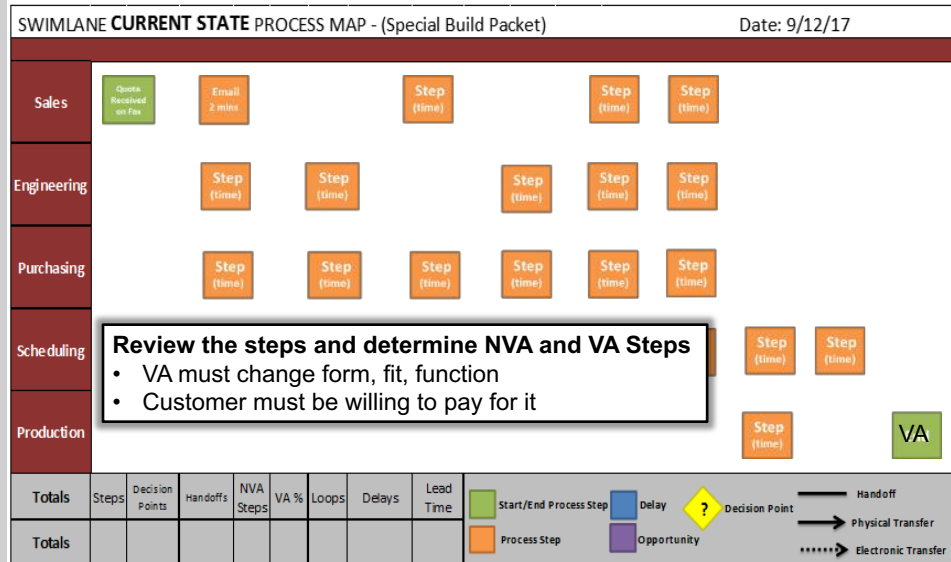
Step 1- Determine Swim Lanes



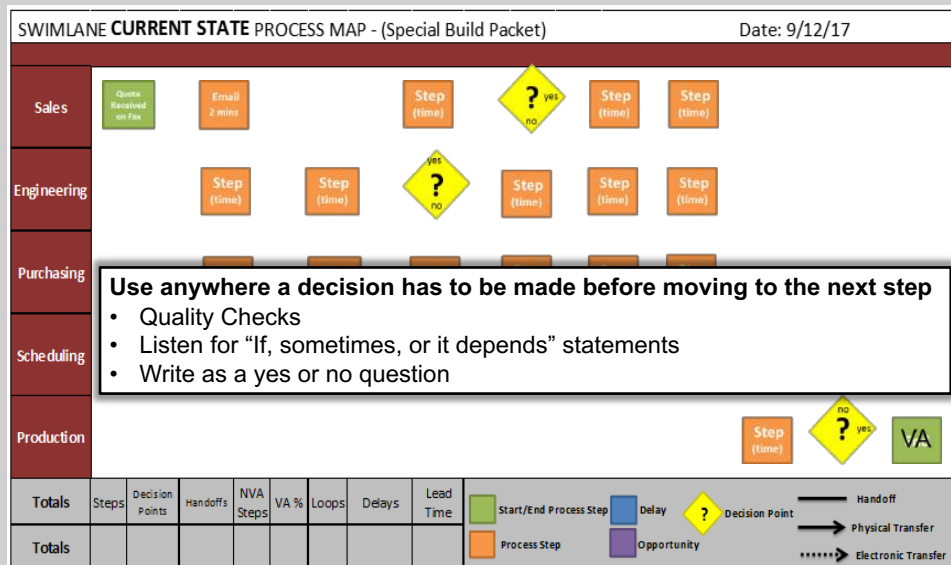
Step 2 – Document the Steps



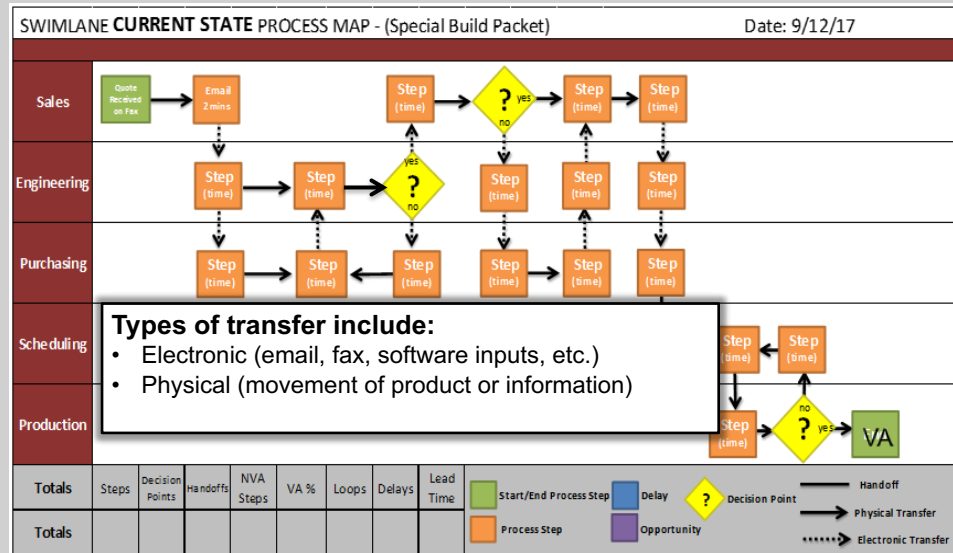
Step 2 – Finalize the Steps



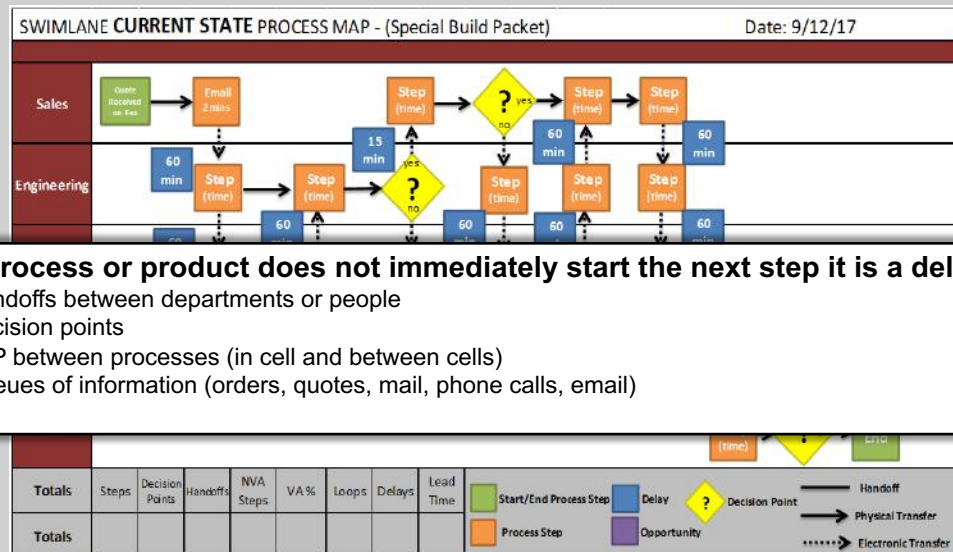
Step 3 – Add Decision Points



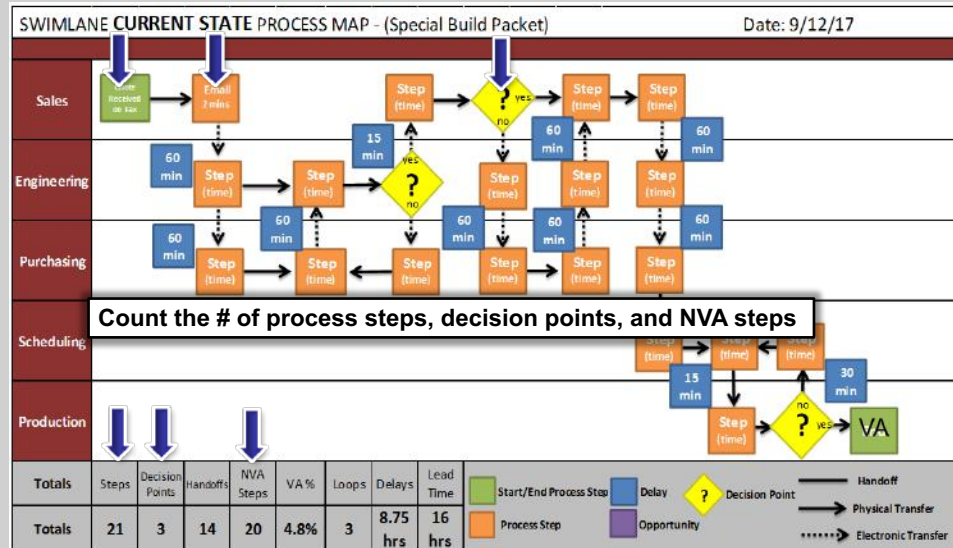
Step 4 – Add Connections and Swim Lanes



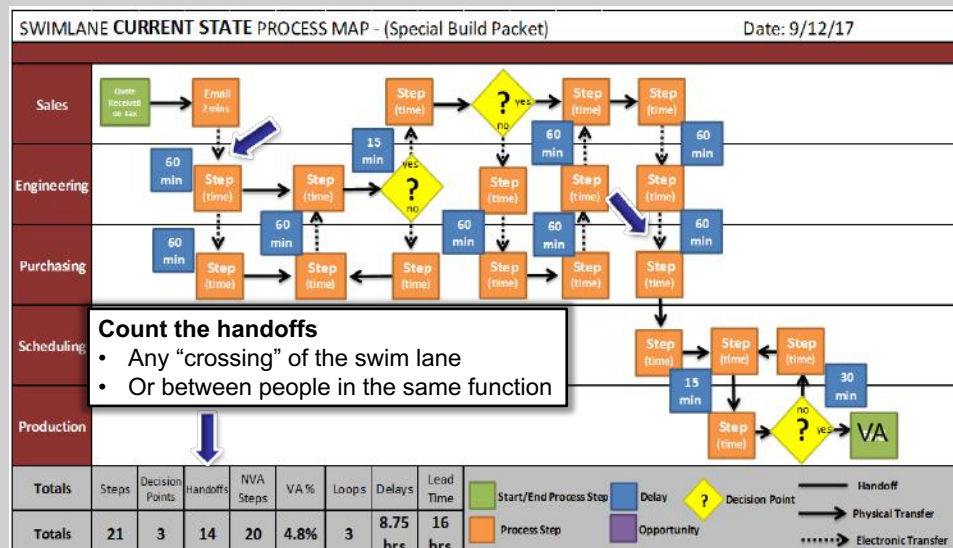
Step 5 – Add in Delays



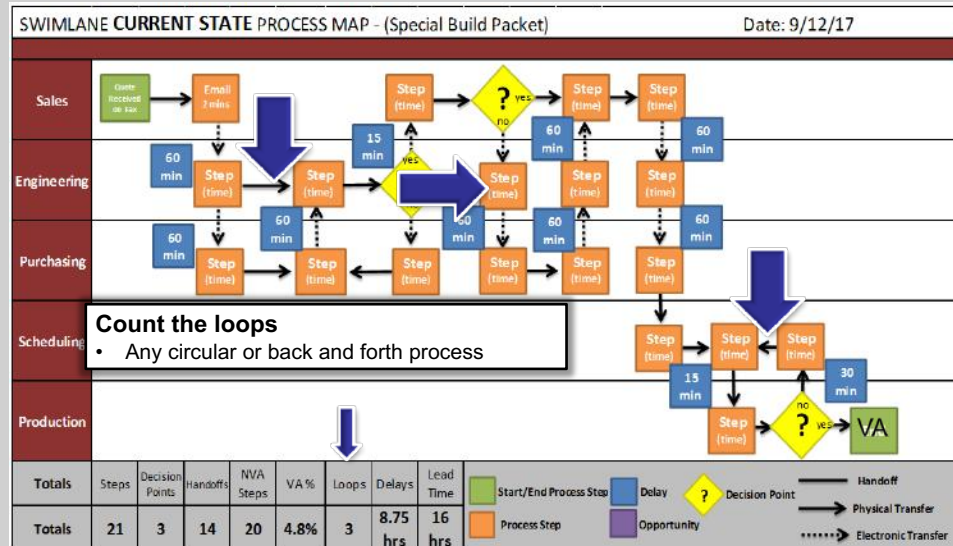
Step 6 – Sum Process Totals



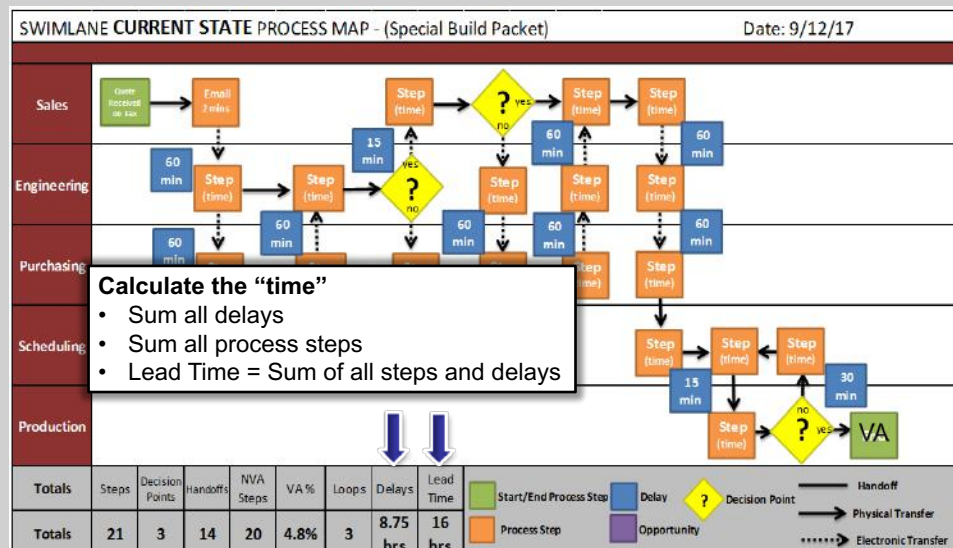
Step 6 – Sum Process Totals



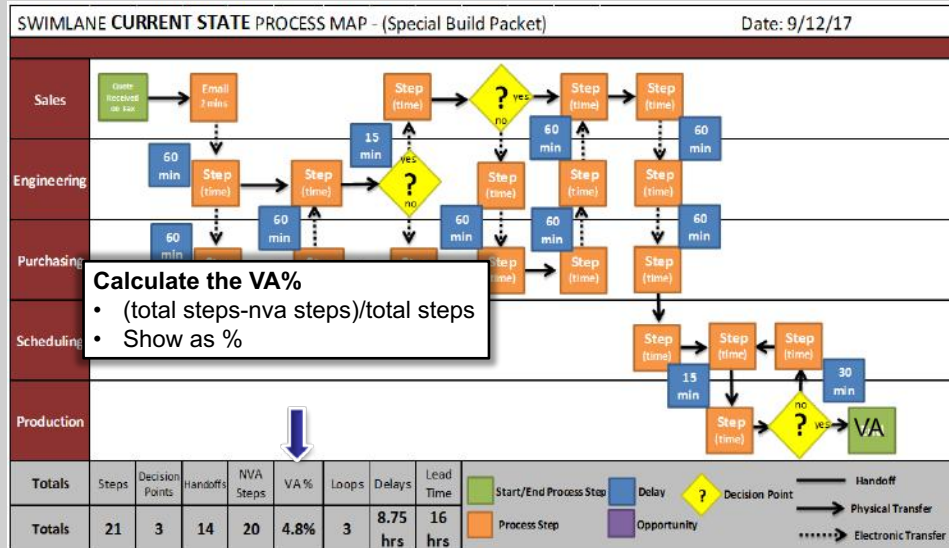
Step 6 – Sum Process Totals



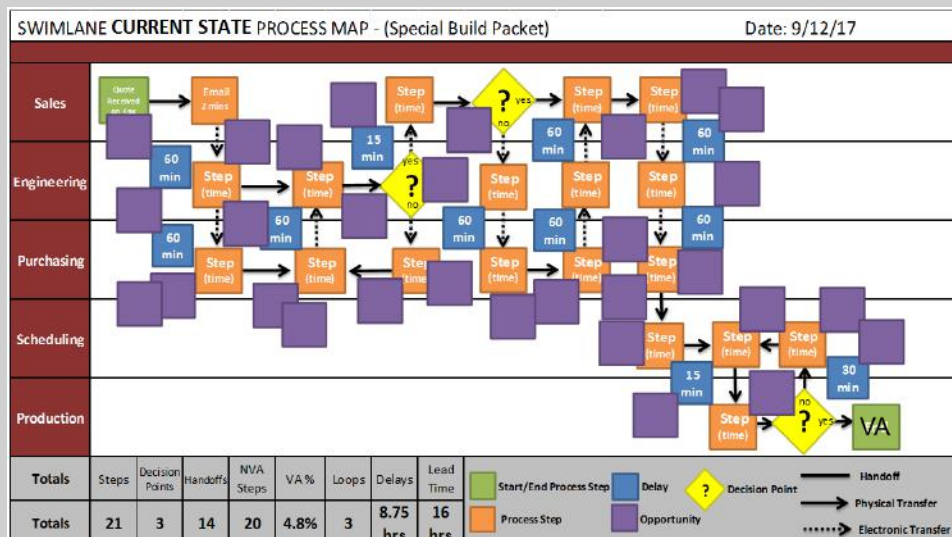
Step 6 – Sum Process Totals



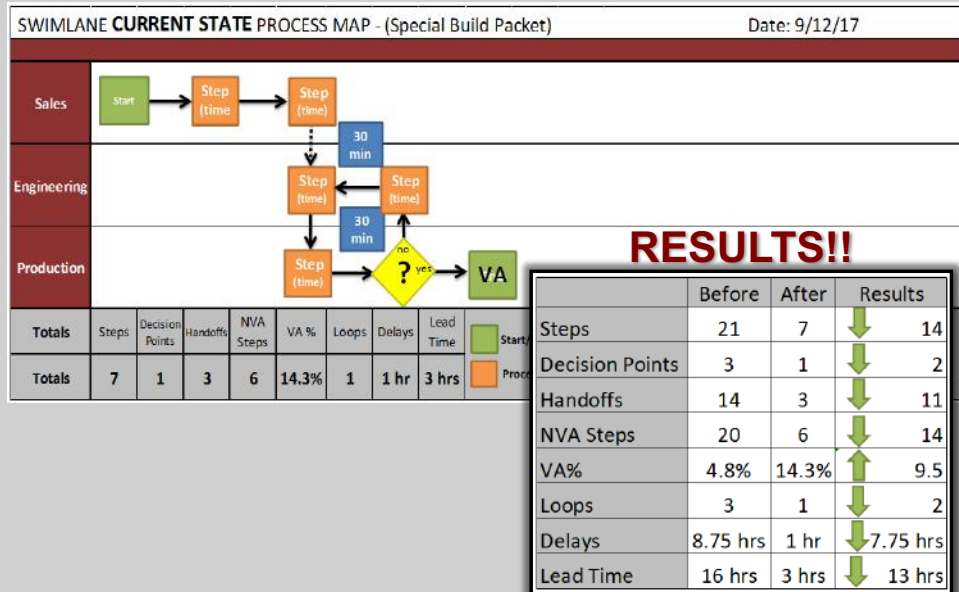
Step 6 – Sum Process Totals



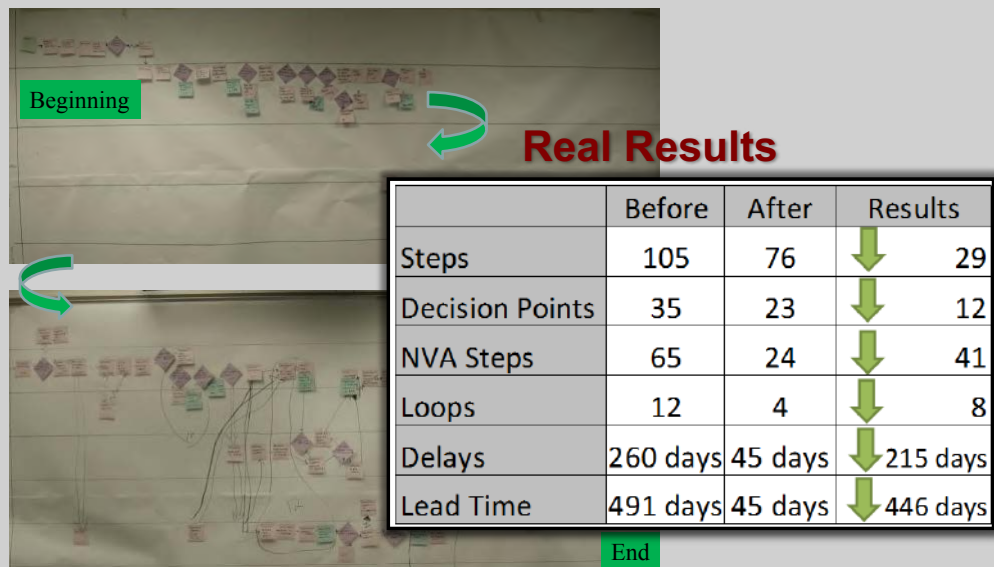
Step 7 – Brainstorm Opportunities for Improvement



Step 8 – Future State Map



Warranty Process Map (Future State)



Challenges

- **Missed steps in the process**
 - ✓ SO WHAT? Everything is CI opportunity
 - ✓ Add it in and move forward
- **Resistance**
 - ✓ Everyone is busy – acknowledge this
 - ✓ Don't forget to explain the why
- **Low Energy**
 - ✓ This is a mentally challenging process
 - ✓ Prepare everyone
 - ✓ Have diversions and treats



OR?



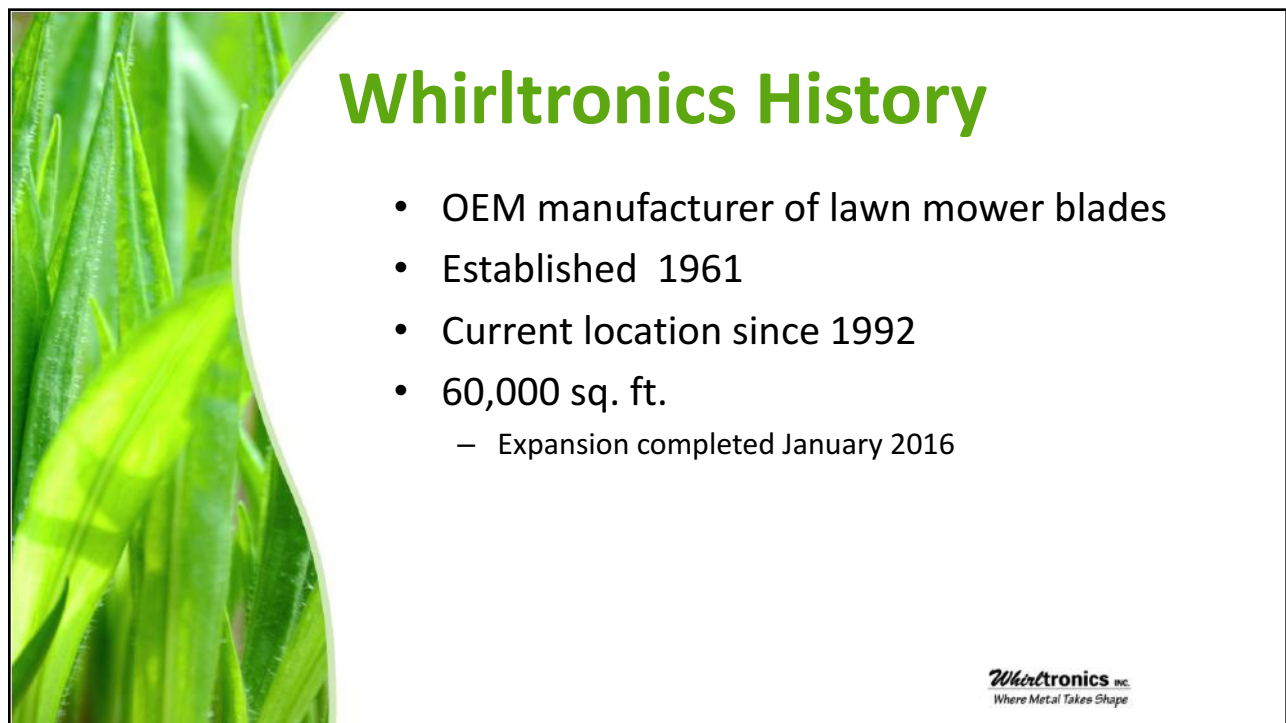


**Thank
You!**

Whirltronics, Inc.

Jennifer Lindquist

VP of Engineering

A presentation slide with a background of green grass. The title "Whirltronics History" is in a large, bold, green, sans-serif font. Below the title, there is a bulleted list of facts about the company's history. The Whirltronics logo is in the bottom right corner.

Whirltronics History

- OEM manufacturer of lawn mower blades
- Established 1961
- Current location since 1992
- 60,000 sq. ft.
 - Expansion completed January 2016

Whirltronics INC.
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OEM Customers



STIHL®

eXmark



JACOBSEN
A Textron Company

Cub Cadet

Ariens

MTD
For A Growing World.®



Wheeltronics INC.
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Core Manufacturing Processes

- Manufacturing Cells
 - Shearing
 - Sharpening
 - Forming – Hot and Cold
- Austemper Heat Treat & Straighten – 3 lines
- Powder Coat Paint
- Packaging
 - Boxing
 - Shrink Wrap
- CNC milling

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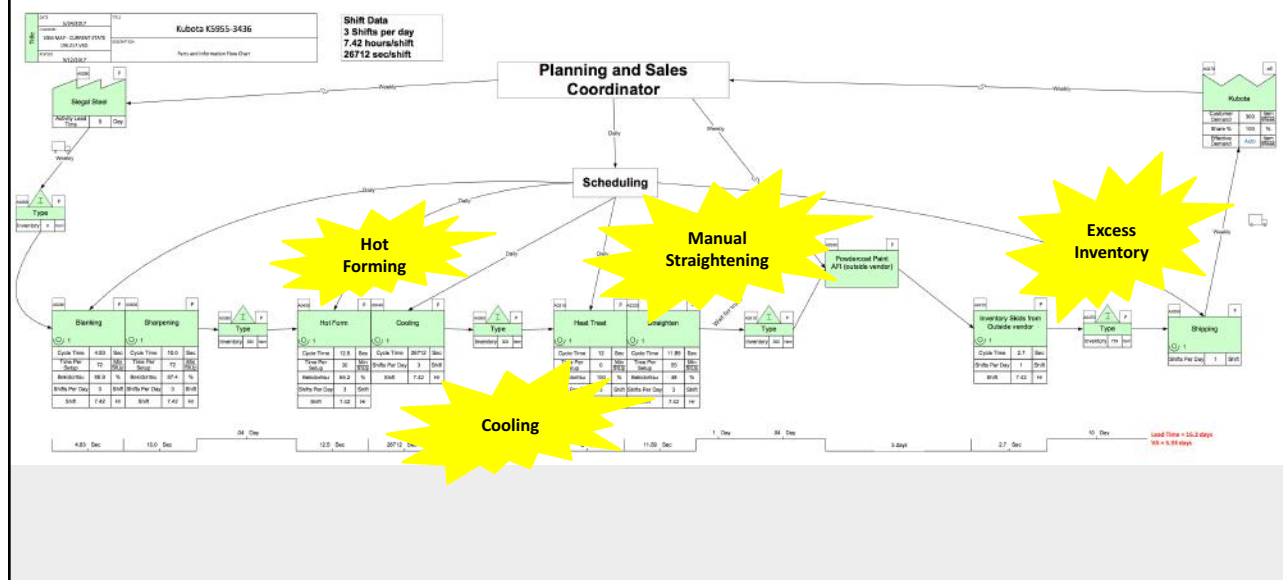


Whirltronics Kaizen Model

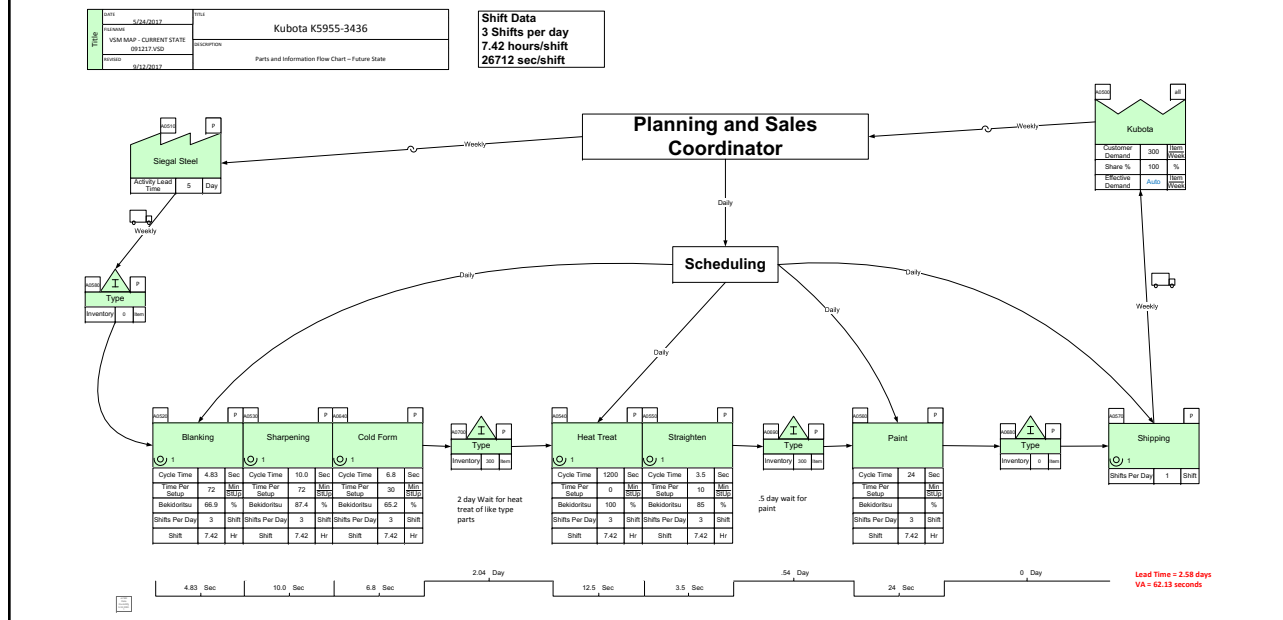
- Set project goals:
 - 20% cost down
 - 0 defects
 - 200% productivity improvement
- Map the current state
- Observations
- Brainstorms
- Choose projects
- Implement
- Audit

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Map the Current State

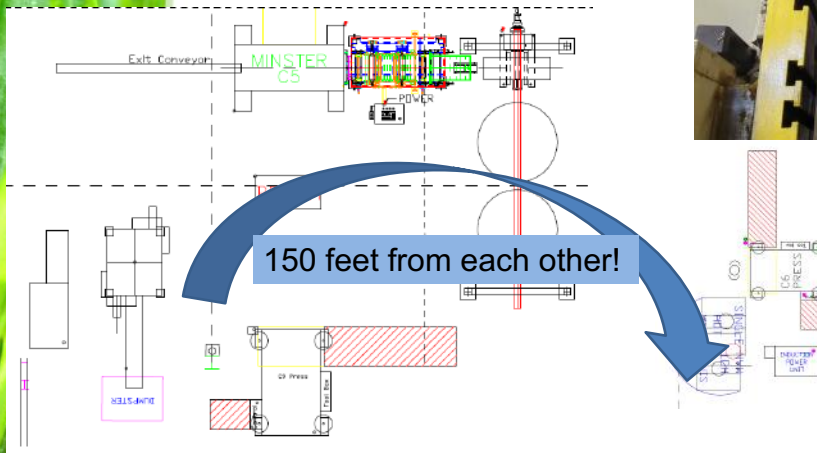


Map the Future State



Before:

- Not Single Piece Flow
- 3 Operators



Wheltronics inc.
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Kaizen Team Charter - Plan

Wheltronics inc. ISO 9001 : 2000 CERTIFIED	Description: Kaizen Team Charter	Rev.	Dr.	Date:	9/9/17
	Department: All				
	Document: P00034				

(kaizen event standard work at end of document)

Event No.:	192	Event Start Date:	9/7/17
Kaizen Name:	Name the kaizen		
Kaizen Area:	Area that the kaizen is taking place		
Team Lead:	Jennifer Lindquist		
Team Members:			
Problem Statement (Describe the issues with the current process):			
Project Scope (What parts of the process are in bounds and what parts are out of bounds):			
Determine what is out of bounds			
Goal Statement (Specific Measureable Attainable Realistic Timely):			
20% cost down			
0 defects			
200% throughput increase			

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Kaizen Team Charter

Project Schedule

Whirltronics inc. ISO 9001 : 2008 CERTIFIED	Description: Kaizen Team Charter
Document: POG034	Rev: 0 Date: 9/17

(Kaizen event standard work at end of document)

Timeline & Meeting Schedule:		
Date:	Time:	Meeting Objective
8/15/17	7:30	Observations and brainstorming
8/28/17	7:30	Project selection
9/3/17	8:00	Progress meeting
9/7/17	8:00	Prep project to close in Tuesday meeting
Project Completion Date:		9/7/17

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Go and See

Time study sheet											
Line	Line 6					Worker	Name Jay				
Process	Hot form					Experience					
Model	K5595-3436					Date	Jun 12, 2017	Name	Jennifer		
Clock time	Start	End				Amount					
Element work	1	2	3	4	5	6	7	8	9	10	Element work time
1 Put part in press (1)	2.57	2.44	2.47	2.58	2.89	2.6	2.8	1.88	2.43	2.67	2.533
2 Cycle Press (1)	2.54	2.61	2.52	2.67	2.56	2.62	2.45	2.46	2.64	2.57	2.564
3 Remove part (1)	1.61	1.79	1.61	1.69	1.66	1.76	1.68	1.87	2.21	1.84	1.784
4 Wait (1)	5.33	6.01	5.85	6.05	6.59	6.2	7.56	6.51	6.64	6.53	6.327
5 Grab part (2)	2.17	2.50	2.3	2.1	2.29	1.88	2.47	2.72	2.38	2.38	2.325
6 Cycle press (2)	2.47	2.50	2.50	2.59	2.53	2.56	2.64	2.54	2.46	2.54	2.545
7 Remove part (2)	2.04	1.63	1.68	1.67	1.52	1.72	1.49	2.53	1.59	1.84	1.771
8 Put in Basket (1&2)	3.8	3.91	4.72	4.28	4.32	5.1	6.53	5.37	4.32	5.11	4.746
9 Wait (2)	2.01	1.74	2.83	1.96	3.11	3.24	1.76	2.27	2.02	2.42	2.336
Total (CT)											13.4655

Analyse process videos

Muda discovery sheet					Date: Jun 15, 2017	
Dept	Line	Process	Takt time	Gr	Gap	Name Jennifer
Hot Form	Line 6	Hot Form	5 sec	13.5 sec	8.5 sec	
No	Element work or Process	Present Muda			Muda value	
1	Wait (1)	Waiting for hot form station to heat part			6.3 sec	
2	Wait (2)	Waiting for hot form station to heat part			2.3 sec	
3	Put parts in basket	Grab 2 parts with tongs and walk to place them in the basket			4.7 sec	

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Before 5 Operators

Standard Work Combination Chart			Part Name/Number: KG955-3436	Demand Amount: 300	Rev Date: 6/22/2017	Approved:	Prepared By: JL						
			Process: Blanking, Sharpening, Hot Forming, Heat Treat	Task Time:	HT NT WT								
			Time (sec)	Work Time (sec)									
Step	Work Name	WT	MT	HT	5	10	15	20	25	30	35	40	50
1	Remove part			2.0									
2	Blank part			2.8									
1	Remove part			2.5									
2	Put Part in Machine			2.5									
3	sharpen part			5.5									
1	Put part in press			2.5									
2	Cycle press			2.5									
3	Remove part			1.8									
4	Put in basket	2.0		2.7									
5	Heat part			13.8									
1	Heat treat			10.5									
1	Straighten			6.5									
Sub Total		2.0	41.9	21.8									
Total			23.8										

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Observations and Brainstorming

200% Thruput Increase
0% Defect
20% Cost Down

Observations

- Cold Form only achieves .010 Flatness
- We've tried manipulating die in die for cold form - not successful
- Flatness 0.01 is at an angle following grain dir.
- Working to put points in basket
- Hot form is 12.55 cycle time
- Cold form is
- No Std. work for induction heating part
- Cooling system via ~40 from operator
- Tolerances is really close
- Cost use wires for flatness due to heat
- Hot Form causes quality issues down the line
 - Part quality
 - Slag on parts
 - Needs die
 - Parts stay in pot
- Lose 8 hr production for casting
- Breaks up the flow
- Handling blades multiple times - load magazines
- Changed to smaller pin in hand to changeover
- Sharpening hours got in from die case the tub
- H6
- Temp not ergonomic
- Energy to heat part
- Contrasting to schedule
- Die gets full of Slag - rare when die when maintained
- Only hot forming because of cast flatness
- Kabota Flatness tolerance is below ind. Std.
- Material is causing flatness issue
- Lines VP/DW don't make a difference
- Measuring flatness in automated state
- K150 dies blades are cold formed
- 150 dies cannot used for all blades

Hot Form: For larger tolerance
- Die flatness is in mounted/removed state
- Reduce the flatness area

Hot Form:

- Reduce heating time - STD work
- Place cooling station to TOL
- G11 cooling
- Reduce full cool parts
- For cool
- Heat casting
- Experiment all time + temp to eliminate slag
- What temp could to get rid of temp + reduce flatness
- Heat die instead of part
- Heat cooler only

Cold Form:

- Double hit
- Die for only 5955
- Cutter that follows the grain angle to achieve flatness
- For cool
- Run parts thru leveler before form
- Lower hot flatness + force to see if planar comes flatness back

Whorltronics inc.
Where Metal Takes Shape

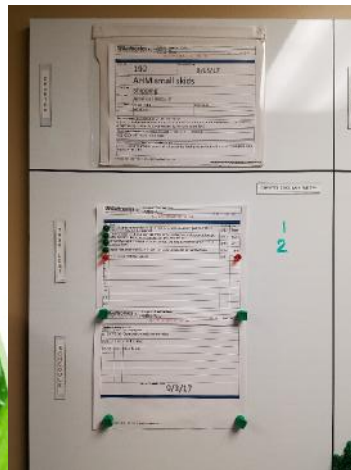
Create project list - Do

Wheeltronics inc. ISO 9001:2008 CERTIFIED	Description: Kaizen Team Charter Department: All Document: PQ0014 <small>(Kaizen event standard work at end of document)</small>	Rev: 01 Date: 08/17
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No.	Task	Due Date	Resp.
1.	Task 1	8/17	Team
2.	Task 2	8/17	Team
3.	Task 3	8/20	Jen
4.	Task 4	8/28	Team
5.	Task 5	9/3	Team
6.			
7.			
8.			
9.			
10.			
11.			
12.			















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Kaizen Team Charter Report Progress



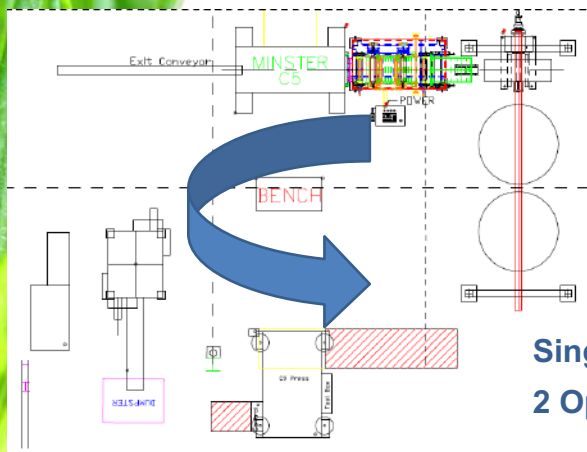
Wheeltronics inc.
Where Metal Takes Shape

After 4 Operators

Standard Work Combination Chart				Part Name/Number: K9555-3436	Demand Amount: 300	Rev Date: 6/22/2017	Approved:	Prepared By: JL						
				Process: Blanking, Forming, Sharpen, Heat Treat, Straighten	Takt Time:	HT  MT  WT 								
Step	Work Name	Time (sec)			Work Time (sec)									
		WT	MT	HT	5	10	15	20	25	30	35	40	45	50
1	Remove part			2.0										
2	Blank part		2.8											
3	Put part in press			2.5										
4	Form Part		2.5											
5	Remove part			1.8										
1	Remove part			2.5										
2	Put Part in Machine			2.5										
3	Sharpen part		5.5											
1	Heat treat		10.5	1.5										
1	Straighten		3.5	1.5										
Sub Total		0.0	24.8	14.3										
Total			14.3											

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After



Single Piece Flow!
2 Operators!

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Kaizen Team Charter Share the Wins

Which of the 8 wastes did the kaizen target?	Describe Impact
Overproduction	
Waiting	x Waiting for parts to be heated
Transportation	
Non-value-added processing	x Hot forming is not required for customer, flatness is the requirement
Excess inventory	
Defects	x Reduces defects during forming and burrs get stuck on hot parts
Excess motion	x Loading magazines handling blades with tongs. Waiting for blade to cool down to inspect
Underutilized people	

254% increase in throughput

\$.06 per part electricity savings!

List the kaizen accomplishments (throughput increase, single piece flow, etc.) What goals were met or exceeded?
1. Were able to achieve center flatness that meets the .127mm print tolerance.
2. Blades can be reformed when process change is approved by Kubota
3. Hot form equipment no needed from parts. Parts can be run in cold form cell.
4. Cold form blades paint more consistently without scaling issues
5. 254% throughput increase!
6. \$.06 per part electricity savings!
7.

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Kaizen Team Charter Check & Sustain




Whirltronics INC. ISO 9001 : 2000 CERTIFIED		Description: Kaizen Team Charter		Rev:	D:	Date:
Department: All		Document: POC034				09/17
(Kaizen event standard work at end of document)						
List ISO/Training Documents that were created/updated due to process improvements:						
Document Nos:	Document Name:					
	None					
Training Plan (who will train and when?)						
Trainer:	Document:	Date Complete:				
	None					
Kaizen Audit (how will you test for kaizen sustainment?):						
Audit Name:	Audit Description:					
	Included in shipping and receiving audit					
Audit Plan						
Auditor(s):	Audit Frequency (eg: 3 times/wk):	How will you know when you achieved sustainment from your audit (Eg: Audit results)?				
Shipping	3 Times/day	Will show up in audit results				

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iAuditor for Sustainment

<https://safetyculture.com/iauditor/>

- Auditing app for an iPad or tablet.
- Simple to create
- Simple to use
- Audit results are emailed to mgmt.
- Helps change culture when an improvement is completed.
- Audit results can be presented in a graph to watch for trends.

Question	Response	Details
Are we currently running line two?	Yes	
Take a picture of the current work order		
 Appendix 1		
Check the part number displayed on the production board by scanning the current job. Is the number correct for the job running?	Yes	
Take a picture of the current magazine heights (make sure sensor heights are clearly visible in the picture)		
 Appendix 2		
Are the magazine set to the correct height?	Yes	180 station is not working and balance problems from cutting edge variation and burr on edge of parts.
Magazines are clear of all excess blades (predominantly below)	Yes	
Select Employee Audited	Lincoln Jensen	
Audited Employee (have them sign)		9/7/17 4:35 AM
		

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Closing Comments

Networking Break

10:00

Networking Break

10:00

Boston Scientific

Bree Bowersox

Global Enterprise Excellence
Sr. Project Manager

Driving High-Performance Across All Areas of Our Business

Boston
Scientific

Helping clinicians treat more than **24 million*** patients each year

135 active
clinical trials
underway

Fortune 500 company with **\$8.4 billion** in sales and seven operating divisions

\$54 million donated to medical research, educational and charitable giving

Boston Scientific is dedicated to transforming lives through innovative medical solutions that improve the health of patients around the world.

13,000
products that change lives

Investing over \$900 million annually in R&D and Clinical Science

Ranked 21st greenest company in the U.S.

Committed to innovation with **93 new products** launched and nearly **23,000 patents** issued globally

Transforming Lives Across the Globe

Boston
Scientific



100+ countries with
commercial representation



27,000+ employees in
40 offices and **13**
manufacturing centers
worldwide

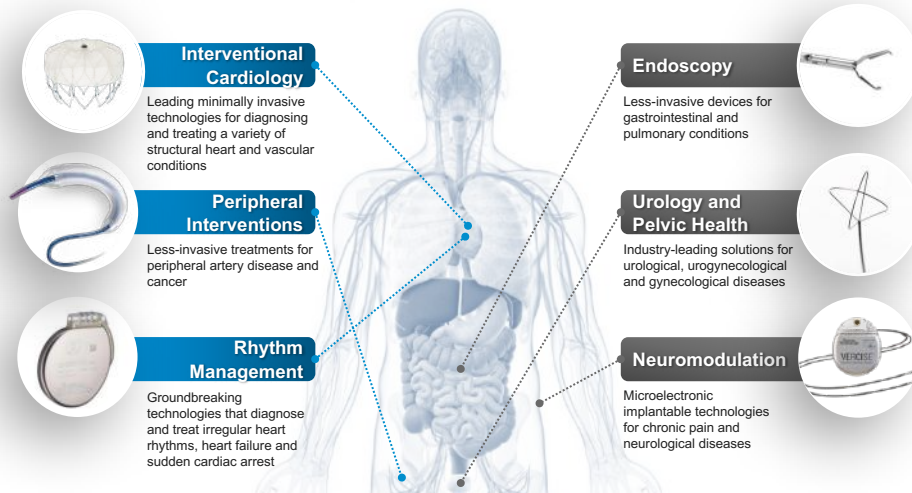


Approximately 40%
of net sales in 2016
were international

63

Developing Category Leadership

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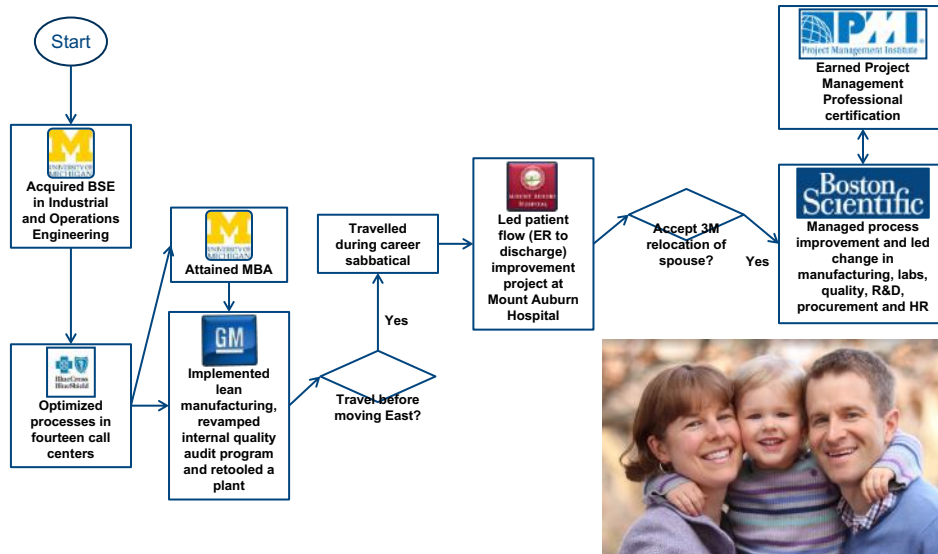


Please visit www.bostonscientific.com for all product indications, safety and warnings.

*The Vercise™ DBS System is CE Marked for Parkinson's disease, Dystonia and Tremor. The Vercise PC DBS System is not available for use or sale in the U.S. The rechargeable Vercise DBS System is investigational in the U.S., currently being evaluated in the INTREPID Study, and is not available for sale.

64

Bree Bowersox Bio

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65

Lessons Learned ➔ Best Practices

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Lesson	Best Practice
What are we trying to accomplish and who owns the process?	Project charter
What is our scope and who should be on the team?	SIPOC
What is in it for our team members and what is team's understanding of process, waste, etc.?	Training
What do we think the process is vs. what is the actual process?	Process map
What did we accomplish?	Metrics



66

Training

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Purpose

- Help team members understand purpose of mapping, their role and WIIFM (what's in it for me)
- Bite sized introduction/ review of tools to be used, so entire team is on the same page



What is a process?

- Series of tasks or activities completed to achieve a result
- Uses resources (people, time, space, etc.)
- Everything we do is a process



Eat More Cake (or Broccoli)

Do more of what you like and less of what doesn't add value!



Make Customers Happy

Spend more time on what customers want to pay for!



Save Money

Identify and eliminate wastes to improve efficiency!



Reduce frustration

Remove waste in processes and improve morale!



Develop Career Skills

Develop problem solving and process improvement skills!

69

Training: Waste (audience specific examples)

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Waste is any activity our customers don't want to pay for.

Wastes add cost and time to our processes. Wastes are symptoms of root cause issues.

Transportation

Excessive travel of information, materials or people

- Multiple hand-offs
- Back and forth email
- Walking to someone's desk for clarification



Waiting

Idle time for information, materials, people or equipment

- Lag time for answers
- Long approval process
- In process work sitting idle



Inventory

More information, projects, material, and/or people than needed to meet customer requirements

- Large work queues
- Archiving redundant data
- Not using FIFO (first in first out)



Over-production

Producing more than the customer needs

- Presenting the same information multiple times in different formats
- Printing hard copies of electronic documents



Over-processing

Performing activities that are not required by the customer

- Recording unused data
- Redundant process checks
- Multiple sign-offs



Motion

Extra effort and complexity that does not add value

- Searching for files
- Starting/ stopping same piece of work multiple times
- Movement between programs



Defects

Work that involves errors or is missing information that causes rework

- Rework loops
- Missing information
- Incorrect information

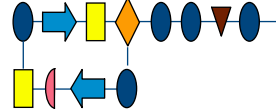


70

Four Versions of a Process

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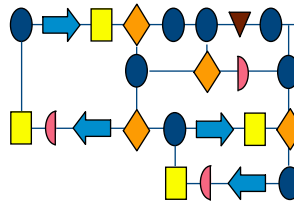
THINK it is
(what's in people's
heads, procedures)



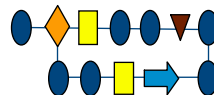
SHOULD be
(ideal state)



ACTUALLY is
(observed current state)



WILL be
(future state)



Best Practices

- Observe/ map the process as a team
- Talk with customers (What is the purpose of the process? How is it/ is it not meeting customer needs?)
- Discuss ideal state (considering a process without constraints will help team alleviate some future state obstacles)

71

Metrics

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Safety
Quality
Delivery
People
Cost



- Set goals (in charter)
- Establish baseline early (How will data be gathered? What is gap between current and desired?)
- Use combination of leading and lagging metrics
- Track metrics after implementation until new process is stabilized/ habitual and goals are achieved

72

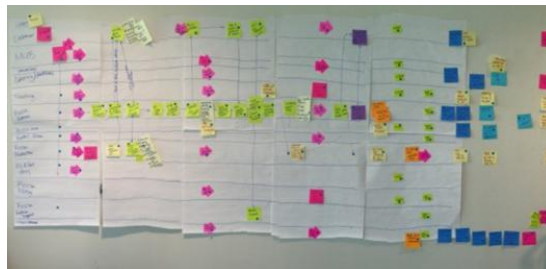
Lessons Learned



Best Practices

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Lesson	Best Practice
What are we trying to accomplish and who owns the process?	Project charter
What is our scope and who should be on the team?	SIPOC
What is in it for our team members and what is team's understanding of process, waste, etc.?	Training
What do we think the process is vs. what is the actual process?	Process map
What did we accomplish?	Metrics



73

Q & A

Manufacturers Alliance
Tammi Dorion

Whirltronics
Jennifer Lindquist

Boston Scientific
Bree Bowersox

How did we do?

Please fill out your ***feedback sheet*** for today's seminar.

Educational Seminars

Leverage the best practices and lessons learned from a diverse panel of industry peers.



Engaging Every Individual in Safety

October 12 at Hennepin Technical College

Learning to See Waste

November 8 at Aveda Corporation

Experiential Workshops

Practical methods to continuously improve manufacturing and leadership practices



Maximizing Team Performance

Sep 21

Lean Product Development

Sep 22

NEW - Accelerating a Lean Culture

Sept 28

Mapping For Business Process

Oct 10

Practical Certifications

It's not enough to understand leadership principles and Improvement techniques. Success lies in implementing them.



Lean Leader Certification

Next series starts September 28

Six Sigma Green Belt Certification

Starts October 4

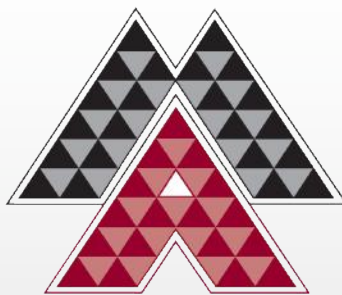
Peer Group Membership

Would you like feedback on your challenges? Leverage a group of your peers as your own board of advisors.



- Lean Enterprise
- Advanced Lean Enterprise
- Business Process Improvement

See you soon!



Manufacturers Alliance

www.mfrall.com