



Lean Yellow Belt Certification

LEAN **LS**
SOLUTIONS

Meet Your Instructor



- Background
- Lean Solutions "Train-The-Trainer" Course
- Internationally Certified Trainer



CLASS SCHEDULE

Session 1

- Roles and Responsibilities of Belts
- What is Lean & Six Sigma?
- 8 Wastes
- Voice of the Customer (VOC) and CTQs Process
- 5S
- Total Productive Maintenance
- Standard Work

Session 2

- PDCA
- Kaizen
- Continuous Flow
- Process Mapping
- Visual Management
- Jidoka/Poke Yoke
- SMED
- **YELLOW BELT EXAM**

Yellow Belt

The Fundamentals of Lean Six Sigma	Defining a Process / CTQ
History / Process / Cause & Effect	The 8 Elements of Waste / Belt Roles
Principles of Lean / Six Sigma	5S / Lean Tools / Visual Management / SMED
Process Mapping / DMAIC	Kanban / Poka-Yoke / Standardized Work
PDCA / Kaizen & Kaizen Events	Lean & Six Sigma Belt Roles
Kano Analysis	Total Productive Maintenance
Voice of Customer, & Business	Value Add & Non Value Add Work

Lean Green Belt

Project Management	Fishbone Diagrams / Graphical Analysis
Project Charter	Lean Metrics & Projects
SIPOC	FMEA
7-Quality Tools / Pareto Analysis	Facilitating a Kaizen Event
Control Charts	Strategy Execution
Control Plans	Hoshin Kanri
Gantt Chart	Change Management
Structured Problem Solving	

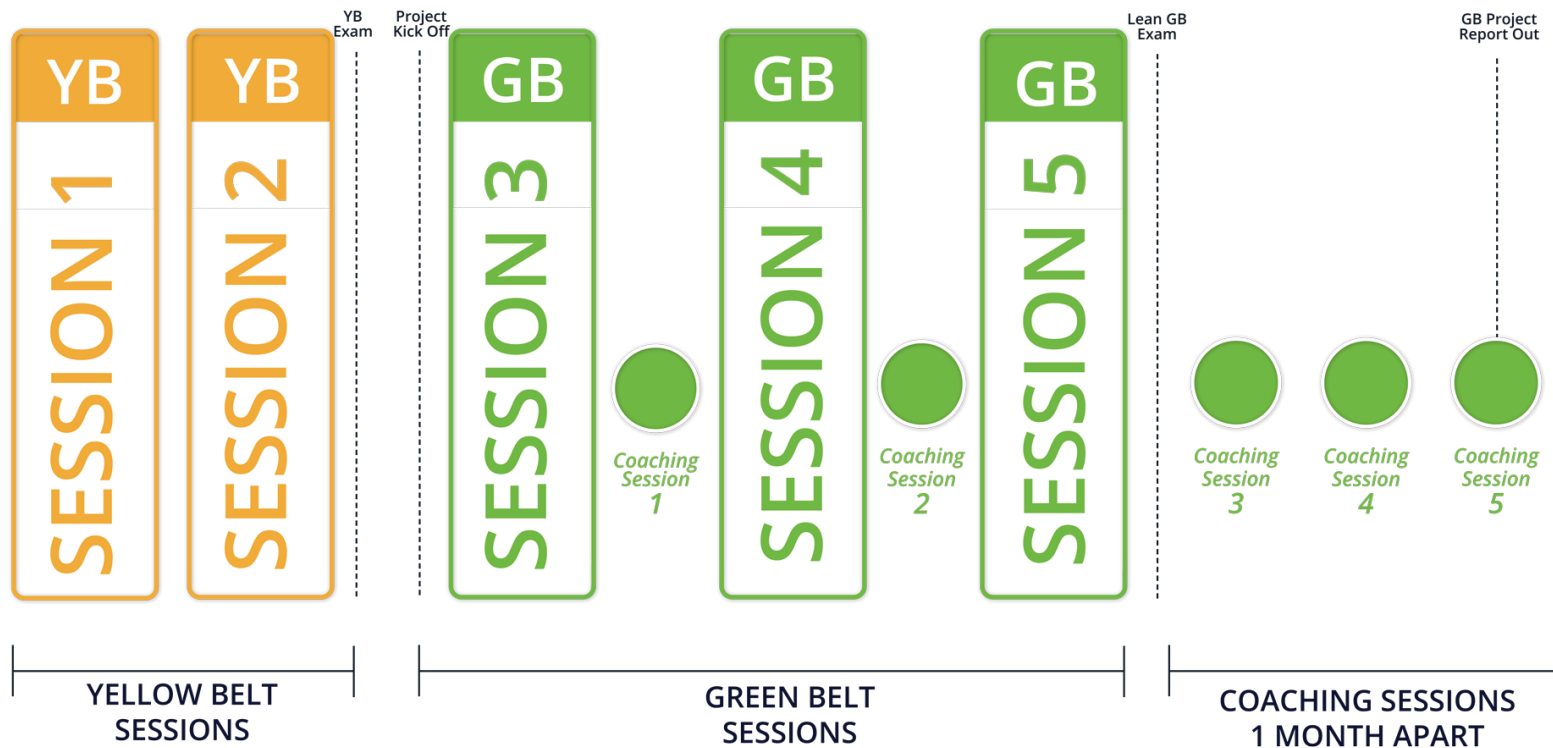
Six Sigma Green Belt

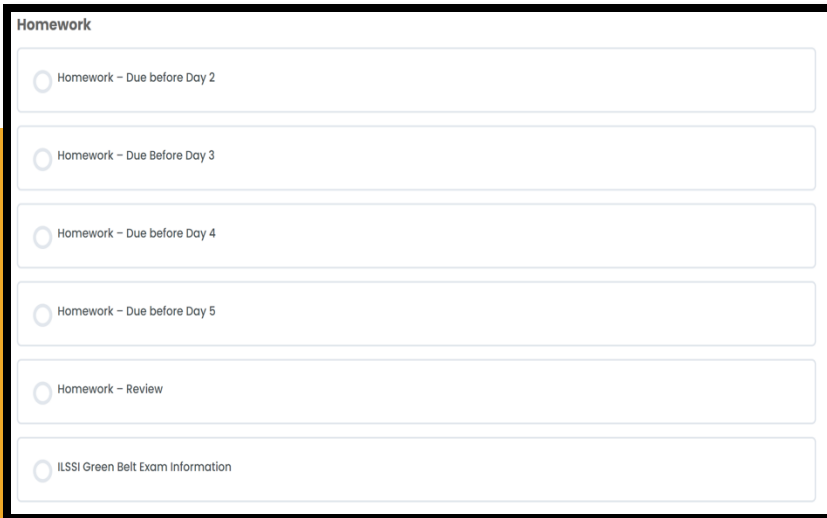
Six Sigma Statistics	Correlation and Regression
Measurement Systems Analysis	Introduction to DOE
Process Capability	Hypothesis Testing

BODY OF KNOWLEDGE

Black Belt

Mann-Whitney / Kruskal-Wallis	Orthogonal Designs
Friedman Mood's Median / Simple Linear Regression	Full Factorial Experiments & Designs
1 Sample Sign / 1 Sample Wilcoxon	Fit, Diagnose Model and Center Points
One and Two Sample Proportion	Taguchi Designs Control Phase
Chi-Squared (Contingency Tables)	Statistical Process Control (SPC)
Correlation / Regression Equations	Data Collection for SPC / I-MR Chart
Regression Equations / Residuals Analysis	Xbar-R Chart / U Chart / P Chart
Non- Linear Regression	NP Chart / X-S chart
Multiple Linear Regression	CumSum Chart / EWMA Chart
Confidence & Prediction Intervals	Binomial Distribution and Calculations
Designed Experiments / OFAT	Poisson Distribution and Calculations
Experiment Objectives	Design for Six Sigma (DFSS) / Hoshin Kanri
Experimental Methods	Cost Benefit Analysis / ROI, Payback Period
Experiment Design Considerations	
Linear & Quadratic Mathematical Models	



A screenshot of a homework assignment list. The list is titled "Homework" and contains six items, each with a radio button icon. The items are: "Homework - Due before Day 2", "Homework - Due Before Day 3", "Homework - Due before Day 4", "Homework - Due before Day 5", "Homework - Review", and "ILSSI Green Belt Exam Information".

Homework

- ☐ Homework - Due before Day 2
- ☐ Homework - Due Before Day 3
- ☐ Homework - Due before Day 4
- ☐ Homework - Due before Day 5
- ☐ Homework - Review
- ☐ ILSSI Green Belt Exam Information

HOMework

As a Yellow Belt student, you are expected to review and complete the homework for each lesson.

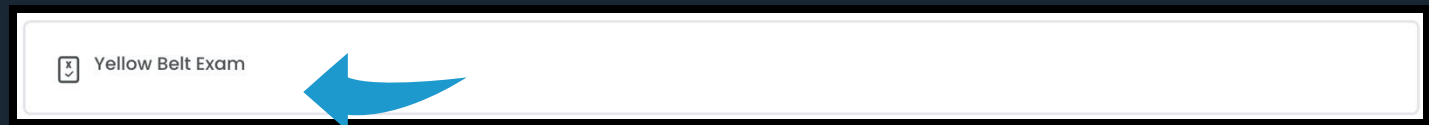
The assignments can be accessed on the student dashboard inside your course.

YELLOW BELT CERTIFICATION EXAM

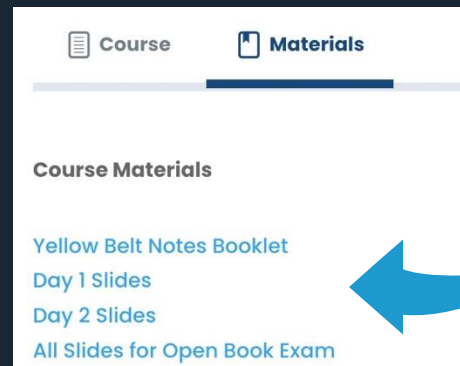
- Lifetime certification
- Done online on your student dashboard after training is finished
- Open Book
- 50 Multiple Choice Questions
- Pass mark is 70%
- Result issued immediately
- Retake is available

YELLOW BELT CERTIFICATION EXAM

Find information on how to access the exam on the student dashboard



Download the class PowerPoint slides (as a searchable pdf) to help while studying for and taking the exam



LEAN SIX SIGMA ROLES & RESPONSIBILITIES

Champion + Executive Support

Black Belts

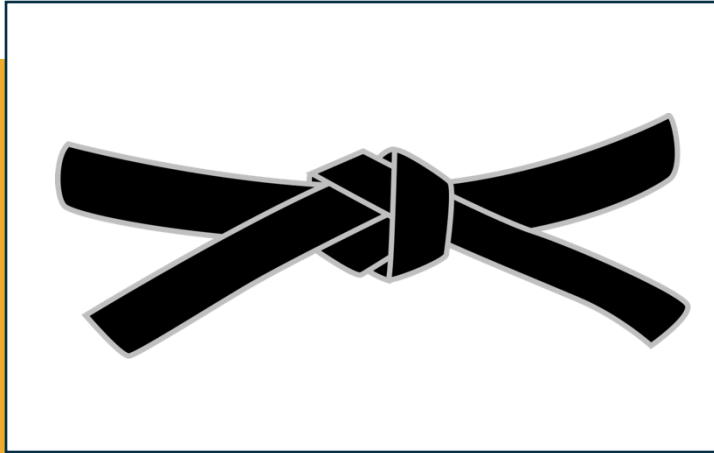
Green Belts

Yellow Belts

CHAMPION/ PROCESS OWNER

Champions help to identify and select the most important projects to work and break down political barriers and roadblocks for Lean Six Sigma to succeed

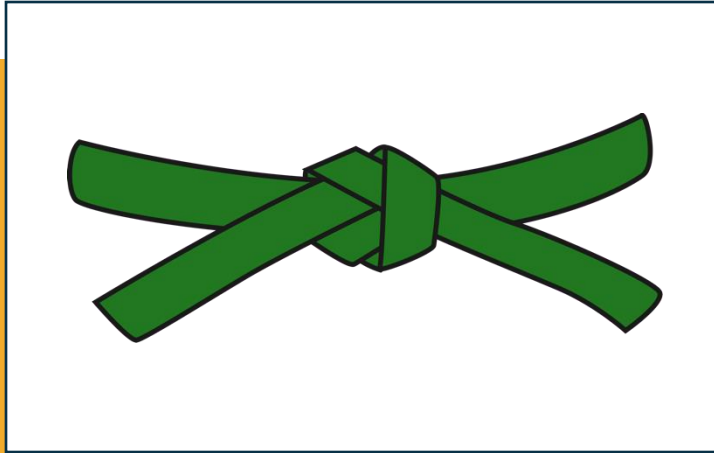
- Assist with Project selection and initiation
- Obtain needed project resources and eliminate roadblocks
- Participate in project review meetings
- Provide Governance / Ask the right questions
- Set up a training programs



BLACK BELT

Black Belts are Lean Six Sigma process experts, think strategically and lead larger projects within the business.

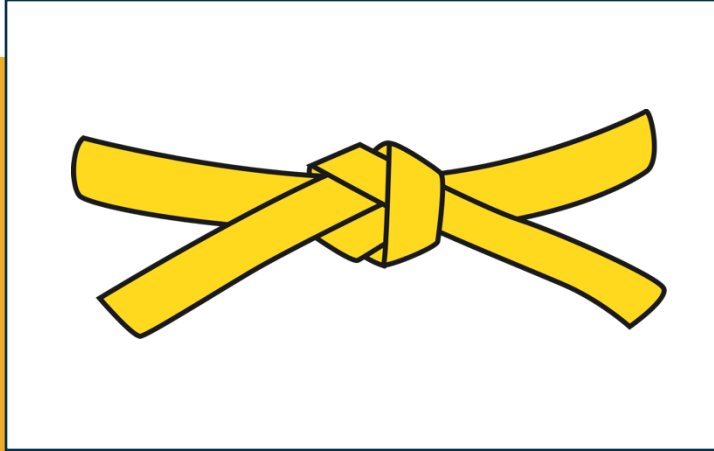
- Approx 1 Black Belt every 50 - 100 employees (1%)
- Dedicated to process improvement 100% of time
- Project team leader for larger / high profile projects
- Facilitates project teams and helps Green belts
- Thinks strategically and towards Enterprise level goals
- Works cross-functionally



GREEN BELT

Green Belts are practitioners of Lean Six Sigma improvement and lead small/medium projects or support larger Black Belt Projects.

- Approx 1 Green Belt for every 10-30 employees (5%)
- Involved approx 50% time on projects
- Typically works projects within their functional area
- Team members for larger projects
- Team leaders for small / medium projects



YELLOW BELT

Yellow Belts are Workers and Functional Specialists and apply the Lean Six Sigma Methodology to their own work and serve on project teams on a part-time basis.

- As many as possible (target is 100% of workers)
- Functional workers, Subject Matter Specialists. Team members
- Provide support to Black Belts and Green Belts as needed
- Team members on project teams
- Supporting projects with process knowledge and data collection



What is Lean & Six Sigma?



Historical Phases in Manufacturing & “Lean Principles” Applied Outside of Toyota

	When	What	Examples
Craft Production	Before 1900s	Individual pieces made by experts	Everyone
Mass Production	1910 – 1980s	Large volumes of standard product made in specialized processes	FORD
Lean Manufacturing	1970s – 1990s	Small batches with pull, approaching “1-pc flow”	Japanese companies, Intro to US
Lean Operations	2000s – Future	Manufacturing companies and Non-manufacturing companies improving operations using Lean principles	Banking, Insurance, Manufacturing
Lean Enterprise	2000 – Future	Operations, Design Engineering, Marketing, Sales, and support processes fully integrated	Everyone 

LEAN & SIX SIGMA TIMELINE



Guinness
Brewery



Walter
Shewhart
Introduces SPC
Statistical Process Control



W. Edwards Deming
Joseph Juran

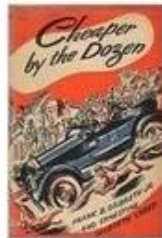
1900

1930

1950



Ford
Assembly Line



Gilbreth,
•Management
Theory
•Industrial
Engineering



Toyota Production
System

Taiichi Ohno
Shigeo Shingo
Kaoru Ishikawa

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LEAN & SIX SIGMA TIMELINE



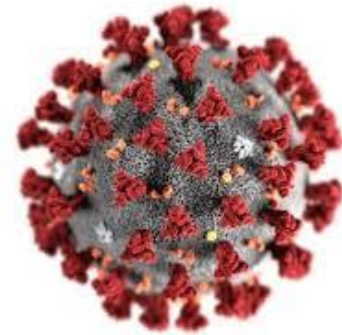
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LEAN & SIX SIGMA TIMELINE

Shift in Focus

2008 Financial Crisis

Covid-19



Cost Cutting
Automation
Down-sizing
'Do More with Less'

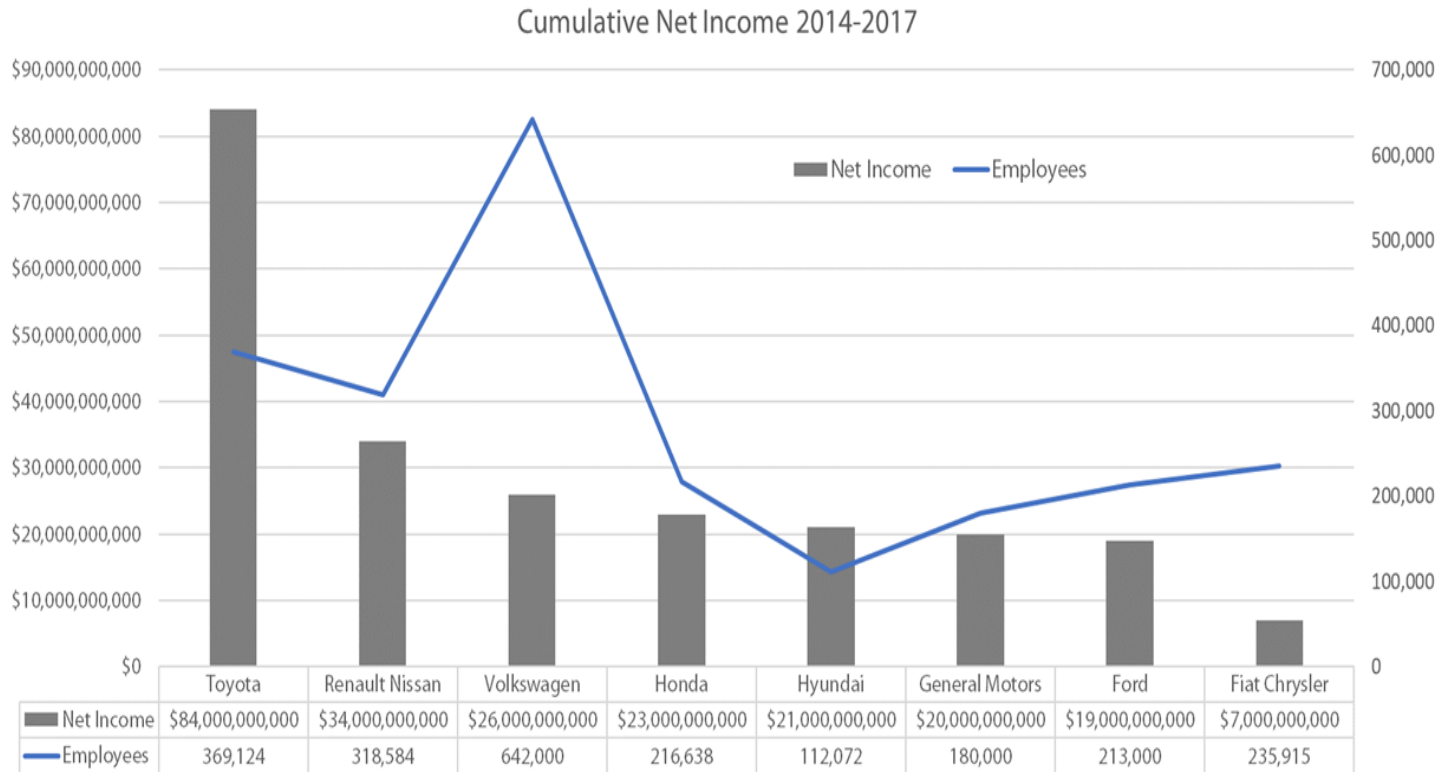


Survival
Innovation
Adapting
Re-structuring
Re-designing



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Superiority of the Toyota Production System



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Data Source: Yahoo Finance

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Walter Shewhart
(SPC and Control Charts)



W. Edwards Deming
(Quality Management
PDCA Plan, Do, Check, Act)



Shigeo Shingo
SMED, Poka Yoke



Lillian Gilbreth
Process Flow
Ergonomics



Joseph Juran
(Quality Planning, Quality
Improvement
Quality Control)



Taiichi Ohno
7-Wastes, Gemba-Walk



Kaoru Ishikawa
7-Quality Tools

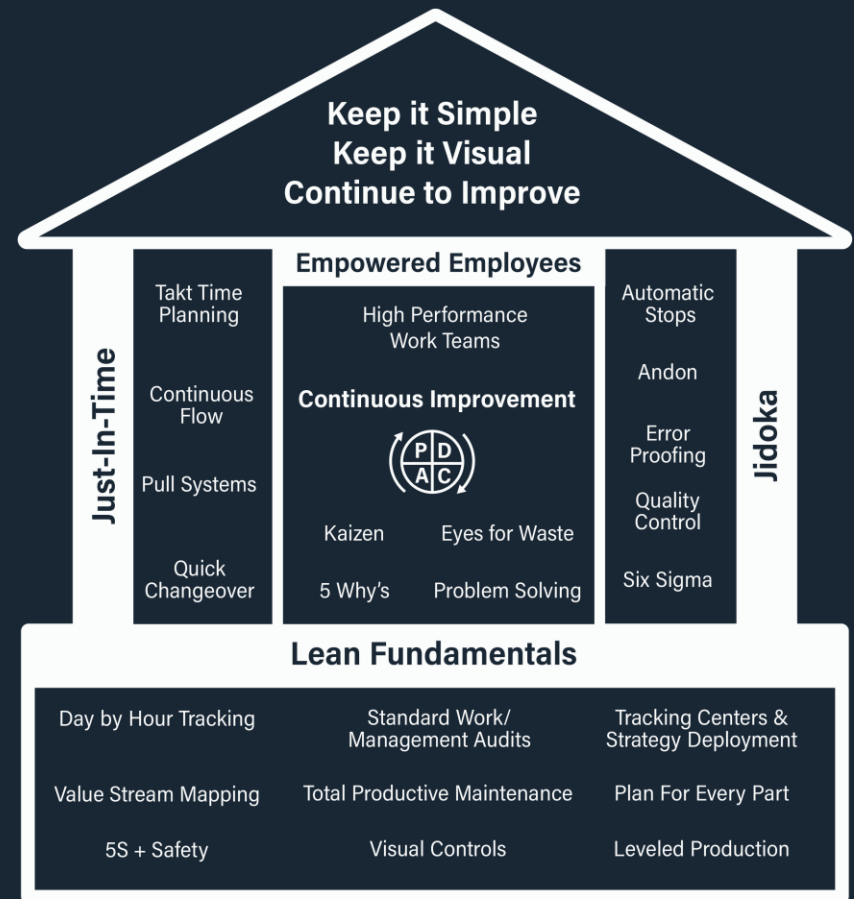
INFLUENTIAL LEADERS

IN LEAN & SIX SIGMA PRINCIPLES

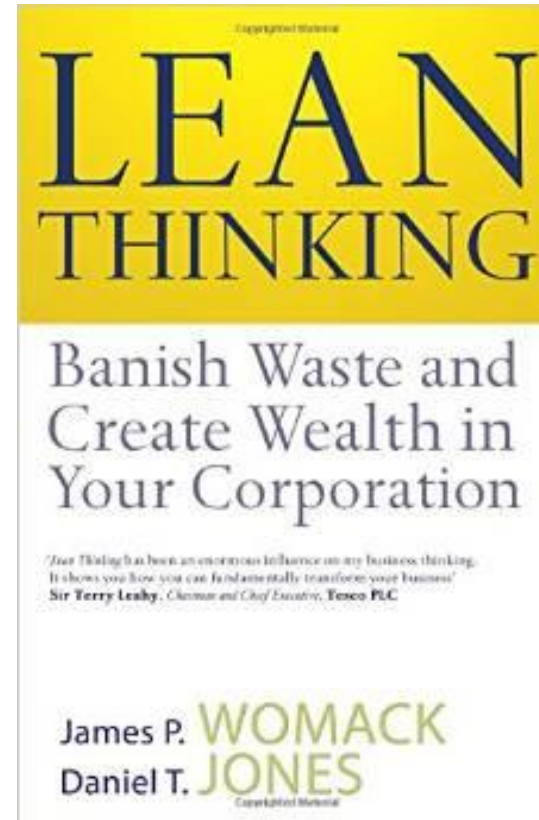
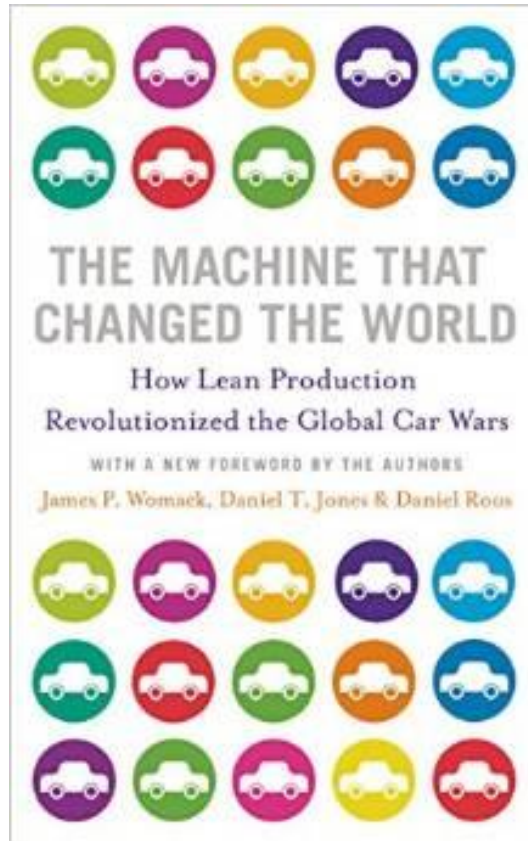
The evolution of Lean & Six Sigma was heavily influenced by American and Japanese engineers, statisticians and quality control experts 1950-1980.

Toyota Production System (TPS)

HOUSE OF LEAN



“The Machine that Changed the World” 1990



“Lean Thinking” (1993)

ORIGINS OF SIX SIGMA

MOTOROLA & GENERAL ELECTRIC (GE)



**Bob Galvin: CEO of
Motorola 1980's**



**1985 Bill Smith coins
the term "Six sigma"**



**1987 Motorola trademarks
the term "Six Sigma"**

ORIGINS OF SIX SIGMA

MOTOROLA & GENERAL ELECTRIC (GE)



Jack Welch : CEO of GE 1981-2001

Jack Welch (CEO) made Six Sigma the management and corporate culture of General Electric 1981 – 2001.

- Every manager was trained as at least a Green Belt level.
- During his tenure at GE, the company's value rose 4,000%.

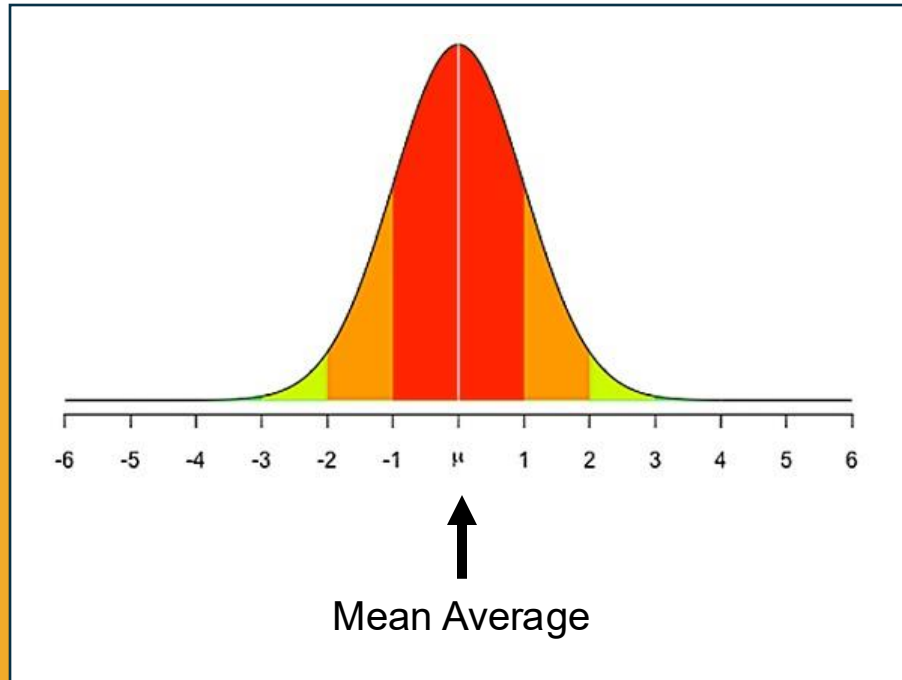
WHY IS IT CALLED SIX SIGMA?

σ , sigma

‘Sigma’ is a Greek Symbol to signify the mathematical concept called Standard Deviation. This is an important measure of Variation in a process.

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (X_i - \mu)^2}{N}}$$

You don't need to remember or even understand this equation...Its just 'behind the scenes'!!



SIX SIGMA

Six Sigma refers to a process having 6 Standard Deviations (Sigmas) between the mean average of the process (center) and the closest customer specification limit.

***LSL = Lower Specification Limit**

***USL = Upper Specification Limit**

DEFECTS VS PROCESS SIGMA LEVEL

Process Sigma Level	Defects per Million Opportunities (DPMO)
1	691,500
2	308,500
3	66,800
4	6,200
5	233
6	3.4

DEFINITION :

A “Six Sigma Process” is one that produces no more Than 3.4 defects per million opportunities for defects

3.4 DPMO

A “Six Sigma Process” is often described one that produces no more than **3.4 Defects Per Million Opportunities** for defects

3.4 DPMO (Defects Per Million Opportunities)

0.00034 % Defects

99.99966 % Correct

WHAT DOES A 0.1% DEFECT RATE LOOK LIKE?

What is 99.9% Quality?
...Or 0.1 % Defects?

- 1 unsafe plane landing per day at JFK International Airport
- 100 wrong drug prescriptions per day in US
- 10,000 Houses without electric / day in US
- 100,000 wrong bank transfers per day
- 1 million e-mails sent incorrectly per day

This is why we need Six Sigma processes!

Lean & Six Sigma Complement Each Other

Lean can work alone

Six Sigma can work alone



But...they work really great together!



LEAN PRINCIPLES

1. Understand the **Value** in the product or service
2. Identify the **Value Stream** in each product or service
3. Make the product or service **Flow**
4. **Pull** value from the downstream (just in time delivery)
5. Continuous Improvement towards **Perfection**
6. Involve workers and **Respect Workers** opinions

NOTE: Only the first 5 Lean Principles were taught.
Many books and videos still refer to the '5 Lean Principles'

**Source: Lean Thinking by James P. Womack and Daniel T. Jones*





SIX SIGMA

PRINCIPLES

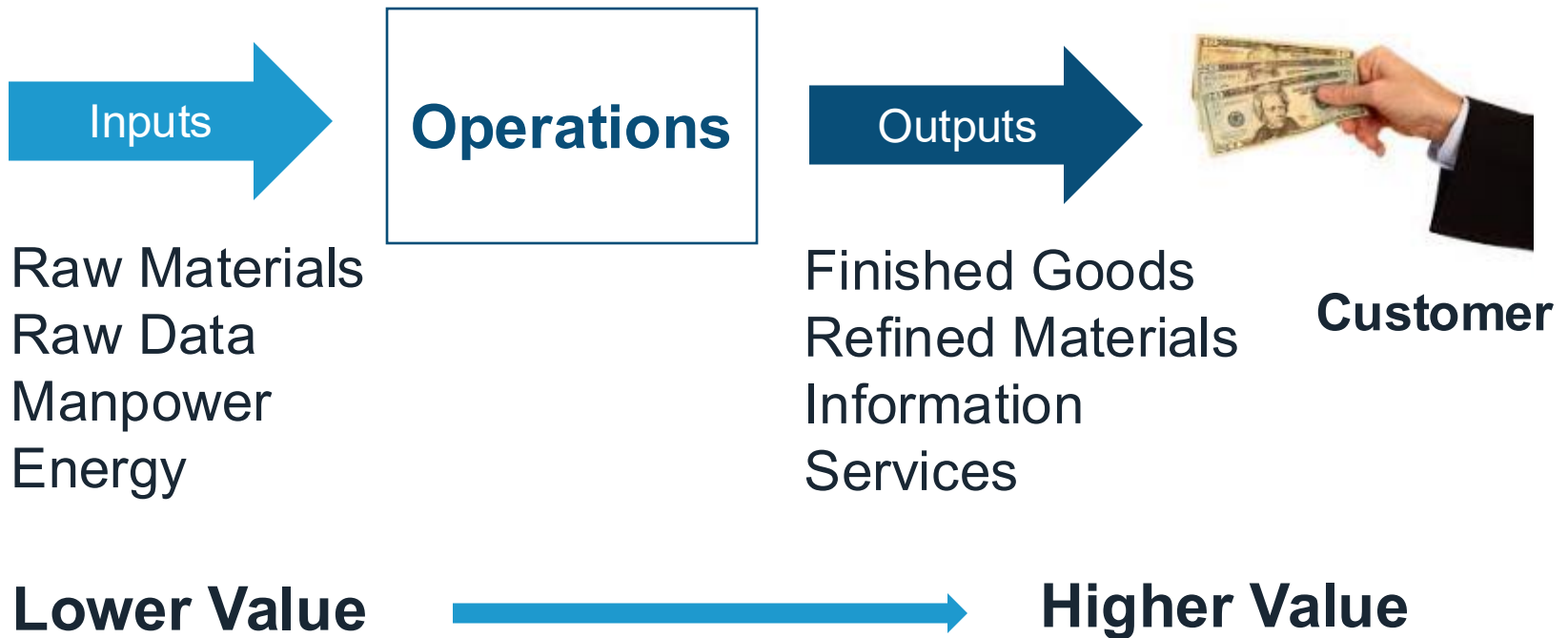
1. **Reduce Variation** and you will reduce Defects / Errors
2. **Root Cause Analysis** of problems
3. **Use Data** for Decision making (instead of guessing!)
4. Use of **Statistical Analysis** tools and charts
5. Process **Optimization** using Designed Experiments and Regression Analysis, Predictive Modelling. Hypothesis Tests
6. Improvement projects using the **DMAIC** Framework



We Use Lean & Six Sigma For
Process Improvement

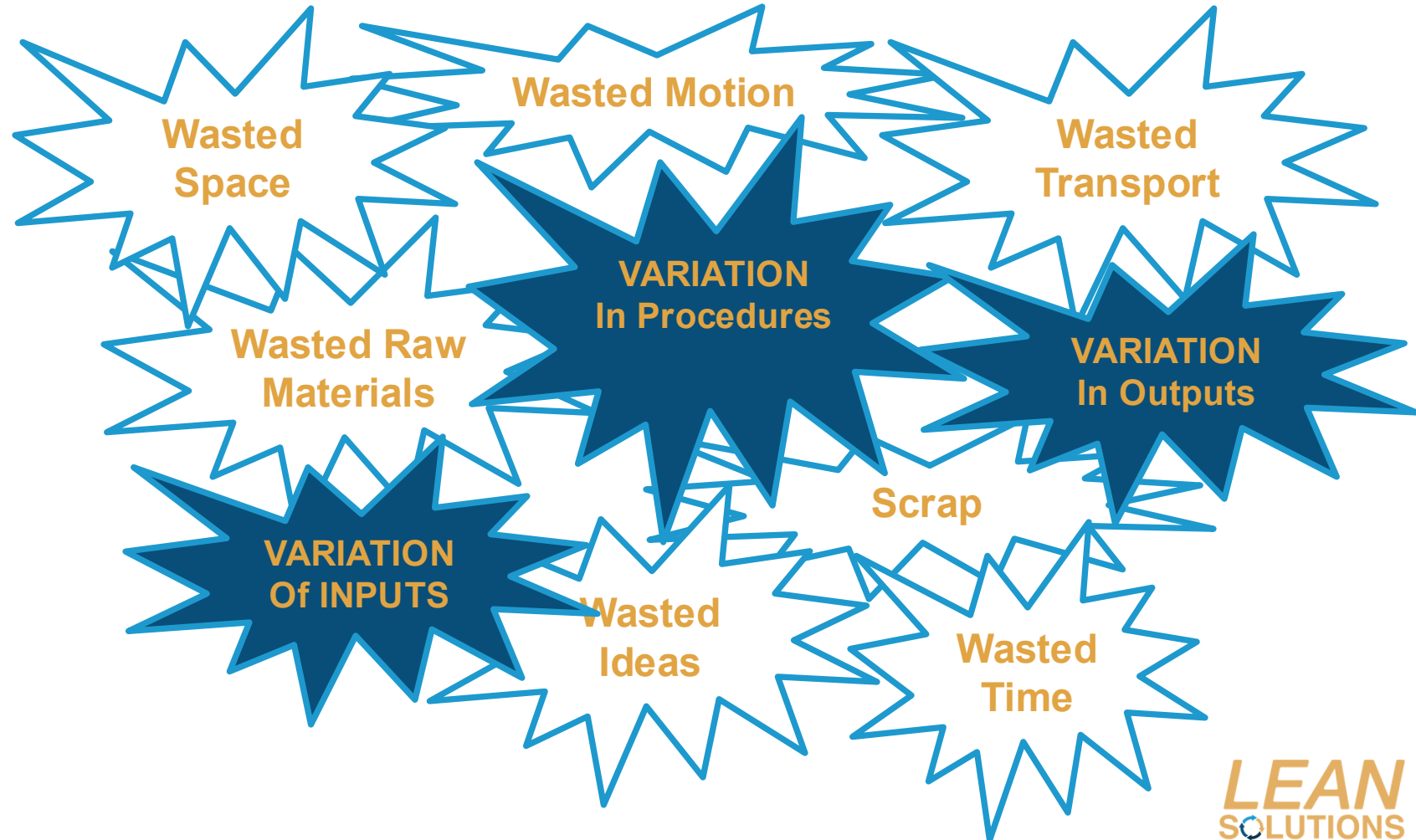
Increase Value

Traditional View of Our Processes



Waste & Variation

What Our Processes Actually Look Like





3-STAR MANUFACTURING INC.

What are the possible Defects?

Shapes

Colors

Size

Concentric

What Defect Rate is acceptable?



3-STAR MANUFACTURING INC.

PERFECT FOR CAKE DECORATIONS

- 3 Shapes
 - 3 different Colors
 - 3 different Sizes
 - Concentric Shapes
-
- Target Weight = 10 grams
 - Upper Specification Limit = 12 grams
 - Lower Specification Limit = 8 grams

3-Star Manufacturing Inc.



3-Star Manufacturing Inc.

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ROLL → WEIGH → FLATTEN → CUT → ASSEMBLE → WEIGH



Roll Ball

Small : 8 to 12 grams Target = 10 grams

Medium : 13 to 17 grams Target = 15 grams

Large : 18 to 22 grams Target = 20 grams

3-Star Manufacturing Inc.

Perfect for Cake Decorations

- 3 Shapes
 - 3 different Colors
 - 3 different Sizes
 - Concentric Shapes
-
- Target Weight = 10 grams
 - Upper Specification Limit = 12 grams
 - Lower Specification Limit = 8 grams



INPUTS

What do we need to create Value for Customers ?

Hint : The '4 M' rule

M A T E R I A L S

M A N P O W E R

M A C H I N E S

M E T H O D

INPUTS

What do we need to create Value?

Examples of Inputs in your work (Which 'M' is it ?) :

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

OPERATIONS

Transforming the Inputs into Outputs



Examples of Operations at your company :

1. _____
2. _____
3. _____
4. _____

OUTPUTS

What Your Customer Wants

The '**TOP 5**' Outputs at your company :

1. _____
2. _____
3. _____
4. _____
5. _____

Increase Value

Lower Value  Higher Value



Customer

- Safer
- Easier
- Better Quality (less defects & rework)
- Faster (on time)
- Lower Cos



Shigeo Shingo

'There are four purposes of improvement: easier, better, faster, and cheaper. These four goals appear in order of priority. Hence the first is to make the work easier for workers while improving the fruits of their labour.'

'Intensifying the work should never be undertaken even if the same working hours are maintained.'

Non-Stock Production : The Shingo System of Continuous Improvement', (1988)

Shigeo Shingo was a primary architect in the development of the Toyota Production System.

SQDC

1. Easier and Safer for workers (S)
2. Produce Better Quality Outputs for customers (Q)
3. Deliver the Outputs on Time (D)
4. Lower the Cost of Production (C)

The SQDC model of Production

SUMMARY

At This Point You Should Be Able To...

- Describe the defined roles of Lean & Six Sigma belts
- Describe the goals of our Process Improvement
- Understand the origins of Lean & Six Sigma
- Describe the principles of Lean
- Describe the principles of Six Sigma

QUIZ:

1. What was the name of the first company to use the name 'SIX SIGMA' to describe its Quality Management System?
 - MOTOROLA
2. What is the First Principle of Lean production ? What is the most important thing that a Lean process must produce?
 - VALUE (for the customer of the process)
3. Which Japanese company is considered as being the first to use true 'Lean Production "effectively and successfully"'?
 - TOYOTA
4. A basic principle of Six Sigma is to always find the true original source of a defect or problem. This is called _____?
 - ROOT CAUSE ANALYSIS
5. A "Six Sigma Process" is often described one that produces no more than 3.4 DPMO What does DPMO stand for?
 - DEFECTS PER MILLION OPPORTUNITES FOR DEFECTS

QUIZ:

6. What is the role of a Yellow Belt on a Lean Six Sigma project?
 - A YELLOW BELT IS A TEAM MEMBER WHO ASSISTS A GREEN OR BLACK BELT, USING THEIR KNOWLEDGE OF THE PROCESS THAT THEY CURRENTLY ARE WORKING WITHIN.
7. What is the role of a Green Belt in an organization ?
 - A GREEN BELT IS A PROJECT TEAM LEADER FOR SMALL AND MEDIUM SIZED PROCESS IMPROVEMENT PROJECTS.
8. What is the role of a Black Belt in an organization ?
 - A BLACK BELT IS A PROJECT TEAM LEADER FOR LARGE PROBLEM SOLVING / IMPROVEMENT PROJECTS or OVERSEES THE WORK OF GREEN BELTS FOR MULTIPLE PROJECTS. A BLACK BELT IS A FULL TIME PROBLEM SOLVER FOR THE ORGANIZATION.

VALUE & WASTE

Lean focuses on identifying which activities add value, and which do not...

Value Added Activity

- Transforms or shapes (for the 1st time) material or information to meet customer requirements
- Anything the customer is willing to pay for ONE TIME ONLY

Non-Value Added Activity (Waste)

- Anything else that consumes resources or is related to rework or scrap
- Incidental Non-Value
 - Serves you or the company but the customer doesn't value it

WHAT DO YOU WANT TO PAY FOR?

If you were the patient, what would you be willing to pay for?

Value Added steps are those the customer is willing to pay for — all else is a form of Non-Value Added or Waste.

Doctor Visit	
Making appointment	10 min
Driving to the doctor's office	30 min
Filling out insurance and health history forms	10 min
Waiting in the reception area	20 min
Walking to the vitals room	2 min
Nurse taking your blood pressure and weight	4 min
Walking to the exam room	2 min
Waiting in the exam room for the doctor	15 min
Exam by doctor	15 min
Checking out at the front desk	3 min
Driving home	30 min
TOTAL	141 min



Recognizing Waste



D



DEFECTS

Waste from a product or service failure to meet customer expectations

O



OVERPRODUCTION

Waste from making or staging more product than needed

W



WAITING

Waste from time spent waiting for other processes, approvals etc.

N



NON-UTILIZED TALENT

Waste due to people's talents, skills, and knowledge that are not utilized

T



TRANSPORTATION

Wasted time, resources, and costs when unnecessarily moving products

I



INVENTORY

Wastes resulting from excess products, materials, or storage points

M



MOTION

Wasted time and effort related to unnecessary movements by people

E

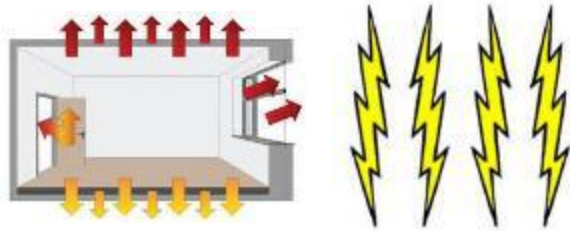


EXTRA-PROCESSING

Waste related to more work or higher quality than is required

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‘Non-Traditional’ Categories of Waste



Utility/Energy (Heat/Electrical) Losses



Miscommunications

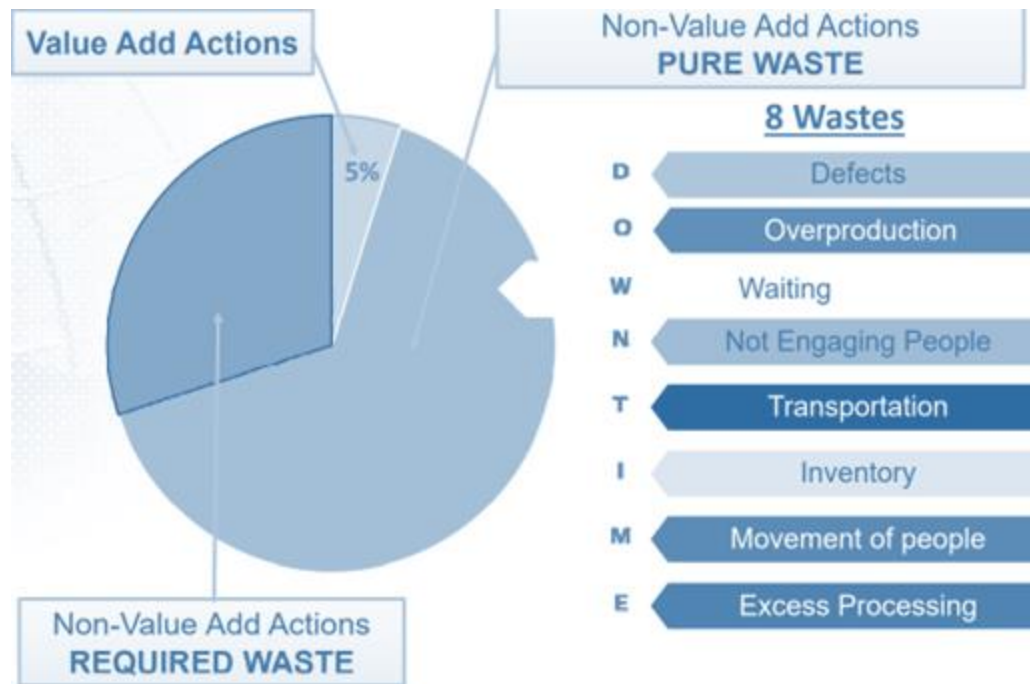


Over - Communications



Skilled Staff Losses

CATEGORIES OF ACTION



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WASTE WALK

A planned visit to where work is being performed to observe what's happening and to note the waste.

- Explain to the people in the area of observation what you are doing
- Study the area for 20-30 minutes
- As you see work that appears to be waste, jot down the example you see
- Take action immediately if possible or develop a plan to remove waste



Waste Walk Form

Date: xx/xx/xx
 Location/area: Main Production
 Observer: Craig To



Type of Waste	Definition	Observations
Defect/Rework	Product that does not meet customer requirements	Excessive amount of Hoods in Repair Bay, 4 racks at 20 per rack
OverProduction	Producing more than is required	There are 35 Left Hand Rockers but only 7 Right Hand Rockers. These ship as sets of one each
Waiting	Delays in the process, waiting for next step to occur	Paint Line is full of parts waiting to be loaded
Non-Utilization of Talent and/or Resources	Not utilizing people's skills properly	Lay up operators are being used to hang parts on the paint line
Transportation	Unnecessary movement of material from one location to another	Material Handler is required to move parts from lay-up, to bonding, to sanding, and to paint.
Inventory	More supplies/equipment than required to service customer	275 Hood outer panels are held at bonding
Motion	Movement that does not add value to the work being completed	Left and Right Hinges are removed from boxes and put in totes to be staged at bonding cell
Excess-Processing	More work is done than required by the customer, or things are made more complicated than necessary	Hood outer panel is getting sanded in areas that are no longer used to bond to inner panel

3-Star Manufacturing Inc.

Where is the **Waste**?

ROLL → WEIGH → FLATTEN → CUT → ASSEMBLE → WEIGH



QUIZ :

1. Which of the traditional 8-Wastes of 'DOWNTIME' is concerned with reducing the complexity of processes and taking out unnecessary steps or activities ?
 - **NON-ESSENTIAL PROCESSING / OVER PROCESSING**
2. What is the name of the Waste of producing more than the customer demand can absorb ?
 - **OVER-PRODUCTION**
3. What is Waste called when an activity or step in process needs to be repeated because it was not done 'Right-First-Time' ?
 - **REWORK / DEFECTS**
4. What Waste results in Queues or Backlogs of materials or work ?
 - **WAITING (DUE TO A BOTTLE-NECK IN THE PROCESS)**
5. What is the Japanese word for 'Waste' ?
 - **MUDA**



Lean Principles & Tools



6 FUNDAMENTALS OF LEAN

- Value 
- Value Stream
- Flow
- Pull
- Perfection
- Respect for People

WHO IS YOUR CUSTOMER?

IN LEAN SIX SIGMA...

- Value is always viewed “Through the eyes of the Customer”
 - Who is our customer ?
 - What is The Voice of our Customer (VOC) ?
 - What is Critical to Quality (CTQ) to our Customer ?

WHO IS YOUR CUSTOMER?

'Internal Customers' VS 'External Customers'

- An internal Customer could be a different department or operation. It could be the next downstream operation in the process.
- Can you name some different types of 'Internal/External Customers'?

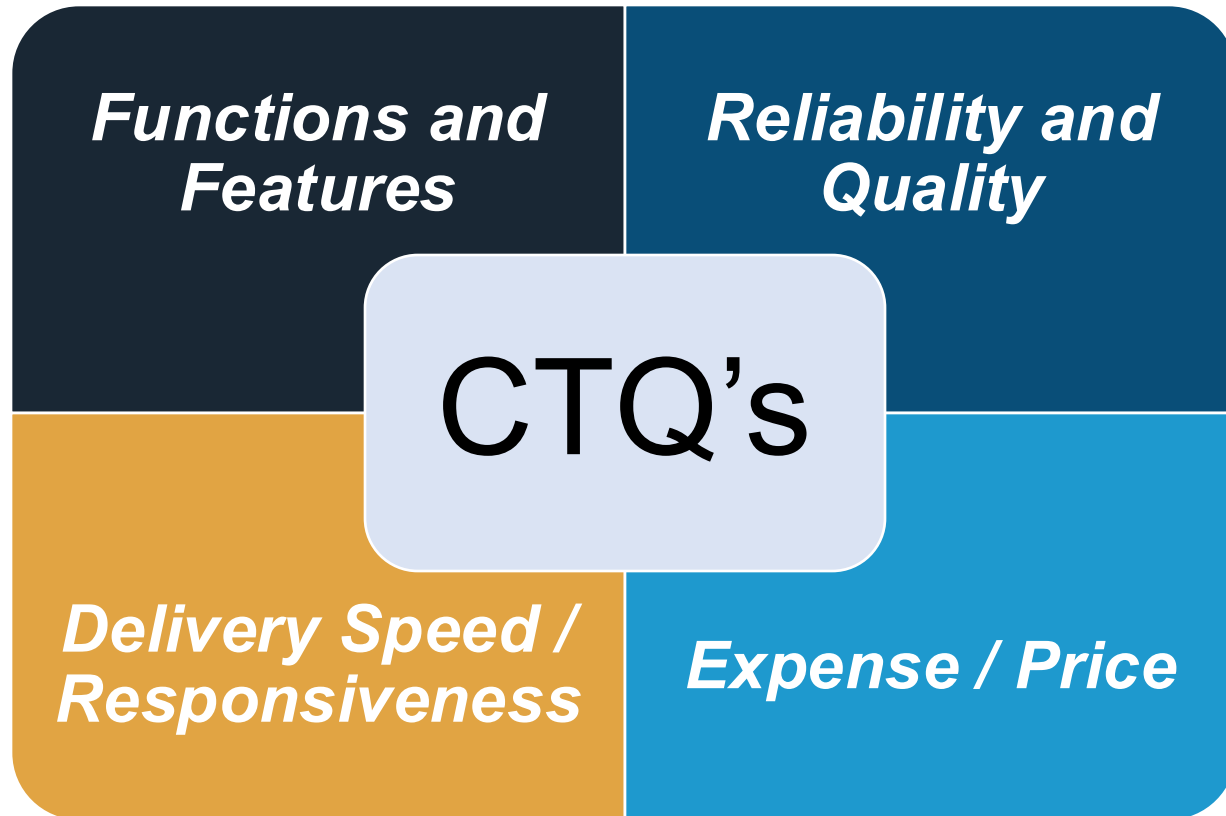
WHAT IS A CTQ?

Critical to Quality (CTQ's) are measures we use to capture VOC properly.

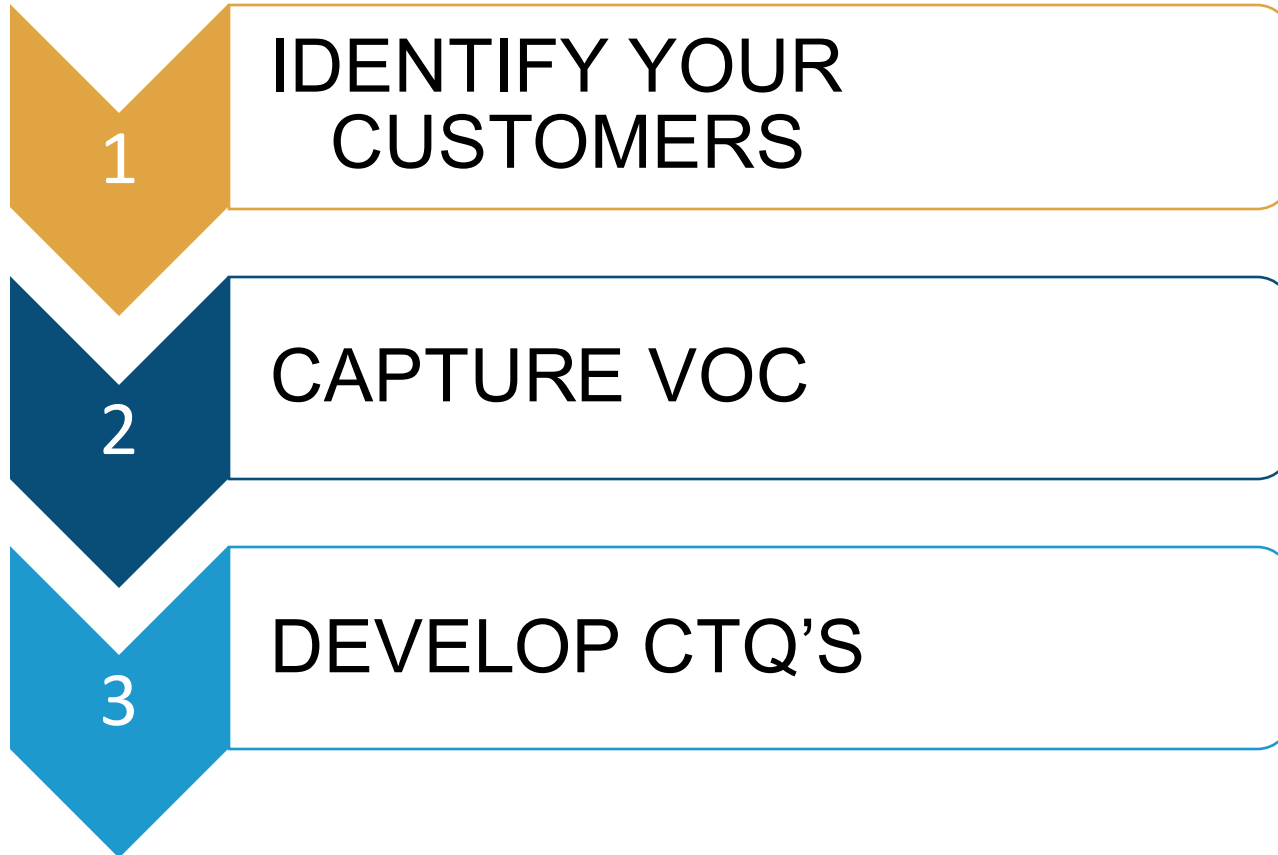
- Also referred to in some literature as :
 - CTC's – Critical to Customer
 - CTS's – Critical to Satisfaction
 - CTQC - Critical to Quality Characteristics
- CTQ's are a tool to help to break down VOC into well defined and measurable terms.

DEFINING CTQ'S

Customer CTQs usually fall into one of 4 categories :



DEVELOPING CTQ'S



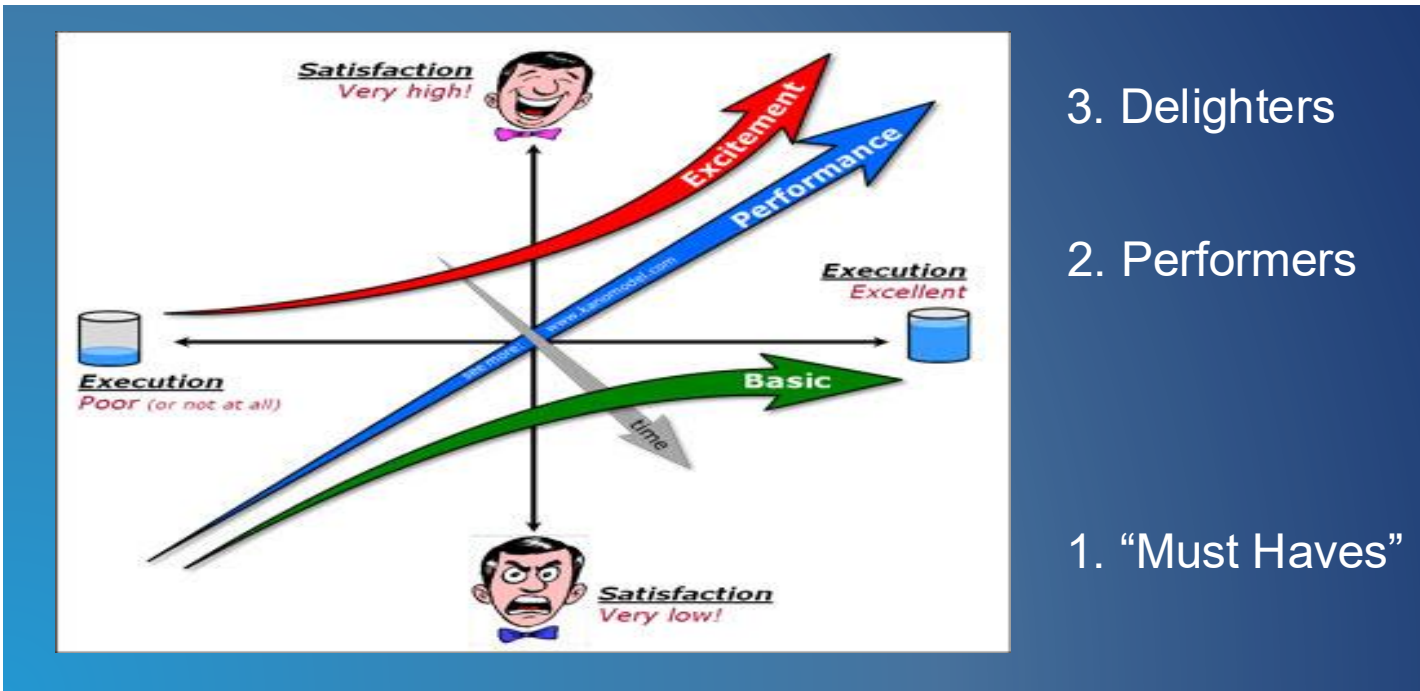
SPECIFICATION LIMITS

“Specification Limits” are Lean Six Sigma’s way of defining your customer expectations

USL = Upper Specification Limit

LSL = Lower Specification Limit

Also called ‘Tolerance limits’ in some businesses

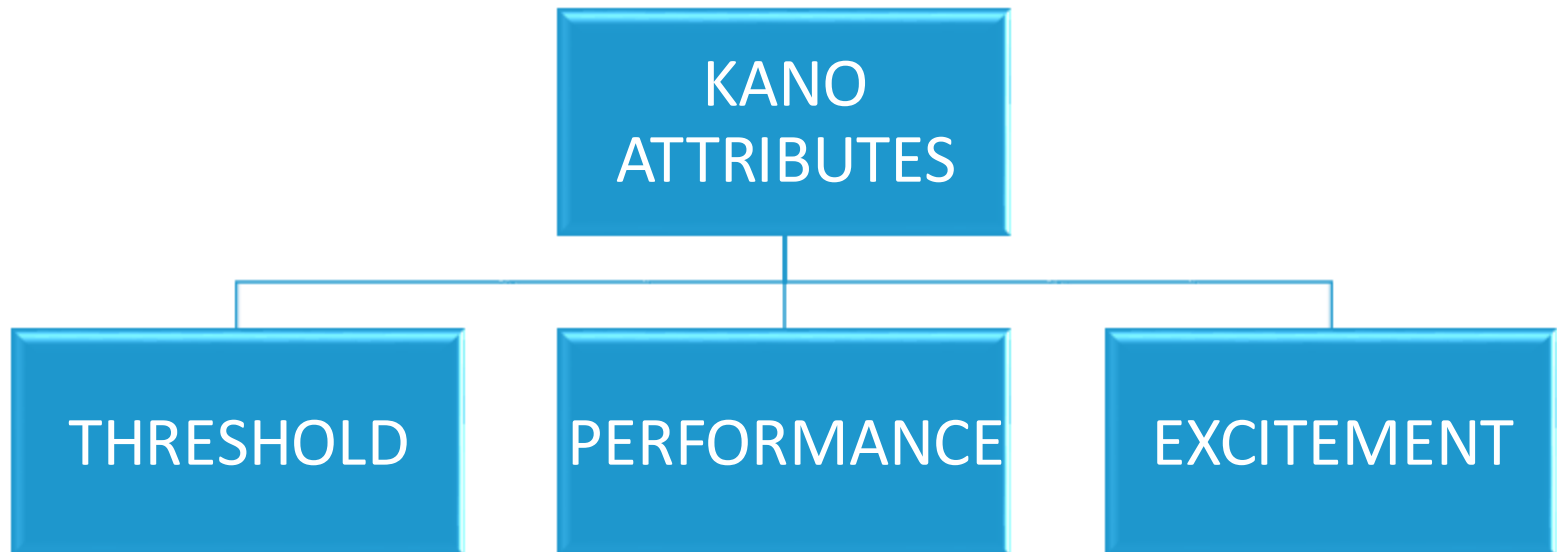


KANO ANALYSIS

Developed in the 1980s by Professor Noriaki Kano, which classifies customer preferences into three main categories

KANO ANALYSIS

The Kano Model has three main categories of attributes:





CTQ's & KANO

Consider 3-Star Manufacturing

- What are the CTQs for the process?
- What are the Basic Requirements?
- What are Performers?
- What are Delighters?

QUIZ:

1. What Tool is used to understand what is Critical to Quality (CTQ) by Forming 3 categories: *threshold*, *performance*, and *excitement*?
 - **KANO ANALYSIS**

2. Splitting Customers into groups according to different needs or behaviours is called _____.
 - **SEGMENTING**

3. CTQs are also sometimes called CTCs or CTSs. What does CTS stand for?
 - **CRITICAL TO SATISFACTION**

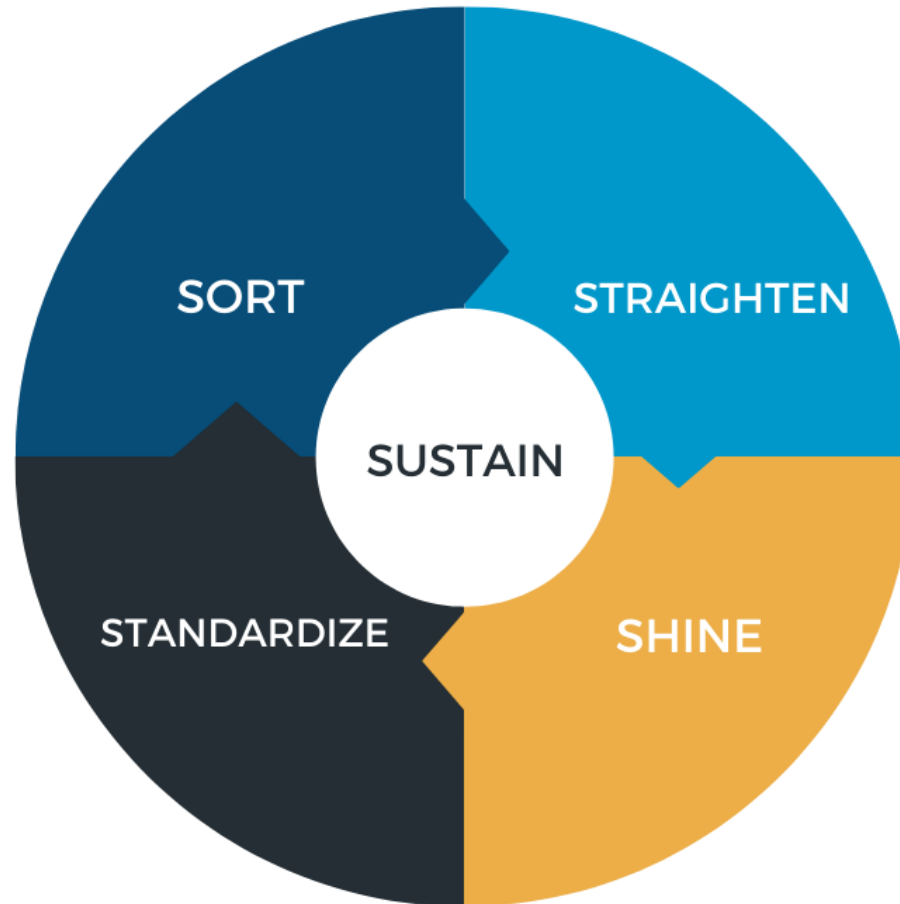
4. Give one example of a method used to understand the **Voice of the Customer**?
 - **SURVEYS**
 - **FEEDBACK**
 - **FOCUS GROUPS**
 - **REPEAT SALE METRICS, etc**



5S

Continuous
Improvement should
not be just an event

5S





WHY 5S?

Workplace Organization and Visual Management should be Fundamental to Your Facility

- SAFER!
- Problems Become Visible
- Promotes Culture

Result: Improved Safety, Quality, and Cost

FIND A FLATHEAD SCREWDRIVER



FIND A FLATHEAD SCREWDRIVER



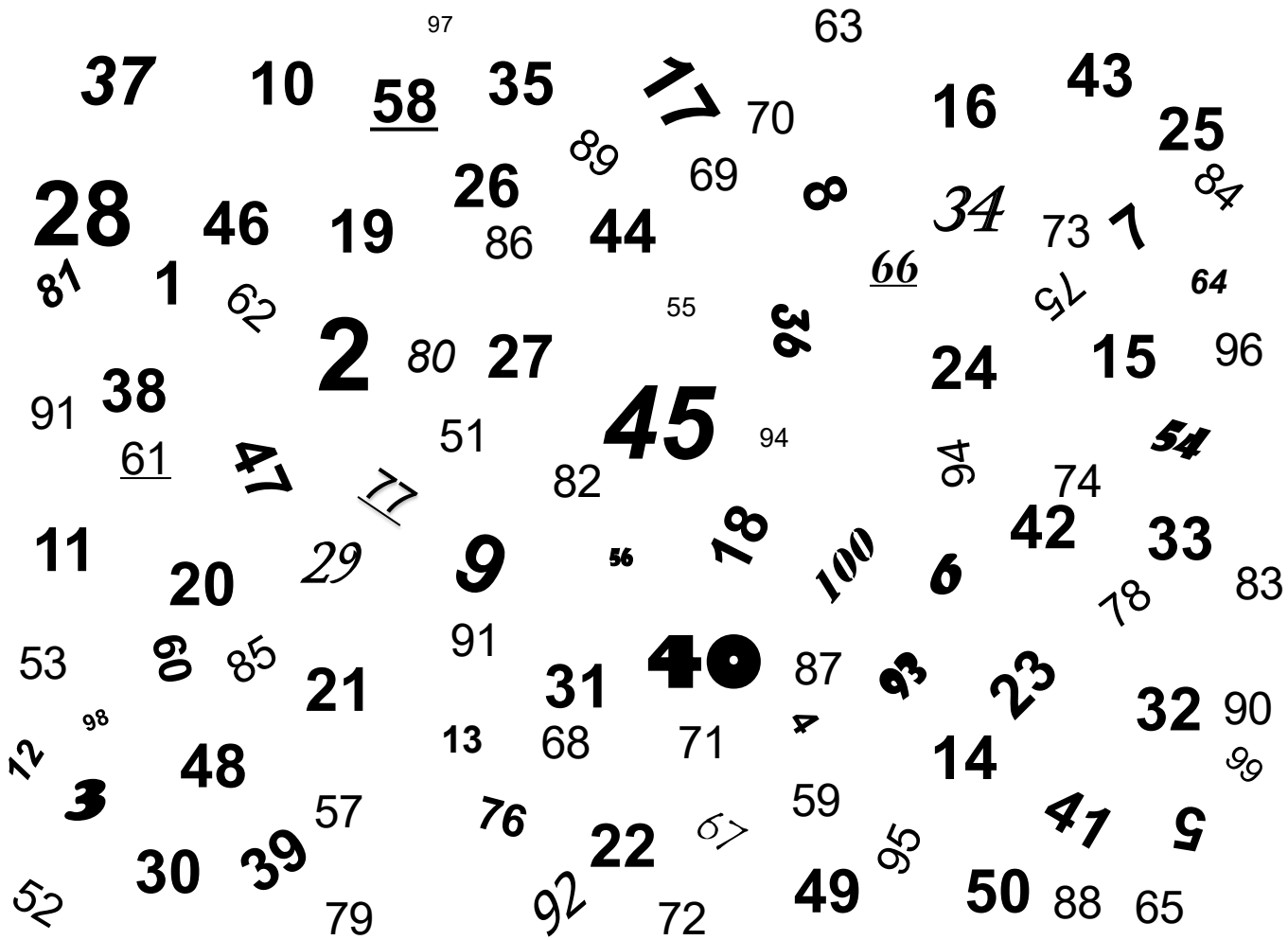
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Exercise #1



60



SORT

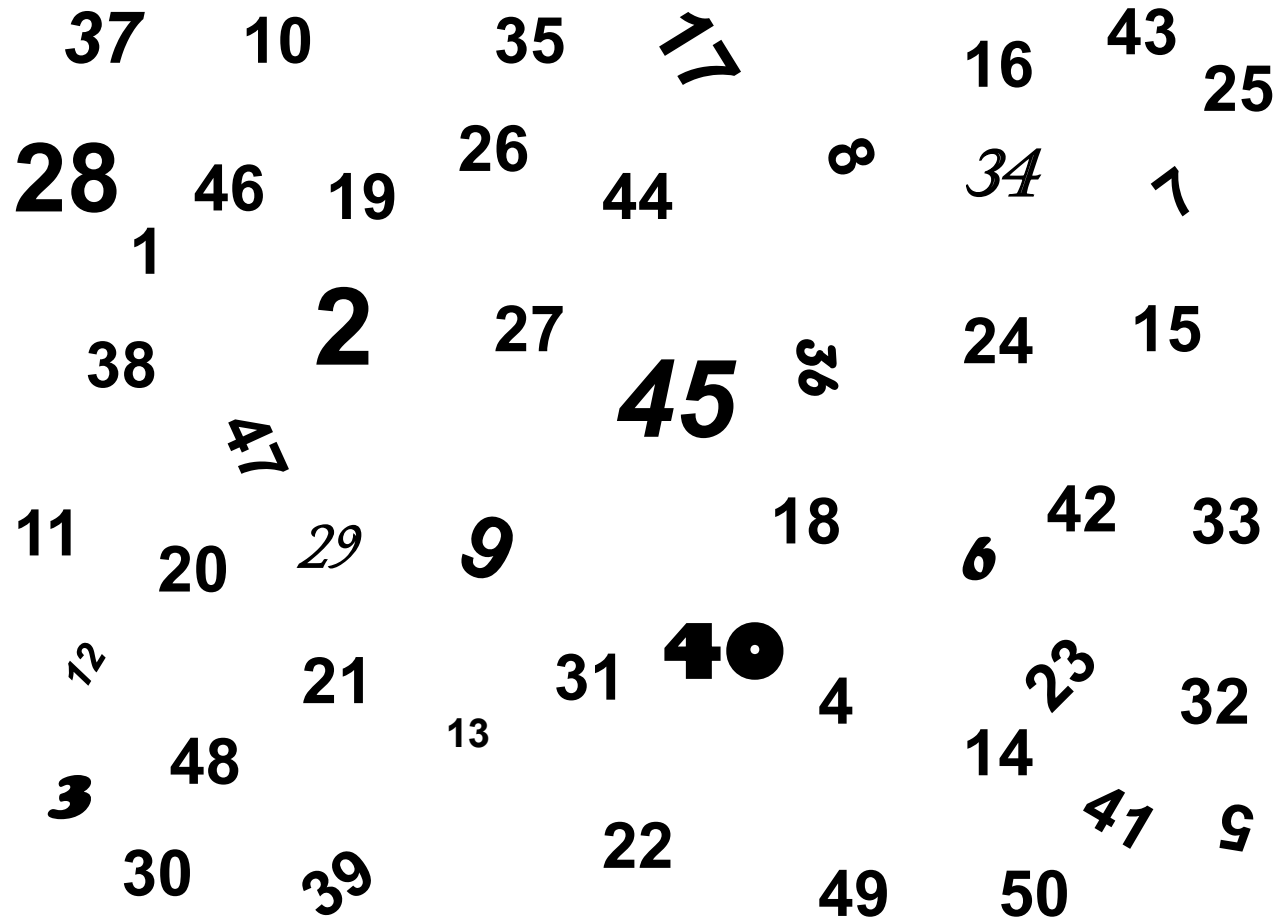
- Critically examine everything
- Red Tag Process
 - Always use-Have a place for it
 - Sometimes use-Tag and Date
 - Never use-Red tag area
- Need a 6mm Hex? Keep only the 6mm Hex, not a whole set
- Members know best what is needed
- Everything in the area should have a purpose



Title _____ Tagged By _____	
Item Description _____	
Department _____	
ITEM TYPE:	
☐ Raw Materials	☐ Tools
☐ Finished Goods	☐ Instruments
☐ WIP	☐ Equipment
☐ Machine Parts	☐ Other
Other _____	
REASON TAGGED:	
☐ No Longer Used	☐ Unknown Owner
☐ Doesn't Work	☐ Other
Other _____	
5S RED TAG	
ACTION TO TAKE:	
☐ Throw	
☐ Hold	
☐ Move to _____	
☐ Contact _____	
☐ Other _____	
Date _____	Manager's Initials _____
Tag No. _____	
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Exercise #2

60



STRAIGHTEN or SET IN ORDER

- For what's left, where does it go?
- Be mindful of frequency of use
- Be Visual
- Arrange so things are easy to find and readily retrieved.
- “A place for everything and everything in it's place.”





SHINE

- Clean the area (tools, equipment, lighting, etc.)
- Re-painting may be required
- Implement regular housekeeping so that any dirt or grease is immediately obvious.
- Always use your 5S Color Standards



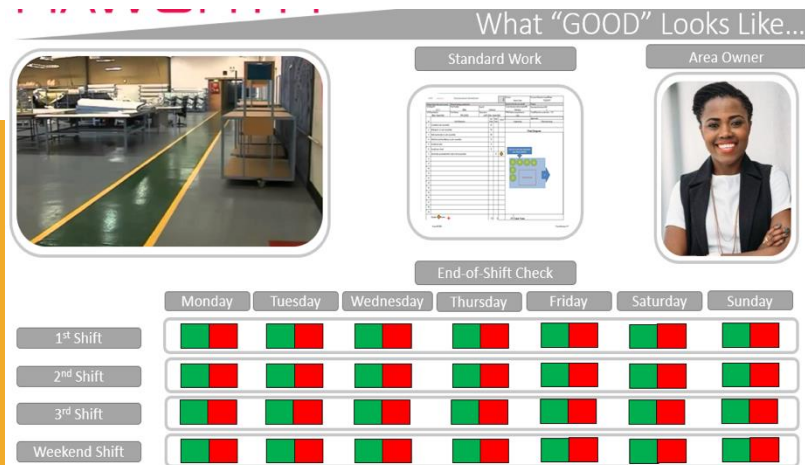
Exercise #3



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37 1 28 46 19	35 17 26 44 8	16 43 25 34 7
38 2 47 11 20 29	27 36 45 9 18	24 15 6 42 33
3 12 39 48 30 21	13 31 4 40 22 49	14 23 32 41 5 50

STANDARDIZE



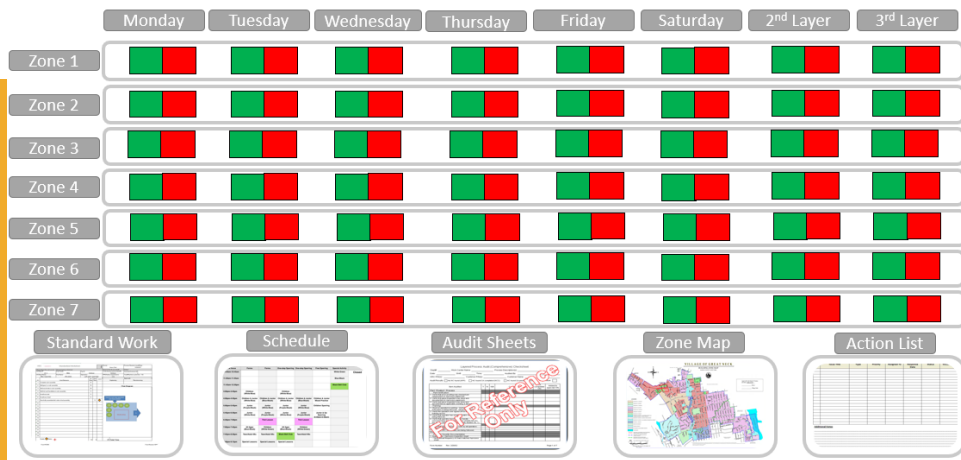
- Implement Work Center 5S Board
- Take a picture of the area
- Assign an area owner
- Develop standard work for regular housekeeping
- Implement Daily End of Shift Checks



Exercise #4



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50



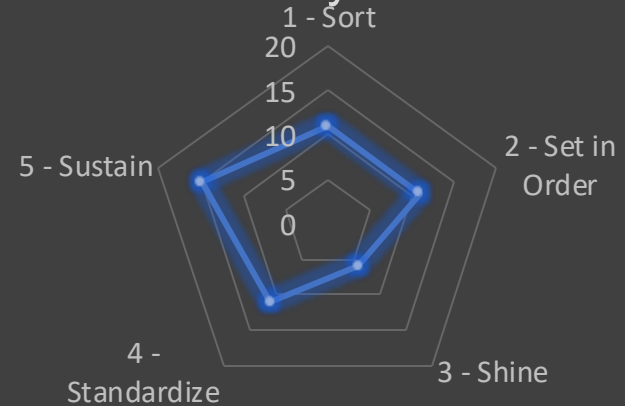
SUSTAIN

- Implement Layered Process Audits in order to sustain improvements

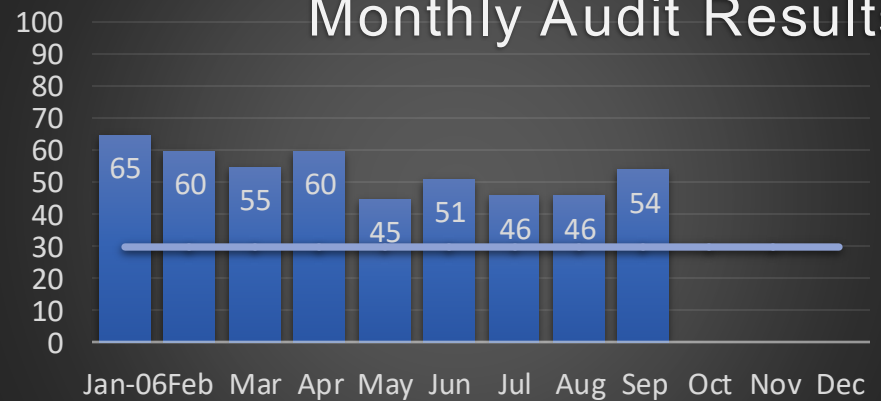
5S Audit & Results

5S Workplace Scan Checklist										
Department:		Place an "X" in the appropriate box based on number of issues observed.								
Date:		Scored By:		Number of Observations >>						
				0	1-2	3-4	5-6	>6		
Sort	Distinguish between what is needed and not needed									
	1	Unneeded equipment, tools, furniture, etc. are present								
	2	Unneeded items are on walls, notice boards, etc.								
	3	Items are present in walkways, stairways, corners, fire exits etc.								
	4	Unneeded inventory, supplies, parts, or materials are present								
	5	Safety hazards (water, oil, chemical, machines) exist								
		Subtotal >>	0	1	4	6	0			
Set in Order	A place for everything and everything in its place									
	1	Correct places for items are not obvious								
	2	Items are not in their correct places								
	3	Walkways, workstations, equipment locations are not indicated								
	4	Items are not put away immediately after use								
	5	Height and quantity limits are not obvious								
		Subtotal >>	0	1	4	6	0			
Shine	cleaning, and looking for ways to keep it clean and organised									
	1	Floors, walls, stairs, and surfaces are free of dirt, oil, and grease								
	2	Equipment is not kept clean and free of dirt, oil, and grease								
	3	Cleaning materials are not easily accessible								
	4	Lines, labels, signs, etc are not clean and unbroken								
	5	Other cleaning problems of any kind are present								
		Subtotal >>	0	2	4	0	0			
Standardize	Maintain and monitor the first three categories									
	1	Necessary information is not visible								
	2	All standards are not known and visible								
	3	Checklist don't exist for all cleaning and maintenance jobs								
	4	All quantities and limits are not easily recognizable								
	5	How many items can't be located in 30 seconds								
		Subtotal >>	0	1	4	6	0			
Sustain	Stick to the rules									
	1	How many workers understand the 5s principals								
	2	How many times last week was daily 5s not performed								
	3	Number of times that personal belongings are not neatly stored								
	4	Number of times job aids are not available or up to date								
	5	Number of times last week daily 5s inspection were not performed								
		Subtotal >>	0	1	0	6	0			
		Total >>	0	6	16	24	0			
		Grand Total 5S Score	54							

Monthly 5S Overview



Monthly Audit Results



5S Your Computer Hard/Shared Drive

5S Principle	Description
Sort	• Check all your files and software, and get rid of any that are unnecessary
Set In Order	• Organize your files and optimize the use of file folders • Keep in mind how often you need them and how much time you need to store them • Create specific shortcut icons for the most used files or programs
Shine	• Eliminate any files under deleted items, sent items and the recycle bin
Standardize	• Establish procedures for maintaining your computer 5S system
Sustain	• Include hard drives in 5S audits • Focus on how people maintain files and program organization, and the time they spend doing so

5S 3-Star Manufacturing Inc.





5S IN YOUR COMPANY DISCUSSION

- What areas of your work could do with 5S?
- Who do you need to get involved?
- When are you going to try 5S?

QUIZ :

1. Which stage of the 5S method is used to ensure that the workers have the good habits and discipline to continue the other 4S tasks?
 - **SUSTAIN**

2. In 5S the action of removing unnecessary tools, equipment and materials from the workspace is called

 - **SORT**

3. Cleaning the workplace of dirt, dust and litter is called what in 5S ?
 - **SHINE**

4. Give one example of a 5S method used for **SET IN ORDER / STRAIGHTEN**
 - **SHADOW BOARDS**
 - **RACKS**
 - **COLORED LABELS**
 - **FLOOR MARKING etc**



TOTAL PRODUCTIVE MAINTENANCE

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WHAT IS TOTAL PRODUCTIVE MAINTENANCE?

A set of techniques which ensures that each and every machine in the production process is always able to perform its required task

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WHAT IS TOTAL PRODUCTIVE MAINTENANCE?

- The approach needs to be Total; It requires the participation of all employees. Production operators are trained to handle routine maintenance activities such as lubricating, cleaning, tightening and inspecting equipment on a regular basis
- It blurs the distinction between the roles of production and maintenance by placing a strong emphasis on empowering operators to help maintain their equipment.

WHY IMPLEMENT TOTAL PRODUCTIVE MAINTENANCE?

TPM increases stability by...

- Reducing unscheduled downtime
- Determining abnormal / normal conditions at a glance
- Improving knowledge on equipment operation and maintenance
- Equipment performs as expected
- Equipment is ready when needed

TPM APPROACH

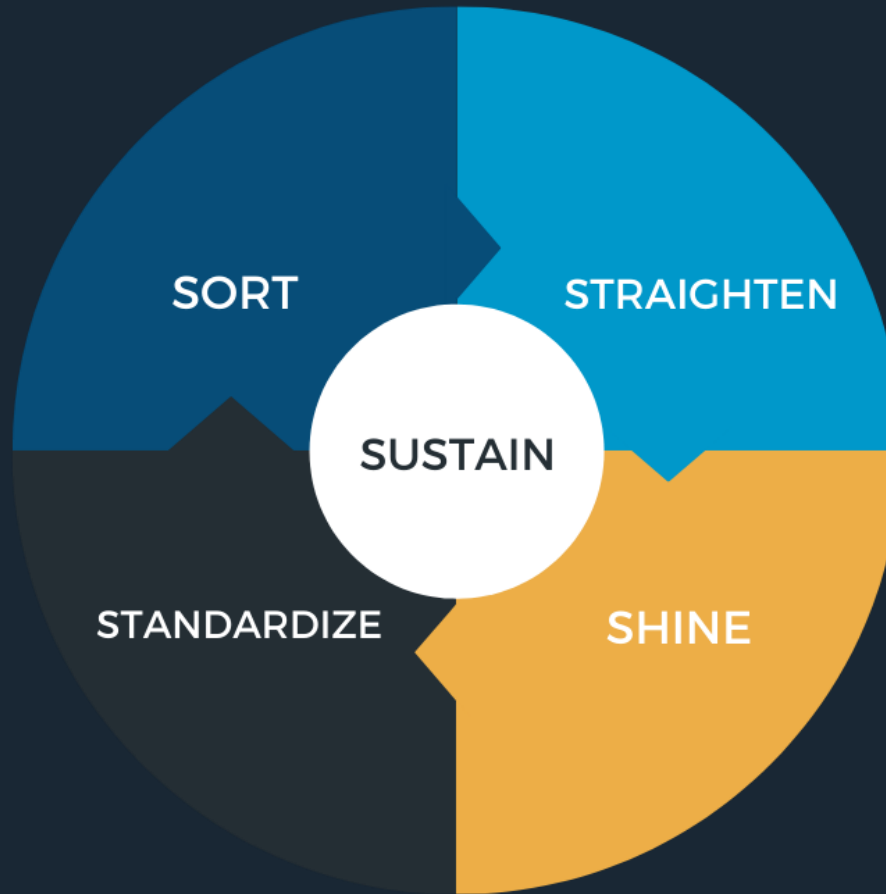
A shared responsibility for the equipment;

- It gives operators a chance to take ownership of their equipment
- Frees up the resources needed to fix problems caused by lack of maintenance
- Operators work together with maintenance

It seeks the total productivity of all the equipment;

- Achieved by focusing on the elements which account for the usual major losses, or downtime that occur to equipment

RESTORE TO ORIGINAL CONDITION



**DOES THE
MACHINE HAVE
AN OIL LEAK?**



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**DOES THE
MACHINE HAVE
AN OIL LEAK?**



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MEASURE OEE

OEE stands for “Overall Equipment Effectiveness”.

OEE is a metric that identifies the percentage of planned production time that is truly productive. It was developed to support TPM initiatives by accurately tracking progress towards achieving “perfect production”.

Simply put – it identifies the percentage of manufacturing time that is truly productive.

DEVELOP

THE ROUTINE & SCHEDULE

- Research equipment-maker's recommendations
- Add “experience-based” things to be done
- Utilize all your resources when determining tasks
- Use Preventative Maintenance System already in place

TRAIN PERSONNEL ON RESPONSIBILITIES

Operating equipment correctly and safely

- Do operators know how to start-up, shut-down and operate the equipment?
- Can operators run the equipment safely?
- Can operators changeover the equipment safely and in the targeted time?

Knowing recommended equipment maintenance

- Do operators have the required level of knowledge on the equipment?
- Do operators understand how to perform the required Preventative Maintenance routine, and scheduled tasks?



OUR ROLES & RESPONSIBILITIES

Operators perform routine maintenance

- Think of them as the car owner
- Goal is to keep the car at optimal performance
 - Learn to properly operate car
 - Check and refill fluids
 - Keep automobile clean
 - Provide feedback to mechanic when problems occur

Maintenance delivers specialized service

- Think of them as the Mechanics
- The goal is a well running automobile
- Provide pre-scheduled maintenance
- Diagnose problems when car not performing to expectations
- Trained to handle more complex repair
- Provide feedback to car owner



MONITOR TO IMPROVE

- Visual card systems are effective to monitor the TPM Systems
- TPM Tasks are listed on colored cards; Red/Incomplete and Green/Completed
- Tasks are broken up into Daily, Weekly, and Monthly Requirements
- When a TPM task is complete the card is turned from red to green
- Cards are flipped back to red depending on the frequency of the TPM task i.e., the beginning of the week, or month
- The TPM system is monitored using Layered Process Audits

TPM FOUNDATION:

DAILY DATA

Hour by Hour can be used to identify the losses that are occurring

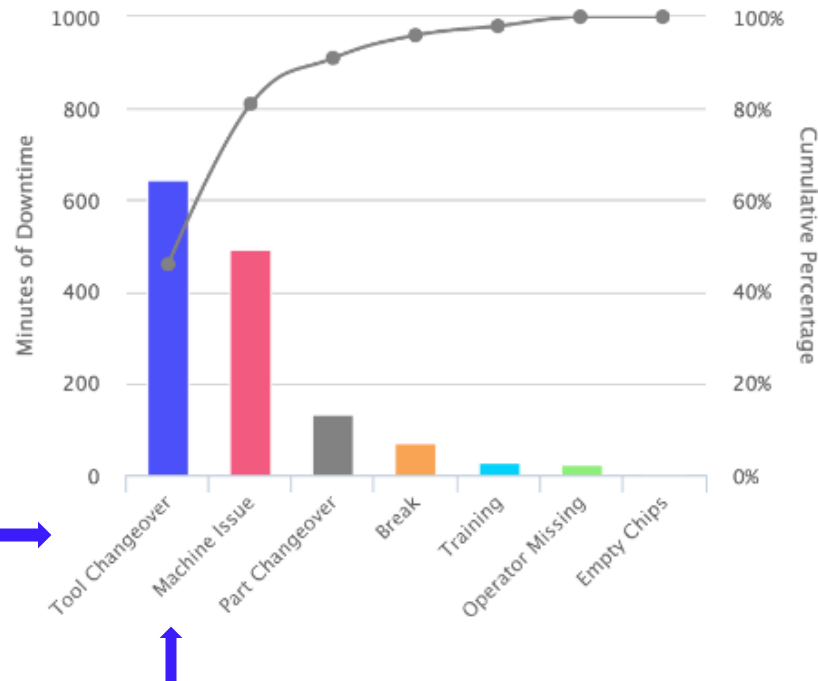
There are five main categories of losses:

1. Equipment downtime
2. Changeover
3. Minor stops
4. Speed Loss
5. Rework/Scrap

Break down each category for effective Problem Solving

PARETO ANALYSIS

Use Team Improvement Boards to Pareto Losses



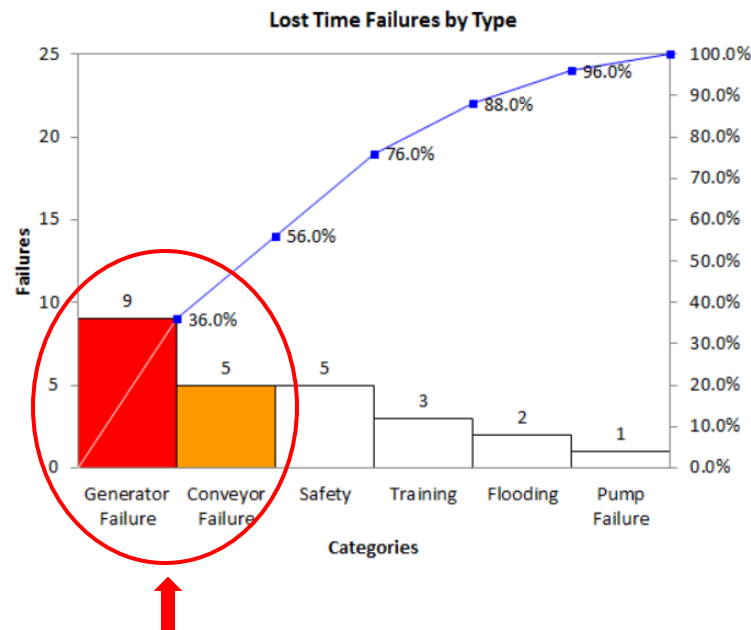
Reduce the Planned
(Changeover)



Eliminate the Unplanned Issues

PARETO ANALYSIS

Second Level Breakdown Pareto May Be Necessary



Breakdown the Machine Issues



STANDARD WORK

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ONE OF FOUR RULES OF TOYOTA

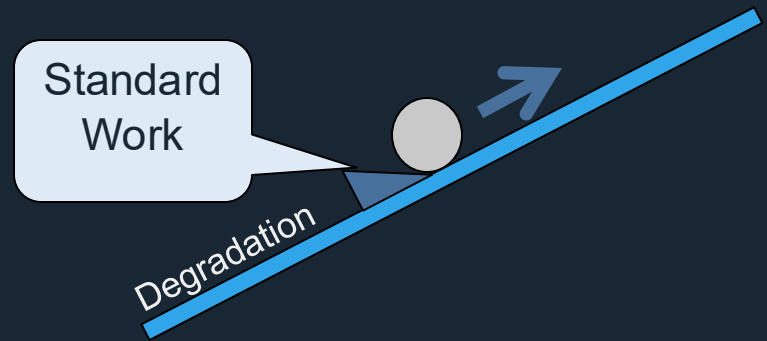
All work shall be highly specified as to content, sequence, timing and outcome.

WHAT IS STANDARD WORK

- Detailed work sequence of the operator
- Provides a routine for consistency of an operation
- Details the best process we currently know
- Is the basis for improvement by defining the normal

WHY STANDARD WORK?

- Prevents backsliding
- Makes problems obvious
- Removes ambiguity
- Makes managing schedules/resources easier
- Agree to work together/agree to change together



Draw a Pig Exercise

Customer Expectations

- Happy pig, with smile
- Curly tail
- Nose with two nostrils
- One eye
- 4 legs
- 2 ears
- “Plump”

STANDARD WORK DOCUMENT

Work Instructions										
PATRICK ADAMS CONSULTING		NO.	REV.	Part Number	Part Name	Quantity / Shift	Takt Time	Date	Completed By	Approved By
No.	Work Element				<u>Layout / Pictures</u>					
1										
2										
3										
4										
5										
6										
7										
8										
9										



AUDITING STANDARD WORK

AUDIT PURPOSE

- Check understanding of the standard
- Discover individual difficulties
 - Did lack of training lead to the problem
 - Kaizen: to take away difficulty
- Identify waste in process

Standard Work audits are NOT meant to be punitive



WHY AUDIT STANDARD WORK?

- Go to Gemba
- Establish standards if not in place
- Kaizen day after day, even the small things
- Kaizen creates basis for larger change
- Developing people
- Encourage team work



STANDARD WORK

AUDIT AGENDA



Member trained & documented?



Work area layout correct?



Work in progress within allowance?



Step sequence followed?



Within time?



Results discussed with member?



What to do if someone is not following the standard?

ASK WHY

**They're not following the
standard**

RESPOND TO

The reason they indicate



STANDARD WORK SUMMARY

- Every facility must implement and maintain Standard Work
- Applying Standard Work demonstrates how methods to improve quality, increase operational speed, and reduce costs are all interconnected
- Standardized Work establishes the foundation for all productivity, quality, safety, and cost improvements of the future



STANDARD WORK SUMMARY

- Standard Work - The BEST combination of people and machines (assets) while using the minimum amount of materials, equipment and space
- We need to test out possible improvements by changing only one thing at a time.
- Standard work should be developed by those who perform the tasks. The operators that do the work are most likely to know how to do it well and are the experts.



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QUIZ:

1. All work shall be highly specified as to content, sequence, timing and _____.
 - **OUTCOME**
2. True or False? Standard work provides a routine for consistency of an operation.
 - **TRUE**
3. True or False? Standard work helps to hide problems.
 - **FALSE**
4. Discussion: Why is it so important to audit standard work?



End of Section 1

