



Productivity Improvement thru 5S



HOW TO IMPROVE PRODUCTIVITY AND REDUCE THE COST
OF OPERATIONS USING 5S?



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Course Introduction



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- Higher Productivity in every walk of life is individual responsibility.
- As Operational Excellence Enthusiast, you are welcome to the Prosperous world of Productivity!
- This program is designed to help participants to systematically identify opportunities for improvement from their own processes and help the organisation to improve its efficiency

- At the end of the program, you will
 - Appreciate the importance of velocity and flow in business
 - Recognise the need for productivity improvement
 - Appreciate the simplicity and effectiveness of 5S in productivity improvement
 - Attain a deep understanding of 5 Steps of inculcating a culture of productivity throughout the organisation
 - Gain confidence to implement 1S, 2S and 3S in your organisation
 - Be able to systematically identify the opportunities for improvement
 - Understand how to manage 5S projects



Faculty Profile



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Profile of LS Kannan



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Business Consultant, Lean Six Sigma Kaizen Expert, Trainer, Author, Leadership Speaker & Coach

- > Working with Entrepreneurs - bringing clarity in vision, strengthening connection between personal and professional goals, helping to nurture the **Leader within**.
- > Improving Profit, Profitability, Prosperity and Perpetuity of organisations by tapping **the Indigenous Wisdom**
- > Delivering Keynote Speeches and conducting training programs for Leaders and Managers.
- > Helping the workforce to make their **job easier**
- > Inspiring people to believe **Wisdom isn't Alien!**



Academic Credentials

- > Postgraduate in Chemistry, Gold Medallist in Under Graduation.
- > Master Black Belt in Lean Six Sigma
- > Certified Lead Auditor for ISO 9001
- > MBA in General Management

Professional Credentials

- > Visiting Faculty at ITM Group of Institutions, Navi Mumbai
- > Visiting Faculty at KLN College of Engineering, Madurai
- > Empanelled Lean Manufacturing Consultant with National Productivity Council (NPC)
- > Certified Master Trainer for ZED Program of Ministry of MSME
- > Empanelled faculty at Confederation of Indian Industry (CII), Centre for Manufacturing Excellence, Vikhroli, Mumbai.
- > Member of National Institute of Personnel Management (NIPM), Quality Circle Forum of India (QCFI) and National Council for Quality Management (NCQM).

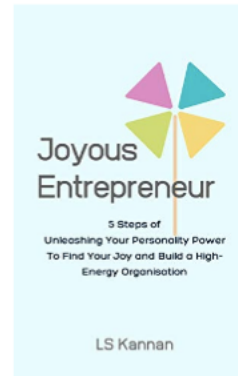
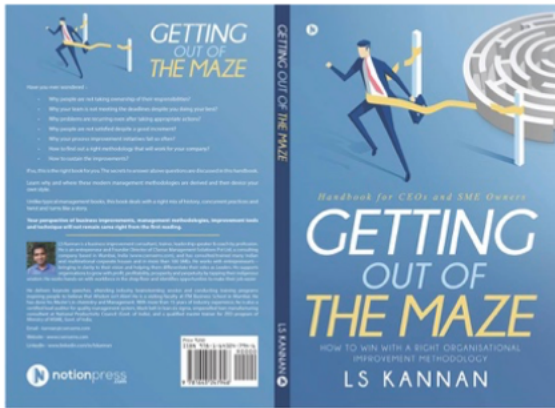
- Lean Six Sigma Implementation: Implemented 150+ Lean Six Sigma Green Belt Projects, 25+ Black Belt Projects, and trained 3000+ Green Belts, 100+ Black Belts.
- Lean Transformation: Handled 40+ Lean Transformation Projects based on Kaizen Approach in India's Top 500 firms to SME's.
- In the field of consulting since 2009, and more than 18 years of industry experience.
- Delivered more than 400 training programs on
 - Leadership
 - Business Strategy
 - Business Development
 - Productivity & Profitability
 - Lean Manufacturing
 - Lean Six Sigma
 - Kaizen
 - 5S
 - Value Stream Mapping
 - Lean with BPR
 - Workstation Design
 - Problem Solving
 - Autonomous Maintenance
 - Poka-Yoke
 - Statistical Process Control
 - ISO Systems
 - Design of Experiments (DoE)
 - Minitab, etc.

Authored two books

Getting out of the Maze – How to win with a Right Organisational Improvement Methodology? <https://amzn.to/2JXW6Tg>

Joyous Entrepreneur: 5 Steps of Unleashing Your Personality Power To Find Your Joy and Build a High-Energy Organisation.

<https://amzn.to/2OaLuFl>



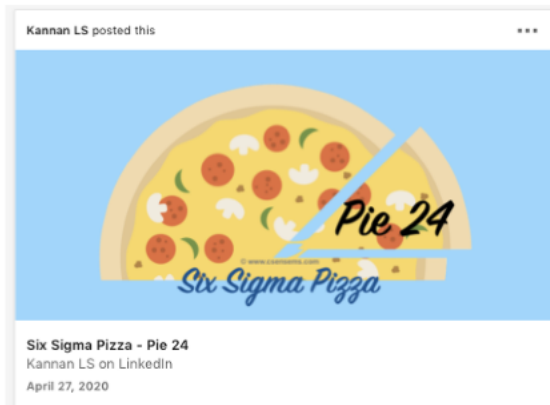
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On Social Media

Writes article on LinkedIn on the subject of Operational Excellence.

Blogs on CSense website

<https://www.csensems.com/category/csense-blogs/>



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5S



THE SECRET TO
JAPANESE SUCCESS



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What is 5S?



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- Absenteeism
- Attrition
- Lower Morale
- Cluttered / Unsafe working conditions
- Accidents
- Mistakes / Defects
- Delays
- Breakdowns

- 5S
 - Improves working conditions
 - Improves visibility
 - Improves productivity
 - Improves quality
 - Enhances participation & morale of people
 - Reduces accidents

- Is it all about housekeeping and cleaning?

- But it is the simplest productivity improvement methodology.

- It can be successfully implemented by everyone, every day, everywhere – at every size of the organisation, whether it is a manufacturing, tool room, bank counter, restaurant, hospital, medical shop, IT company or be your home.

- Henry Ford created the CANDO program
 - ÷ C – Clearing Up
 - ÷ A – Arranging
 - ÷ N – Neatness
 - ÷ D – Discipline
 - ÷ O – Ongoing Improvement

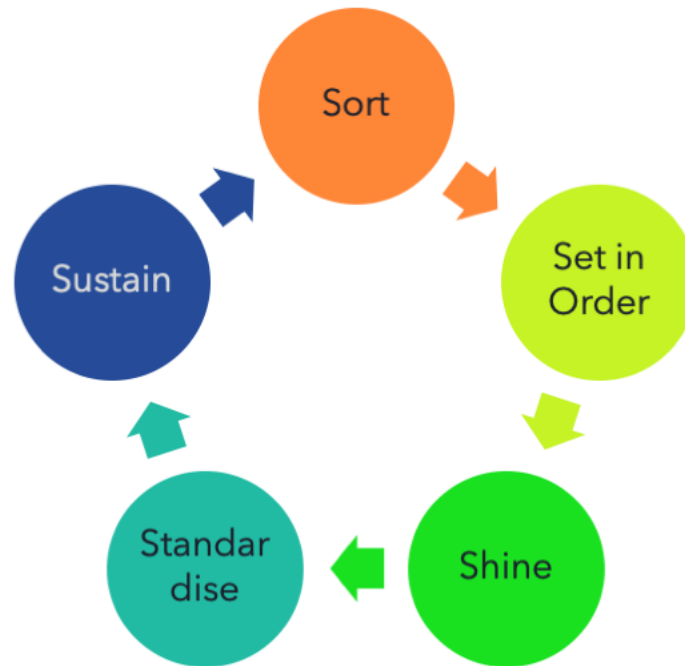


- Postwar (Taichi Ohno & Shigeo Shingo) studied Henry Ford's production Methods
- Learned from Americans (Edwards Deming & Joseph Juran)
- Improved Ford's model by involving workers

- Translated the CANDO program into Japanese
 - ÷ Seiri (Sort)
 - ÷ Seiton (Set in Order)
 - ÷ Seiso (Shine)
 - ÷ Seiketsu (Standardise)
 - ÷ Shitsuke (Sustain)



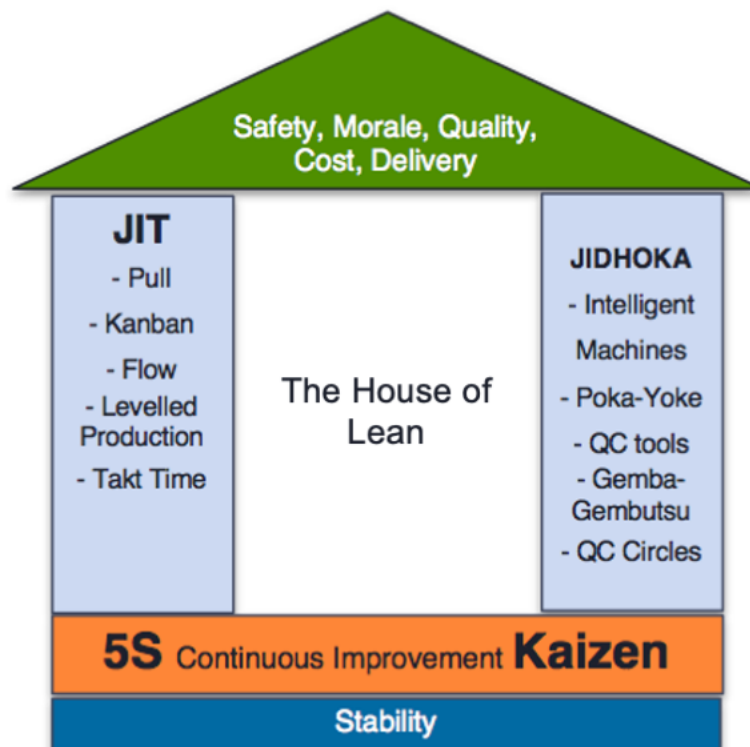
5S – 5 Steps of Productivity Improvement



The Philosophy of 5S

- **Cleaning for Ownership**
 - A Person who cleans and maintains a property becomes the moral owner of it. By cleaning his workspace or machine, a person becomes attached to it.
- **Cleaning is inspection**
 - A person comes to know the potential damages, abnormalities at an early stage by cleaning daily. Thus 5S reduces the chances of breakdowns, accidents, and other losses.
- **Cleaning for positive Energy**
 - It is not all about cleaning. But it is about remaining positive and attractive. The Objective of 5S is to keep the workspace, machines, and people attractive all the times (step 3 – Shine). Good attracts Good.
 - Conducive / attractive working environment helps to Achieve high levels of quality, safety and productivity.

- The Toyota Production System (TPS) is an integrated socio-technical system, developed by Toyota
- Comprises of management philosophy and practices.
- Organises manufacturing and logistics for the automobile manufacturer, including interaction with suppliers and customers.
- The system is a major precursor of the more generic "lean manufacturing".
- Taiichi Ohno and Eiji Toyoda, Japanese industrial engineers, developed the system between 1948 and 1975.





Velocity



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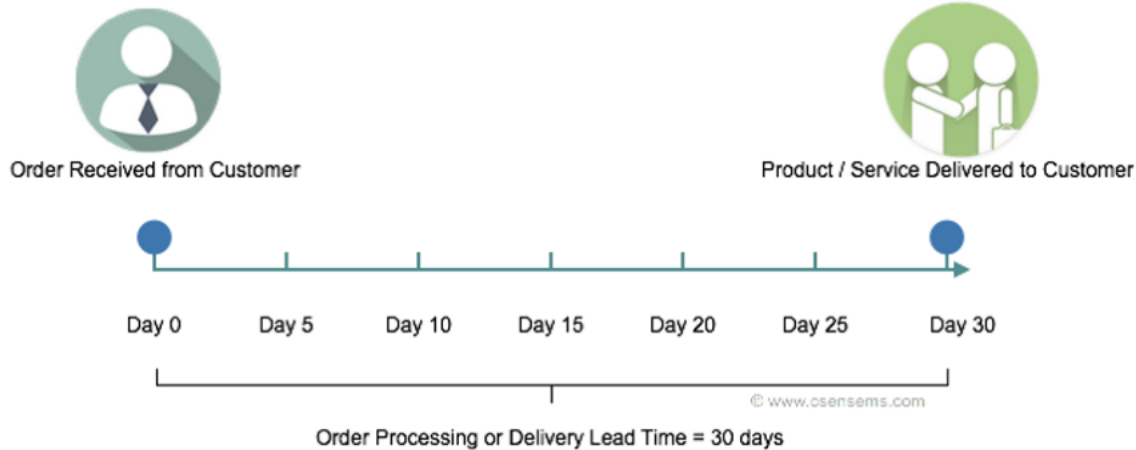
Throughput



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- Throughput is a measure of Productivity of a machine, procedure, process, or system over a unit period,
 - expressed in a figure-of-merit or a term meaningful in the given context, such as output per hour, cash turnover, number of orders shipped
- It can also be considered as the capacity of a machine or a plant to produce and ship certain quantity of material. It is generally expressed as quantity of material per time unit.
- For example, 100 mT per month or 15 Million Pieces per week.

- Throughput time is the time required for a company to produce a product or service - especially in the form of Input to Output.
- This could also be termed as Production Lead-time or Service Delivery Lead-time.



- Higher throughput time means longer wait time for customers.
- As per the Philosophy of Lean, the customer is willing to pay for the product or service at the time of placing an order.
- It is the throughput time capability of an organisation that determines how quickly it delivers the products to the customers and gets their money.
- Less throughput translate as speed of processes. We call it as Velocity



Value



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Value



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- Value is anything for which a customer is willing to pay.
- It can also be thought of as an activity that can create a comparative advantage for your company.
- In line with Philosophy of Lean, we can say that any activity that support the progression of business in the direction towards customers is Value.
- Such activities are called as Value Adding Activities.



- Any activity that consumes the resources but fails to move the business process in the direction towards customer is called Non-Value or Non-Value Adding Activity. Time, effort, money, energy etc., are considered as resources.
- Taiichi Ohno classified these NVAs into 7 categories such as
 - Transport
 - Inventory
 - Motion
 - Waiting
 - Over Production
 - Over Processing
 - Defects
- This list of 7 Wastes are useful as checklist for conducting process observations.



Non-Value Adding Activities



7 WASTES - TIMWOOD



Transport

Inventory

Motion

Waiting

Over Production

Over Processing

Defects

- Movement of Material without any change in size / shape / property of material
- Transporting product between processes consumes cost but adds no value to the product.
- Cost is also incurred for material handling equipment and their Maintenance



- Transporting Raw Material from stores to process area.
- Carrying WIP from one machine to the next machine
- Sending components to Outsourced processes (sending out of own premises and receiving back)
- Keeping semifinished materials in a common stores at the end of shift
- Carrying components across the shed using overhead cranes
- Moving materials on a pallet using pallet trucks

- Material that are not attended - lying on floor
- Inventory lies in the production floor in the form of
 - Excess Raw Material
 - Work In Progress
 - Excess Finished Goods
- Inventory Reduces the velocity of business flow.



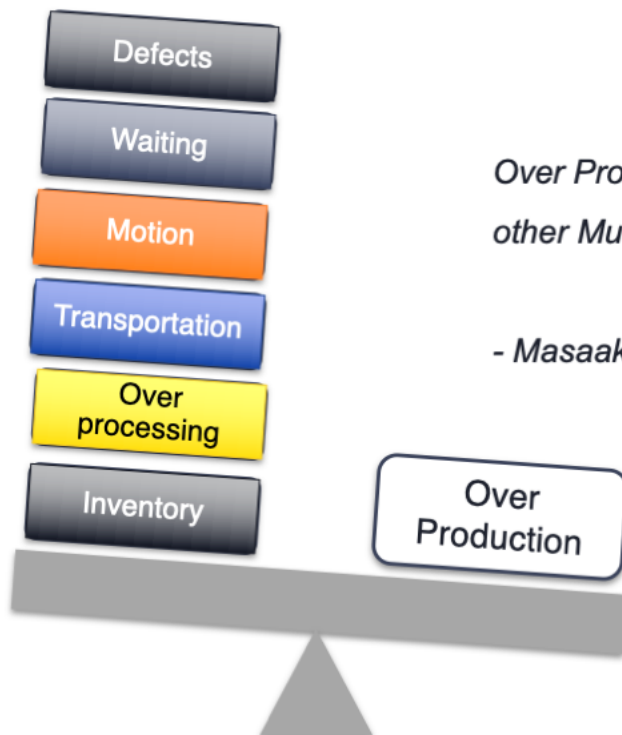
- Movement of People and / or machines without producing any change in size / shape / property of material
- Walking to printers, excessive clicking, or searching for supplies in a messy cabinet are all examples of wasted motion.



- Material, Machine or Man waiting for something
- Waiting extends the throughput time and thus reduces the velocity and cashflow
- *Materials waiting for getting batched up*
- *Materials waiting for next process*
- *Materials wait for getting transported*
- *Materials wait for operators*
- Machines wait for feed materials
- Machines waiting for power
- Machines waiting for operators
- Operators waiting for material



- Producing more than orders in hand / more than what next process can consume



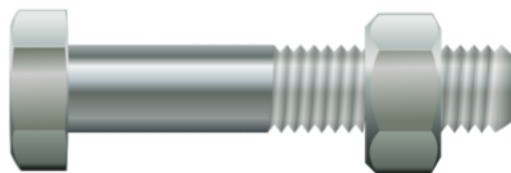
Over Production is a Crime, Sin and Mother of all other Muda.

- Masaaki Imai, Father of Kaizen

- Process / activity that is not specified, not required or not producing any change in material size / shape / property
- It consumes resource and increases production time
- It is caused by
 - Out dated procedures / lack of procedures
 - Experience - "Working like this for 20 years!"
 - Insufficient process knowledge
 - Lack of process observations

- Threading a nut for several rounds is over-processing
- Because the fastening happens at the last thread!

- Shiego Shingo



- Products that are not meeting requirements right at first time
- This waste includes the waste of rework and reprocessing



The 3 Mu's





Muda: Wastefulness



Muri: Overload



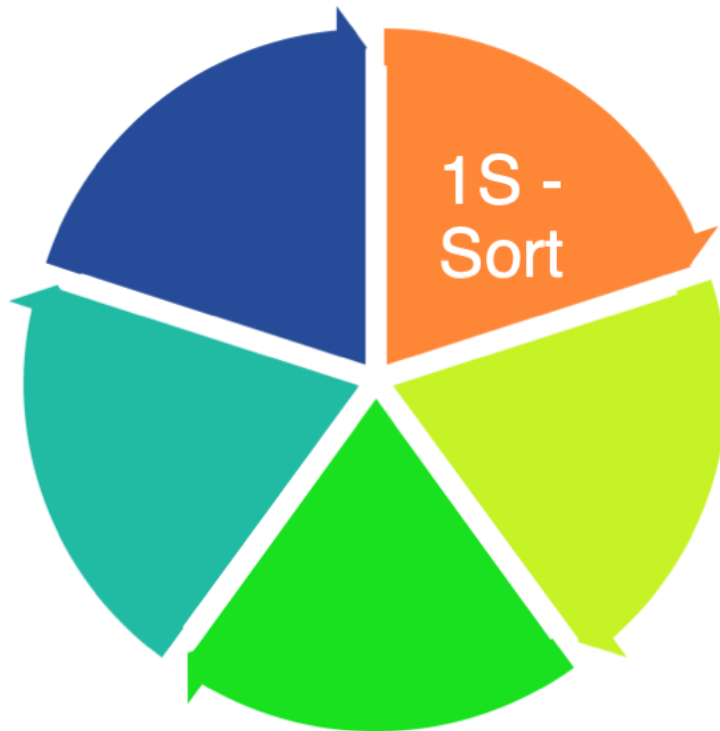
Mura: Imbalance

Curtesy: www.blog.etq.com

- What is Muri?
 - Just as simple as this - if anyone feels a pain, strain or even stress we have Muri.
- Some define Muri as an excess effort to complete a task.
- A simple definition - whichever causes physical pain, strain to the body or causing stress.
- The secret of becoming an effective manager and getting the buy-in from the shop floor people is talking to them only in terms of Muri.

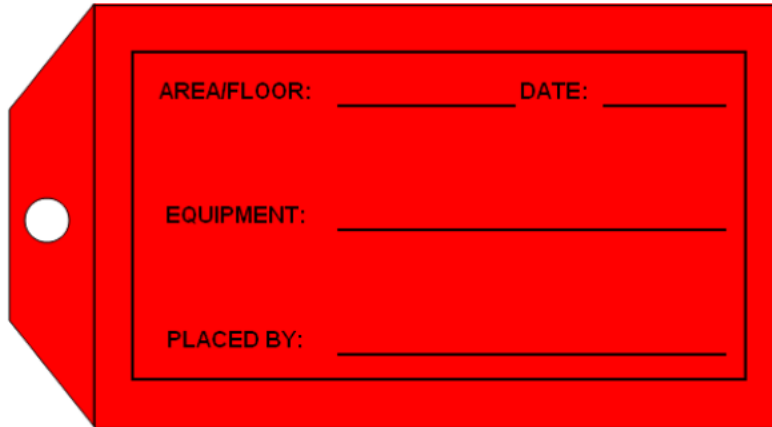
- The least talked about among the 3Ms.
- Mura meaning variation of any kind.
- Variation with respect to time, measurements, efforts, or anything.
- It is given least focus because it is too vague to explain and difficult to plan a corrective action for it.

- Lets first remove the clutter
- Removing unneeded items allows the operator/user to concentrate on the work content needing to be performed.
- Placing unneeded items in a red tag area helps reduce costs by reducing the number of purchases required for tools/equipment



Why Sort?

- Work space is crowded with parts, tools and unwanted items
- Storage of un-needed items creates walls between employees, reducing effective communication
- Waste of time in searching for parts and tools
- Excess inventory of unwanted parts.
- Unneeded items and equipment make it difficult to improve process flow.

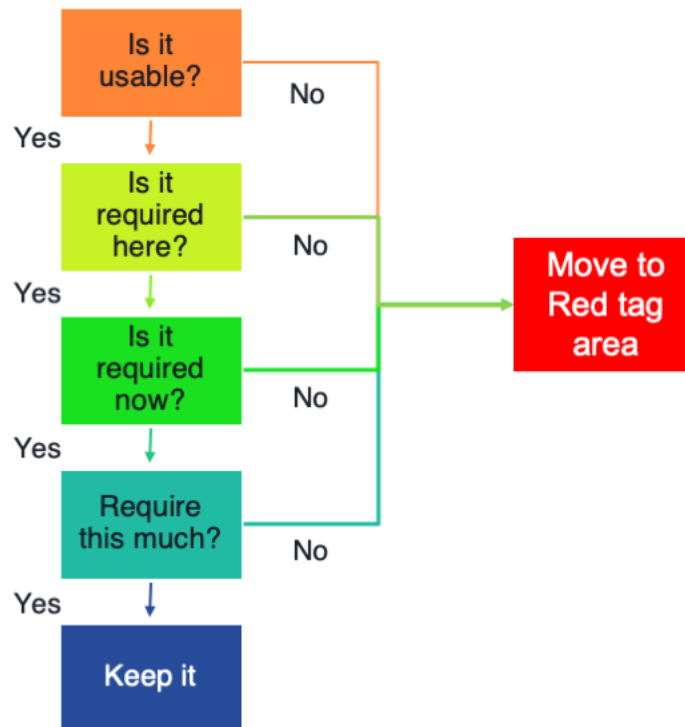


AREA/FLOOR: _____ DATE: _____

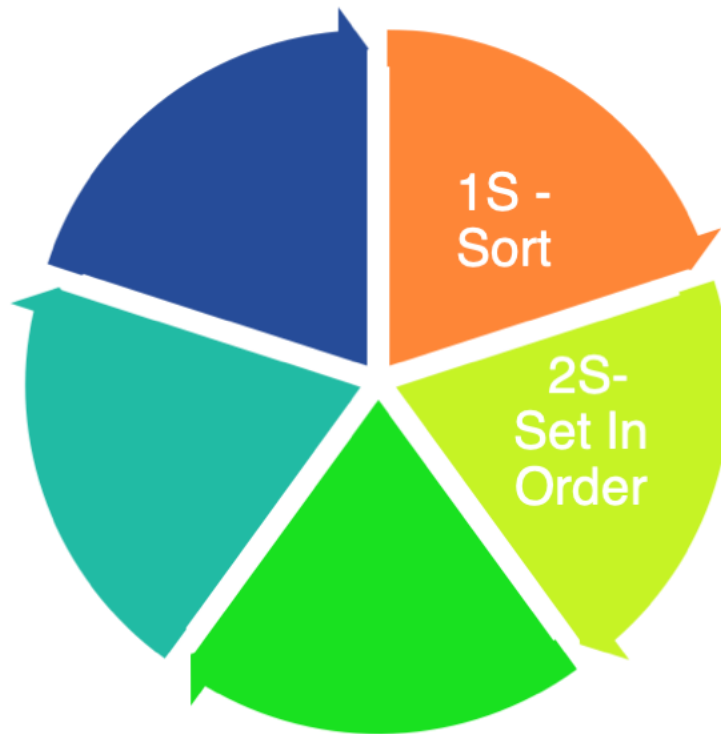
EQUIPMENT: _____

PLACED BY: _____

- Go to shop floor with red tag
- Decide what you need
- Remove unnecessary clutter
- All tools, gauges, materials, classified and then stored
- Remove items which are broken, unusable or only occasionally used



- Team to designate the “Red Tag Area” to hold items awaiting disposition
- Any item with a fixed asset number will be moved to the Red Tag Area must go through a special disposition process
- Team will establish a deadline for initial disposition
- Any parts such as motors, gearboxes, bearings, belts, etc... will be referred to Maintenance & Stores for final disposition
- Chemicals will be referred to Safety Manager & Quality Manager for disposition directions
- Raw materials are reviewed from a “visual inventory” standpoint



The 2nd S – Set in Order

- Set In Order or Seiton is putting all necessary items in the optimal place for fulfilling their function in the workplace.
- Goal is to make the workflow smooth and easy.

- Reduces and eliminates many kinds of wastes:
 - ÷ Waste of Motion
 - ÷ Waste of searching
 - ÷ Waste of excess inventory
 - ÷ Waste of unsafe conditions
 - ÷ Waste of defective products

- Principles of storing parts and tools
 - Arrange all necessary items so that they can be easily selected for use.
 - Make it easy to find and pick up necessary items.
- Principles of Motion Economy
 - Arrange work stations in such a way that all tooling / equipment is in close proximity, in an easy to reach spot and in a logical order adapted to the work performed.
 - Place components according to their uses, with the frequently used components being nearest to the workplace.
 - Arrange all necessary items so that they can be easily selected for use.
 - Make it easy to find and pick up necessary items.

- Visual Controls
 - Signboard strategy – identify what, where, and how many
 - Painting strategy – identify locations on floors and walkways
 - Color-coding strategy – clearly show which part and/or tool is to be used for which purpose

- 5S Map – “Before” and “After” map

“A place for everything, and everything in its place.”

Before



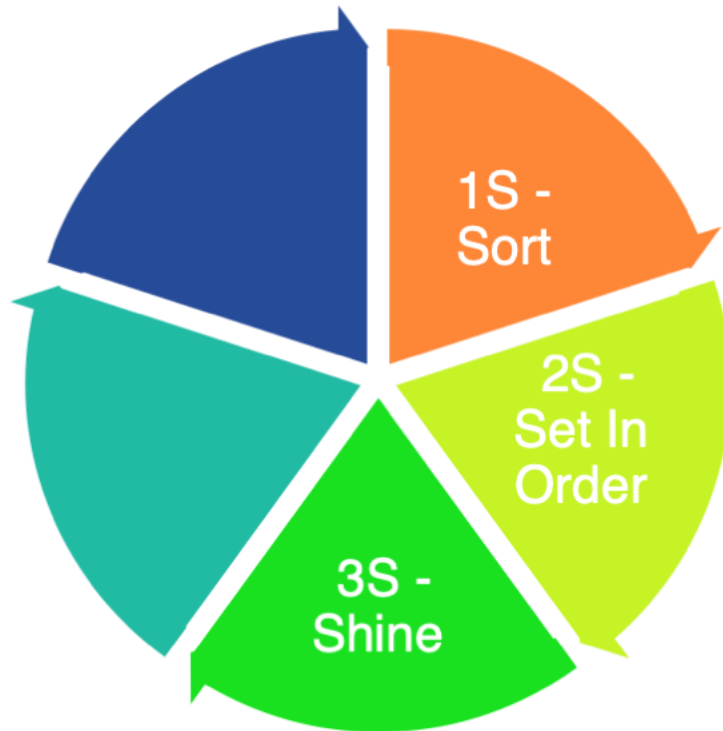
After



- In sequential order connect as many numbers as you can in the time allowed
- Record Results



- Shine involves the elimination of dirt, dust, and foreign matter to keep equipment, tools, and workplace clean.
- SHINE is also a form of inspection.



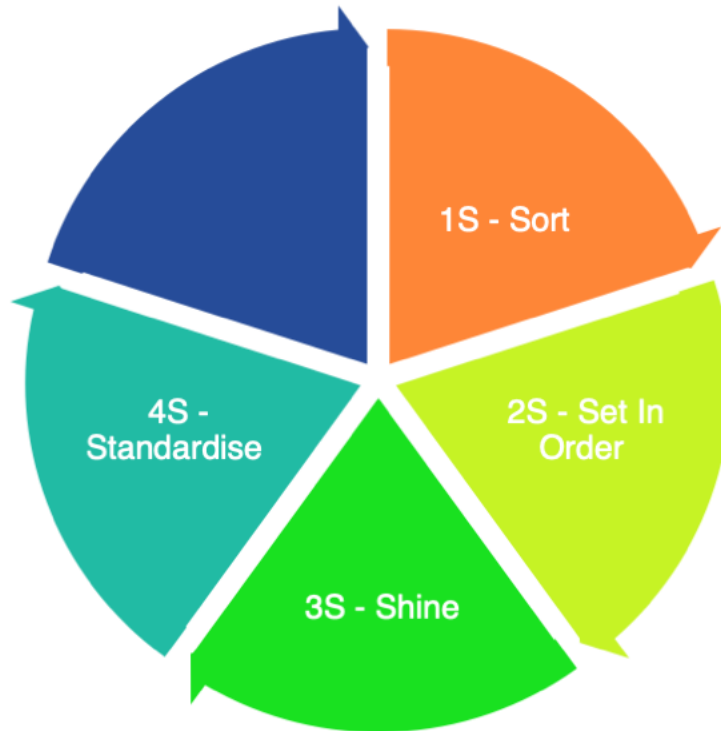
Example - Shine



Cleaning for Inspection

- Perform daily cleaning and inspection to understand work conditions
 - Identify points to check for performance
 - Determine acceptable performance
 - Determine visual indicators/controls
 - Mark equipment/controls
 - Conduct daily cleaning/inspections

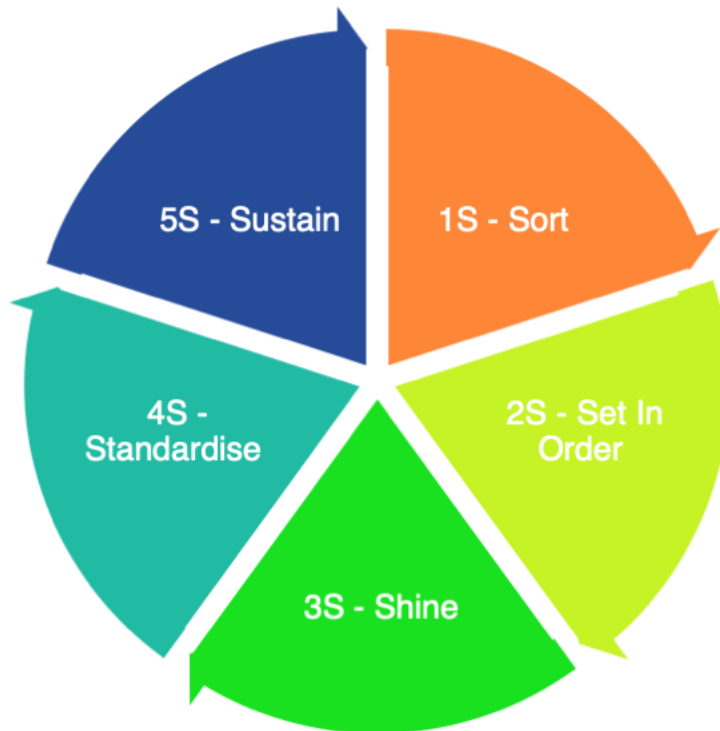
- Determine Targets
- Develop a 5S Assignment Map
- Develop a 5S Schedule
- Daily five minute shine
- On-going inspection and maintenance of cleanliness



The Fourth S - Standardise

Developing Common Methods for Consistency

- Make abnormal conditions noticeable and document agreements
 - Document agreements and checks
 - Establish/document standard methods across similar work areas
 - Document new standard methods



Holding the Gains and Improving

- Maintain the gains from other 5S activities and improve
 - Determine 5S Level of Achievement
 - Perform routine checks
 - Analyse results of routine checks
 - Measure progress and plan for continuous improvement
- Involves education, communication, and supervisory and management engagement to ensure that everyone adheres to the standards developed for workplace organization

- Increased productivity
- Lowered costs
- Improved quality
- Reduced space (foot print) needed

- SORT – Removed the clutter
- SHINE – Removed dirt/debris from the work area
- SET IN ORDER – Created a method/process for storage
- STANDARDIZE – We set up the area to see at a glance if anything has changed
- SUSTAIN – Used Visual Factory (shadow board) and improved on our already improved area ... Continuous Improvement



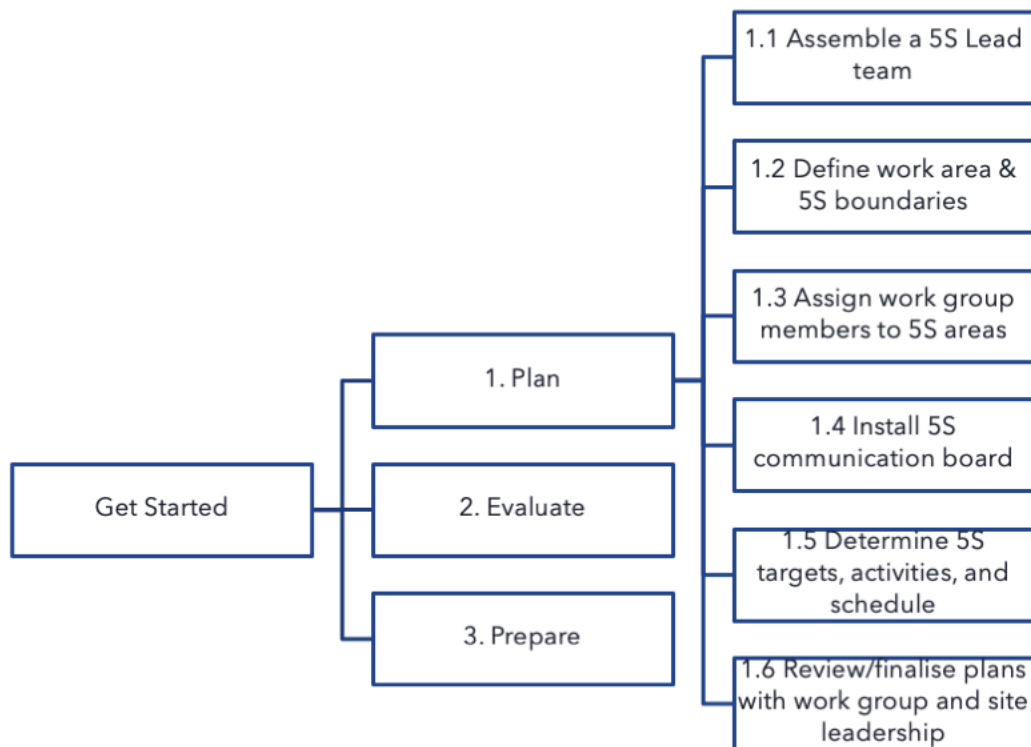
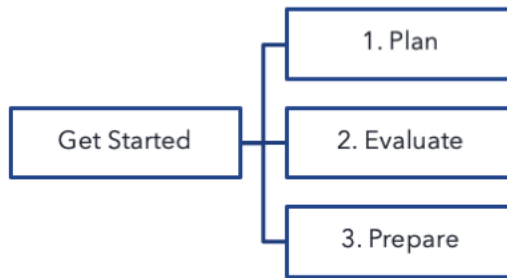
Implementation Plan

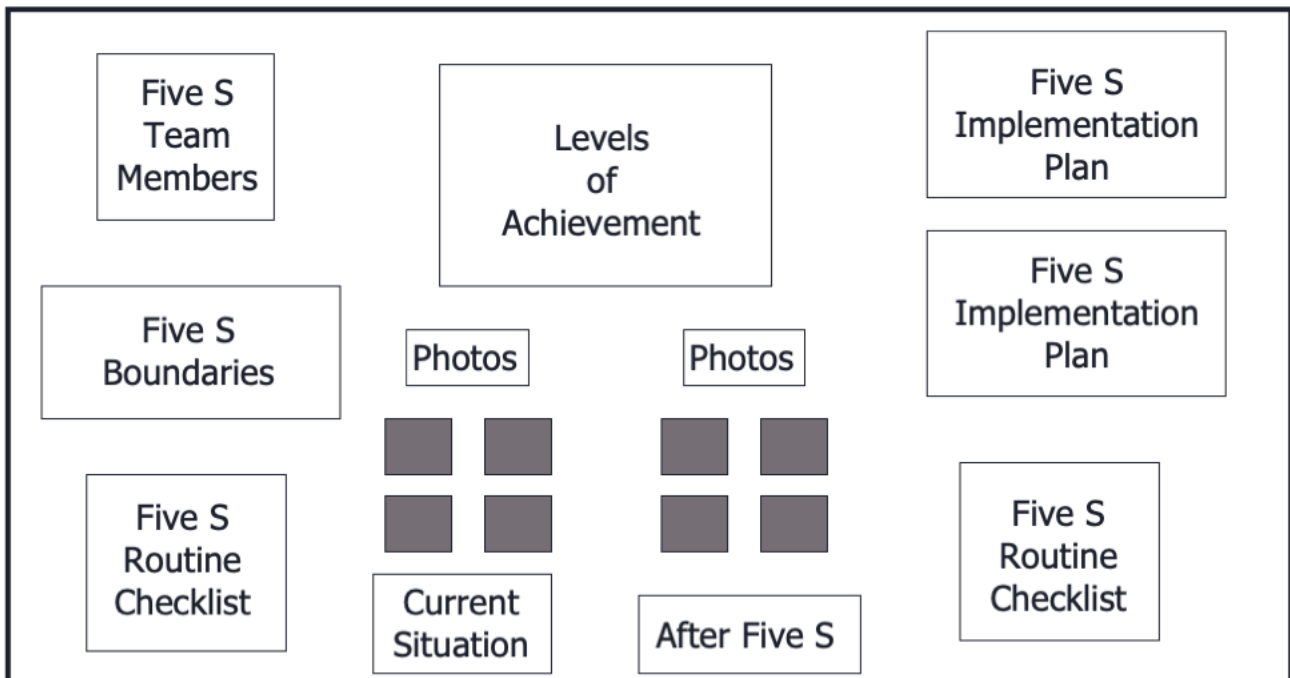
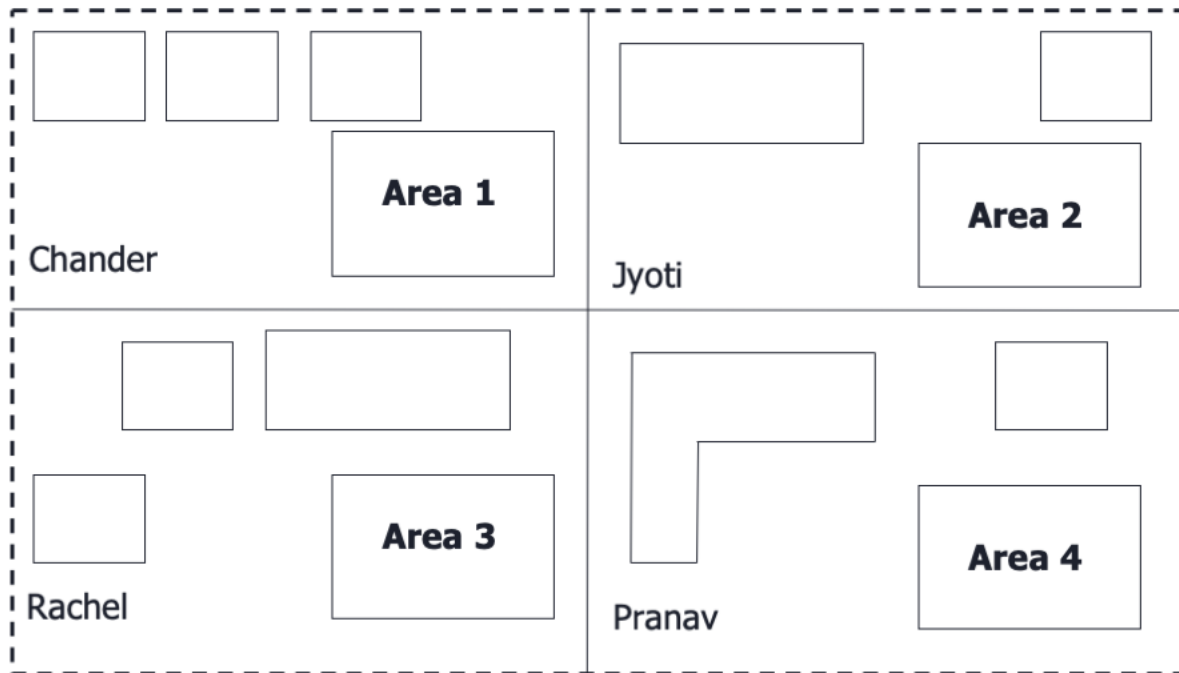


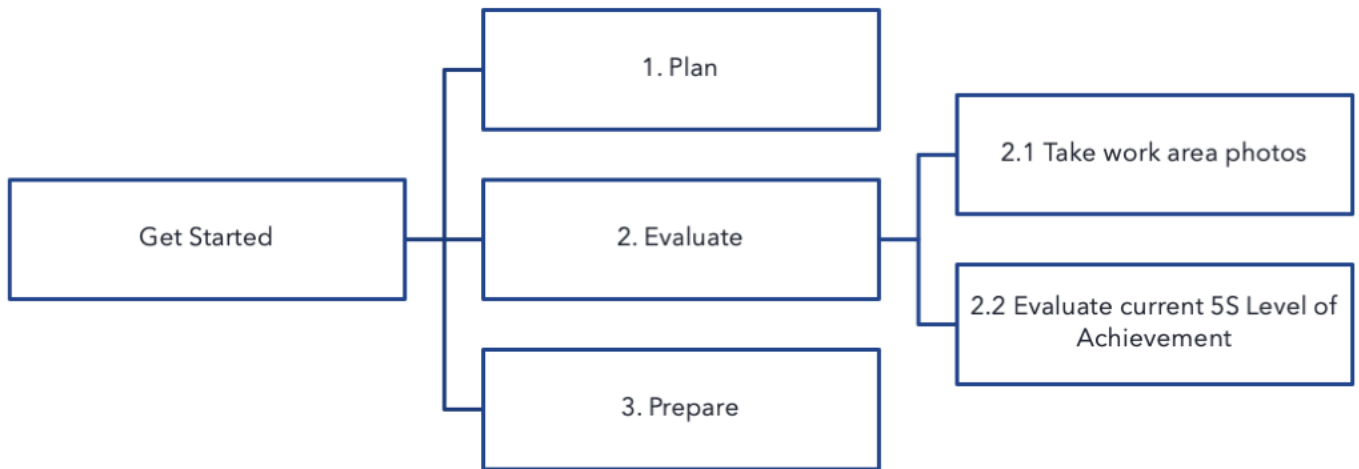
Area / Section chosen	Team members	Red Tag area	Red tag items segregation	Red Tag Disposal Resp

	Wallet	Handbag	Mobile	Laptop	My Table
1S					
2S					
3S					

1. **Planning** – Launch your 5S activity
2. **Evaluating** – Know Where you are and what you need to do
3. **Preparing** – Get ready for implementation







Organisation Level - 5S Culture Assessment					
	Sort	Set in Order	Shine	Standardise	Sustain
1	Needed and not-needed items are found together shopfloor. Unsafe conditions observed.	Items are placed randomly throughout the work place	Work area and machines are not cleaned thoroughly at regular intervals	No work area agreements exist	There is no measurement of 5S performance
2	Not-needed items are identified and evidence of Red Tagging observed. But, non-required items found in work area	Needed items have been safely stored and organized according to frequency of use	Work area and machines are cleaned to remove dust and dirt	Work area agreements are identified and documented for needed item organization and work area controls	5S level has been determined and posted on the communication board
3	Only required items are available in the work-area.	Locations allocated for needed items. All available items like tools are clearly marked.	Visual controls for equipment, files and supplies have been established for the work area	Work area agreements for needed item labeling and visual controls are posted and followed by work team	Work team is routinely checking area to maintain 5S agreements and posting results
4	List of items are clearly documented and displayed. Needed items are routinely assessed.	Visual indications like shadow boards are in use and required items are progressively reduced.	Daily inspection occurs to assess area readiness, potential problems are identified and fixed	Agreements for labeling, housekeeping, inspections, and work place design are consistently followed and demonstrate area performance improvement	Sources and frequency of problems are documented as part of routine work, root causes are identified, and corrective action plans are developed
5	Red tag areas are clearly marked and disposal of red tag items happens periodically.	Needed items can be retrieved within 30 seconds and require a minimum number of steps	Problem sources are documented with solutions defined and implemented	Methods for housekeeping, labeling, inspections, and work place design are continually improved and shared externally as applicable	Root causes have been eliminated and improvement actions focus on developing preventive methods

5S IMPROVEMENT OPPORTUNITY REPORT		
Date:	Work Area:	Performed by:
Improvement Opportunity: (Generally describe the 5S improvement opportunity and the location)		
Solution:		
Target Date:	Actual Completion Date:	Responsibility:

5S Audit Sheet			
Zone		Audit Date	
Zone Leader			
Focus Area	#	Observation	Remarks & Suggestion
Man (Safety)	1	Safety equipment like fire-hydrants or extinguishers available	
	2	Safety equipment are clean and in usable condition	
	3	Safety equipment & Personal Protective Equipment are kept in designated place	
	4	Safety equipment are easy to access and no materials are kept hindering their access	
	5	They are in working condition & servicing is done as per schedule	
	6	Are there any loose wiring or by-pass wiring?	
	7	Are there any unsafe / potential injury causing conditions?	
	8	First Aid kits are available in accessible area	
	9	Required items are available in first aid kit with shelf life	
	10	First Aid items checking and replenishment period and responsibility are documented and followed	
	1	Old / obsolete / broken dies, tools or fixture in shopfloor	
	2	Jigs, tools and fixtures are identified (numbered) & List of items are documented	
	3	Jigs, tools and fixtures are colour coded	
	4	Tools are arranged at the point of use with clearly identified location and marking	
	5	Vacant spots (like shadow boards) are visible to identify whereabouts of the tools and and trace them	

Page 1

- Communicating across shifts
- Disposing of, or moving, personal items
- Making time available
- Following agreements consistently
- Maintaining the gains
- Giving rewards and recognition
- Integrating 5S with other improvement activities



Litmus Test



- 30 second rule
 - One must locate the item within 30 seconds if 5S is properly implemented
 - Also applies to the electronic records retrieval



Complementing Tools for Sustenance





Total Productive Maintenance



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What is TPM?



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- TPM (Total Productive Maintenance) is a holistic approach to equipment maintenance that strives to achieve perfect production with

1 Zero Break Downs

2 Zero Production Loss

3 Zero Defects

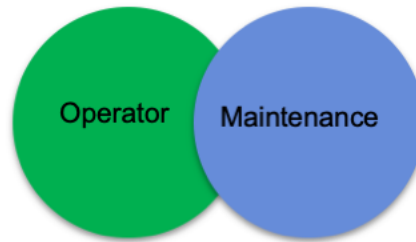
4 Zero Accidents



I use



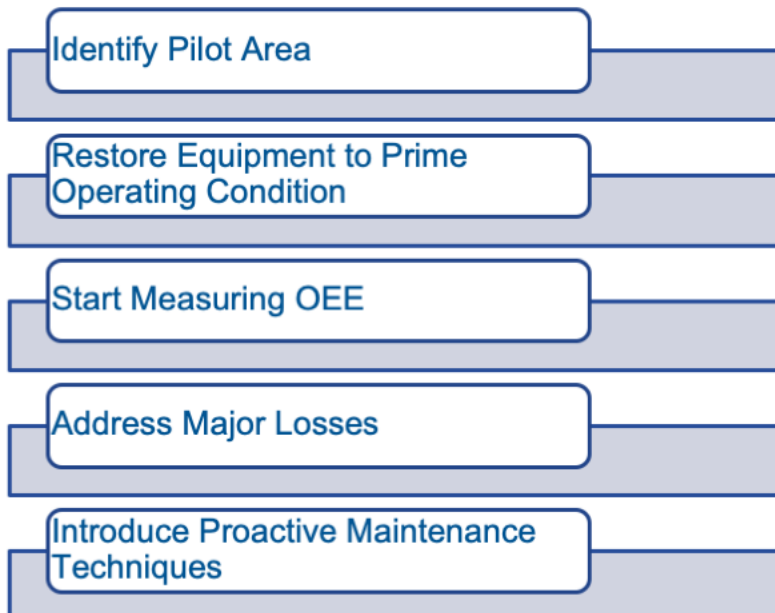
I maintain &
I fix



We maintain

**Conventional
Mind set**

**TPM
Mind set**







What Is It?	How Does It Help?
-------------	-------------------

Places responsibility for routine maintenance, such as cleaning, lubricating, and inspection, in the hands of operators.

- Gives operators greater “ownership” of their equipment.
- Increases operators’ knowledge of their equipment.
- Ensures equipment is well-cleaned and lubricated.
- Identifies emergent issues before they become failures.
- Frees maintenance personnel for higher-level tasks.



What Is It?

Schedules maintenance tasks based on predicted and/or measured failure rates.

How Does It Help?

- Significantly reduces instances of unplanned down time.
- Enables most maintenance to be planned for times when equipment is not scheduled for production.
- Reduces inventory through better control of wear-prone and failure-prone parts.



Layout & Spaghetti Diagram

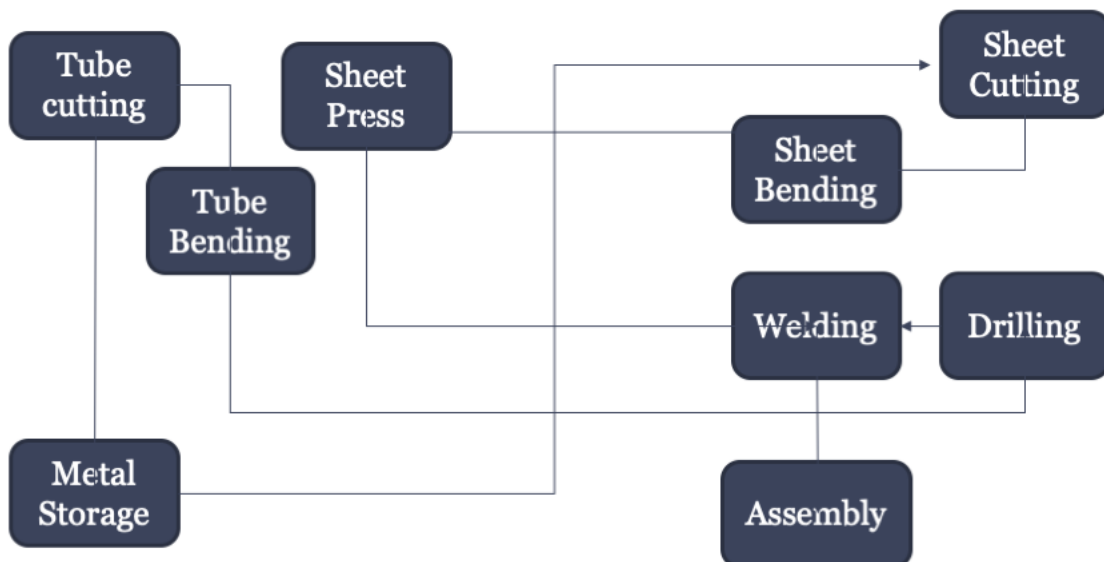
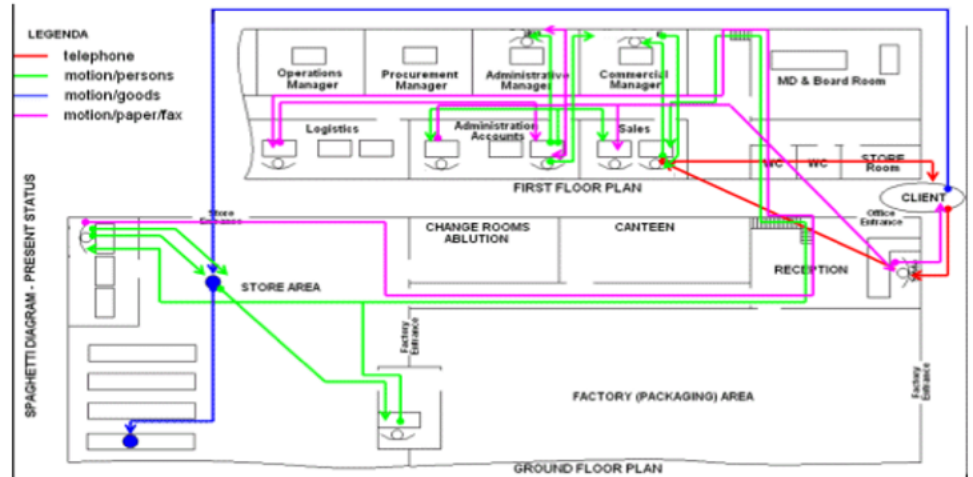


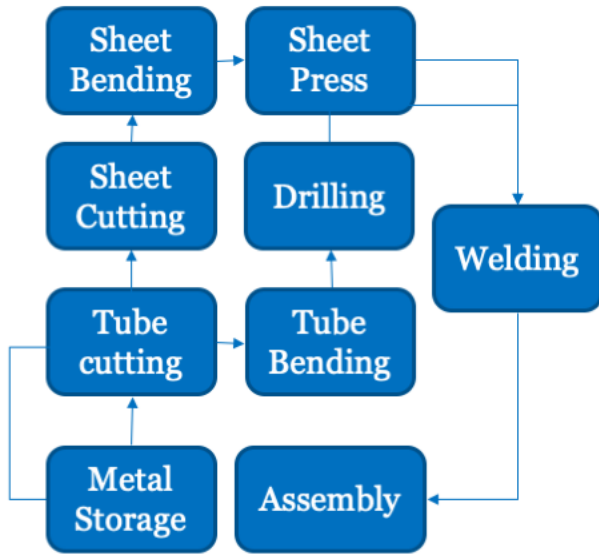
- “Over production is a crime, sin and mother of all other waste”
- Masaki Imaai, Father of ‘Kaizen’.
- Overproduction and all associated waste are originating from Poor layout.
- In lean manufacturing, to improve flow and velocity - the first step could be relayout.
- It also enables processing cells and single piece flow.

- A spaghetti diagram (sometimes called a physical process flow or a point-to-point workflow diagram) is a line-based representation of the continuous flow of some entity, such as a person, a product or a piece of information, as it goes through some process.
- The name comes from the resemblance of the final product to a bowl of cooked spaghetti.



- With this tool we can understand
 - Travel distance
 - No. Of hand offs
 - No. Of stations / departments





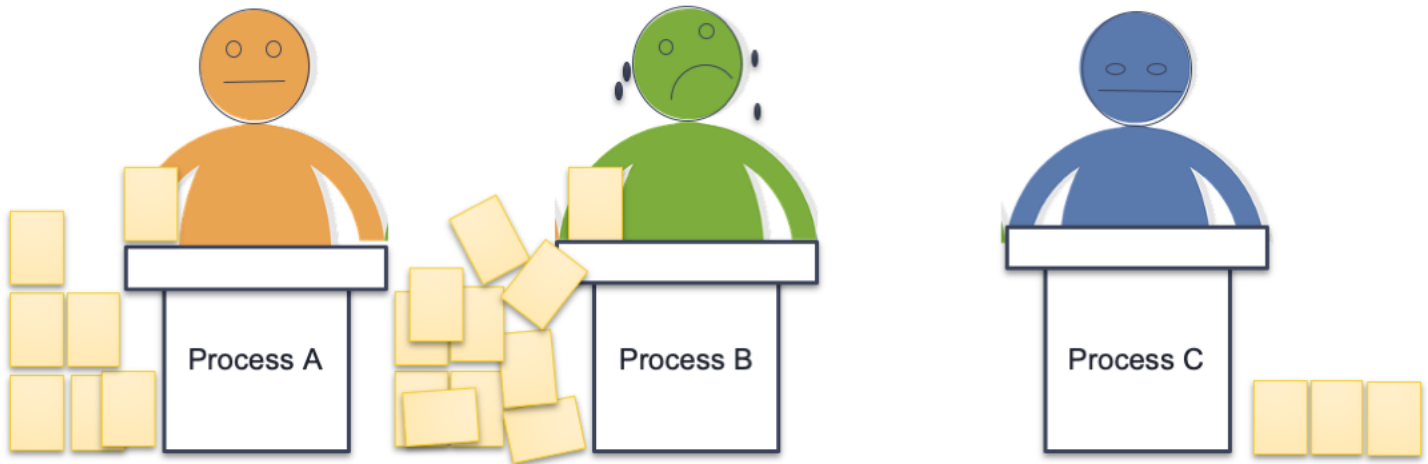
Benefits

- Improved Productivity
- Reduced Waste
- Reduced Lead Times
- Improved feedback
- Reduced space consumption
- Reduced inventory
- Improved Safety

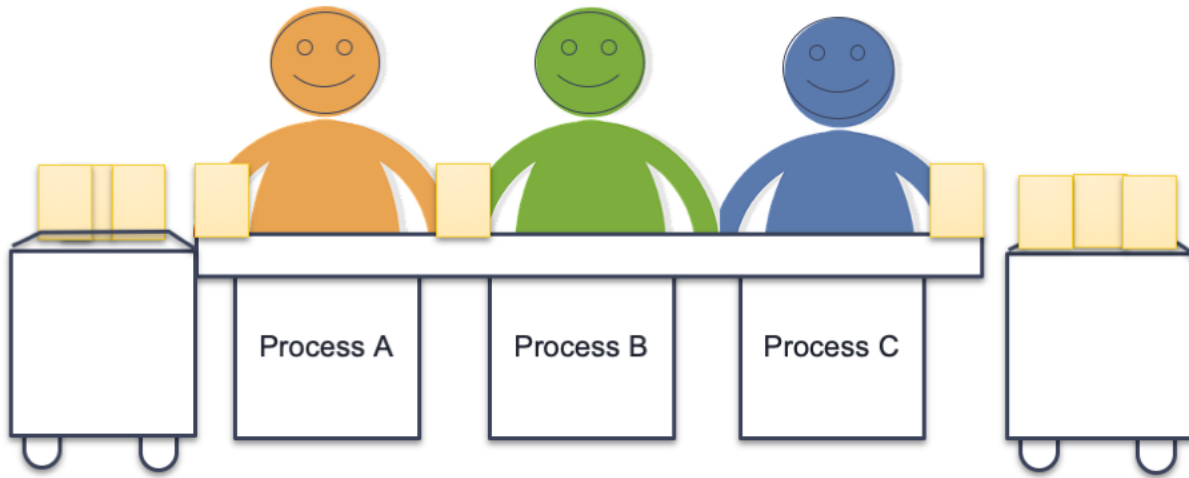


Manufacturing Cells



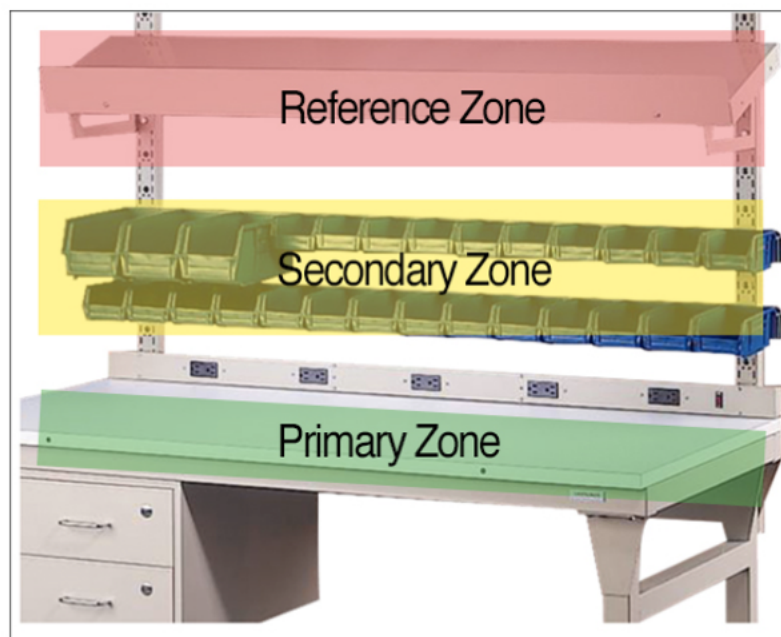
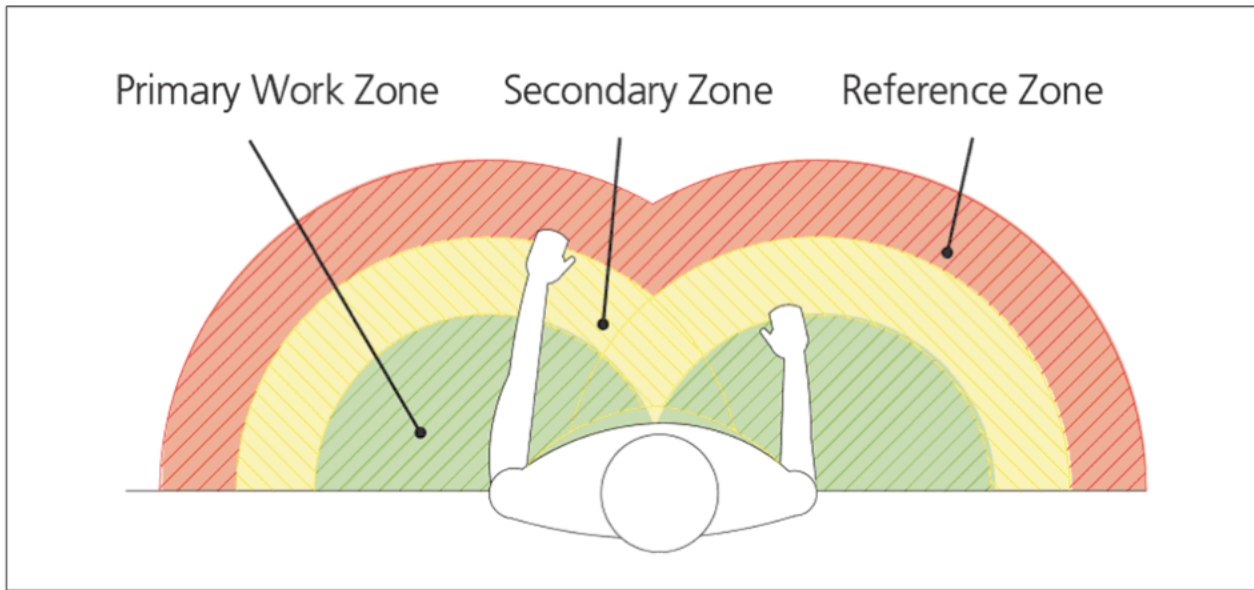


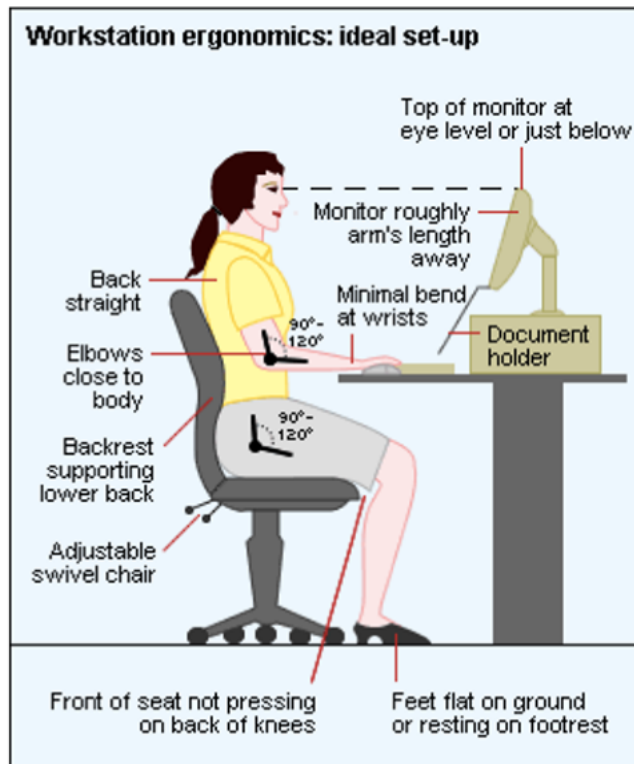
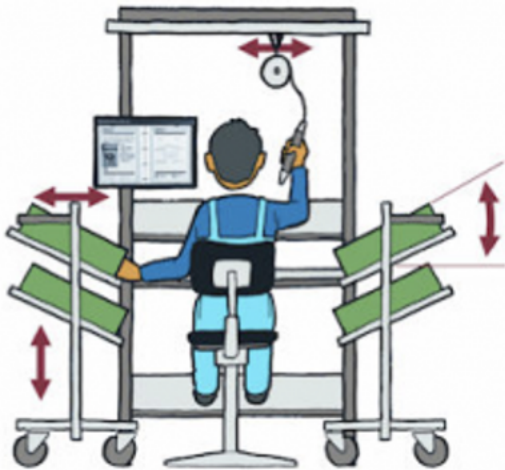
- The ideal processing as per lean is single piece flow. Each item will be passed immediately after completion of one process to the other process - without any delay or stagnation in between.
- Take one piece - Process one piece - send one piece.
- This is also referred as continuous flow. This is the first change we bring in during Lean Transformation.
- Feedback on product and process quality is almost immediate from the next process.



Ergonomics and Workstation Design



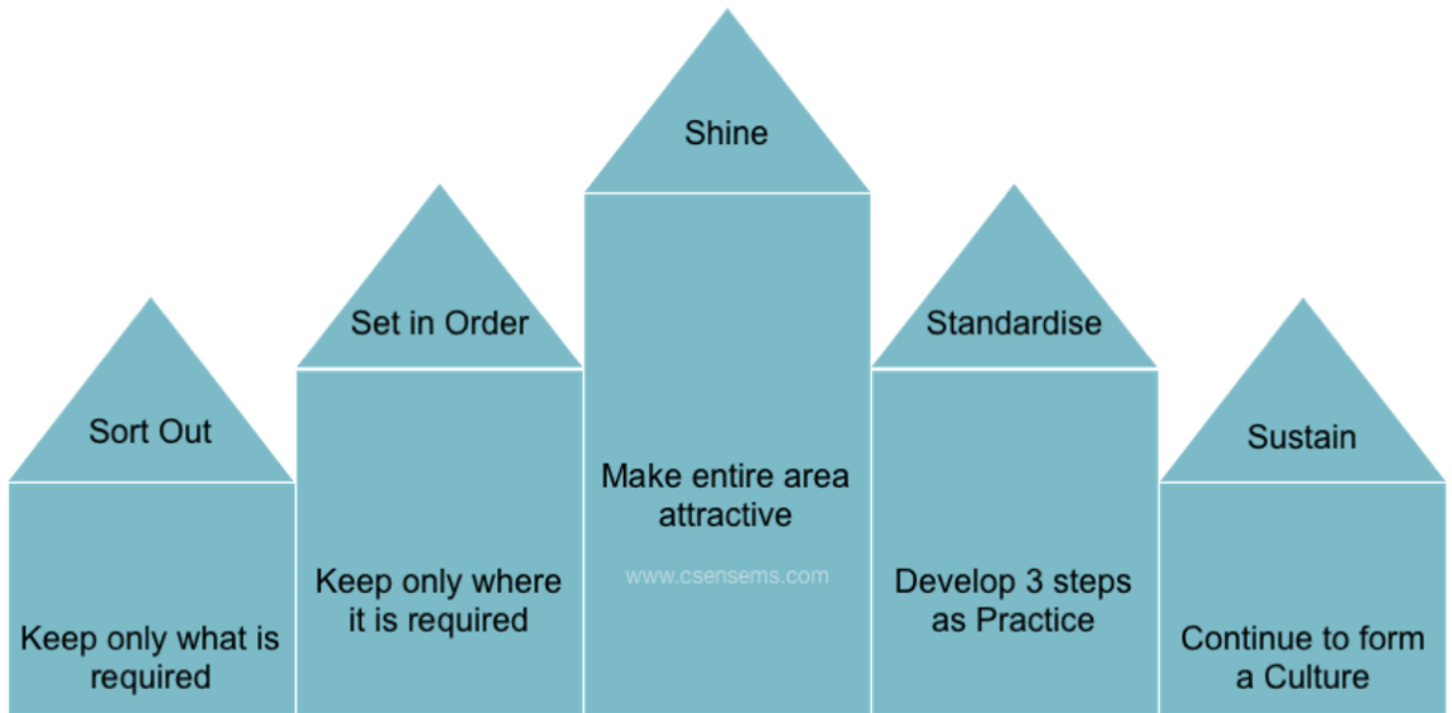






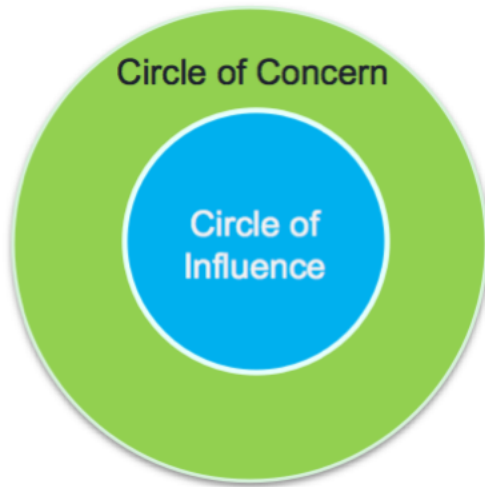
Conclusion





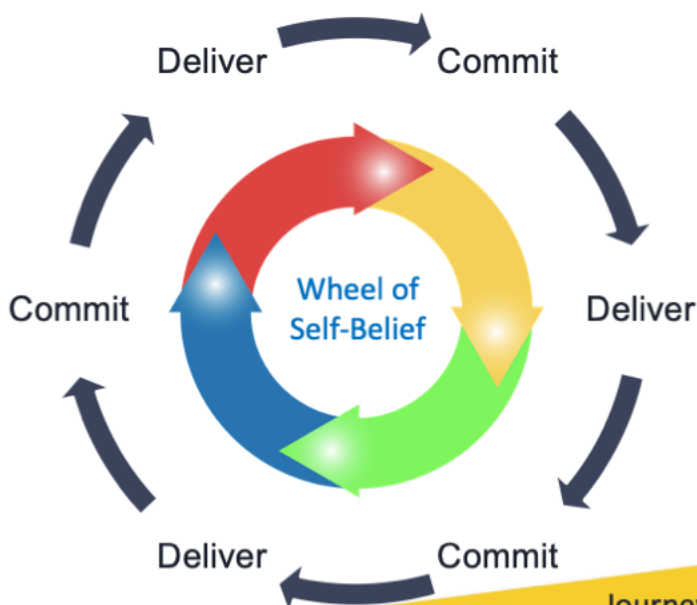
The Fort of Productive Workplace

- What do we need to get rid off?
- What are the thing that need to be kept in order?
- How to remain healthy and active?
- What do you want to teach your children?
- What is the legacy you want to leave behind?



The Wise King will focus only on what he can control and will not waste his energy on the things that he cannot control.

Inspired by The 7 Habits of Highly Effective People, by Stephen Covey



Simple resolution

- Keep your own Promises
- However small they are
- However big they are
- On a Daily Basis!



End of Module



Confederation of Indian Industry