Lean Manufacturing: A Panacea to Meet Global Competition

Aman Sharan[£] , Animesh Pratap Singh[β] ,Priyanka Mahendru[€] and Prof. D.V.Mahindru[α]

Abstract*:* The ***"Lean Manufacturing"*** is production of a product to meet demand on daily basis with minimum lead time and nonvalue added activities eliminated and minimized. Tracing the history and evolution of lean, it goes back to the period of " Craft Manufacturing" before 1850, production of " Interchangeable parts" by Eli Whiney, drawing conventions, tolerances and modern machine tools development after the American Civil war. In the year 1900, Fredrice Taylor and Frank Gilberth introduced standardized work time study, Process Charts and motion study. During World War –I, Henry Ford, developed Assembly lines, flow lines and manufacturing strategy.

In world war –II, Deming and Juran implemented SPL and TQM. Again in 1950, Eiji Toyoda, Taichi Ohno, Shigeo Shingo introduced Toyota production system, JIT Stockless production, World class manufacture. Then in 1990, came the concept of Lean Manufacture. The paper describes in detail, the history ,evolution of the concept of "Lean" how it addresses Industries' Concerns viz ;

a) Govt. Policies.
b) Rising cost of Input.
c) Global Competition
d) Accountability to share holders
e) Finance

The results have been further substantiated /supplemented by case studies and presented in text form supported by real photographs. Based upon the study, it is concluded that "Lean" acts as "PANACEA" to meet the cut throat global competition.

Index Terms--- Interchangeable, Lean, Manufacturing, Panacea, Value, Waste

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1. INTRODUCTION

In this competitive world of "Globalization" of market, every industry has to ensure optimum utilization of all resources to survive. The application of lean manufacturing concepts to the continuous production/ process sector has become a necessity. After World War II, Japanese manufacturers, particularly in the automotive industry, were faced with the dilemma of shortages of material, financial, and human resources. Eiji Toyoda and Taiichi Ohno at the Toyota Motor Company in Japan pioneered the concept of the "Toyota Production System", or what is known today in the US as "Lean Manufacturing." The basic idea behind the system is eliminating waste. Waste is defined as anything that does not add value to the end product from the customer's perspective. The primary objective of lean manufacturing is to assist manufacturers who have a desire to improve their company's operations and become more competitive through the implementation of different lean manufacturing tools and techniques.

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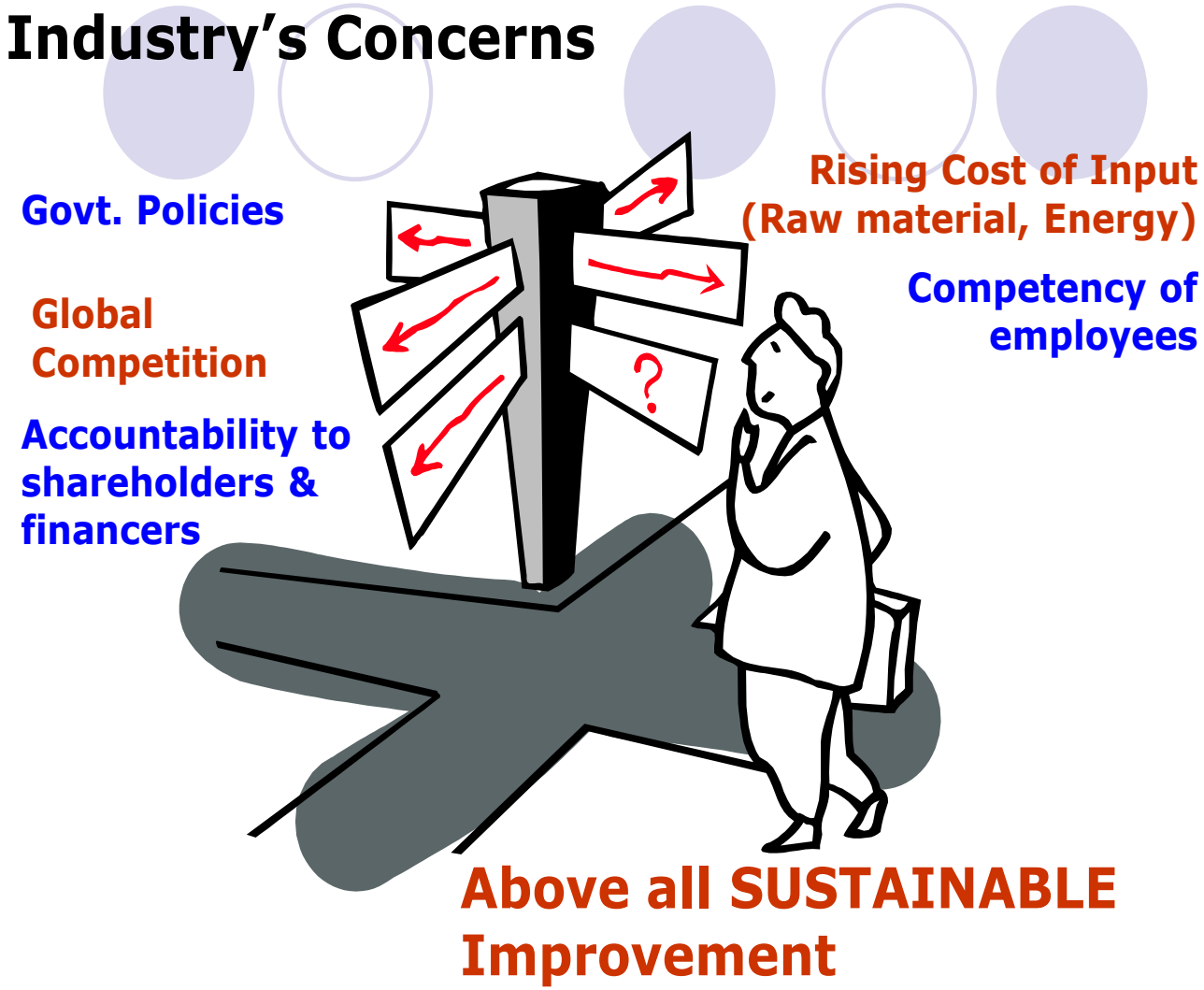
2. DESCRIPTION

The goal of this research is to investigate how the tools of lean manufacturing can be adapted from the discrete to the continuous manufacturing environment and to evaluate their benefits at a specific industrial concern.. Although the process and discrete industry share several common characteristics, there are also areas where they are very different. Both manufacturing settings have overlap, but at the extreme, each has its unique characteristics. The objective is to look at commonalities between discrete and continuous manufacturing where lean techniques from the discrete side are directly applicable, and to also examine ways to do so in other areas where this may not be quite so straightforward.

Lean manufacturing is not a collection of best practices from which manufacturers can pick and choose. It is a production philosophy, a way of conceptualizing the manufacturing process from raw material to finished goods and from design concept to customer satisfaction. Lean is truly a different way of thinking about manufacturing . In this competitive world, for any industry to survive, they have to strictly follow the latest management techniques ;



2.1 Main Features of Lean Manufacturing

- Greater Product Variety
- Fast Response (Flexibility)
- Stable Production Schedules
- Supply Chain Integration
- Demand Management
- Broader jobs, highly skilled workers, proud of product
- Excellent quality
- Reduced costs
- Ability to meet global market & competition

2.2 Survival Kit

- Create precise customer value
- **goods and services with higher quality and fewer defects with less human effort, less space, less capital, and**
  less time than the traditional system of mass production.
  - **Remove 'waste'**
  - **Consume 'just enough' resources**
  - **Do more with less**

2.3 Definition of "Value and Waste"

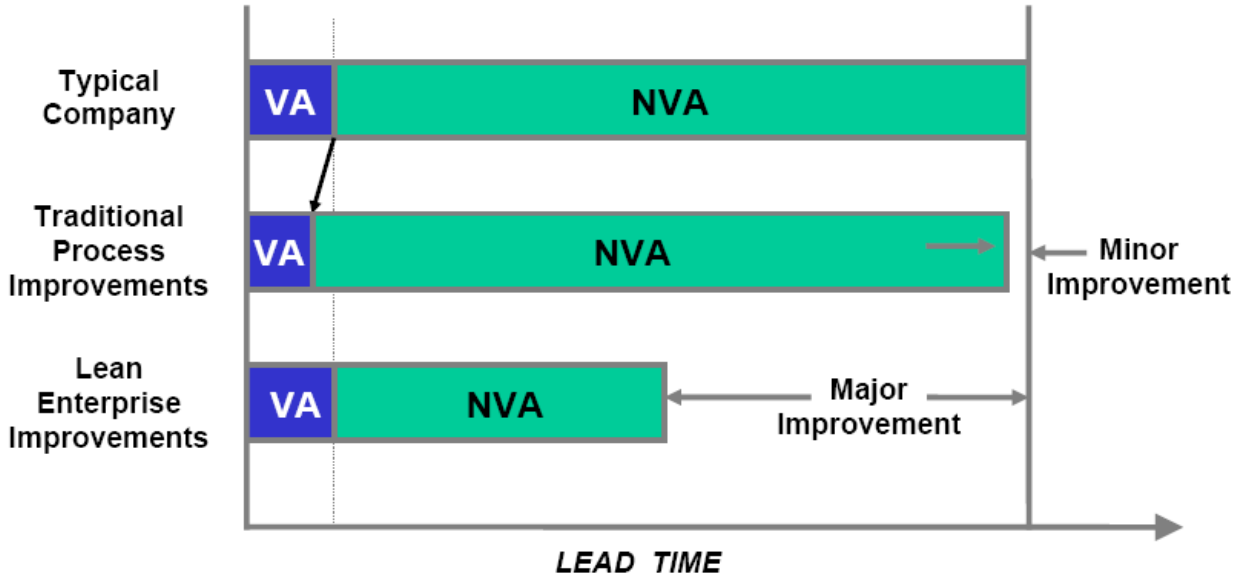
- **Value**
- an item or feature for which a customer is willing to pay.
- Every thing else – Waste
- Waste - activities that consume time, resource and/or space but do not add value.
- Lean - Production of product to meet demand on daily basis with minimum lead time & non value added activities eliminated or minimized
- Focus on Waste

2.4. LEAN TOOLS:

2.4.1 KAIZEN (CONTINOUSIMPROVEMENT) Kaizen(Continuous improvement) is a fundamental principle of lean manufacturing. It is a systematic approach to gradual, orderly, continuous improvement. In manufacturing settings improvements can take place in many forms such as reduction of inventory, and reduction of defective parts. This deals with moving those items that are not currently being used on a continuous basis (e.g., items that will not be used for the next month or so) away from those that are being used. Moving those items and tossing away needless items will make material flow smooth , and workers move and work easily . This will make it easier to move those items that are not labeled from that area. Arranging items in the right place will make tools, jigs, fixtures, and resources noticeable, detectable, and easy to use. It deals with cleaning and sweeping the work place methodically. The workplace should

look neat , clean and ready to use for the next shift. The work place should be maintained on a regular basis (e.g., daily). All tools and items should be in the right place and nothing should be missing. A well-maintained workplace creates a healthy environment to work with It is also maintaining a high standard of house-keeping and workplace arrangement. If every area has people assigned to it then everyone has responsibility to maintain a high standard of housekeeping and cleaning . It is management's accountability to train people to follow house- keeping rules. Management should implement the house-keeping rules in a practiced fashion so that their people can adjust themselves accordingly. Management should keep surveying the shop floor, explain what they want from people, reward those who follow and instruct those who do not .

2.4.2 Focus on Waste



The value adding parts of the process are obvious, so companies mistakenly focus on trying to make them go faster. The waste is not obvious, so it is not addressed. Lean focuses on eliminating the waste.

2.4.3 Value Added Activity

•Test for value added activities

-Transforms product in some way
- Customer sees & willing to pay
- Will the customer know if eliminated

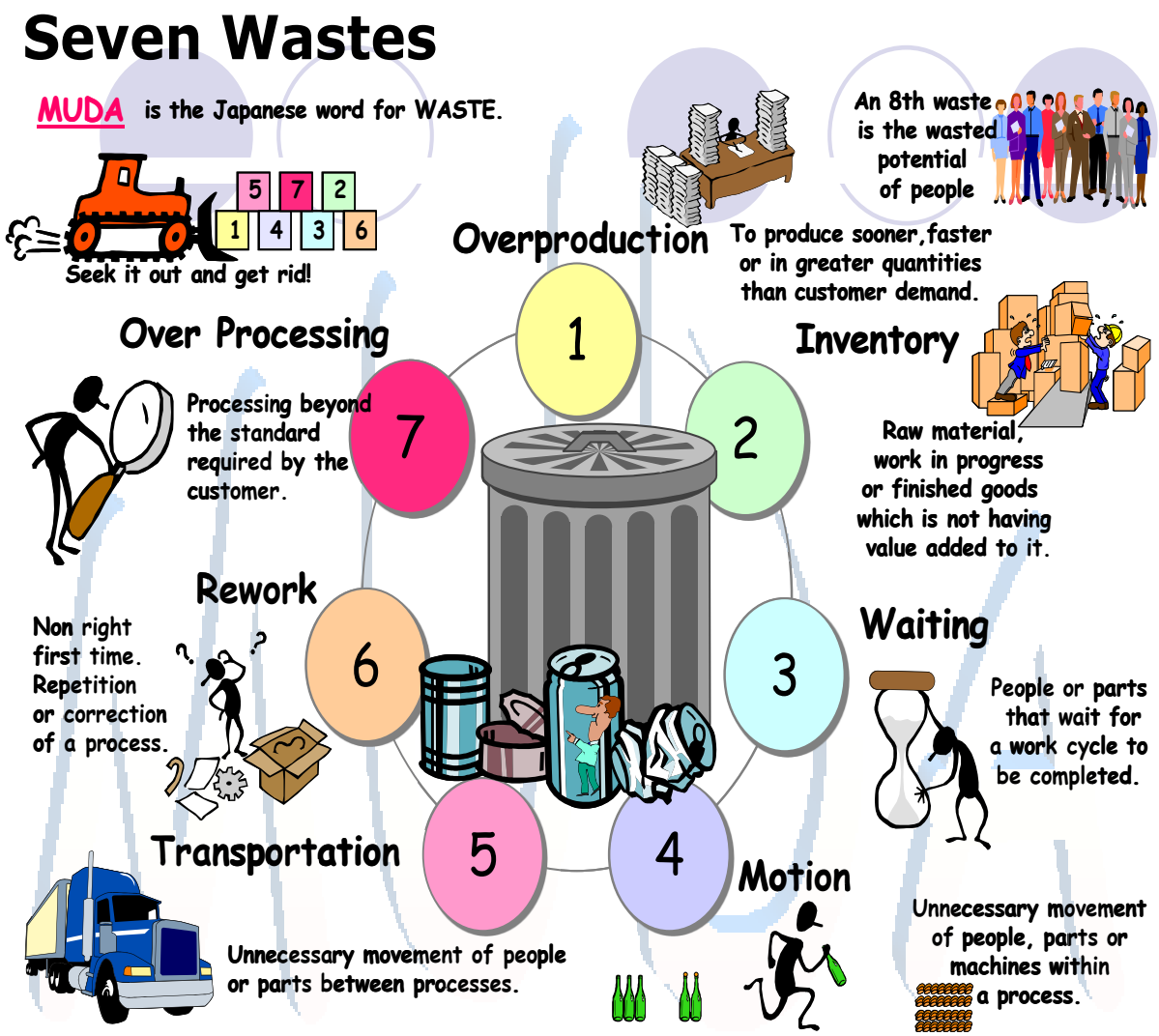
2.4.4 Eliminating Waste
7 steps

1. Reduce lead time
2. Cut operations costs
3. Improve business performance visibility
4. Speed time to market
5. Exceed customer expectations
6. Streamline outsourcing processes
7. Manage global operations

2.4.5 Typical benefits of waste elimination initiative

- Internally organised
- Items marked and addressed
- Easy to find what you need
- Nothing is lost
- No wasted time searching
- Broken or out of date items discarded

2.4.6



2.5. 5"S"

5S is a system to reduce waste and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. Implementation of this method "cleans up" and organizes the workplace basically in its

existing configuration, and it is typically the first lean method which organizations implement.

The **5S pillars**

Sort (Seiri),

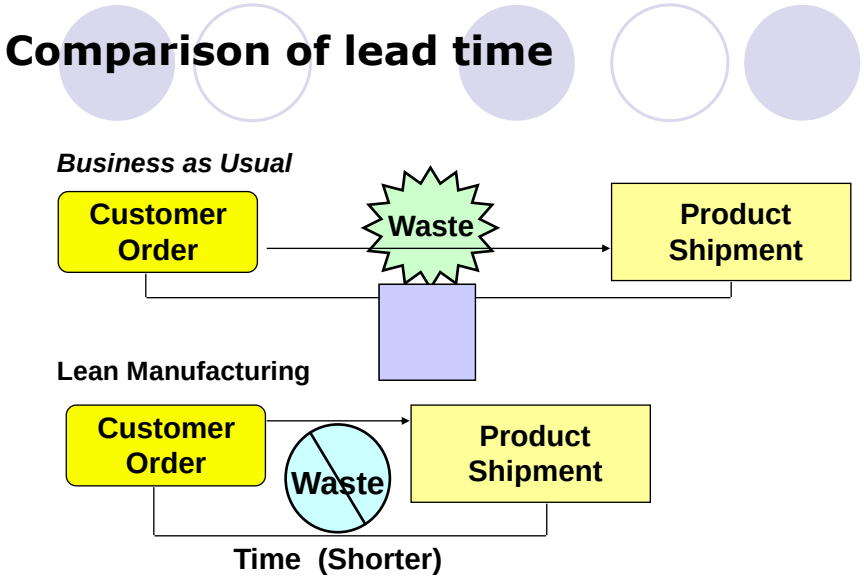
Set in Order (Seiton),

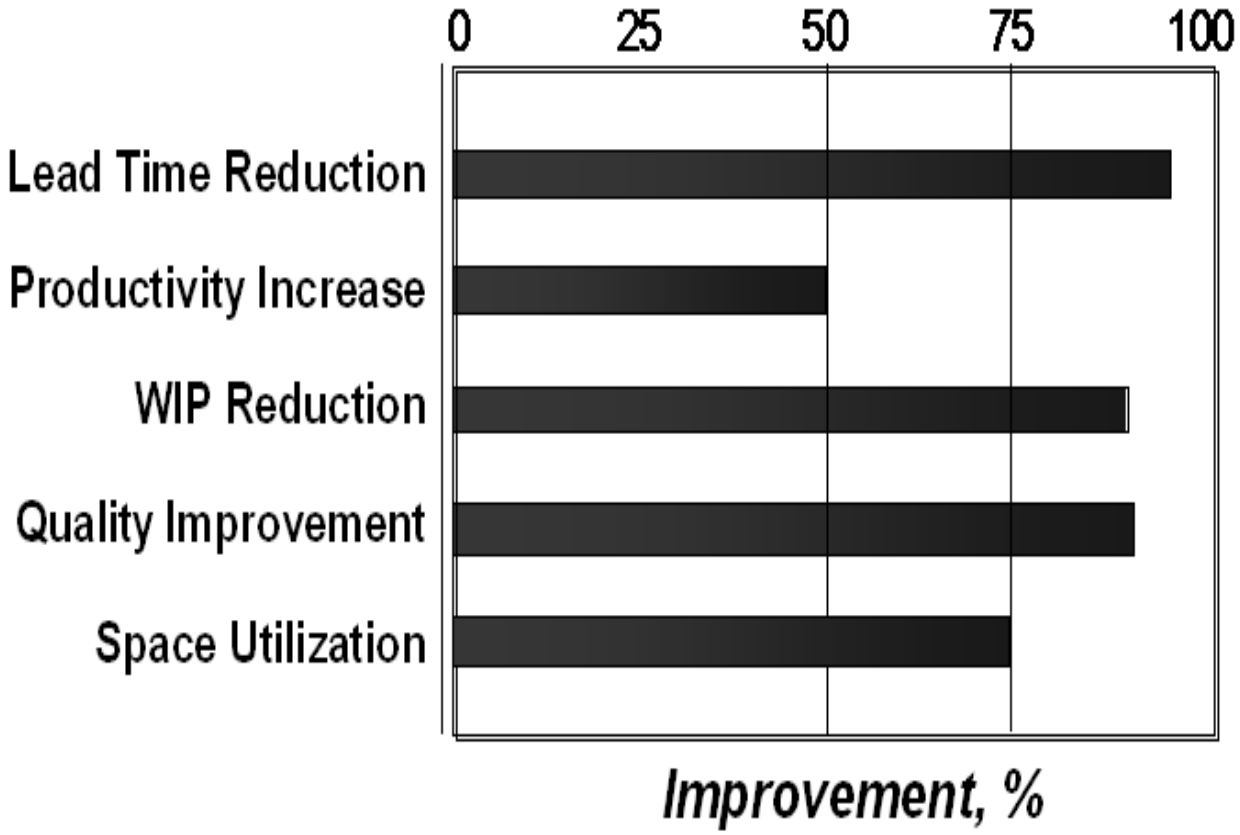
Shine (Seiso),

Standardize (Seiketsu),

and Sustain (Shitsuke),

A typical "5S" implementation would result in significant reductions in the square footage of space needed for existing operations. It would also result in the organization of tools and materials into labeled and color coded storage locations, as well as "kits" that contain just what is needed to perform a task. 5S provides the foundation on which other lean methods, such as TPM, cellular manufacturing, **just-in-time production**, and **six sigma** can be introduced. provide a methodology for organizing, cleaning, developing, and sustaining a productive work environment. In the daily work of a company, routines that maintain organization and orderliness are essential to a smooth and efficient flow of activities. This lean method encourages workers to improve their working conditions and helps them to learn to reduce waste, unplanned downtime, and in-process inventory.


Comparison of lead time
Business as Usual
Customer Order
Waste
Product Shipment
Lean Manufacturing
Customer Order
Waste
Product Shipment
Time (Shorter)



Lean Thinking, Lean Tools & Supporting Strategies

Lean Tools to Lean Management

- **Lean thinking**
  "The basics of Lean Thinking is 'the customer first"
- **How do we do that?**
  "By creating thinking people"
- **And how do we do that?**
  "By creating workplaces that are more human and encourage people to think"

5S- A method for organizing a workplace, and keeping it organized.

Benefits

1. **Improve safety**
2. **Decrease down time**

3. **Raise employee morale**
4. **Identify problems more quickly**
5. **Develop control through visibility**
6. **Establish convenient work practices**

5S's - The Foundation for standardisation

"There are no world class manufacturing companies without the 5S's in place."

Why the 5 S's?

The ***5 S's*** provide the foundation for any manufacturing business wishing to start along the path of Continuous Improvement.

The ***5 S's*** provide a structure for supporting Productivity, Quality and Health & Safety.

The ***5 S's*** fosters a sense of genuine pride and personal ownership in the work environment.

The ***5 S's*** form a 'common sense' approach to a better working environment.

What are the 5 S's?
The 5 S's are based on 5 Japanese words, these have been translated into 5 English equivalents:-

English	Original	Description
Sort	Seiri	Determine which materials are necessary in the area
Straighten	Seiton	Remove unnecessary items from the workplace
Sweep	Seiso	Clean up the workplace & perform routine maintenance
Standardise	Seiketsu	Have a place for everything; have

everything in it's place

Self Discipline	Shitsuke	Making the previous 4 S's part of every day life and sustainable. Promote a self disciplined culture

'The Shed'

- No organisation
- Tools have no home
- Easier to buy new tools than to find old ones
- Impossible to tell what is of use and what isn't.
- Tools broken when needed

'The Supermarket'

- Internally organised
- Items marked and addressed
- Easy to find what you need
- Nothing is lost
- No wasted time searching
- Broken or out of date items discarded

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Why should **Everyone** be involved in 5S?

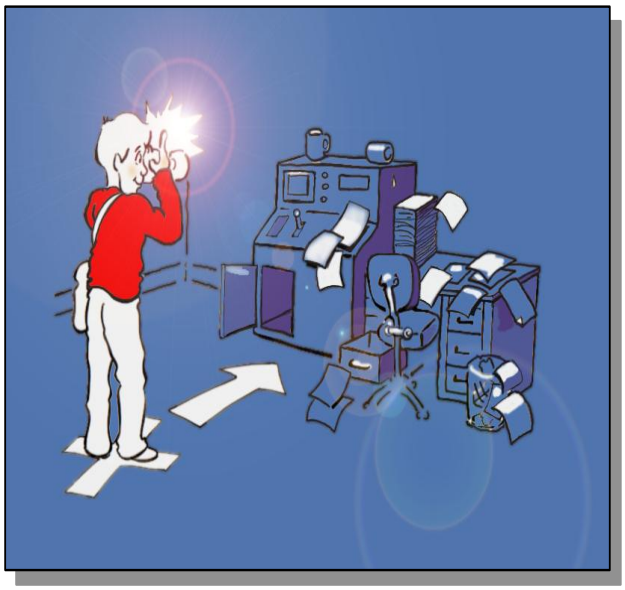
- 5S's are everyone's responsibility
- Opportunity for input on how **your** workplace should be organised
- Make **your** workplace more pleasant to work in
- Make the job more satisfying
- Remove obstacles and frustrations
- Help understand what is expected in the job
- Improve communication

5S Guidelines

- No-one is to blame for how things are now
- 5S is the responsibility of everyone
- Use the power of the team - everyone is an expert
- 5S is an attitude of mind as well as a practical tool
- 5S is continuous, don't rely on one day events
- If in doubt, throw it out!
- Solve problems at their root cause
- Always address safety issues immediately
- Use your heads not your wallets
- Think of how to make it work, not why it won't
- Don't expect perfection - 50% is OK for now

Step 2 - Audit

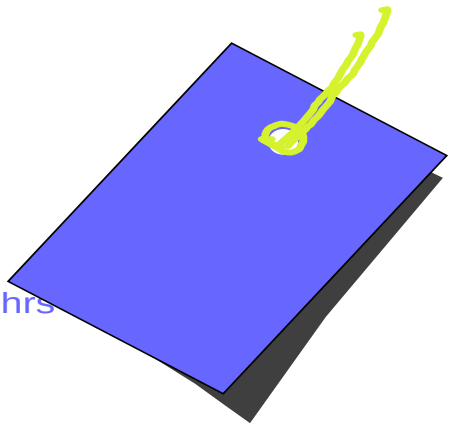
- Establish the start point - things can only get better!
- Using audit sheets, assess each area
- Take pictures of the before condition and make reference to where this is for future comparison
- Plot scores on Radar charts



Step 3 - Sort

"Determine what is required and what is not, in the amount needed and only when needed"

- Carry out red tag exercise
  - Identify area to be looked at
  - Leave no stone unturned
  - If in doubt, throw it out
  - Think of need, quantity and location
  - Record information on all items tagged
- Put red tagged items in quarantine
- Hold an auction after a fixed period e.g.24 hrs



Step 4 - Straighten

"Arrange items that are needed so that they are easy to use, labelled and anyone can find them and put them away"

- Think of setting a new standard
- When devising appropriate locations, think about
  - Items used together, stay together
  - Place according to frequency of use
  - Motion economy
  - Commonise tools used for different jobs in order to reduce total
- Visual displays are the key to standardisation
  - Make locations visible, (shadow boards, floor paint etc.)

Step 5 - Sweep

"Clean and sweep on a regular and frequent basis, so that when you need something, it's there and it works! "

- Set sweep responsibilities for daily, weekly, monthly 5S
- Use the 5S map from the story-board to help
- Set targets and work to them
- The 5 minute daily sweep will prevent the need to 'Blitz' the area
- Cleaning is inspection, the first stage to PM.

Step 6 - Standardise

"Revisit the first 3 of the 5S's on a regular and frequent basis and consolidate with standard procedures."

- Assign responsibilities for 5S covering **everywhere**
- Enbed the habits of 5S into the daily routine through standardised activity
- Visual controls build on visual displays with the ability to warn and detect abnormalities (e.g. lights and alarms)
- The 5 minute visual sweep tells you if anything is obviously wrong
- Look for improvements in the first 3 S's at all times
- Failsafes (Poka Yoke) prevent abnormalities. These can be used to prevent dirt and the need to Sweep (e.g. suspended tools)
- Implement standard operations
- Aim to standardise such that others from outside can do the job.

Step 7 - Self Discipline

"To sustain and improve 5S activities through policy."

- Probably the most difficult of the 5S's
- Takes time and requires awareness, cultural acceptance, structure, support, recognition, satisfaction.
- Tools to help sustain are:

  - Slogans and Poster campaigns
  - Photos and Story-boards
  - Newsletters
  - Pocket Manuals
  - Inter departmental tours
  - Campaign months

5S's - The Foundation for standardisation

"There are no world class manufacturing companies without the 5S's in place."

3. CASE STUDY (AT SRMGPC, Lucknow)

RED TAGGING

- **RED TAGGING**

BEFORE

AFTER

RESULTS

Highly satisfying results have been obtained that are detailed through data and pictures given below.

Removal of waste of mass about 1190 kilograms and sold at the rate of Rs.21/kg and total amount of Rs24,990 have been accrued.

3. WORKSHOP AFTER APPLICATION OF LEAN

The site is used for maintaining inventory which is used for making the jobs of various types :-

4. Mild steel rod (Φ = 10 mm) for smithy shop.
5. Mild steel rod(Φ=20mm) for Machine shop.
6. Mild steel rod(Φ=50mm) for Milling shop

7. Pine wood Log for Carpentry shop
8. Mild Steel Sheet for Welding shop.
9. Removal of waste of mass about 1190 kilograms have been removed and sold at the rate of Rs.21/kg and total amount of Rs24,990 have been accrued.