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Methodology for '5S' implementation in a small scale manufacturing industry

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Abstract

The purpose of this paper is to use 5S tool in order to help small scale manufacturing organization to become more productive and more efficient. A simple approach has been adopted for implementing 5S. During results, it has been analyzed that implementation of '5S' resulted in overall improvement of the organization. With the implementation of '5S', Tool searching time from shop floor has been reduced from 25 minutes to 6 minutes along with other significant benefits. '5S' audit has been conducted in the organization.'5S' audit score has been increased at the end of the project. 5S is powerful tool and can be implemented in various industries whether it is micro, small, medium or large. The publications and work presented in this paper will be useful to researchers, professionals and others concerns with this subject to understand the significance of 5S.

Keywords: *Lean manufacturing, 5S Audit, Red tag, log book.*

1. Introduction

In Indian economy small-scale industries occupy an important place, because of their employment potential and their contribution to total industrial output and exports. Now-a-days this sector facing challenges to retain its prosperous position due to uprising of new competitors both in the national and international market. So, continuous improvement is required to overcome these challenges. In the competitive business the manufacturing companies have to pay attention for the improvement in productivity, quality, efficiency, safety and its service.

Lean manufacturing (LM) is the only method with which all these problems can be solved. LM can be implemented by its various tools such as '5S', 'KAIZEN', 'Total Productive Maintenance', 'Value Stream Mapping, Just In Time, POKA-YOKE, 'Overall Equipment Effectiveness', 'Plan Do Check Act' .Out of all these '5S' being economical and effective tool was chosen for solving concerned industry.

1.1 Summary of 5S methodology

5S Methodology is one of the basic and the most important tool to implement Lean Manufacturing. It is a system to regulate the work flow by systemizing the workplace, thus supporting the culture of continuous improvement.5S has been introduced in Japan mainly in the manufacturing and service industries.5S is the acronym for five Japanese words Seiri, Seiton, Seiso, Seiketsu and Shitsuke respectively. The following table explains these five words in best way.

Table 1: 5S and its meaning in English

Japanese word	English Word	Meaning
Seiri	Sorting	Making a distinction between required and non-required items & removing unnecessary items.
Seiton	Storing	Arranging the items in a system within the reach of the user
Seiso	Shining	Clean the working space.
Seiketsu	Standardizing	Standardize all important processes
Shitsuke	Sustaining	Make a habit to follow above 4S

2. Methodology

The whole methodology for implementation of 5S was framed by using one of the lean tools i.e. Plan Do Check Act (PDCA). In this, plan was made for 5S activities which was then implemented and checked i.e. assessment was carried out to find the results of implementation. Act refers to steps taken to fill the gap found in Check stage nothing but the improvement is done and PDCA cycle is repeated for better results.

2.1 Plan

Before going to the implementation phase, Higher officials and engineers who are going implement 5S should visit industries who have successfully implemented 5S to set the benchmark. Accordingly training on 5S must be provided for all. Then the 5S Council is required to be formed. The council would set-up 5S zones and also would determine 5S objectives, goals and implementation phases. The action plan is to be then framed and 5S is launched.

2.2 Do

2.2.1 Sort: Identification of necessary items and separating unwanted items with help of red tag. Keep them away in storage or discard them. This will create more free space and hidden problems can be identified and this indirectly avoid accidents thereby increasing safety.

2.2.2 Set in Order: After identifying the necessary items, decide the place for every item. Make sure every thing is kept on its predetermined place only. Yellow tape should be put to restrict machine area and human interference. This activity helps in reducing accidents, searching time for tools and other necessary items needed frequently.

2.2.3 Shine: This refers to cleaning of one's surrounding and of himself. Periodic cleaning should be done. Cleaning makes work environment more better for work. This indirectly improves ergonomics and thereby productivity.

2.2.4 Standardise: Every process in company should be standardise i.e. Standard Operating Procedure (SOP) is made. This includes standard for 5S activities too. Awareness is created with help of posters pasting on the wall. Also Vision and Mission of company as well as 5S should be displayed on walls of shop floor.

2.2.5 Sustain: This activity focuses on maintaining these four S activities. It tries to prevent fallback because of disinterest of employees.

2.3 Check

In this step 5S Audit is conducted on weekly or monthly basis for assessment of 5S work status. Audit is carried out by 3rd party to avoid biasing. Audit contains 5 questions for each 'S' and each question has rating 0 to 4.So maximum marks can be given to any question is 4.So for each S maximum marks is 20 and for complete audit is for 100 marks. After Audit is carried out results are displayed on 5S board.

2.4 Act

For continuous improvement, the concerned authority should ensure that gap found in that Audit should get fill till 2nd Audit. Meeting is to be conducted to train employees for better results by comparing with benchmark. Results are displayed on 5S board and Employee is rewarded who has greatest score among all other zones' employee so that employees get motivated and they work harder.

3. Implementation and Result

3.1 Sort

The whole space available was divided into four zones Z1, Z2, Z3, Z4 viz. 'Maintenance', 'Production', 'Raw material and storage' and last is 'Quality and dispatch' respectively. Now unwanted materials in those zones were identified and red tagged. Entry is made into red tag log book. Red tag contains action to be taken with that particular item and accordingly it is sent to storage or discarded. Log book helps us when we want to retrieve certain item which was kept in storage long way back. After removing those unwanted items from the zones space was saved in Z3, Z4.

Fig. 1 Storage area before 1S implementation

Fig. 2 Storage area after 1S implementation

Table 2 shows the improvement in saving space on the factory floor. Same can be seen through figures 1 and 2.

Table 2: Cost saving due to space clearance at company

Zones	Space Saving (sq. Feet)	Cost Saving
Z3	51.45	Rs.92610
Z4	9.6	Rs.17280

Note: Cost is calculated in above table considering rate of Rs 1800/sq.feet

3.2 Set in order

Before and after conducting this activity searching time for tools was calculated which was the most frequently thing which every employee needs. Before it was about 25 min/employee per week. After it was 6 min/employee per week.

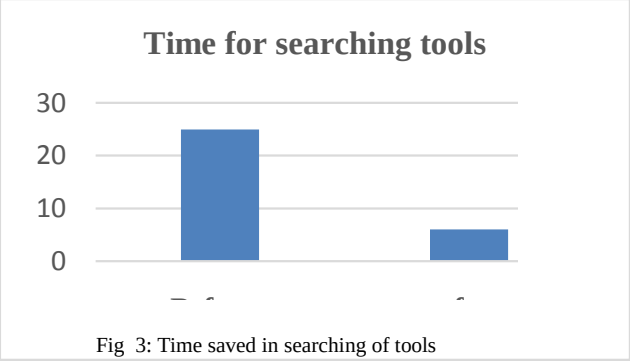

Fig 3: Time saved in searching of tools

The following calculations show the cost saving in labour cost:

Saving in time / week = 25 - 6 = 19 min.
Saving in time/ month = 19×4 = 76 min.
Salary of employee /day Rs.280/8hrs = Rs.0.58/min
Cost saving per month / employee = Rs.44
Total labour cost saving /month = Rs. 44×8 = Rs.352 (since 8 employees work there.)
Total labour cost saving/year =Rs.352×12
=Rs. 4224

3.3 Shine

Before 5S implementation there was no particular cleaning schedule. Cleaning was done in an irregular manner. During 5S implementation a cleaning schedule was prepared. The items which required cleaning were identified. A particular time interval was allocated after which these items must be cleaned. The cleaning schedule for all items is given in table 3.

Table 3: Cleaning schedule

Places	Frequency of cleaning
Maintenance Table	Once/week
Shop Floor	Twice/week
Dispatch	Once/week
Storage	Once/week
Washroom	Once / day
Office	Once/week

Due to this schedule automatically work environment started improving and now it improved employees working capability.

3.4 Standardize:

Every important process was standardized with the help of seniors and management and it is represented in the form of flow charts and visual diagrams. Labels were attached to all files as well as to all dies rack so that easily it can be taken without measuring it .The problem of starting the machine in reverse direction of motor was eliminated because labels were put on starters to start the machine in right direction. This minimized much wastage of screws due to reverse threads. It also helped new workers who join and don't work according to steps which are to be followed and end up with waste or an accident. As we can see from fig. 4,Coils are labeled which ordinary worker can read and feed appropriate wire to machine. This minimized the wastage.

Fig. 4 labels are attached for easy access

3.5 Sustain:

Results will be seen only if this 4S is followed consistently. Due to this activity 5S was made a habit of every employee. Every worker who scored good in Audit (Refer fig.4) was rewarded and this helped a lot in motivating employees who was least interested in implementing 5S.

Audit on : PRODUCTION MANISH FASTNERS Dt: 29/1/17

Concerned Person: MR. RITESH SOLANKI

*0: Very bad, 1: Bad, 2: Average, 3: Good, 4: Very good

5S	NO.	Check point	General Assessment Criteria	Score 0	1	2	3	4
1S	1	Materials	There is no unneeded material or parts	✓				
	2	Equipment	All machines should have identification labels		✓			
	3	Connection apparatus	No unused tools, dies or jigs are present		✓			
	4	Visual control	Unnecessary materials can be easily recognized		✓			
	5	Written standards	Clear standards to dispose unused things			✓		
2S	1	Quantity indicators	Maximum and minimum inventory levels should be indicated			✓		
	2	Item indicators	Each shelf at the storage areas and each part on it are marked	✓				
	3	Location indicators	Regions and places have clearly designated name and place		✓			
	4	Separation lines	Separators lines are certain and clear		✓			
	5	Connection apparatus	30 seconds removal of tools and equipment			✓		
3S	1	Machines	Machines kept away from chips and oil		✓			
	2	Floors	Floor should be free of waste water and oil			✓		
	3	Cleaning and control	Cleaning inspections and correct minor problems		✓			
	4	Cleaning responsibility	Individual cleaning responsibility assigned	✓				
	5	Cleaning habit	Operator habitual of cleaning his place			✓		
4S	1	Ventilation	Air is odourless and fresh		✓			
	2	Lighting	Adequate lightening should be there		✓			
	3	Working clothes	Operators clothes are clean & free of lubricant			✓		
	4	Protection from dirt	Avoiding dirtiness is must			✓		
	5	First 3S	System for promoting first 3S			✓		
5S	1	Training	Regular training programs for workers				✓	
	2	Safety gadgets	Regular wearing of helmet/gloves/shoes		✓			
	3	Interaction between people	Is applied properly & good environment		✓			
	4	Rules and procedures	Up to date & regularly reviewed			✓		
	5	Seiso is believing	Check for 5S environment				✓	

Signature: Ritesh

Total score out of 100 : 0 11 18 06 00

= 35

Fig. 4 5S Audit sheet

4. Conclusions

Conventional manufacturing was getting converted into Lean Manufacturing due to implementation of 5S. Plant layout was changed little bit for implementation of 5S, operating procedures, tool organization, material handling and cleaning schedules was also altered. The first phase, sort, resulted in removing unwanted items, broken tools, unused parts and scrap materials. Unused inventory was returned to purchasing, rarely used tools were located in storage and frequently needed items were located near machine in the reach of operator and scrap items were discarded.

The second phase, set in order, resulted in several changes in the organization of the workplace. Each of the workstations received their own set of tools. All the tools were colour coded to their respective workstation. All equipment had specific locations. Trashcans and other items on the floor had floor markers to indicate their locations. All tools were removed from the floor and were placed on clamps. Commonly used parts were placed in bins on every workstation. The third phase, shine, resulted in removing scrap, dust and other unwanted items from each workstation. This initial clean-up helped to visualize other issues clearly. The fourth phase, standardize, resulted in developing standard operating procedures for the employees in the assembly area. Overall these activities as a whole contributed in minimizing waste, optimizing performance, maximizing profit due to reduction in losses, improving safety and the last but not the least capability of workers.

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