



IMPLEMENTATION OF 5S IN SMALL SCALE INDUSTRY

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ABSTRACT

5S is a basic foundation of Lean Manufacturing systems. It is a tool for cleaning, sorting, organizing and providing the necessary groundwork for work piece improvement. This paper deals with the implementation of 5S methodology in the small scale industry. By following the 5S methodology, it shows significant improvements to safety, productivity, efficiency and housekeeping. The improvements before and after 5S implementation is shown by pictures in the paper. It also intends to build a stronger work ethic within the management and workers who would be expected to continue the good practices.

KEYWORDS:

I. INTRODUCTION

5S is an approach to organize, order, clean, standardize and continuously improve a work area. 5S is not just about housekeeping, It is one of the efficiently working tools of Lean Manufacturing. The program gets its name from five activities beginning with the letter S, which were derived from five Japanese words. The words are Seiri, Seiton, Seiso, Seiketsu and Shitsuke, which when translated mean Sort, Set in Order, Shining, Standardize and Sustain, respectively. Sort helps to remove all unneeded items: only what is needed stays. Set establishes locations and quantities needed for efficient operation. Shine represent cleaning through inspection. Standardize implements visual displays and controls. Sustain helps to keep the organization effort in place through training and total employee involvement. This system helps to organize a work space for efficiency and decrease wasting and optimize quality and productivity via monitoring an organized environment and use visual evidences to obtain firmer results effectiveness. As importance role of 5S implementation in today's organizations, this study aims to review previous studies about benefits of 5S implementation and its efficiency in organizations. Consequently, 5S can support the objectives of organization to achieve continuous improvement in performance and productivity. The most important barrier for implementation of 5S effectively is poor communication. Techniques of communication and their efficiency are seldom evaluated, and communication faults rarely addressed in an industrial workplace. Poor communication can cause wasting resources, time and money, and lowering moral amongst employees. The results of evolving communication systems in an uncontrolled fashion in industries or business could be confusing and complex. There must be an applicable way for using 5S as an improvement tool for communication system. The surveys indicate that there are difficulties in the effective 5S implementation. Another significant barrier is the space between managerial level and shop

floor employees and the poor training and awareness of 5S. Since some critical decisions of 5S activities, including time and budget performance must approve and support by management, therefore more cooperation is recommended during implementation period. It is concluded that 5S key of success is training. 5S implementation is not possible without proper training and employees are not capable to actively standardize the 5S. Organization should pay attention to this fact that resistance to change is one issue which will be occurring during 5S implementation. Therefore, it is believed that continuous training is the key applying to change the organization culture, and assessment should focus on improvement and progress regarding all input from the organization until complete establishment of 5S system. It is obvious that the target of 5S application is vast and diverse and when effectively implemented, the business improvement can be surprising. However, the total benefits of 5S cannot be imagined in industries and business, until the barriers associated, fully understood, addressed and removed [1].

II. LITERATURE REVIEW

Arash Ghodrati, Norzima Zulkifli studied and proved that 5S is a systematic technique resulting diverse benefits. First benefit of 5S helps to organize a work space for efficiency and reduce waste by optimizing quality and productivity. 5S can help organizations to achieve continuous improvement in performance and productivity. 5s insists on use of effective communication within organization and appropriate training for employees.

According to Vipulkumar C. Patel, Dr. Hemant Thakkar, introducing the 5S rules bring the great changes in the company viz. process improvement by costs reduction, increased effectiveness and efficiency in the processes, improvement of the machines efficiency, safety, security, quality and reduction of the industry pollution. They also observed that 5S implementation leads to Visible results within a short period of time (2-3 weeks), workers get

used to order and discipline, and reduction of physical effort, accidents during the production process.

Shraddha P. Deshpande, Vipul V. Damle, Merang L. Patel, Akshay B. Kholamkar implemented 5S in organization and observed that the successive implementation of 5S transformed the organization drastically, right from the working conditions to the employees work satisfaction. The implementation of '5S' in the organization resulted in proper workplace management for better use of working area, time saving in searching for tools and materials due to proper location and identification, Huge cost saving from waste and unwanted materials and Increased morale of the workers due to enhancement of working environment.

Soumya R. Purohit¹, V. Shantha² concluded that 5S is a step wise method to remove unnecessary items, reduce the search time for the items, standardize arrangement to avoid misplacing and sustain all the above through self-discipline. Housekeeping methodology has helped effectively reduce waste and improve productivity. This paper highlights the step by step implementation guideline required for successful implementation of 5S as a part of the daily management practices. 5S concept is especially attractive to older manufacturing facilities looking to improve their bottom-line production without the need for capital investment. The secondary benefits of implementing 5S methodology included higher enthusiasm and punctuality among the workers and safer working conditions.

P. M. Rojasa¹, M. N. Qureshi² observed that small scale industries in India plays an important role in Indian economy, contributes more than 50% of the industrial production in value addition terms and generates one third of the export revenue. To sustain cut throat global competition, 5S technology provides powerful tool to improve efficiency and productivity without huge investments. This paper deals with the implementation of 5S methodology in the Krishna Plastic Company, Udhyognagar, Amreli, Gujarat. The results after the 5S implementations states that production system efficiency is improved from 67% to 88.8% in the successive week.

III. OBJECTIVE

The aim of this paper is to implement 5S methodology and measure the performance improvement in **B. M. Industries Pvt. Ltd.** A small scale industry situated at **Gokul Shirgaon (M.I.D.C), Kolhapur.** Implementation of 5s is should achieve following objectives

1. Improve productivity up to 10%.
2. Reduce time required to retrieve tools and raw material.
3. Provide more organized space for raw material storage.
4. Increase morale of workers due to proper workplace management.

IV. METHODOLOGY

As mentioned in introduction, it is planned to implement 5S in **B. M. Industries**, a small-scale industry situated at **Gokul Shirgaon, Kolhapur.** 5S is Lean manufacturing tool for cleaning, sorting, organizing and providing necessary ground work for work place improvement. Products manufactured in the plant under consideration with the manufacturing operations being performed are shown in following Table 1.

TABLE 1. PRODUCTS MANUFACTURED & ASSOCIATED OPERATIONS

Sr. No.	Product Name	Manufacturing Operations
1	Inlet Manifold	Bottom facing, Facing, Drilling, Tapping
2	Exhaust Manifold	Bottom facing, Flange facing

Current layout of the plant under consideration is shown in Figure 1.

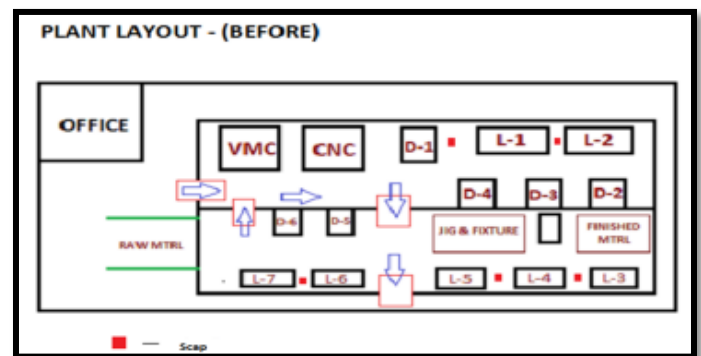


FIGURE 1. LAYOUT OF THE PLANT BEFORE IMPLEMENTING 5S

5S tool received its name from 5 important steps to be focused for achieving desired results and includes:

1S: Sort

- Process development by cost reduction
- Stock confinement
- Better usage of workplace

2S: Set in order

- Process growth
- Increasing Efficiency
- Shortening of time required for searching necessary things

3S: Shine

- Improved working conditions for workers.
- The number of customers has been increased after maintaining a clean and neat layout.
- Machine maintenance cost has been reduced.

4S: Standardize

- The standards of the company came to next level.
- Improvement in safety has supported in reducing the injuries of workers.
- Slips and falls of the material have been reduced.
- Travel time of materials is reduced which led to reduction of work hazards.

5S: Sustain

- It gives a scope for Workers participation in the work area design and maintenance.
- Workers absenteeism has been lowered down.
- Increasing of the awareness and morale.
- Decreasing of mistakes quantity resulting from the inattention.
- Proceedings according to decisions.
- Improvement of the internal communication processes.

Before implementing 5S, detailed study of current layout, material handling and manufacturing processes is carried out. Many potential problems were identified. Many unnecessary things such as metal scrap, damaged components, tools and jig-fixtures which are not in use are kept in workshop as shown in Figure 2. These unnecessary things lying on floor of workshop results in reducing available working space.



FIG. 2- UNNECESSARY SCRAP MATERIAL IN WORKSHOP

To deal with unnecessary scrap material lying on the floor of workshop following suggestion are made:

- Taking action on removal of unwanted scrap
- To provide separate storage area for unused Jigs fixtures and damaged components

Next problem is related with absence of dedicated storage

room. There is no separate storage room for storing raw material and Hence raw material is kept unorganised throughout the plant as shown in Figure 3. This results in losses of raw material as well as corrosion of raw material.



FIG.3- UNORGANIZED RAW MATERIAL SCATTERED ON FLOOR

To deal with unorganized raw material lying on the floor throughout the plant following suggestion are made:

- To provide storage room for raw material
- Organising raw material according their type.

Next problem is related to improper arrangement for storing Jigs-fixtures and tools are not kept at specific locations. Unorganized jigs-fixtures and tools are shown in Figure 4. Workers face difficulties in finding jig-fixtures and tools resulting in wastage of time. This further delays production of jobs. Jig-Fixture and tools are not cleaned from time-to-time.



FIG. 4- UNORGANIZED JIGS-FIXTURES AND TOOLS

To deal with unorganized jigs-fixtures and tools following suggestion are made:

- All jig-fixtures and tools labelled
- A rack with separate compartment for each jig fixture and tools should be provided
- Jig-Fixture and tools should be cleaned periodically

Next problem is related to company office which is not well organised and is shown in Figure 5. Files are kept randomly. Unwanted files, papers & so many unnecessary things are kept in company office.



FIG.5- UNORGANIZED OFFICE

To deal with unorganized jigs-fixtures and tools following suggestion are made:

- Company office should be organised neatly
- Old files which are not in use should be removed
- Office table should be cleaned and well organised

Action Plan:- To tackle above mentioned problems appropriated changes in layout are suggested and are shown in Figure 6. Management of plant was convinced to undertake some drastic changes in organizing scrap material, raw material, jigs-fixtures and tools as well as office documentation. After implementing the changes the overall plant looked neat and clean as shown in Figure 7, 8 and 9.

During study of current system the time required for each process is recoded. Since process times are not deterministic but stochastic it was decided to collect 30 readings for each process and then mean of the 30 readings is considered for further analysis. After implementing above mentioned suggestions and changes it was expected that process times will reduce. The comparison of process times before and after implementation of 5S will be discussed in next section.

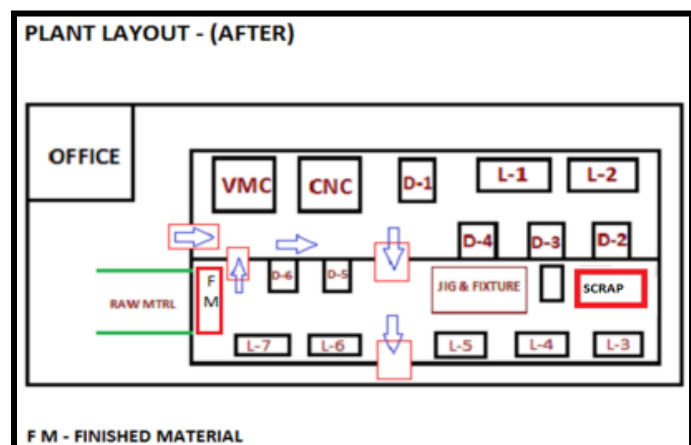


FIG. 6- SUGGESTED LAYOUT OF THE PLANT



FIG. 7- ORGANIZED SCRAP MATERIAL



FIG. 8- ORGANIZED RAW MATERIAL



FIG. 9- ORGANIZED OFFICE

In order to improve something, one needs to measure it. This article is related to 5S and is about improving 5S score. So, it was decided to measure 5S score of the plant under consideration. For this a checklist is used. This checklist has five questions under each 'S'. Questions are answered on a scale of 0 to 5. Lower the score for a particular question, the worst the organization is doing in an area referred by question. The score for each question is added up and the total score is divided by the number of questions. The checklist used for calculating 5S score is shown in Table 2. The current score before implementation of 5S is found out to be 2.2.

TABLE 2. CHECKLIST FOR 5S SCORE BEFORE IMPLEMENTATION

5S	Questions	Rating					
		0	1	2	3	4	5
SORT	Are there items such as obsolete or unused signage & documentation on walls, floors, ceilings within the area?		x				
	Is there any unused or surplus equipment in the area?			x			
	Are notice boards or similar current with regard to content ?	x					
	Is it obvious which items are marked as unnecessary?				x		
	Is uncontrolled personal equipment or belongings in the direct work areas?					x	
	Total	10					
SET IN ORDER	Is there a 5S map or layout for the work area?			x			
	Are any items stored in a manner that obstructs or hinders?			x			
	Are files & other media arranged in a manner				x		
	Are storage areas (e.g. racks, cabinets, floors) clearly identified as to their content?			x			
	Are appropriate facilities provided to store personal equipment away from the workspace?		x				
	Total	10					

SHINE	Are the schedules & responsibilities defined for the cleaning & checking?				x		
	Is the workplace & equipment kept clean & free from uncontrolled waste?				x		
	Are information areas & notice boards kept up to date, orderly & regularly reviewed?			x			
	Are Floor areas clean, undamaged (e.g. shiny) without slip, trip, or quality hazard?			x			
	Do persons habitually clean their area without being told?			x			
	Total	12					
STANDARDIZE	Is the workplace visual in its control methods?				x		
	Is the climate set to provide suitable work conditions such as temperature, humidity & lighting?			x			
	Is there a clear & visual improvement plan that drives performance improvement?				x		
	Are the first 3S being maintained?		x				
	Do people wear clothing which is clean & undamaged?			x			
	Total	11					
SUSTAIN	Are people within the area trained in key procedures & practices?				x		
	Are tools, equipment, materials and information being stored correctly?			x			
	Are Team Activity Boards & Information Centers up to date & regularly reviewed?				x		

	Is the standard for visual control common across all 5S areas?				x		
	Are all the Team compliant in the agreed rules ?		x				
	Total				12		

The next section will discuss the effects of suggestions and changes discussed here such as suggest layout, actions taken to organize scrap material, raw material, jigs-fixtures and tools.

V. RESULTS

As discussed in previous section, the process times for all operations related to inlet manifold and exhaust manifold before implementation and after implementation are collected and compared hereby. Comparison of process times for inlet manifold are shown in Table 3. Comparison of process times for exhaust manifold are shown in Table 4.

TABLE 3- PROCESS TIMES FOR INLET MANIFOLD

	Mtrl Handling (Sec)	Loading (Sec)	Machining (Min)	Unloading (Sec)	Total (Sec)
Operation: Bottom facing					
Before	7.63	62.20	6.31	38.40	483.54
After	7.04	58.45	5.62	36.85	439.55
Operation: Facing					
Before	-	28.87	1.07	18.82	113.02
After	-	28.82	1.07	18.82	111.84
Operation: Drilling					
Before	5.05	19.89	16.05	8.30	49.31
After	5.02	19.89	16.05	8.28	49.24
Operation: Tapping					
Before	4.90	8.59	18.02	3.37	34.90
After	4.86	8.59	18.02	3.37	34.84

TABLE 4-PROCESS TIMES FOR EXHAUST MANIFOLD

	Mtrl Handling (Sec)	Loading (Sec)	Machining (Min)	Unloading (Sec)	Total (Sec)
Operation: Bottom facing					
Before	6.20	62.83	6.46	34.04	490.67
After	6.17	62.83	6.40	34.04	487.56
Operation: Flange Facing					
Before	-	30.20	76.89	20.05	127.27
After	-	30.17	76.89	20.05	127.11

As described in previous section 5S score is calculated even after implementation of changes suggested in this article. The 5S score after implementation of 5S is found

out to be 2.68. The comparison of 5S scores before and after implementation of changes using spider chart is shown in Figure 10.

VI. CONCLUSION

From previous section results it can be concluded that

1. Reduction in process times, though in seconds, can lead to productivity improvement.
2. 5S score of the organization under consideration is improved by 21% after implementing changes suggested by authors.
3. The available space looks organized and is utilized more efficiently. This reduces time lost in searching jigs-fixtures and tools which in turn contributes to productivity.
4. As space is organized, clean and neat the working conditions and moral of workers is improved.

REFERENCES

1. ArashGhodrat, NorzimaZulkifli, "The Impact of 5S Implementation on Industrial Organizations' Performance", International Journal of Business and Management Invention, Volume 2, pg no 43-49, March. 2013.
2. R. S. Agrahari, P.A. Dangle, K.V.Chandratre, "Implementation Of 5S Methodology In The Small Scale Industry: A Case Study", International Journal Of Scientific & Technology Research, Volume 4, pg no 180-187, April 2015.
3. Shraddha P. Deshpande, Vipul V. Damle, Merang L. Patel, Akshay B. Kholamkar, "Implementation Of '5s' Technique In A Manufacturing Organization: A Case Study", IJRET: International Journal of Research in Engineering and Technology, Volume 4, pg no 136-148, Jan-2015.
4. P. M. Rojasra, M. N. Qureshi, "Performance Improvement through 5S in Small Scale Industry: A case study", International Journal of Modern Engineering Research (IJMER), Vol. 3, pg no 1654-1660, May - June 2013.
5. MohdNizamAbRahman, Nor KamalianaKhamis, RosmaizuraMohdZain, "Implementation of 5S Practices in the Manufacturing Companies: A Case Study Volume 7, pg no 1182-1189, 2010.
6. K. Ramesh, V.R.Muruganantham, N.R.Arunkumar, "5S Implementation Studies in Biomass Processing Unit", International Journal of Innovative Research in Science, Engineering and Technology, Volume 3, pg no 312-318, April 2014.