

IMPLEMENTATION OF LEAN MANUFACTURING IN SMALL SCALE INDUSTRY

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Abstract: In current scenario, cost of product is playing an important role in customer expectation and satisfaction. This paper is based on study in Small scale industry (As per Govt of India for Small Industry Investment in Plant and Machinery or Equipment: Not more than Rs.10 crore and Annual Turnover ; Upto Rs. 50 crore) has contribution of 50% in total exports and near 15 Carore employment generation in the country. Global markets are continuously changing and demanding due to high quality and low cost. Such products can be produced using lean manufacturing , by this we aimed to reduce all types of wastes at product manufacturing so as to reduce product cost.

5S is a basic foundation of Lean Manufacturing systems. It is a tool for cleaning, sorting, organizing and providing the necessary groundwork for workpiece improvement. This paper dealt with the implementation of 5S methodology in the small scale industry. By implementing 5s it results in significant improvements to safety, productivity, efficiency and housekeeping. The improvements before and after 5S implementation is shown by pictures and data analysis in the paper. Consequently, 5S techniques would strongly support the objectives of organization to achieve continuous improvement and higher performance.

Keywords: Lean Manufacturing, 5S, productivity, Analytical Hierarchy Process (AHP), Effective Organization.

INTRODUCTION

The concept of lean manufacturing was developed for maximizing the resource utilization through minimization of waste, later on lean was formulated in response to the fluctuating and competitive business environment. Due to rapidly changing business environment the organizations are forced to face challenges and complexities. Any organization whether manufacturing or service oriented to survive may ultimately depend on its ability to systematically and continuously respond to these changes for enhancing the product value. Therefore value adding process is necessary to achieve this perfection; hence implementing a lean manufacturing system is becoming a core competency for any type of organizations to sustain.

7 Wastes to be controlled in Lean Manufacturing

- ❖ Waiting
- ❖ Defects
- ❖ Motion Unconditionally high level of inventory
- ❖ Processing
- ❖ Over Productio
- ❖ Transport
- ❖ Storage

What is 5S

5's is a system to reduce waste and optimize productivity through maintaining an orderly workplace . Implementation of this method “cleans up” and organizes the workplace basically in its existing configuration

1. Sort - Eliminating any obstacles that get in the way of production. Remove any unneeded items, put things away, and make sure the right people are performing the right jobs.

2. Set in Order - Arrange things so that they are located where they need to be used. Reducing or eliminating the need for employees to walk to another area to get a tool will help prevent wasted time and effort.
3. Shine - Clean workplaces are much more efficient than dirty ones. In addition, clean tools and machines last longer and cause fewer issues during operation.
4. Standardize - Setting standards for how work should be done will reduce errors and improve efficiency. While standards can be improved upon, having everyone operating in the same way will help increase production.
5. Sustain - Make sure any improvements implemented will be effective long into the future. Performing audits and inspections can help sustain the improvements gained through the other four steps.

II LITERATURE REVIEW

The Research Papers related to Lean Manufacturing and Implementation through 5S' are taken from various journals result of some of them are as below :

Rose, A.M.N., Deros, B.Md., Rahman, M.N.Ab. & Nordin, N.[1] Presented case study on “Lean manufacturing best practices in SMEs”

Results :

This study has focused on feasible lean practices which are required to be implemented in order to be successful in lean implementation. The proposed practices were based on three categories; least investment, feasible to apply in SME and recommended by researchers. Among the lean practices that require least financial investment are 5S, visual control & display, standardization of operation.

Dr Devendra Singh Verma[2] presented case study of Study work on “Application of Lean Manufacturing to Achieve Higher Productivity in Precision Surface Equipment Industries”

Results :

The paper aims to Many of the concepts in Lean Manufacturing Originate from Toyota Production System It shows mainly following type of wastages :

- | | |
|--------------------|-------------------|
| 1. Over Production | 3. Inventory |
| 2. Defects | 4. Transportation |

Panizzolo, R. (1998), [3] presented paper on “Applying the lessons learned from 27 lean manufacturers. The relevance of relationships management,”

Result :-

The researcher's main objective of the thesis is to succeed in implementing 5S into a customer company's warehouse. The target is to make 5S and lean part of every employees daily work routines. The project organizations were formed in a way that as many employees, as possible, were able to be involved.

Jugraj Singh Randhawa and Indrajeet Singh Ahuja [4]presented paper on 5S implementation methodologies: literature review and directions.

Result :

In order to maintain the competitiveness of organisations, the top management has to continuously strive to innovative tools and techniques. 5S initiatives offer significant benefits to manufacturing and service organisations to attain drastic improvements at workplace.

F.Ferdousi, and A. Ahmed[5] presented paper on “An investigation of manufacturing performance 4. Improvement through lean production: A study on Bangladeshi garment firms,”

Result :

They have reported that in Indian economy, small scale industries play a significant role in employment and industrial production with 33.33% of export revenue. It is important to implement the basic lean tool (5S) in small scale industries for their development. He concluded that implementation of 5S in (SMES) bring vital improvement of 88.8% in production system within sequential weeks.

III NEED OF THE STUDY

1. Improper utilization of storage space for raw material, bins and finished products.
2. Wastage of time in searching the raw material due to non-permanent location for storage of raw material.
3. Low productivity due to the time wastage in searching for tools, materials due to improper workplace management.
4. Presence of unwanted materials at the workplace which affects the moral of the worker while working.
5. Useful storage space being acquired by the unwanted materials.
6. More time and cost required for the inventory process of unwanted stored materials in raw material stores.
7. No well defined space for storing the unwanted or rejected material.
8. Unequal participation of officers and workers in workplace management due to non standardization.

Objectives

- To identify potential avenues for improving present level of lean manufacturing for increasing productivity and eliminating all waste in the production processes.
- To optimize inventory levels.
- To reduce rejections and improve quality.
- To implement 5's. and to achieve a competitive advantage by reducing the overall cost.
- To increase annual savings by increasing capital productivity, labour productivity and reducing overall cost

IV Methodology

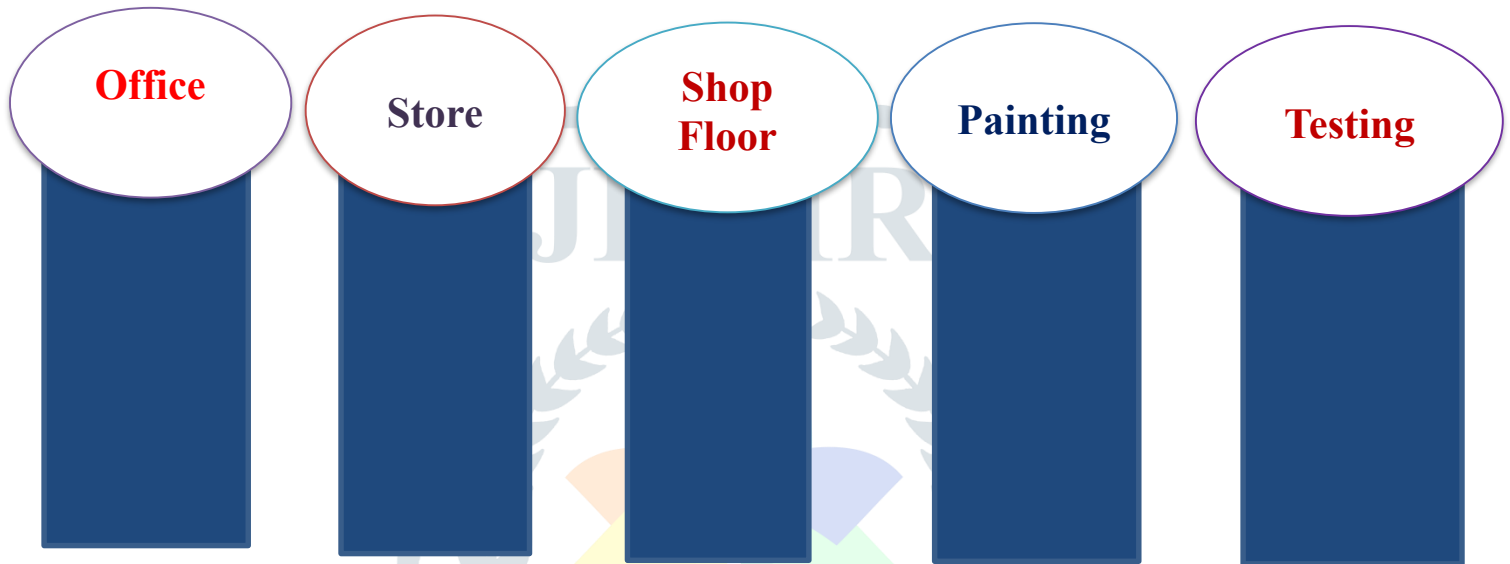
Steps for implementation of 5S on selected processes

1. Training of the concerned team leaders and team members.
2. Identify losses, wastages expected hazardous conditions in the process/plant.
3. Apply Seiri (1s), Seiton (2s) and Seiso (3s) for the process.
4. Explore for the Kaizen in the process.
5. Explore for the improvement in Sphagetti Diagram to reduce the losses.
6. Standardise (Seiketsu-4s) the change and make record related to the change.
7. Regular audit of the implementation (Shitzuke-5s) of new change/modification etc.



Implementation carried out in phased manner as below :**1. Phase I :-**

- (1) Management planned for in house training of the teams of different zones with respect to improvement in productivity, quality and safety. Reward schemes also introduced on implementation of Kaizen.
- (2) It increase morale of the teams and employees. Training improved their soft skills as well as technical skills. Soft skills improved interpersonal relations and understanding between the employees and it resulted in better coordination with respect to result of the study to be carried out next phases.

AREAS OF IMPROVEMENT**2. Phase II (Implementation of Seiri and Seiton)**

Pre Audit of the situation and identification of red tagging of unwanted items in present situation. These items are kept at separate place so as to minimize the time of finding useful items in the store. Decision is made by management whether these items are to be disposed off or to be kept for future use in red tag holding area. Useful items were arranged in order so it is convenient to find them. Tools were also kept in systematic way at work place.

3. Phase III-Implementation of Seiso (Shine), Kaizens.

Shine aims for keeping cleanliness at workplaces, workstations, offices, stores, outlet, passage ways, gangways, etc. in the organization. The workplace was untidy previously. It was excessively dusty. So we cleaned the cupboards and floor to ensure the Seiso. For implementation of Seiso workers' participation and support is most important. Kaizens were carried out to improve quality and enhance safety conditions to reduce work hazards. Train your employees to do it correctly. Make sure they know what they are responsible for and give them the tools to do the job.

Improvement through Kaizen

Sr. No.	Zone of Kaizen	Kizen	Benefits
1	Testing Zone	Calibration stickers on every instrument.	Easy calibration status check before use
2	Painting Area	Barricades installed at upcaster platform.	Safety Improvement

4. **Phase IV :- Post audit of improvements. Seiketsu(Standardise)** Standardize aims for preparation of standard methods to continue to follow the first '3S' effectively in the organization, thus to standardize, following activities were taken into consideration. We have maintained a red tag register in which we kept record of all the red tags for our reference. Standardize your cleaning program for best results. Utilize checklists and diagrams for consistency. This way, each employee knows what he needs to do, when he needs to do it, and exactly how to do it. There is no room for uncertainty.

Improvement of 5S



BEFORE



AFTER

5. **Phase V :- Sustain the standards** Form a committee made up of employees and supervisors of different departments. Their job will be to oversee the implementation of 5S for a fixed period, maybe six months. Then you can rotate in new members. Standardize uses three steps to make sure that the 5S pillars are getting done consistently and correctly: (1) Make sure each employee knows his responsibilities. 2) Make it a part of their daily routine. (3) Periodic evaluation. (4) Have friendly competitions between departments each month and reward the winner.

IV RESULTS**Labour Productivity**

Month	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar- 20
Net Sales in Rs.	33,08,025	11,39,111	39,41,676	31,36,573	51,30,350	47,50,000	52,00,254	51,05,637	52,53,685	47,50,741
Direct/ indirect labour cost in Rs	1,50,000	1,20,000	1,18,000	1,25,000	1,05,000	1,20,000	1,10,000	1,15,000	1,20,000	1,25,000
Labour Productivity	28.77	9.49	33.43	25.09	48.86	39.58	47.28	44.40	43.78	38.01

Capital Productivity

Month	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	March-20
Net Sales	33,08,025	11,39,111	39,44,676	31,36,573	51,30,350	47,50,000	52,00,254	51,05,637	52,53,685	47,50,741
Capital Investment	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000
Capital Productivity	1.32	0.46	1.58	1.25	2.05	1.9	2.08	2.04	2.1	1.9

Economic gains were observed after implementation of 5S

S No.	Description	Unit	Before 5s	After 5s
1	Annual Turnover	Cr	3.10	4.17
2	Labour Productivity	Ratio	28.77	38.01
3	Capital Productivity	Ratio	1.32	1.9
4	Annual Savings	Lakhs	30	41

V CONCLUSION

In order to maintain the competitiveness of organisations, the top management has to continuously strive to imbibe innovative tools and techniques. 5S initiatives offer significant benefits to manufacturing and service organisations to attain drastic improvements at workplace, thereby motivating the organisations to learn more knowledge about 5S technique for its effective implementation in their organisations. Implementation of 5s requires complete involvement at all level of the organization. Cost of implementation is not significant at the same time management has to regularly train their manpower the system. 5s leads to better and constant quality products and Services.

Breakdown of equipment reduces. It improves workplace safety due to properly arranged work place and causes fewer hazards. It leads to reduced claims of injuries. Implementation of 5s results in reduction in material handling, reduced lead time and cycle time. It prevents missing of tools. It creates discipline in the employees. 5S is a system, a philosophy, and a culture. It increase Turnover, Capital and Labour Productivity hence enhances Annual Savings of the industry.

REFERENCES :

- [1] Rose, A.M.N., Deros, B.Md., Rahman, M.N.Ab. & Nordin, N (2011)“Lean manufacturing best practices in SMEs”, *International Conference on Industrial Engineering and Operations Management*.
- [2] Devendra Singh Verma and M D Saleem (2014) “Application of Lean Manufacturing to Achieve Higher Productivity in Precision Surface Equipment Industries”. *International Journal of Scientific & Engineering Research*, Volume 5.
- [3] Panizzolo, R. (1998), “Applying the lessons learned from 27 lean manufacturers. The relevance of relationships management,” *International Journal Production Economics* 55(3), 223-240.
- [4] Jugraj Singh Randhawa and Indrajeet Singh Ahuja, (2017) “5S implementation methodologies: literature review and directions” *Int. J. Productivity and Quality Management*, Vol. 20, No. 1,
- [5] F.Ferdousi, and A. Ahmed,, 2009, “An investigation of manufacturing performance 4. Improvement through lean production: A study on Bangladeshi garment firms,” *Int. Journal of Business and Management*, 4(9), 106-114.
- [6] D.Y. Golhar, Stamm, C.L. and Smith, W.P.,1990, “JIT implementation in Small Manufacturing Firms,”*Production and Inventory Management Journal*, 31(2), 44-47.
- [7] Lee, C.Y., 1997, “JIT adoption by small manufacturers in Korea,” *Journal of Small Business Management*, 35(3), 98-107.
- [8] Nagendra Sohani and Rakesh Kumar Pundad 2015, “Case Study of Counter Shaft Rejection through Lean Manufacturing” *International Journal Of Advanced Research in Engineering & Management (IJAREM)* Vol.1, Issue 5.
- [9] Gunasekaran, A.; Forker, L. and Kobu, B., 2000, “Improving operations performance in a small company: a case study,” *International Journal of Operations & Production Management* (20)3, 316-335.
- [10] S. Rothenberg, and F.Cost, 2004, “Lean manufacturing in small and medium sized printers,” *Printing Industry Centre*, 1-11.
- [11] C. Herron, and P.M.Braiden,, 2007, “Defining the foundation of lean manufacturing in the context of its origin,” *Agile manufacturing, ICAM*, 148-157.