

Implementation of 5S to Improve the Productivity of Detergent Manufacturing Industry



P. Sundharesalingam, B. Hemalatha, P. Vidhya Priya, M. Mohanasundari

Abstract: *this work is carried out to apply the lean tools i.e., 5S to solve the problems in a detergent manufacturing industry. The lean tools are one of the most effective and efficient method for eliminate the waste, improve the quality, overall performance of the machine and improves the annual profit. Their main aim is to reduce the cycle time. The objective of this work is to increase the productivity and eliminate the unwanted steps. Primary method is used for the data collection i.e., Observation method. The stopwatch is used to calculate the time taken for each job. The improvement of work process was executed by eliminating and combining the work process, which reduce the production time, number of process, increases the production rate and also provides the free space. 5S is used to achieve the objectives. The time taken to complete the work has been noted down before and after implementation of 5S. When we reduce the cycle time, the productivity will increase. When we implement the 5S the cycle time will reduce from 190 sec to 110 sec.*

Keywords: 5S, Productivity, Cycle Time, Improves overall performance

I. INTRODUCTION

In a competitive global market, the company wants to increase the profit and they want reduce the cycle time. Same way the detergent company wants to reduce the cycle time. To reduce the cycle time, the company wants to follow the 5S concept. 5S is a technique developed by Japanese in 1980's. The 5S technique is mainly used to reduce the waste. Waste is also called *Muda* in Japanese which removes the unnecessary parts or materials, reduces the production cost. The waste can occurred through Over processing, Motion, Transportation, Inventory, Overproduction, Defects and Waiting Time.

5S is adopted to reduce the waste, clean environment or workplace, reduce cycle time, on time delivery, improves the productivity and quality. 5S principle is not only for the shop floor workers but also for the entire organizations. 5S principle helps the shop floor workers to keep the place clean. The 5S should be implemented in every department of the organization

to improve the organization.

SEIRI (sort): It removes all the unwanted materials. It separates the wanted material from unwanted material

SEITON (set in order): it helps to arrange the wanted material in order.

SEISO (shine): It helps to clean the workplace.

SEIKETSU (standardize): Standardize the practice of cleanliness and neatness

SHITSUKE (sustain): Maintain 4S and keep practice on it

II. REVIEW CRITERIA

[16]Rahani AR, Mohammad al-Ashraf, (2012) in this paper, they used Lean concepts for manufacturing automotive parts. In those lean concepts they used Value Stream Mapping (VSM) for identification of various opportunities in lean technique. It helps to visualize the hidden waste and also source of waste. Initially they investigate the existing assembly line. Then they collected and measured the processing time or cycle time. After implementing the method they compare the performance before and after implementation of Kaizen. They measured in terms of output per man hour on daily basis. The work measure technique is used to eliminate and reduce the waste. Finally the Value Stream Mapping (VSM) technique found the hidden waste which reduces the productivity. Lean tools reduced the waiting time.

[13]P.M. Rojasra, M.N.Qureshi, (2013) the manufacturing industries play an important role in the Indian Economy. The technologies are kept on changing. The management aimed to reduce all types of waste and to increase the profit and also to reduce the product cost. They choose the 5S strategy for better workplace. Out of all Lean concepts 5S provides the good potential for required improvement. The implementation of 5S improves the efficiency of the production (67%-88.8%). The 5S is the technique which reduces the non value added products and waste and improves the operational efficiency of the company. It promotes the neatness of raw material and also the inventory (stock). The 5s techniques provides the better working area, better environment, reduce the accident, Discipline of employees, increase the awareness; decrease the error or manmade mistake.

[5]Hasnain Bashir, (2014) in this paper explains the process and supply chain of soap. The value is added in each step. Issues faced by the company are energy crisis, Unstable Condition, Trend change, price of the raw material, high repair cost, Tax changes, and labour problems. They choose the recommendations are continuous supply of electricity and gas, quality Assurance system, Technology up gradation.

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Correspondence Author

Dr.P.Sundharesalingam*, Assistant Professor, Kongu Engineering College, Perundurai, India. Email: Sundharesalingam.mba@kongu.edu

Ms.B.Hemalatha, pursuing Master of Business Administration in Kongu Engineering College, Perundurai. E-mail:hemalathab.18mba@kongu.edu

Dr.P.Vidhya Priya, Associate Professor, Kongu Engineering College, Perundurai, India. Email: Vidyapriya@kongu.ac.in

Dr.M.Mohanasundari, Assistant Professor, Kongu Engineering College, Perundurai, India. Email: Mohanasundari.mba@kongu.edu

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[17]Sandesh Mali and Prof.A S Bhongade, (2017) in this paper implies the implementation of 5S in the small scale organization workplace. Their main problem is the time delay which affects the customer relation. To avoid the problem they try to implement the 5S concept in the organization workplace. After implementing the 5S concept in the workplace the operational efficiency increased to 20%. Planning and scheduling was done before the implementation of 5S. Based on the 5S concept they removed the unwanted items and arranged the important files because for finding information an individual spends 150 hour each year. After that they maintain the place clean. After implementing 5S they monitor the efficiency and cycle time. They found that it create productive work environment. They feel that it is easy to use and maintaining is difficult. Planning and scheduling gives the standard framework to the process and exact time required can be calculated as well as where is problem that can be easily identified.

[3]Anil Shastree, S A Arundhati, (2006) in this paper implies the downsizing of employees using lean manufacturing concept and also they implemented the concept on the real life operations. The main aim of Lean is to reduce the time of operations and also the receipt of order and payment. When reducing the cycle time and assigning all the activities in the correct place which will reduce the waste, costs and improve the quality. When they applied 5S, the workplace becomes clean. The factory looks and feels World Class. The companies try to improve the productivity to increase the market share and also to enter into a new market.

[11]Mihail Aurel Titu; Constantin Oprean and Daniel Grecu, (2010) in this paper implies the application of Kaizen and 5S in the real organization. The Kaizen method is the best in the Japanese management and it provides better efficiency, productivity, quality and better business. Apply the 5S in the organization and measure in terms of productivity, efficiency. After implementing the 5S and Kaizen concept in the organization workplace, the organization confirmed that this application need no investment or major expenses, but they have to paid more attention to the details. The man made problem occurs, at the time blaming people will not provide solutions for the problem. For that we have to use feedback techniques. It also provides low cost of improvement and continuous loss reduction and also improvement in employee performance.

[15]R. S. Agrahari, P.A. Dangle, K.V.Chandratre, (2015) this paper implies the Implementation of 5S in the Manufacturing Industry. The lean techniques create the value for the product and eliminate the waste. 5S is not just a housekeeping concept. It is the effective tool of Lean manufacturing. The main objective of this paper is whether the implementation of 5S shows the significant improvement in safety, productivity, efficiency. They implemented the 5S concept in the industry and they measured the output. They identified that the workers participation in the work increases, workers absenteeism has been decreased, time spirit and discipline were introduced and operation efficiency increased in a better working environment.

[14]Prof. Saad Shaikh, Ansari Noor Alam, Khan Naseem Ahmed, Sawant Ishtiyak, Sayyed Ziaul Hasan, (2015) this paper also implies the implementation of 5S in the Small scale organization. The main importance of the organization is quality and productivity. The problem

occurs due to the defects in raw material, process and product. They want to find out whether the implementation of 5S provides environmental cleanliness, health and safety. The main problem in the company is they want to reduce the cycle time and also increase productivity. The unwanted things are removed and the materials are kept in the order and arranged. They compared the effectiveness of the process before and after implementation of 5S. The effectiveness increased from 55% to 75% which almost increased up to 20%. The productivity also gets increased. Safety, work environment, Tool arrangement everything gets improved after the 5S implementation.

[4]A. Sai Nishanth Reddy, P. Srinath Rao and Rajyalakshmi G, (2016) this paper imply the productivity improvement using Time Study analysis in a small scale solar industry. The global economy is improving now days. The most facing problem is how to improve efficiency and productivity. Motion and Time study is used to calculate the time spend by the average worker to complete the task. Assembly line is used to improve the productivity. They drawn the current layout and then calculate the time taken by the worker and also the idle time, efficiency, balanced delay and balanced efficiency. The workstation gets arranged. The cycle time is reduced to 165 sec. As a result of assembly line balancing, the line efficiency increased to 30.41%, the idle time decreased from 0.179 hours to 0.016 hours, the balance efficiency increased from 55% to 91%. From that we can conclude that it reduce the time taken by the each component and improve the output, speed and flow of the process.

[9]Mayur Shinde, Aniket Sul, Gaurav Vyas, Vibhav Saraf, Zubair Shaikh, Somesh Mohanty and Prof. V.P. Kulkarni, (2019) this study implies to increase the Overall Productivity using Time study. The problem in the small scale industry is Improper working conditions and decline in productivity. The main objective is reducing cycle time, time waste or breakdown of the machine to increase the productivity. They prepared the activity sheet and they notice the time required for the job. They found the time loss during the operation and they targeted the loss to improve the productivity. The cycle time of one job is reduced from 210 sec to 204 sec. The productivity is increased from 625.5 min to 631.5 min. The efficiency of the operator is increased from 89% to 96%. To increase the productivity they suggested to sort out the unused the time and utilize it. The small improvement in the cycle time can save a small time. It increases the overall productivity.

[8]Mayank Dev Singh, Shah Saurabh K, Patel Sachin B, Patel Rahul B and Pansuria Ankit P, (2012) this study explains the productivity improvement using Work Study in a Small Scale Industry. The main objective is they want to identify the problem in the production area and they rectify it. The problem in this study is to reduce the work process and production time number of process and space utilization. They observed the process flow and time study as methodology. They create the existing plant layout and the physical facilities to have a quickest process flow with low time and cost. They compared the First layout with the changed one. In that the total time reduced form 28.15 hrs to 26 hrs. The saved time is 2 hrs. They reduced the cost to 20000 and also increased the profit from Rs.1504800 to Rs.1663200.

To conclude that the process is improved based on the work process, method study, and cost analysis and time measurement. The modification reduces the waste and time of the work.

[7] **Lusia permata sari hartanti, (2016)** in this paper the aim of this research is to determine the standard time of assembly process by using work measurement. The work measurement is conducted to improve the productivity of the assembly process. The time measurement is used to calculate the time taken by the worker for doing a job. The primary data (observation) is used in this study. The observed time is calculated based on the observation of the job. Normal time which is actual time required by the operator to finish the work is calculated. The time study helps to control the cost and time of the process and also the wage and budget estimation.

[2] **Abdul Talib Bon, Siti Nor Aini Samsudin, (2018)** the main aim of this research is to reduce the cycle time for the improvement of productivity. The Time study is used to reduce the cycle time in the assembly process. They measured the time taken for each job using stopwatch. After the implementation of Work time measurement the time is reduced for each workstation. The cycle time reduced to 70.8 sec. They eliminate the unwanted things and set the workstation in order for spacious and to improve the process. Single change in a process can reduce the time taken for each work sequence to improve the process flow and speed. Furthermore, time standards to be used as a basis for labour cost control. Besides that, helps to know the labour productivity, labour efficiency, labour performance and overall time required to perform the task. The operations depends on the consistent cycle times to schedule the production and allocated the workers.

[12] **Patange Vidyut Chandra, (2013)** this paper focus on the improve productivity using work study method. Their main aim is to reduce the man power, waste, time and to increase profits. They calculated the basic time and standard time. Observe the operator performing a task and record the time taken for each element. After applying they observed the process. The cycle time is reduced from 55.36hrs to 52.01 hrs and saves 3.35 hrs. Increase in productivity creates income and also improves the living standards.

[6] **Ishwar Bhiradi, B.K.Singh, (2014)** this paper is aims to improve productivity of mixed model production system of a medium scale manufacturing industry through work measurement method. The main objective is to reduce the time and non value elements and to increase the worker's performance. They calculated the basic time and standard time. The new work method is implemented it is eliminating the hydraulic set up and changing the horizontal deployed on the work station to get the improvement in the process. The cycle time is reduced from 6.78 to 4.16 min. The average production is increased from 115 to 131 units. The productivity increases to 35%.

[1] **Aakash Jaiswal, Shriram Madhukar Sane and Varsha Karandikar, (2016)** this paper explains about the implementation of engineering tools in a paint Industry. The problem is identified by observation of process. Time study,

Method study and layout study technique is help to identify the problem and rectify the loss in the unnecessary movements of labour and tools. They record the time taken for the job and then redesigning the process flow and then measured the time taken for a job. The time was reduced from 111.26 to 93.61 min and the time saved is 17.65 min. The production of bags is improved from 5252 to 6240 bags. The increment in productivity is 18.81%. The newly implemented layout increases the productivity and decreases the time taken to complete the job.

[18] **Shantideo Gujar, Dr. Achal S. Shahare, (2018)** this paper implies the Increasing in productivity and efficiency of the Small scale Industry by using Work study Method. This technique improved the production, reduce the production time and process, increase the production rate. Time study provides the standard time of the job. The data were collected and rearranging the process flow. The standard time for new method is 4.16min. The saved time is 29 sec (4.45 min-4.16 min). The production increased by 11%. The idle time is reduced from 0.45 min to 0 min. The new layout increases the productivity, quality and reduces the cycle and idle time.

[10] **Mod.Jishankhan, Utkarsh Dubey , Deep Patel , Akil Jariya, (2017)** this paper explains the productivity improvement by using motion study and work measurement. The most important thing is to identify the delay and problem in the machine which will increase the productivity. The time noted for the existing layout. The machineries were arranged in different position and the new layout was created. The time noted for the new layout. After all the change of layout the distance is reduced from 33.98 m to 23.7 m. So the saved time is 4.86 min. The productivity is increased by 4%. The travel time is reduced to 42% and the distance by 30%.

III. PROBLEM STATEMENT

The small scale industry occupies the better position in the Economy of India. It has provided larger employment. Global market continuously changes the demands of the product which implies the product with high quality and lower cost. The growth of the industry is depends upon the innovation, operational efficiency, productivity. Many companies try to update the new technologies to stay in the competitive market place.

A. Problem Description

The main problem in the detergent company is that they want to reduce the cycle time and also they want to improve the productivity.

B. Objectives of the Study:

1. Minimize the cycle time
2. Minimize the waiting time
3. Improve the production methods and productivity
4. Increase profitability and also reduce the expense

IV. RESEARCH METHODOLOGY

The problem observed in detergent manufacturing company is to reduce the cycle time. The data are collected and analyzed according the requirements. Primary data is used in this research. Primary data were obtained through observation. Data analysis was conducted after the data collection. The primary data required for the study is collected from the organization.

A. PLANT LAYOUT

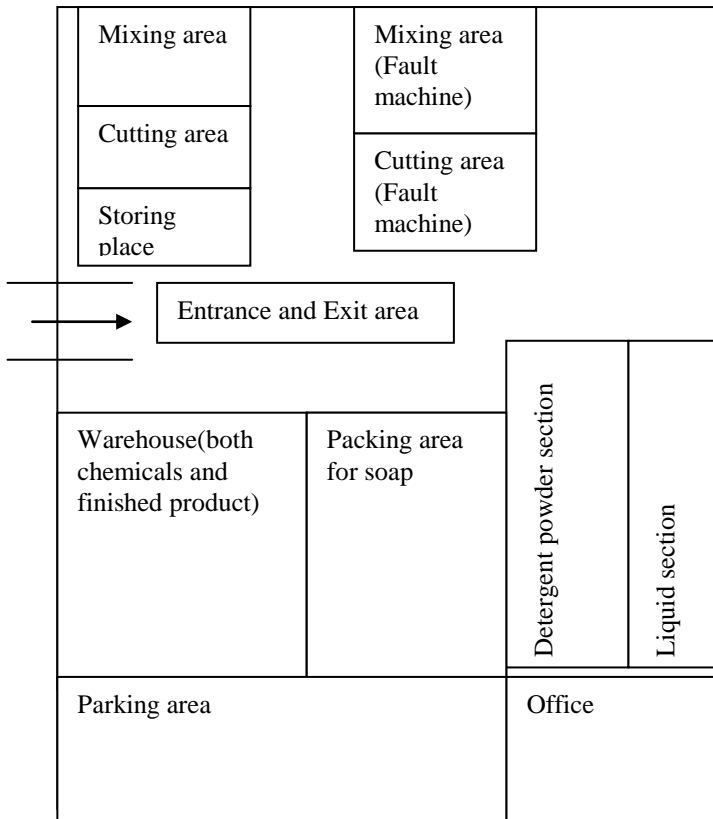


Fig 1: Plant Layout before Implementation of 5S

B. Data Collection

Iteration	A	B	C	D	E
I 1	70	27	65	28	190
I 2	75	25	75	29	204
I 3	79	27	68	30	204
I 4	69	26	73	33	201
I 5	68	26	76	35	205
I 6	70	25	73	32	200
I 7	73	26	76	35	210
I 8	69	27	72	33	201
I 9	73	27	71	35	206
I 10	72	25	75	32	204

Table 1: Data collected before Implemented 5S

- A – Chemical Mixing
- B - Cutting
- C - Transportation
- D - Packing
- E – Cycle Time

V. IMPLEMENTATION OF 5S

A. SORT

Sorting is the first step in housekeeping. In this step we have to decide the wanted materials and separate the unwanted material from the wanted material. The Sorting refers the removing of surplus materials. Check the material whether it is working or not and check whether it is useful or not. Remove the material when it is not working and not useful. It is an opportunity for every company and team to re evaluate their tools. The worker should satisfy the working environment after implementing the Sort. The changed layout should increase the productivity and high efficient work flow. Remove the items which are not used routinely.

- Remove Unwanted Materials
- Remove not working Machine
- Remove the tray
- Remove the unwanted covers and waste

B. SET IN ORDER

The Set In order is the second step in the housekeeping technique. The Set in Order deals with the proper arrangement of materials, tools and equipment. Keep the things everything in their place. It arranged the materials in the order to increase the work flow, productivity. It also helps the employees to do their work properly. For this company, it plays a major role because it saves the time and reduces the employees. It helps to identify the mistake easily.

- Group and Arrange materials
- Remove the unwanted steps
- Connect the packing area with the cutting section
- Keep the raw material in a arranged manner based on the chemicals

C. SHINE

Once the unwanted material is thrown away the arrangement of the material is done. Shine is essential for all the industry. This step helps the company to keep the clean working environment. When the company not maintains the system properly, it creates the faults which lead to inefficiency. The main objective is to eliminate the waste, dirt and dust. We have to check whether the machine is clean or not and the process path is clean or not. After implementation of this step the machine will work properly and no breakdown.

- Clean the machine
- Clean the tools
- Clean the workplace
- Eliminate the waste

D. STANDARDIZE:

After the organization clean the work place, the organization has to maintain the cleaning area. The cleaning standards have to be developed. It should be maintain by all the team and it should be take care. The main objective is to eliminate the waste, damage and also identify the root cause of the damage. The manufacturing company has to maintain the men, material, measurements, environment and methods.

E. SUSTAIN:

After implementation of above method, the above method is clearly maintained and it should be measured. Sustain is the final step in the entire 5S system. This can be done with the help of cooperation of employees, storekeeper, engineer and manager.

F. NEW LAYOUT

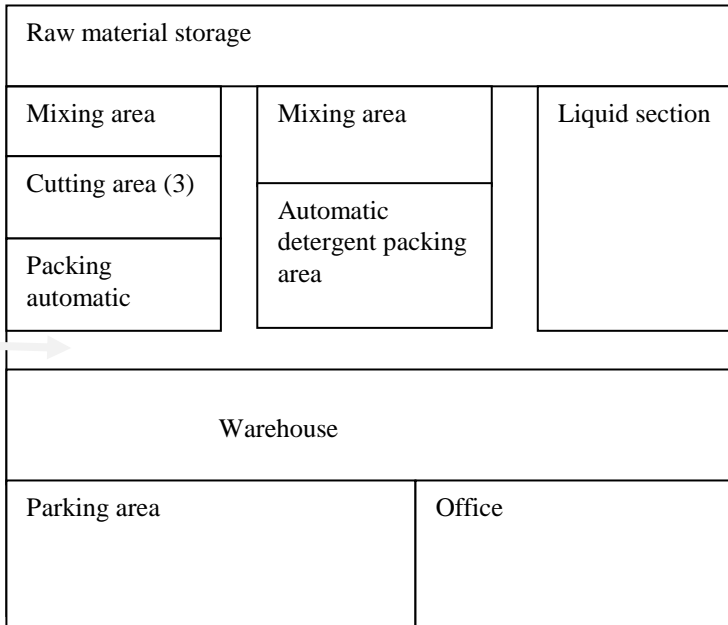


Fig 2: Plant Layout after 5S Implementation

G. DATA COLLECTION

Iteration	A	B	C	D
I1	70	18	28	116
I2	75	17	29	121
I3	79	18	30	127
I4	69	18	33	120
I5	68	17	35	120
I6	70	17	32	119
I7	73	18	35	126
I8	69	18	33	120
I9	73	18	35	126
I10	72	17	32	115

Table 2: Data collected after 5S Implementation

- A- Chemical mix
- B- Cutting
- C- Packing
- D- Cycle time

VI. RESULT AND DISCUSSION

By changing the plant layout we can reduce the cycle time. When we introduce the automatic plant, then it will reduce the cycle time. There is no need of storage place after the cutting section. There is no need of employees for transporting the material from cutting section into packing material. This will automatically send the cutting soap for packing. Then the cycle time will automatically reduce, it will improve the productivity is shown in fig 3.

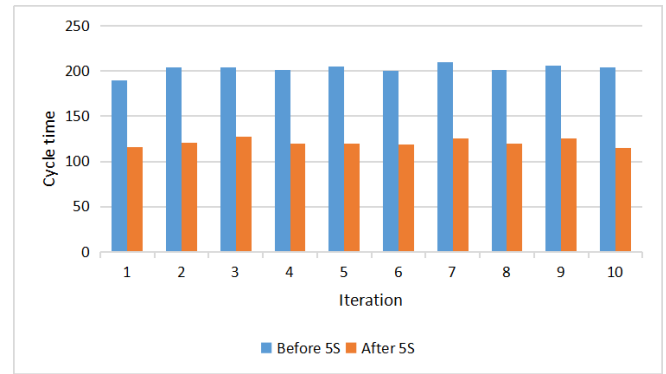


Fig 3: Graphical representation of changes in Cycle time

VII. CONCLUSION

The 5S technique will improve the productivity, reduce the cycle time, creates the safety, provides the visibility of the problem, improves the quality and production of the product, and provides the clean workplace and better impression of customer. When we reduce the cycle time, the productivity will increase. When we use the automatic machine or conveyor for the moment of material from one machine to another machine will reduce the cycle time. When we implement the 5S the cycle time will reduce from 190 sec to 110 sec.

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AUTHORS PROFILE



Dr.P.Sundharesalingam BE, MBA. Assistant Professor in Kongu Engineering College, perundurai, Erode (D.T), Tamil Nadu, India. His Research interest include Operations, finance.



Ms.B.Hemalatha B.E, MBA. pursuing Master of Business Administration in Kongu Engineering College, Perundurai, Erode (D.T), Tamil Nadu, India.



Dr.P.Vidhya Priya MBA, Associate Professor in Kongu Engineering College, perundurai, Erode(D.T), Tamil Nadu, India. Her research interest includes Corporate Finance, Operations.



Dr.M.Mohanasundari MBA, Assistant Professor in Kongu Engineering College, perundurai, Erode (D.T), Tamil Nadu, India. Her research interest includes Finance, Operations.