Optimization of Food Processing Industry to increase the Productivity by using 5S Methodology

Dr.S.T Bagde[1],Arjun B Gade[2],Prajakta Bhelawe[3], Sagar R Mundale[4], Tilakshaha B Kangali[5], Vaibhav Chopade[6]

[1]*Mechanical Engineering, Yeshwantrao Chavan College of Engineering*

[2]*Mechanical Engineering, Yeshwantrao Chavan College of Engineering*

[3]*Mechanical Engineering, Yeshwantrao Chavan College of Engineering*

[4]*MechanicalEngineering,Yeshwantrao Chavan College of Engineering*

[5]*Mechanical Engineering, Yeshwantrao Chavan College of Engineering*

[6]*MechanicalEngineering,Yeshwantrao Chavan College of Engineering*

Abstract -In this paper, one of the Lean manufacturing tool that is 5S, is implemented in a food processing industry named as Bapat Production, which is situated in MIDC, Nagpur. 5S is a methodology used to organize the workplace.5S becomes necessary tool in a food industry because it helps ineliminating the waste and increasing the productivity. Productivity and efficiency what are major factors in any industry which can be achieved by different Lean manufacturingtools like Poka-Yoke, Just-in-time, Kaizen, etc., but the main objective of using 5S in this industry is to manage the raw materials, to reduce the searching time, to make the workplace dust free and to standardize the activities.To achieve all these objectives analyzation of workplace was done and methodologies of 5Swere implemented in a systematic way. This resulted in proper management of inventory, the material flow time is reduced, hygienic work place and due to standardization awareness amongst the workers is increased.

Key Words:5s methodology,Productivity, Standardization,LeanManufacturing.

1.INTRODUCTION

5S is a tool of lean manufacturing , which is a methodology used to improve the productivity and to remove waste from the workplace. 5S is nothing but a combination of 5 japanese words, they are Sieri, Seiton, Seiso, Seiketsu and Shitsuke. As it is a tool of lean manufacturing, which is also termed as lean production is a relevancy of practices in Lean. With different tools and principles we try to eliminate waste , process optimization, bring new technique in market and try to cut the cost. Lean manufacturing also helps in removal of non-value adding things. The differences in lean manufacturing systems can be known by doing comparison with its type like Make in order manufacturing and Mass manufacturing system. Make in order manufacturing is done after placing the orders of products. This system requires skilled workers, adjustable tools and machines for making good quality products.

Mass manufacturing system is done to make standard areproducts at high volume, fo which low skilled workers needed. For such manufacturing systems it is necessary tomaintain large amount of inventory of raw materials so that production can be done in mass quantity. Bottlenecks of this system is they can't change their production so easily, as they have to change whole setup and machines. Hence it is limited fo manufacturing of particular products.

Among these all systems, lean manufacturing is always preferable. There are different tools in lean manufacturing such as Just in Time(JIT), Value Stream Mapping(VSM),

Poka-Yoke(also known as Mistake Proofing), Six Sigma, 5S System. The purpose behind using 5S is to optimize the current layout, remove the unnecessary things present in workplace, proper arrangement of machines, to keep the storage neat and clean and to make the surrounding of workplace safe so that workers will not face any health issues while doing their job.

2. LITERATURE REVIEW

This section include data collected from the past research done on 5S methods. They are:

Saad Sheikh(2015) carried out a study in an industry at MIDC, Ambernath Maharashtra which showed how implementation of 5's can help manage the materials which can further help in housekeeping and increase quality and productivity of the company. It showed how sorting can help eliminate unused or unwanted materials from storage room. It was also observed of set in order can allocate space for other items which further gives more area for sorting materials and tools thus reducing searching time.

Implementation of 5'S methodology was studied by Shreya Chavan (2017) in Prabha Engineering manufacturing industry at Rabale, New Mumbai. Implementation of 5's methodology in manufacturing unit was found out to be appropriate since there were many merits of implementing it like the wastes were reduced and the production was carried out with flexible and proper workstations. Major problem in this industry were improper inventory management, less quality improvement and lack of quality control. The desired results were obtained after sorting materials systematically, labelling the areas as well as the tools, cleaning dust from the floor and creating new guidelines for keeping discipline.

A Food and Beverage industry implemented 5's methodology by developing framework. Different types of products are exported by this company to 90 countries. Lean tools like 5's was implemented in the industry to keep in the race with their growing competitors. Thus 5's methodology was implemented in the industry beginning with observation, collection of data, implementing the technique and auditing. Four different sections were made and 5's activities were carried out in all the sections. Cost and space saving for each section were identified separately. The audit showed huge increase in the production after 5'S methodology was successfully implemented.

Mr. Y.R. Chavan (2017) with his team, implemented 5's technique in a workshop at their college, CGMCOE, Mahagaon. Spreading awareness about this technique was the main aim behind this task. But the teachers and students were unaware of technique which was an issue while implementing it so the team arranged seminars to give them knowledge about this technique.For implementation the workshop was divided into three zones to make the implementation easier. For example, the unnecessary items were placed in red zones. For sorting process various such zones were made in workshop and supervisors and volunteers were allocated for each zone. After audit, the team came to a conclusion that by implementing SEIRI or sorting the processes were taken place in a systematic manner. So, sorting was implemented successfully in the workshop.

3. Concept of 5S

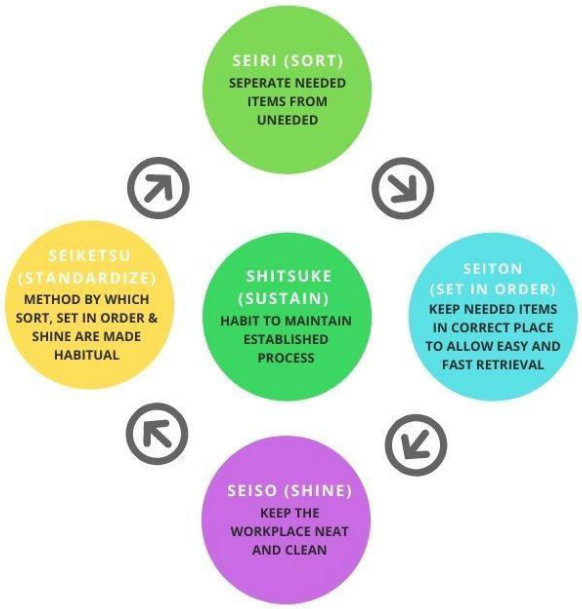


Fig -1: 5S Methodology

3.1Seiri

First fundamental of 5S methodology is Seiri, which means sorting. Sorting is done to separate all the unneeded items from the needed one and also separating those items which are used occasionally. Malfunctioning items are moved to maintenance area while infrequently used items should be placed in storage. Sorting is helpful for reducing cross-contamination risk.

3.2Seiton

Seiton is the second fundamental of 5S , which meanssetting in order. Here, we have to follow one principle rule i.e., "A place for everything and everything in its own place". Productivity is the most important part in any industry because it increases the efficiency. So, if set everythingin a proper order employees job get easier as they can find what they need and from this searching time can be saved. This methodology can be implemented my making a shelf to keep the things and labelling it properly.

3.3Seiso

Seiso, which means Shine. It is the most simplest and easiest methodology of 5S. As the name suggests , workers need to keep the work place neat and clean, it may be the tools used in machines, it may be the machines, it may be the shop floor or the storage. Because there are lot of chances of creating biofilms and dust in the workplace. But cleaning should be done with inspection. And this process should be followed on regular basis to avoid the future risk. This perhaps helps to reduce the pests in food processing industry.

3.4Seiketsu

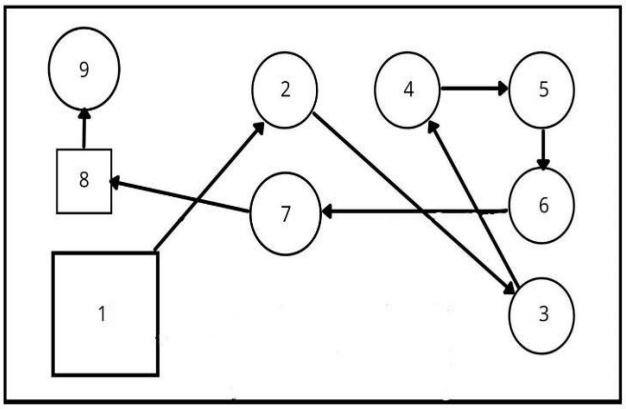
Meaning of Seiketsu is standardize. It is the methodology to manage the above 3 steps by giving some standards. This process is for the study of daily habits of employees because it is a state occurred after properly maintaining Seiri, Seiton and Seiso. And studying the habits of workers helps to optimize the way of working. Standardization is necessary because one don't need to perfom all the above 3 methodologies repeatedly. This methodology can be implemented by providing color codes for particular thing.

3.5Shitsuke

Shitsuke meaning Sustain or maintaining things in disciplined manner. This methodology is to maintain all the 4S techniques and this is the final step in whole 5S procedure. This step is not only about implementing the things and forgetting it. Every day workers and supervisors have to monitor the process so that appropriate steps can be followed and procedure will be done smoothly. This step is said to be difficult because it requires continuous alertness and an inspection manager. To maintain the 5S procedure , training programs for workers should be conducted in a particular time frame. This results in reducing the human errors. In sustain, workers motivation is also kept in mind. That's why to preserve the whole 5S system in a industry, sustain is very crucial step.

4. Problem Occurred

1) Improper utilization of available floor space (unused machines are placed on work place. cleaning area is in front of entry gate, both entry and exit is done through same gate).
2) Material low is inappropriate because machines are not placed properly.
3) Improper storage of raw materials due to which it get moist.
4) Work place is not cleaned on regular basis which leads to labor discomfort.
5) Wastage is not eliminated on regular basis, which occupies a lot of apace.
6) Material handling tools are not used in storage which increases the motion time.
7) Workers are not trained and having lack of knowledge which affects the productivity.



Existing Layout

1. CLEANING PROCESS
2. SORTING MACHINE
3. SEWING MACHINE
4. DRYING MACHINE
5. GRINDING MACHINE
6. SEWING MACHINE (3 NETS)
7. BLENDING MACHINE
8. WEIGHT MACHINE
9. PACKING MACHINE

Fig -2: Existing material flow chart

5. Implementation of 5S Methodology

5's implementation is necessary in any type of Industry as it subsidize to eliminate muda (waste) of 8 types namely (inventory, motion, defects, over production, transport, motion, non-utilized creativity, waiting time) and increase involution of workers i.e., morale, teamwork, health and safety. 5's methodology is important because it reduces variability and cost and secondly it eliminates the waste.

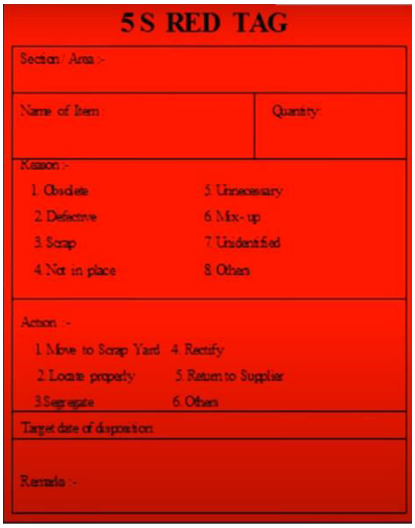
5.1Seiri (Sort)

The methodology is helpful in removing unnecessary items. It can be done with pillar of Toyota production i.e., Just in Time (JIT) and also by doing red tag campaign. For implementation we have kept 4 elements in mind:

- Not needed at all
- Needed but not here
- Needed but in specific quantity

After analyzing these 4 elements we took following action:

- Moved all unnecessary items like oil pipes, broken parts of parts, expired raw materials to the red tag area
- Moved the machines to yellow tag area which are seasonally used.



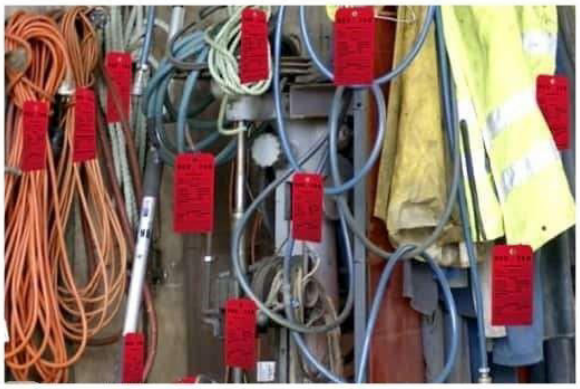


Fig -3: RED TAG Area

5.2Seiton (Set In Order)

This method is necessary for searching things easily in the workplace. In food processing unit this method is applicable to raw materials, oil tanks so that one can find the required ingredients and can save motion time. Guidelines to follow while implementing this are as follows:

- Firstly, we analyzed and identified the current status of the workplace.
- Then we decided which items should be placed at which place.
- Identified how much quantity is required.
- Then labelling and indexing is done to particular items.

Also, color codes are suggested to easily identify the inventory like black for raw materials, green for finished goods, yellow for materials to be reloaded and ref for items needed to be clean.

Fig -4: Before and after pictures after implementing Seiton

5.3 Seiso (Shine)

Shine is nothing but keeping the work place net and clean; and in a hygienic condition so that there will be no discomfort for the workers. In a food processing unit this is most important process. Keeping this in mind implementation is done using following steps:

- Firstly, things needed to be cleaned are determined.
- Workspace are divided into 4 parts and then assigned workers and suggested a time interval for cleaning these items in a time interval.

- Other than workplace, wastebins, tool boxes, machineries, equipment, storage area are systematically cleaned and prepared a chart for cleaning these items in a particular time interval..

These steps are necessary to be repeated in a food processing plant because a lot of air borne particles and bio films are created. Installation of aspiration and deducing system is suggested to keep the environment dust free..

ITEMS	TIME INTERVAL	NO. OF TIMES IN AN INTERVAL
Floor	1 Day	2
Wastebin	1 Day	1
Tool box	1 Week	1
Machinery and Equipment	1 Week	1
Raw materials	1 Month	1
Storage area	15 Days	1

Table 1 -: Time Interval Chart

Fig -5: Before and after picture ofimplementing Sieso

5.4 Seiketsu (Standardization)

Seiketsu as discussed early, it is a methodology used to manage first three steps by giving some standards. Seikestu is a state which occurs after properly implementing serio, seiton and seiso. Standardization in a food processing industry is done by:

- Employing a person who look into maintaining the first 3s.
- Daily maintaining the procedure by not doing any major mistakes.
- Maintenance level is to be checked regularly.

For standardization, first observation of existing process (i.e., flow of material) is done and then suggested a Quality Assurance Manager for overseeing the production process and analyzing the data to improve the productivity. Charts for standard things are also prepared like color codes for raw materials and for recognizing the area of workplace one chart is prepared which contains symbols and their meanings. For example, walking direction with foot symbol and so on.

SPECIFICATIONS	COLOUR CODES
RAW MATERIALS	
FINISHED GOODS	
MATERIALS TO BE RELOADED	
ITEMS NEEDED TO BE CLEANED	

Table 2 -: Standard Colour Codes Chart

SPECIFICATIONS	SYMBOLS
DIRECTIONS	
DANGER MARKING	
WALKWAYS	
OIL PIPELINES	
DOOR OPENING	

Table 3 -: Chart for Standard symbols in workplace

Fig -6: Standards for walkway

5.2 Shitsuke (Sustain)

Shitsuke can be achieved by self-discipline and continuous improvement in the 5's procedure. In this methodology daily monitoring of all activities is done, workers are trained on quarterly basis, for maintaining the efficiency. Some tips given for self-discipline in 5's are as follows:

- Teams are made and divided the work in different zones for analyzing the performance.
- Provided resources like posters, articles and newsletters for making the workers aware about 5's.
- Suggestions and ideas are taken from workers also so that they can stimulate creativity and generate interest for working.
- Proper communication was built up between each and every individual working in the workplace. Proper communication helped a lot for reducing the motion time.
- For sustaining the 5's motivating the employees is necessary so some rewards are to be given to the best performing worker on the basis of their efforts.

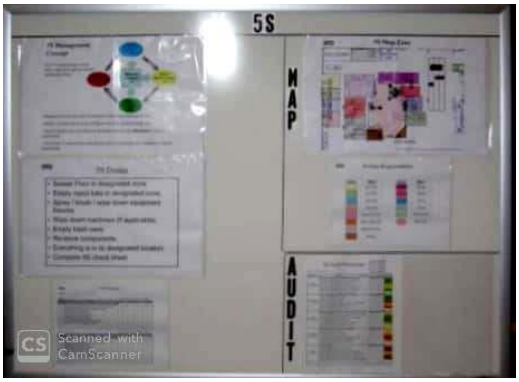


Fig -7: Posters for maintaining 5S in workplace

6. CONCLUSIONS

Benefits of a food processing industry by implementing 5S methodology:

- Elimination of waste and unnecessary items.
- More space is available in workplace.
- Searching time is saved.
- Inventory is managed properly.
- Efficiency of work is improved.
- Working condition is improved which reduced labor discomfort.
- Maintenance cost of machine is reduced.
- Quality of product increased, i.e., complaints of customer are reduced.
- Accidents and pollution is reduced which created a safe environment for working.
- Travel time of both men and machine is improved.
- Company standards get increased.
- Awareness amongst the workers is increased.

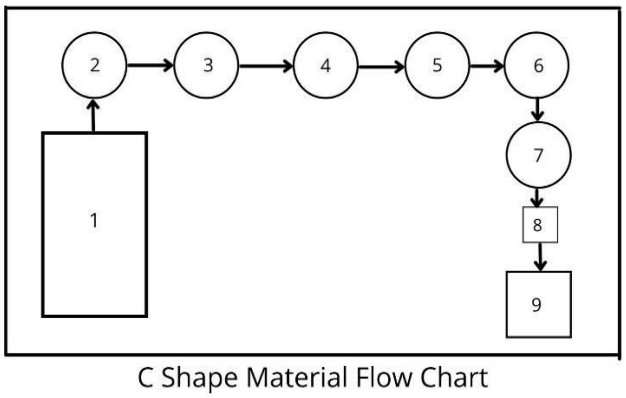


Fig 8:Optimized Layout

ACKNOWLEDGEMENT

We are grateful to the BAPAT PRODUCTIONS, M.I.D.C. Nagpur for providing us an opportunity to implement the 5S methodology in their industry and sincere thanks to our Dr. S.T Bagde Sir for proving guidance to us.

REFERENCES

[1] Greif, M. (1989), The Visual Factory: building participation through shared information. Productivity Press, Portland, OR, USA.

[2] Hirano, H. (1988), Just in Time Factory Revolution: A pictorial guide to factory design of the future. Productivity Press, Portland, OR, USA.

[3] Hirano, H. (1995), 5 Pillars of the Visual Workplace: The sourcebook for 5S implementation. Productivity Press, New York, USA.

[4] Hirano, H. (1996), 5S for Operators: 5 Pillars of the Visual Workplace. Taylor & Francis.

[5] Suzaki, K. (1993), The New Shop Floor Management: empowering people for continuous improvement. The Free Press, New York, USA.

[6]Eng. Ana Rotaru, "Implementing Lean Manufacturing",theannalsof"dunăreadejos"universityofgalaţiFasciclev,technologiesinmahinebuilding,2008.

[7]Y.Yadav,G.Yadav,S.Chauhan,"ImplementationofSSinBanks,"InternationalJournalofResearchinCommerce,Economics&Management,VolumeNo:1(2011),IssueNo.2(June).

[8]S.Erdem,K.Aksoy,"ImplementingLeanServiceOperations:ACaseStudyfromTurkishBankingIndustry,"İşletmeFakültesiDergisi,Cilt10,Sayı1,2009,pp.171-198.

[9]K.W.C.U.Kendangamuwa,S.Sridharan,DRKHerath, R.M.M.K.Ratnayake,"FactorsContributingtotheSustainabilityof5SProgrammesinGovernmentHospitals in Regional Director of Health Services AreaKurunegala,"InternationalJournalofScientific&TechnologyResearch,Volume4,Issue03,March2015.

[10]Prof. Saad Shaikh, Ansari Noor Alam and Khan Naseem Ahmed, Sawant Ishtiyak Sayyed Ziaul Hasan (2015): "Implementation of 5S Practices in a Small-Scale Organization" Volume-5, Issue-2, ISSN (ONLINE): 2250-0758, ISSN (PRINT): 2394-6962, pp.130-135

.

[11] ShreyaChavan, Reena Pant (2017):"Process improvement by using '5S' in manufacturing unit: A case study"

[12]Sk. Riad Bin Ashra1, Md. Mynur Rashid, Dr. A R M Harunur Rashid (2017): "Implementation of 5S Methodology in a Food & Beverage Industry: A Case Study" IRJET, Volume: 04 Issue: 03, e-ISSN: 2395 -0056 p-ISSN: 2395-0072pp.1791-1796.