

**A PROJECT REPORT
ON
“IMPLEMENTATION OF 5S”**

Submitted by

Ansari Noor Alam

Khan Naseem Ahmed

Sawant Ishtiyak

Sayyed Ziaul Hasan

In partial fulfillment for the award of the Degree

Of

BACHELOR OF ENGINEERING

IN

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UNDER THE GUIDANCE

Of

Prof. Mohammad Javed & Prof. Saad Shaikh



DEPARTMENT OF MECHANICAL ENGINEERING

ANJUMAN-I-ISLAM

KALSEKAR TECHNICAL CAMPUS NEW PANVEL,

NAVI MUMBAI – 410206

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ANJUMAN-I-ISLAM
KALSEKAR TECHNICAL CAMPUS NEW PANVEL
(Approved by AICTE, recg. By Maharashtra Govt. DTE,
Affiliated to Mumbai University)

PLOT #2&3, SECTOR 16, NEAR THANA NAKA, KHANDAGAON, NEW PANVEL, NAVI MUMBAI-
410206, Tel.: +91 22 27481247/48 * Website: www.aiktc.org

CERTIFICATE

This is to certify that the project entitled
“IMPLEMENTATION OF 5S”

Submitted by
Ansari Noor Alam
Khan Naseem Ahmed
Sawant Ishtiyak
Sayyed Ziaul Hasan

To the Kalsekar Technical Campus, New Panvel is a record of bonafide work carried out by him under our supervision and guidance, for partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Mechanical Engineering as prescribed by **University Of Mumbai**, is approved.

Project co-guide
(Prof. Saad Shaikh)

Internal Examiner
(Prof. Mohammad Javed)

External Examiner

Head of Department
(Prof. Zakir Ansari)

Principal
(Dr.Abdul Razzak Honutagi)



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APPROVAL OF DISSERTATION

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Ansari Noor Alam
Khan Naseem Ahmed
Sawant Ishtiyak
Sayyed Ziaul

In partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Mechanical Engineering, as prescribed by University of Mumbai approved.

(Internal Examiner)

(External Examiner)

Date: _____

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Ansari Noor Alam

Khan Naseem Ahmed

Sawant Ishtiyak

Sayyed Ziaul Hasan

DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(Signature)

Ansari Noor Alam (11ME11)

Khan Naseem Ahmed (11ME31)

Sawant Ishtiyak (11ME47)

Sayyed Ziaul Hasan (11ME49)

Date:

ABSTRACT

Small scale industries plays an important role in Indian economic. It has emerged as powerful tool in providing relatively larger employment next to agriculture. It contributes more than 50% of the industrial production in value addition terms and generate one third of the export revenue. Global markets are continuously changing and demanding product of high quality and low cost. Such products can be produced using lean manufacturing, a management philosophy that aimed to reduce all types of wastes at all levels of product manufacturing so as to reduce product cost. 5S is a basic lean manufacturing tool for cleaning, sorting, organizing and providing necessary groundwork for work place improvement. This report deals with the implementation of 5S methodology in the Otoklin filters Company, Ambarnath, Maharashtra. Out of the available various lean manufacturing techniques, 5S offers good potential for required improvement.

5S is a systematic technique used by organizations comes from five Japanese words; Seiri (sort), Seiton (set in order), Seiso (shine), Seiketsu (standardize), and Shitsuke (sustain). This system helps to organize a workplace for efficiency and decrease wasting and optimize quality and productivity via monitoring an organized environment. It also provides useful visual evidences to obtain more firm results. There is a real need for empirical studies in field of new management systems and their impact on company's performance. As importance role of continuous improvement in today's organizations, and lack of sufficient evidence to show the positive impact of 5S on organizational performance, this paper aims to determine performance factors and characteristics in industrial organizations and identifying the effectiveness of 5S implementation on organizational performance as well. Surveying method is used and data collection is done by distributing questionnaire among five target organizations which have implemented 5S techniques. The target organizations are chosen from different industries and diverse field of work. The results of this research obtained from a comparative measurement of organizational performance before and after 5S implementation. The results show that 5S is an effective tool for improvement of organizational performance, regardless of organization type, size, its production or its service. Consequently, 5S techniques would strongly support the objectives of organization to achieve continuous improvement and higher performance.

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LIST OF ABBREVIATIONS

Abbreviations	Description
PVT	Private
e.g	for example
etc	and other things
FYP	Final Year Project
i.e	it is
ISO	International Organization of Standardization
JIT	Just In Time
TPS	Total Production System
TQM	Total Quality Management
UK	United Kingdom
USA	United States of America

CHAPTER 1

INTRODUCTION

1.1 Introduction

These chapter overall discuss the introduction of the 5S implementation in the Otoklin filters & solutions pvt ltd. In this part, the briefing of the background, problem statement, objectives, scopes and the objective of the project are discussed.

1.2 Background of the Project

The 5S framework was originally developed by just-in-time expert and international consultant Hiroyuki Hirano. The 5S framework is an extension of Hirano's earlier works on just-in-time production systems. The 5S represent a simple "good housekeeping" approach to improving the work environment.

In general, the 5S approach includes the controls the work floor conditions rather than the worker's behaviour. It is relatively inexpensive for the company to implement. It makes the worker's job easier and safer. It promotes daily activity for continuous improvement. It fosters efficiency and productivity while improving work flow. It encourages a proactive approach that prevents problems and waste before they occur. It provides a practical method for dealing with the real problems that workers face every day. And it fits with a facility's other efforts, such as total preventive maintenance, just-in-time manufacturing, pollution prevention, safety initiatives, and lean manufacturing effort.

The goal for this project is to let people realize about the importance of good housekeeping, especially in manufacturing plan. Many people think that housekeeping should be done by housewives at home, and cleaners at work. They do not realize that they, too, play an important part in keeping their houses/workplaces clean. More importantly, they do not know how much they can gain for themselves by just practicing good housekeeping. Whether work in an office, the factory, the warehouse, the laboratory or any other place, housekeeping is relevant to every people.

Good housekeeping is important as it can create an environment in which even minor abnormalities and mistakes will be obvious. Plus, it will produce an easily managed, safer and more pleasant environment. In industry, a clean, well-ordered and attractive work environment sets can help encourages tidy work habits in employees. It helps reduce fatigue. It will promote good worker-management relations. It also gives a lift to morale, which is reflected in the quality of production and overall efficiency. It can stimulate efforts to improve productivity through better use of people, space, equipment, time and materials.

Good housekeeping is also a good advertisement for every company. It is because customers and clients will have more confidence in an organization when their works is being carried out efficiently in clean, pleasant, well-ordered work surroundings. Good housekeeping portrays professionalism and efficiency to others. It can be expected that the standards displayed in the environment will be reflected in the product.

The more important reason why good housekeeping matter is it makes the undertaking a safer place to work in. Good housekeeping is a main factor in preventing accidents. Majority of all work accidents are caused during the handling of goods or materials, and by people falling, being hit by falling objects, or striking against objects in the workplace. All these causes can be reduced by good housekeeping practices. In fact, good housekeeping is the only cure for hundreds of accidents that occur.

Typical examples of poor housekeeping that lead to these accidents are:

- Excessive material, waste or chips in the working area.
- Congested aisles.
- Tools left on machines.
- Waste containers overflowing.
- Lockers and workroom in disorder.
- Broken glass.
- Electric leads or air lines across aisles.
- Dirty light fittings, windows and skylights.

We can stop accidents through good housekeeping. Where housekeeping is bad, fire is a

constant hazard. It can be caused by many housekeeping problems, such as oil-soaked rags and clothing igniting from spontaneous combustion and many more. Poor housekeeping can also lead to infestation by pests such as rodents and cockroaches and create serious health risks.

1.3 Problem Statement

For a company to implement and practice good housekeeping, it cannot be accomplished either casually or in a day or two. The whole company must take part in order to ensure the program is successful.

According to Herbert (1943), in his opinion, good housekeeping comprises the following elements (these are not necessarily in order of importance):

1. Men and machines should be so placed as to provide the easiest and most efficient flow of production.
2. Operations should be so located that the health hazards, possibly associated with one will not imperil workers on another task.
3. Structural and operational arrangements should be made to permit easy traffic of men and materials within the plant.
4. Adequate space should be allotted for the storage of movable equipment and tools not in current use.

1.4 Objective of the study

The objectives of this project are:

- 1) To study and identify problems at work area.
- 2) To implement 5S practices among the employees.
- 3) To measure the improvement after implementing 5S practices.

1.5 Scope of the Project

This project will thoroughly focus on implementing 5-S in the store room of Otoklin filters & solutions and indirectly improve the employees' manners. This condition will create

win-win situation between employer and employees.

1.6 Outline of the Project

This report writing consists of four chapters. Chapter 1 describes about introduction; which includes the project background, problem statement, objective of the project and scope for the project. Then in Chapter 2, it will stress on the literature review of related issues and philosophy.

Chapter 3 is about the methodology, while in Chapter 4 consists of present work. Lastly, it will state the result & discussion followed by conclusion and references.

1.7 Company Profile



Fig 1.1- Company Profile

Otoklin Global Business Limited

Filters making company which sells various types of filters using German technique, it does not consist of any hydraulic or pneumatic connections and does not use any types of motors.

Establishment

In the year 2003.

Products

- Cartridge Filters
- Air Filters
- Coolant Filters

- Sand Filters
- Bar Filters Slot Tube Filters
- Basket Filters
- Belt Filters
- Strainer Filters

Import/Export Region

- **Import region**

North America

Asia-Pacific

- **Export region**

North America

Western Europe

Central/East Europe

Vendors

- L&T
- TATA Groups
- RELIANCE

Plant Layout

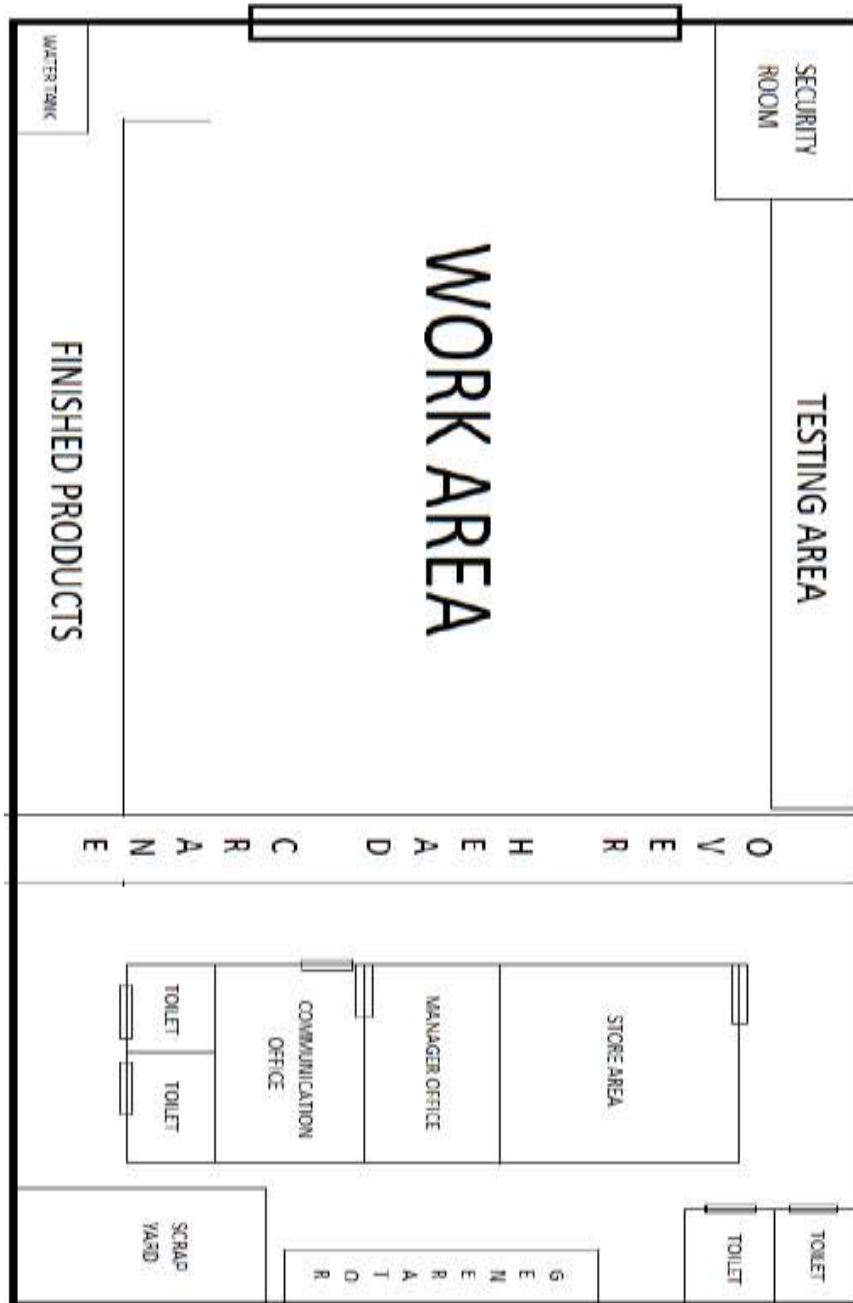


Fig 1.2- Plant Layout

1.8 Problem faced

In Otoklin Global Ltd. Industry, much time was wasted in set up than the machining time. Due to all the material was misplaced & most of the materials get lost. So, to increase the

productivity, it was necessary to reduce the non productive time.

In industry store room, all the items were not sorted & also there was unnecessary scrap, so this becomes the problem for the industry.

There were lots of items which were not set in order, due to this all the items are misplaced & there were difficulties in finding these items so it will increased the time in finding.

Due to sorting & set in order problem, Cleaning is also becomes a problem to this.

1.9 5S Strategy

5S is a strategy for attaining workplace organization and cleanliness, and it will improve quality, productivity and moral than any other lean manufacturing improvement.

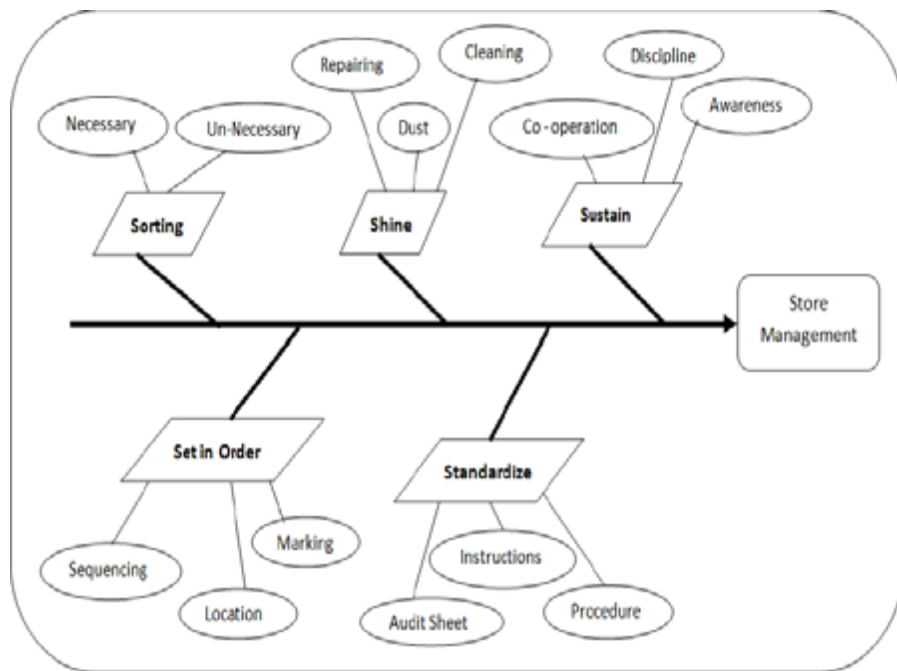


Fig 1.3- Fishbone daigram

Above fishbone diagram shows various phases of 5S methodology. In each phases we have describe the problem by using this phases we have solved the store management problem.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will proceed with referenced review from the relevant literature. It includes the details related to the information and history which already done by other people that involved in implementing 5S, previously.

2.2 Introduction of 5S

5S initially based on the Japanese acronyms of seiri (organization), seiton (neatness), seiso (cleaning), seiketsu (standardization) and shitsuke (discipline), is used as a platform for developing an integrated management system by the parallel use of total productive maintenance (TPM) (Bamber et al., 2000).

Osada (1991) refers to 5S as the five keys to a total quality environment. 5S is a system to reduce waste and optimize productivity and quality through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. The practice of 5S aims to embed the values of organization, neatness, cleaning, standardization and discipline into the workplace basically in its existing configuration, and it is typically the first lean method implemented by firm.

Kobayashi et al. (2008) make a distinction between 5S as a philosophy or way and 5S as a technique or tool by comparing the frameworks provided by Osada (1991) and Hirano (1995) respectively. From their study, they conclude that 5S tends to be recognized as a philosophy in Japan, but in the other hand it is likely to be considered as a technique or tool in the United Kingdom and United State of America. Osada (1991) views 5S as a strategy for organizational development, learning and change, whereas Hirano (1995) considers 5S to be an industrial formula that differentiates a company from its competitors.

A common definition of 5S in the West is housekeeping (Becker, 2001; Chin and Pun, 2002; Ahmed and Hassan, 2003; Eckhardt, 2001). In the West both 5S and TPM are

sometimes disregarded or at least underutilized (Douglas, 2002). A framework of applying 5S within a business (as appose to a personal philosophy of way of life) was first formalized in the early 1980s by Takashi Osada (Ho et al., 1995).

The practice of 5S aims to embed the values of organization, neatness, cleaning, standardization and discipline into the workplace (Osada, 1991). In Japan the 5S practice was initiated in the manufacturing sector and then extended to other industries and services sector. The Toyota Production System provides a well-known example of 5S principles in practice, the early versions were based on 3-S this, became 4-S (Ohno, 1988).

Boeing in the USA pursues 5S as a world-class strategy (Ansari and Modarress, 1997). Even with these prestigious and complex examples it appears that many researchers and practitioners have difficulty going beyond the simplest 5S concept. This is suggested by Hyland and others where they believe that Australian manufacturing firms have only a basic perception of the importance and the potentiality of 5S (Hyland et al., 2000). These authors found of ten continuous improvement tools they investigated the usage and perceived importance of 5S was lowly ranked.

Therefore, we can say that there is no consensus about the scope of 5S. Much of Western literature still acknowledges 5S as housekeeping (Ahmed and Hassan, 2003; Becker, 2001; Chin and Pun, 2002; Eckhardt, 2001). However, 5S is more frequently framed in the “lean” philosophy (James-Moore and Gibbons, 1997; Hines et al., 2004; Kumar et al., 2006), since it encourages workers to improve their working conditions.

2.3 History of 5S

5S was developed in Japan. It was first heard of as one of the techniques that enabled what was then termed 'Just in Time Manufacturing'. The Massachusetts Institute of Technology's 5-year study into the future of the automobile in the late 1980s identified that the term was inappropriate since the Japanese success was built upon far more than components arriving only at the time of requirement. John Krafcik, a researcher on the project, ascribed Leanto the

collective techniques being used in Japanese automobile manufacturing; it reflected the focus on waste in all its forms that was central to the Japanese approach. Minimised inventory was only one aspect of performance levels in companies such as Toyota and in itself only arose from progress in fields such as quality assurance and Andonboards to highlight problems for immediate action.

5S was developed by Hiroyuki Hirano within his overall approach to production systems. Many Western managers coming across the approach for the first time found the experience one of enlightenment. They had perhaps always known the role of housekeeping within optimised manufacturing performance and had always known the elements of best practice. However, Hirano provided a structure for improvement programs. He pointed out a series of identifiable steps, each building on its predecessor. Western managers, for example, had always recognised the need to decide upon locations for materials and tools and upon flow of work through a work area; central to this (but perhaps implicit) is the principle that items not essential to the process should be removed – stored elsewhere or eliminated completely. By differentiating between Seiri and Seiton, Hirano made the distinction explicit. He taught his audience that any effort to consider layout and flow before the removal of the unnecessary items was likely to lead to a sub-optimal solution.

Equally the Seiso, or cleanliness, phase is a distinct element of the change program that can transform a process area. Hirano's view is that the definition of a cleaning methodology (Seiso) is a discrete activity, not to be confused with the organisation of the workplace, and this helps to structure any improvement program. It has to be recognised, however, that there is inevitably an overlap between Seiton and Seiso. Western managers understood that the opportunities for various cleanliness methodologies vary with the layout and storage mechanisms adopted. However, breaking down the improvement activity in this way clarifies that the requirements for the cleanliness regime must be understood as a factor in the design aspect of Seiton. As noted by John Bicheno, Toyota's adoption of the Hirano approach is '4S', with Seiton and Seiso combined – presumably for this very reason. The improvement team must avoid the trap of designing the work area and then considering the cleanliness or tidiness mechanism.

Hirano also reminded the world of the Hawthorne effect. We can all introduce change and

while people in the business consider the change program to be under management focus the benefits of the change will continue, but when this focus has moved (as is inevitably the case) performance once more slips. Western managers, in particular, may have benefited from the distinction between the procedural or mechanical elements, Seiketsu, of keeping these matters in focus and the culture change, Shitsuke, which is a distinct approach to bringing about a new way of working. A number of publications on the subject in the West have questioned whether this culture can really be tackled as part of an exercise of relatively limited scope. The broader kaizen, or continuous improvement, approach is built, among other things, upon the company's valuation of all members of the workforce. If employees don't feel valued within the overall company culture, perhaps the change required falls outside the limits of a housekeeping improvement program.

2.4 Philosophy of 5S

2.4.1 Introduction

The 5S philosophy focuses on effective workplace organization and standard work procedures. It is based on five Japanese words that begin with S. This document contains a translation of those words and their corresponding meanings in the English language.

2.4.1.1 SEIRI - Sorting Out

Through the suitable sorting it can be identified the materials, tools, equipment and necessary information for realization the tasks. Sorting eliminates the waste material (raw materials and materials), nonconforming products, damaged tools. It helps to maintain the clean workplace and improves the efficiency of searching and receiving things, shortens the time of running the operation.

A) On the first stage one should answer to so-called Control Questions:

- Are unnecessary things causing the mess in the workplace?
- Are unnecessary remainders of materials thrown anywhere in the workplace?
- Do tools or remainders of materials to production lie on the floor (in the workplace)?
- Are all necessary things sorted, classified, described and possess the own place?

- Are all measuring tools properly classified and kept?

On the basis of the above questions it is possible the estimation of the workplace in terms of the 1S rule so littering the workplace. If on any question answer is yes, it should execute sorting of things which are in the workplace.

B) On the second stage one should execute the review of all things which are in the workplace and group them according to the definite system. According to carried out sorting it should execute the elimination from the workplace the things, which were found „unnecessary”.

B) To permanent usage the 1S rule is so-called the Programme of the Red Label. It means giving the red label to things, which operator will recognize as useless within his workplace. This label will make possible not only the elimination of the given thing, but through its own formula will make possible the liquidation of the reasons of appearing on the workplace this given thing.



Fig 2.1- SEIRI

2.4.1.2 SEITON - Set in Order

Especially important is visualization of the workplace (eg. painting the floor helps to identify the places of storage of each material or transport ways, drawing out the shapes of tools makes possible the quick putting a side them on the constant places, coloured labels permit to identify the material, spare parts or documents etc.).

- **Implementing 2S rule**

It should execute the segregation of things and mark the places of their storing.

Used things should always be divided on these, which should be:

- In close access (1st degree sphere).
- Accessible (2nd degree sphere).
- In the range of hand (3rd degree sphere). To the estimation of the workplace in terms of the 2S rule, that is setting in order things, serve the following Control Questions:
- Is position (location) of the main passages and places of storing clearly marked?
- Are tools segregated on these to regular uses and on specialist tools?
- Are all transport palettes storage on the proper heights?
- Is anything kept in the area of devices against the fire?
- Has the floor any irregularity, cracks or causes other difficulties for the operator's movement?

Things used occasionally and seldom should be on the workplace but outside the direct using sphere. Their distance and location from the place of work should depend on the frequency of using these materials or tools. Places of storage should be marked in the manner making possible their quick identification. It can be used coloured lines, signs or tool boards. Once defined places and methods of storage should be invariable.



Fig 2.2- SEITON

2.4.1.3 SEISO – Shine

Regular cleaning permits to identify and to eliminate sources of disorder and to maintain the clean workplaces. During cleaning it is checked the cleanness of machine, workplace and floor, tightness of equipment, cleanness of lines, pipes, sources of light, current data, legibility and comprehensibility of delivered information etc. Indispensable is also taking care of and maintenance the personal tidiness of the operator.

- **Implementing 3S rule**

The first step of realization the 3S rule is renovation the workplace. It is assumed that „the first cleaning” forces the exact checking of usage two of the previous rules. The usage of the 3S rule relies on everyday keeping in faultless cleanness the workplace. It is executed by the operator of the given workplace. To the estimation of the workplace in terms of the 3S rule, that is cleaning the workplace, serve the following Control Questions:

- Are the oil's stains, dust or remains of metal found around the position, machine, on the floor?
- Is machine clean?
- Are lines, pipes etc. clean, will they demand repairing?
- Are pipe outlets of oils not clogged by some dirt?
- Are sources of light clean?



Fig 2.3- SEISO

2.4.1.4 SEIKETSU – Standardize

Worked out and implemented standards in the form of procedures and instructions permit to keep the order on the workplaces. Standards should be very communicative, clear and easy to understand. Regarding this during preparation and improving, it should be involved all participants of the process on the given workplace, it means direct workers. The group knows the best specificity of its own activities, and process of elaboration and

that, usage gives them possibility of understanding the essence and each aspect of the operation. In the aim of assuring all the easy access, obligatory standards should be found in constant and visible places.

It is assumed that standards should not be implemented only in the typical operational processes e.g. production, movement maintenance, storing, administrative processes, for example: book-keeping , customer service, human resources management, or secretariat service.

Standards offer employees and employers a way to reach common goals while showing fairness to both sides. Cleaning and organization standards based on the 5S system should be clearly displayed around the workplace using signs and posters. Labels can also be used as reminders to be placed on individual pieces of equipment.

To aid memorization and implementation, pick a 5S colour scheme for your facility that aids in quick reference to 5S-related materials. For example, areas containing many black-on white signs may be outfitted with a white-on-green sign where cleaning or organization instructions are necessary.

As your employees adjust themselves to this new environment, make sure your standards are easy to understand and offered in multiple languages where necessary.

Standards are the backbone of a successful 5S program. Adherence to those standards creates an environment wherein employees can confidently pursue their production goals.



Fig 2.4- SEIKETSU

2.4.1.5 SHITSUKE – Sustain

Implementing the idea of the 5S will demand from workers the compact self-discipline connected with implementing and obeying the rules of regularity in cleaning and sorting. It leads to increasing the consciousness of staff, and decreasing number of non conforming products and processes, improvements in the internal communication, and through this to improvement in the human relations.



Fig 2.5- SHITSUKE

2.5 Pie chart

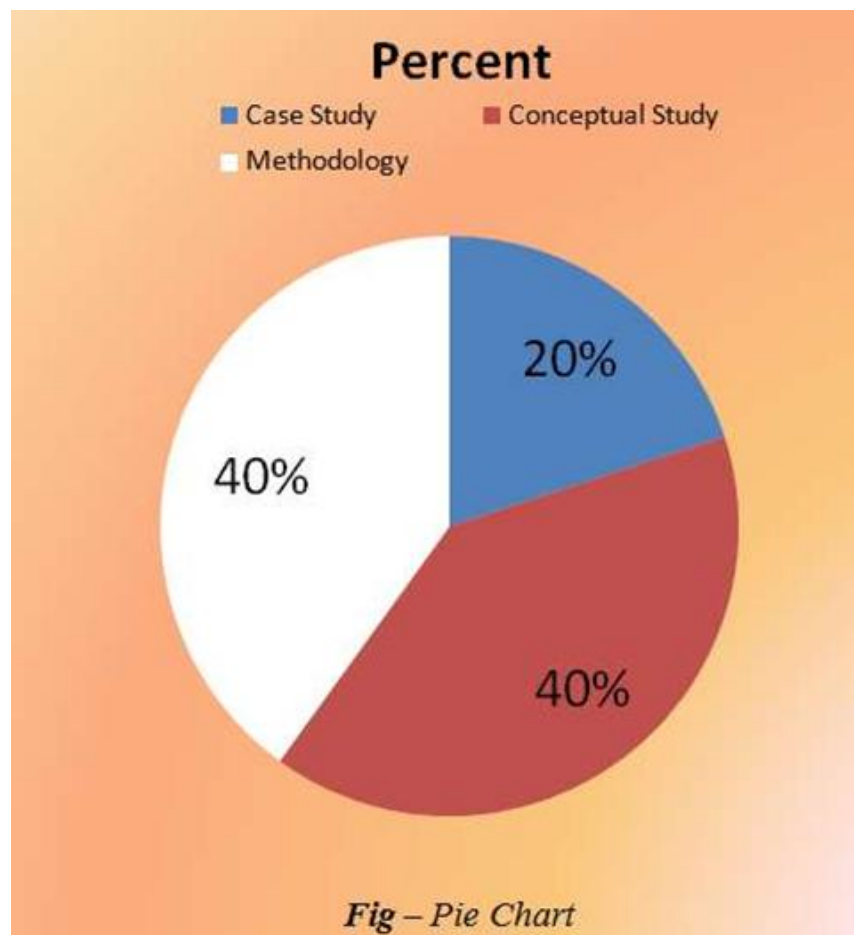


Fig 2.6- Pie Chart

The above pie chart shows that we have reviewed 20 papers out of which 20% part consists of case study, 40% part is of conceptual studies and 40% consists of methodology.

2.6 Project planning

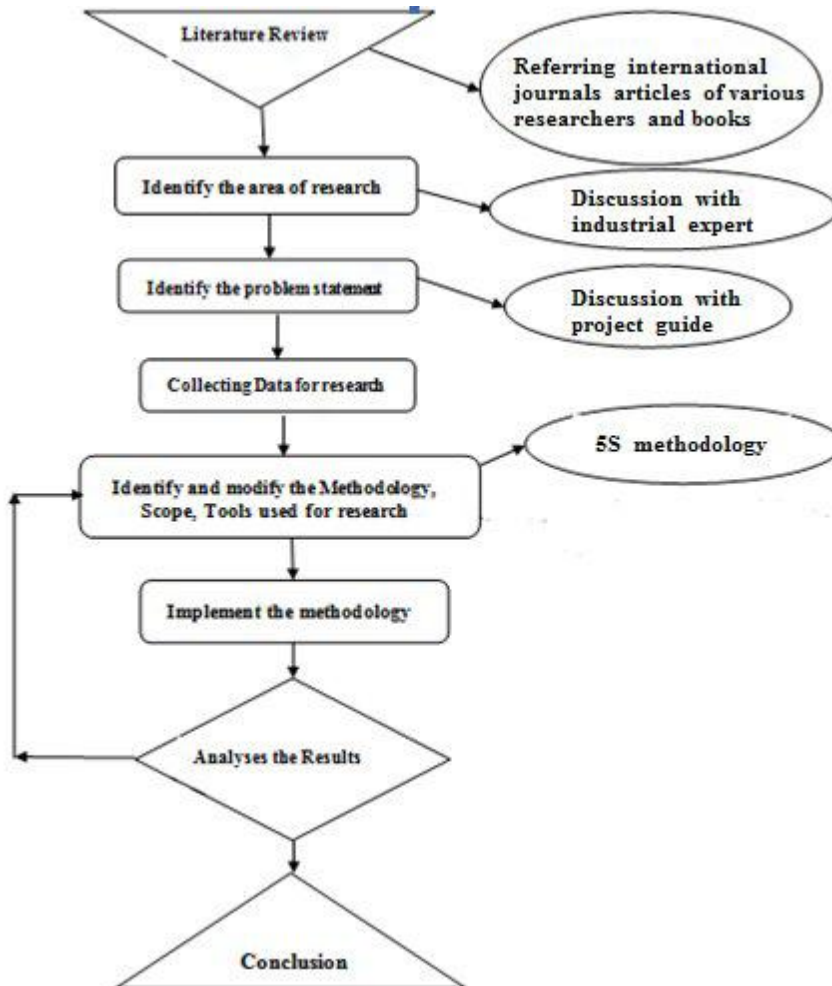


Fig 2.7- Project Planning

In this project, planning has been done by referring international journals articles of various researches and books. After referring journals and having discussion with industrial expert, we found area of research. Once identifying the area of research problem was defined with the help of project guide. After discussion, the data related to the research area was collected. By understanding the methodology, 5S methodology was implemented and result was analyzed.

Chapter 3

Methodology

3.1 Introduction

Many manufacturing facilities have opted to follow the path towards a “5S” workplace organizational and housekeeping methodology as part of continuous improvement or lean manufacturing processes.

5S is a system to reduce waste and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. The term refers to five steps – sort, set in order, shine, standardize, and sustain – that are also sometimes known as the 5 pillars of a visual workplace. 5S programs are usually implemented by small teams working together to get materials closer to operations, right at workers’ fingertips and organized and labelled to facilitate operations with the smallest amount of wasted time and materials.

The 5S system is a good starting point for all improvement efforts aiming to drive out waste from the manufacturing process, and ultimately improve a company’s bottom line by improving products and services, and lowering costs. Many companies are seeking to making operations more efficient, and the concept is especially attractive to older manufacturing facilities looking to improve the bottom line by reducing their costs.

“A place for everything, and everything in its place” is the mantra of the 5S method, and storage and workspace systems such as those provided by Lista International allow improved organization and maximum use of cubic space for the highest density storage. The result is an improved manufacturing process and the lowest overall cost for goods produced.



Fig 3.1- Consolidating stored items into the smallest possible footprint yields benefits ranging from more efficient use of space, faster and easier retrieval and an improved appearance.

3.2 Implementation of 5S

Implementing the 5S method means cleaning up and organizing the workplace in its existing configuration. It is typically the first lean method that organizations implement. This lean method encourages workers to improve their working conditions and helps them to learn to reduce waste, unplanned downtime, and in-process inventory.

A typical 5S implementation would result in significant reductions in the square footage of space needed for existing operations. It also would result in the organization of tools and materials into labelled and colour coded storage locations, as well as “kits” that contain just what is needed to perform a task.

The 5S methodology is a simple and universal approach that works in companies all over the world. It is essentially a support to such other manufacturing improvements as just-in-time (JIT) production, cellular manufacturing, total quality management (TQM), or six sigma initiatives, and is also a great contributor to making the work-place a better place to spend time.

Benefits to the company from using the 5S methodology include raising quality, lowering costs, promoting safety, building customer confidence, increasing factory up-time, and lowering repair costs.

The 5S methodology is typically implemented using a 3-step process, which includes establishing a cross functional team (including employees that work in the associated areas),

touring all areas associated with manufacturing process under review, and brainstorming on ways to improve organization to reduce waste. For example, factories have more than their share of searching waste. It is not unusual for a three hour changeover routine to include 30 minutes of searching. When attempting to reduce changeover time radically (for example, going from 3 hours to 10 minutes), there is clearly no room for 30 minutes of searching waste.



Fig 3.2- Fewer steps and greater organization mean less waste.

3.3 Value Stream Mapping on 5S

Value stream mapping (VSM) can be used in the 5S process to analyze the material, process, and information flow. The information is used to develop a current state map, which sets out how things have been done in the past. The team then analyzes the current state map to identify opportunities for workplace organization and house-keeping improvements. A wide range of ideas is considered – while all ideas won't end up being viable, all are worthy of investigation. The key is to observe non value added processes and create an environment to promote value added work through waste elimination.

Finally, the team envisions a future state based on the exercise and begins implementing the future state. The process is iterative; the future state becomes the current state, and a continuous improvement process should be used to identify new ways to reduce waste. Waste is defined very broadly, and includes things like waste in the movement of material, carrying too much inventory, defects or rework, producing scrap, waiting or unnecessary motion.

Some examples include waste of motion because the person sent to get a part or tool could not find it; searching waste because no one can find the key to the locked cabinet that contains needed tools; waste of defective products because defective parts were not separated properly and used by mistake; and even waste caused by unsafe conditions, as boxes of supplies that are left in a walkway, causing someone to trip and get injured.



Fig 3.3- Small teams work closely together to plan the greatest efficiency and productivity in operations and processes.

For example, team members might observe workers walking long distances to obtain needed parts, or spending time reaching into bins on shelves to find parts. Or they may identify hardware, like nuts, bolts and screws that are used in a certain area, but stored in a central storage facility far away from the point of use. The goal of the VSM is for the team to walk the process, and identify what operators really need versus what they receive.



Fig 3.4- Open shelving (left) is very inefficient at storing small items. High density drawer and shelf storage (right) enables storage of small items in right-sized compartments, increasing cubic capacity and organization.

3.4 The role of storage in 5S workplace

As noted, one of the 5S pillars is identifying and eliminating many kinds of waste, including time wasted searching for items, waste due to difficulty in using items, and waste due to difficulty in returning items. Storage solutions play an important part in implementing waste elimination through space reduction, organization improvement, and inventory management. Storage cabinets and workbench products that allow dense storage, a smaller footprint, and visual organization near where the tool is needed, become a key factor in implementing the 5S program.

Systems should be set up so everything has a place that is available when needed, including the manufacturing floor, areas where products are being packaged, through the equipment maintenance area. Everything should be labelled and identified. Local storage minimizes travel time, and adjustable storage and workbenches make it easier to adapt to the differing needs of individual employees. Using Storage Walls organized with bar-coded handles can reduce wasted time due to lost inventory and searching. Such systems also facilitate quick tool changes for different product lines. Storing tools next to machines in use rather than in multiple storage locations around the facility can save hours each day.

Modular drawer storage cabinets that allow the maximum use of cubic space for the highest

density storage are ideal for high-density storage of parts, tools and items of virtually any size and type. They are scalable enough to adapt to future requirements, provide maximum weight-bearing capacity, tailored drawer organization, and ergonomic item handling and access.



Fig 3.5- Customizable storage solutions allow the creation of storage that accommodates a wide variety of stored item sizes. What you need, where and when you need it.

For example, Lista International, a leading manufacturer of storage and workspace systems, assists companies in implementing 5S methods as part of lean manufacturing programs to drive waste out of manufacturing processes. The Lista products offer waste elimination through space reduction, organization improvement, and inventory management.



Fig 3.6- A place for everything and everything in its place, clearly labeled.

Designed to allow dense storage and a smaller footprint, the storage cabinets make it very easy to add flexibility to production lines to facilitate faster turnaround time. The photos to

the right illustrate how the proper storage unit meets the number one mantra of a 5S system for a manufacturing facility – A place for everything and everything in its place.



Fig 3.7- The 5S visual workplace, where tools are easy to find and located right at the working area, leads to a clean, efficient work environment.

Storage solutions can go a long way to improve using the 5S methodology to improve manufacturing processes, enabling quicker, more efficient production, which contributes to lower overall costs.

3.5 Process flow diagram

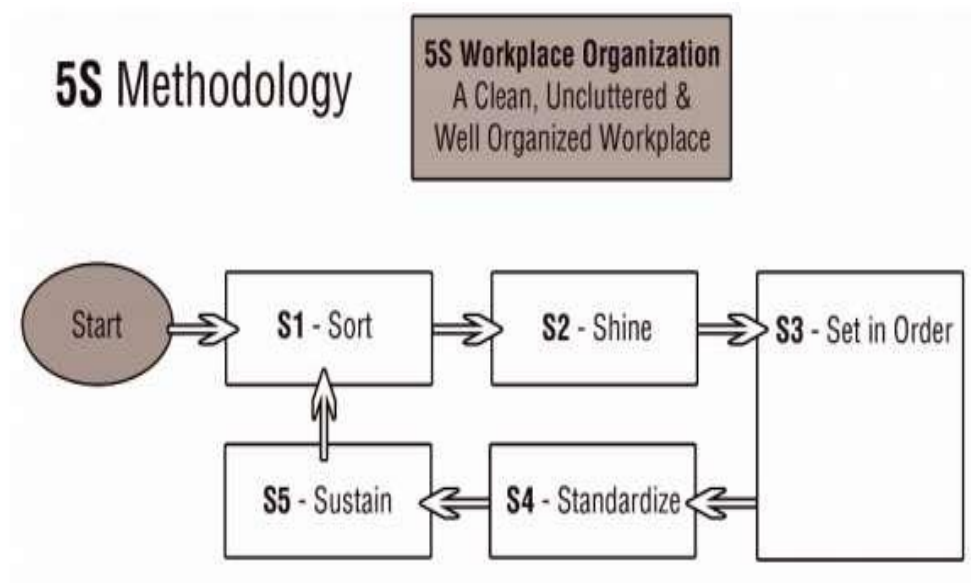


Fig 3.8- 5S Methodology

The above figure shows the process flow diagram of 5S methodology. In this the whole process starts with sorting followed by shine means cleaning all the racks so after sorting and cleaning materials were set in order then once after S3 stage standardization is done and the final stage is sustain.

4. Present Work

Scheduling

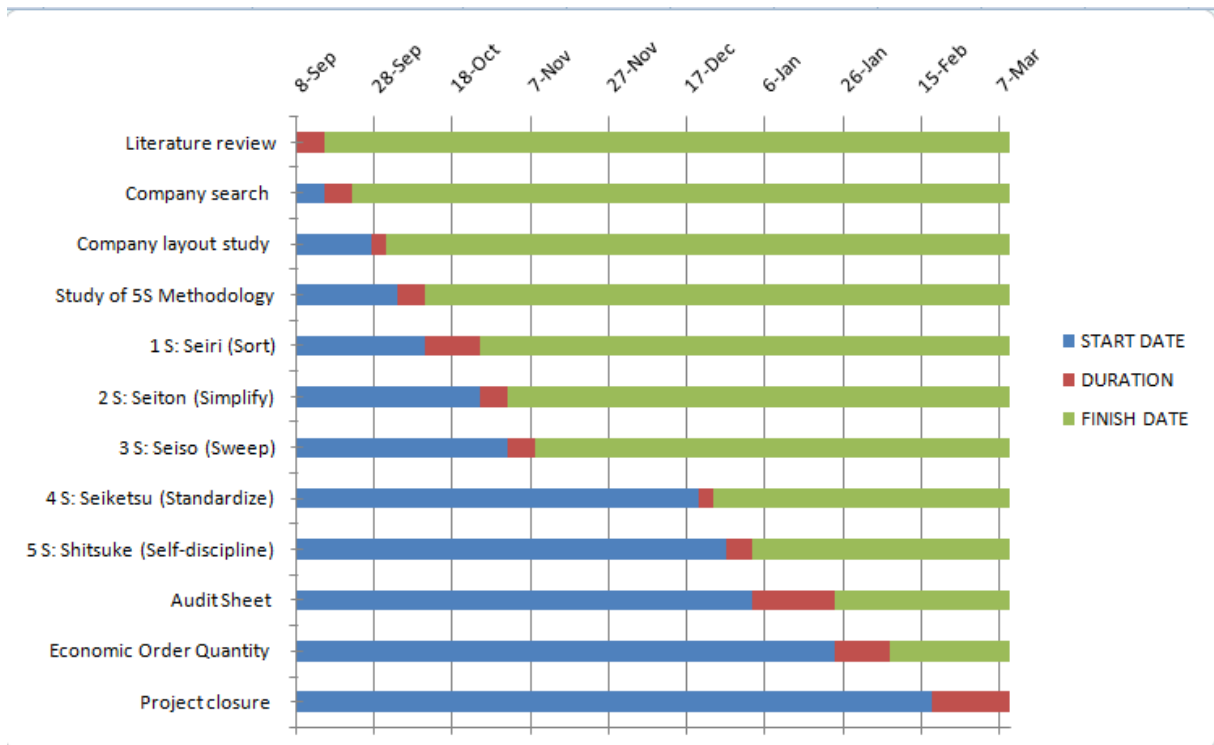


Table 4.1- Scheduling

Before starting project in otoklin we scheduled the project . So first we started with literature review on 8th September and within one week we completed literature review. On basis of literature review we started searching company in which 5S can be implemented. By 24th September 2014 we got opportunity to implement 5S in otoklin. After that by 27th September 2014 we studied the company’s layout and found out the area of implementation. Then we studied the 5S methodology and the whole study of 5S methodology was completed on 7th October 2014. Once after studying 5S methodology we started implementing the methodology from 18th October 2014. There was five stages in which first stage 1S:Seiri was implemented by 28th October 2014, 2S:Seiton was implemented by 3rd November 2014, 3S:Seiso was implemented by 8th November 2014, 4S:Seiketsu was implemented by 28th December 2014 followed by 5S:Shitsuke which was implemented by 6th January 2015. So to maintain the 5S audit were prepared which took around 20 days and was completed on 25th

January 2015. After that as a part of extra activity Economic Order Quantity was performed and was completed by 10th February 2015. Finally the final project closure was expected to be by 7th March 2015.

In otoklin we started our project by first surveying the company's storeroom where all the raw materials are kept. We surveyed the store room, communicated with the store keeper Mr Desai about the functioning of the storeroom. We also communicated with the senior engineer Mr Zarar and on basis of his information we found out that there is a batch production in the company. He also gave us the bill of material of the storeroom. Thus we started the project.

We started the project by following the rules of 5S and worked step by step.

Sorting & Set in order

In sorting we distinguished the useful and scrap items. Then scrap items were kept all aside at one location and we named the location as scrap yard which is just located besides the entrance of storeroom.



Fig 4.1- Scrap yard

The above image is of the company's storeroom where we have segregated the scrap and placed it besides the entrance and named it as scrap yard. In this scrap yard we placed all the scrap at one time and some of the scraps are placed at different location due

to shortage of space.



Fig 4.2- Rejected Items

In store room there are lots of material are present such as cutting wheel, grinding wheel, wire mesh, different types of valves & fasteners ,etc. We also made a list of all the materials which are present in the company & then we sorted these materials according to frequent used, seldom used & rarely used.

After removing scrap we sorted and set in order the useful materials according to their respective sizes. We differentiated grinding wheels and cutting wheels according to the sizes i.e 4", 5", 7" then we sorted fittings into their following categories as butt welded elbow, socket welded elbow and equal tee.

Sorted and arranged the flanges in accordance to their sizes i.e 20NB, 25NB, 50NB, 80NB, 65NB, 100NB. Then we differentiated special welding rod (6010, 316L, 308L, 309L). Sorted all the fasteners in size 3/4, 5/8 and also ejectors. spanners and name plates sorted as per sizes. Differentiated couplings according to sizes 1", 1/2", 3/4". Sorted all Types of valves viz gate valve (Flange end 1", threaded butt weld 1/2" & 1"), ball valve (screwed end 1". 3pic design 1", 3/4"; 2pic design 1", 1/2", 1 1/2"; flange end 1/2"), gate valve flange end (80NB), ball valve flange end (SS316).

The scrap items consists of M.S plate cut, SS Spee perforated sheet, wire mesh cut piece, manifold valve.

Images of sorting and Set in order



Fig 4.3- Sorting



Fig 4.4- Sorting



Fig 4.5- Sorting & Set in Order

In the above figures there are grinding wheels set in order, the name brackets and fasteners has been sorted out .



Fig 4.6- Set In Order

In the above figure cutting wheels has been set in order in their respective racks.



Fig 4.7- Sorting & Set In Order

In the above image various types of spanners has been sorted and placed in respective racks.



Fig 4.8- Set In Order

In above image there is cupboard in which items like handgloves, phenyl, tapes, goggles and some pressure gauges has been arranged.



Fig 4.9- Sorting of brackets



Fig 4.10- Set In Order of brackets

In fig 4.9 brackets has been sorted out and in fig 4.10 brackets has been set in order.



Fig 4.11- safety helmets.

In the above figure safety helmets has been sorted and arranged above the racks.



Fig 4.12- Sickles and Spanners.

In the above figure sickles and spanners are set in order.



Fig 4.13- wire mesh

In the above figure wire mesh has been sorted and arranged.

- **Cleaning**

Cleaning is third method of 5S technique; we implemented this method as we were proceeding with the sorting method. As we were proceeding the sorting, we were differentiating used & not used items and then we cleaned the whole work place, then after this we reached every racks & then cleaned every racks for cleaning method.

For cleaning we removed all the items from their racks and cleaned racks. While cleaning we also fixed the air conditioner leaked pipe.



Fig 4.14- Rack Cleaning

- **Standardize & Sustain**

The fourth 'S' stands for Seiketsu(standardize). In this step standard procedure, audit sheet and work instructions are prepared to maintain 3S. Before starting of work to check and correct the sorted items, placing equipments at its place and cleaning etc. and give proper reading on audit sheet and create awareness in employee to maintain this thing on production line or on non productive line.

The fifth 'S' stands for Shitsuke (sustain), Sustain is about the mental and physical disciplines required to maintain the other 4S items. It is done with help of co - operation between employees, store keeper, engineer and manager.

5S Rating System

S1 Seiri (Sort):

Seiri is the first S in 5S system, which is basically deal with the availability of materials and process of product manufacturing. For calculation of Seiri rating, we allot 4 criterion regions for seiri arrangement, and decide that the sub system should achieve minimum 3 marks out of 4 because it tends us to define that the system will be in issue when it is above 50% active. Following are the Seiri rating criterion.

(1) Material availability Give 1 mark if material is fully available or give 0 marks if material is not fully available.

(2) Defective goods If there are X items which contains Y items as defective Then the marks will be Fraction of fine goods = $[1 - \{Y/X\}]$

(3) Operating condition.

Operating condition is an important aspect for the arrangement of material and tools, because without the comfort of operator the best process arrangement also has zero value. Give 1 mark if operating condition is under control and give 0 marks if operating condition is not under control.

(4) Elimination of waste Elimination of waste is also an important aspect for Seiri rating. Let total N no of waste are listed but only M were eliminated the marks of elimination process will be Fraction of waste elimination = $[1 - \{M/N\}]$ Now add all five marks and get total rating of Seiri out of 5.

If the Seiri system will get less than 3 marks then do the arrangement again because if it is got below 3 marks it means it has very poor condition of analysis.

S2 Seiton (straighten / set in order)

Seiton is second S of 5S system which deals with the proper arrangement of equipment and tools on the shop floor. The main objectives of Seiton are forming a regular workplace, avoiding time loss while searching the material and mistake proofing work. Following are the Seiton rating criterion.

(1) Sequence rating Let there are A no. of tools are in proper sequence and B no of tools are not in proper sequence. Then sequence rating will be Fraction of proper sequence = $[1 - \{B/A\}]$

(2) Material arrangement rating this criterion basically deals with the providing of raw material and accessories for the particular operation. Let D be the lack of material and C be the total material required, then Fraction of material available = $[1 - \{D/C\}]$

(3) Tool arrangement rating: This criteria shows the consistency if the system about providing service for proper fulfilment of tooling requirement. Let P be the no. of irregular process and Q be the total no. of process. Fraction of consistency to tool arrangement: $[1 - \{P/Q\}]$

Now do sum of all the above three criteria and note it as the rate of the Seiton system. This rate should have minimum value of 3 points, if not then system will set again or need analysis again.

S3 Seiso (Shine / Clean)

In order to realize effective tasks, it is essential to create a clean and regular working and living environment. This is because dust, dirt and wastes are the source of untidiness, indiscipline, inefficiency, faulty production and work accidents. We can handle cleaning practices by two approaches: “general cleaning of workplace” and “machine, hardware and tool cleanliness”. Seiso process indicates the “Renovation of the work place”. Seiso system contents the following criteria:

(1) Process path clean: If the path of process is clean then allot 1 point and if not give 0 point.

(2) Proper environment for working condition: Working environment include the ergonomics of the worker like proper souse of light and air, which makes the worker continuously fresh and energetic and make him stay away from errors during operation. Working condition rating will be Let J will be total aspect for favourable condition and I be the no. of fail arrangement. Fraction of environment: $[1 - \{I/J\}]$.

(3) Safety from accident: Let K be the total no. of accident chances and L be the total no for accidents occurs. Then safety rate will be Fraction of safety: $[1 - \{L/K\}]$.

(4) Cleaning consistency: Let E be the total no. of cleaning required and F be the cleaning not done say inconsistency. So consistency rate will be Fraction of consistency = $[1 - \{F/E\}]$.

After adding all the above five criteria the rate of Seiso system can be recorded. This rate should have minimum value of 3 points, if not then system will set again or need analysis again.

S4 Seiketsu (Standardize):

Seiketsu is generally means for make a peak standard which should be achieve by the manufacturing process practice. Standard should be communicative and easy to understand. Seiketsu rating will be found by calculating the average of previous three S, because standard of any system will rise and fall by mean rate depending factors.

$$\text{Seiketsu Standardize rating} = \text{Sierirating} + \text{Seiatonrating} + \text{Seisorating} / 3$$

S5 Shitsuke (Sustain):

Shitsuke (Sustain) is the last S of the 5S system which is deal with the regularity of maintaining the standard of the organization for the particular process, which is only done by regular practices and by following the proper instruction of machine operating. By doing regular following of accurate of instruction we can maintain the machine condition at its peak level, which may help for better production and stay away from breakdown.

- (1) Removing small faults through the aid of cleaning.
- (2) Providing the execution of visual control.
- (3) Providing the performance of protective activities.
- (4) Granting the responsibility of the machine to the operator.
- (5) Formation of a disciplined company.

Shitsuke rating will be depending on the previous four S because without that the regularity will not maintain. Therefore Shitsuke rate will be the average of previous four S ratings.

Shitsuke Sustain rating = Sierirating + Seiatonrating + Seoso rating + Seisukerating/ 4

After the calculation of this rating of 5S, efficiency is calculated at the end of every week and will so the performance improvement at the end of four week. The overall efficiency of the 5S system for the permitted or approved period will be average of the particular efficiencies for required week. Also we will make a graph which will show the real condition of the system and can find the improvement required region.

S1 SEIRI RATING

Week No.	Duration	Material Availability Rating	Defective goods Rating	Operating Condition Rating	Elimination of Waste Rating	Total Rating
		0 or 1	[1-{Y/X}]	0 or 1	[1-{M/N}]	
Week 1	Feb. 14- 19, 2015	1	0.6	1	0.2	2.8
Week 2	Feb. 21-26, 2015	1	0.6	1	0.2	2.8
Week 3	Feb. 28- March 5, 2015	1	0.6	1	0.4	3
Week 4	March 7-12, 2015	1	0.8	1	0.4	3.2
Week 5	March 14-19, 2015	1	0.8	1	0.6	3.4
Week 6	March 21-26, 2015	1	0.8	1	0.6	3.4
Week 7	March 28- April-2, 2015	1	0.8	1	0.6	3.4
Week 8	April 4-9, 2015	1	0.8	1	0.8	3.6
Week 9	April 11-16, 2015	1	1	1	0.8	3.8
Week 10	April 18- 22, 2015	1	1	1	0.8	3.8

Table 4.2- S1 SEIRI

S2 SEITON RATING

Week No.	Duration	Sequence Rating	Material Arrangement Rating	Tool Arrangement Rating	Total Rating
		[1- $\{B/A\}$]	[1- $\{D/C\}$]	[1- $\{P/Q\}$]	
Week 1	Feb. 14- 19, 2015	0.4	0.6	0.4	1.4
Week 2	Feb. 21-26, 2015	0.4	0.6	0.4	1.4
Week 3	Feb. 28- March 5, 2015	0.6	0.6	0.6	1.8
Week 4	March 7-12, 2015	0.6	0.6	0.6	1.8
Week 5	March 14-19, 2015	0.8	0.8	0.6	2.2
Week 6	March 21-26, 2015	0.8	0.8	0.6	2.2
Week 7	March 28- April-2, 2015	0.8	0.8	0.8	2.4
Week 8	April 4-9, 2015	1	0.8	0.8	2.6
Week 9	April 11-16, 2015	1	1	0.8	2.8
Week 10	April 18- 22, 2015	1	1	1	3

Table 4.3- S2 SEITON

S3 SEISO RATING

Week No.	Duration	Process Path Cleanlines Rating	Working Environment Rating	Safety Rating	Cleaning Consistency Rating	Total Rating
		0 or 1	[1- $\{I/J\}$]	[1- $\{L/K\}$]	[1- $\{F/E\}$]	
Week 1	Feb. 14- 19, 2015	1	0.6	0.8	0.4	2.8
Week 2	Feb. 21-26, 2015	1	0.6	0.8	0.4	2.8
Week 3	Feb. 28- March 5, 2015	1	0.6	0.8	0.4	2.8
Week 4	March 7-12, 2015	1	0.6	0.8	0.6	3

Week 5	March 14-19, 2015	1	0.8	1	0.6	3.4
Week 6	March 21-26, 2015	1	0.8	1	0.6	3.4
Week 7	March 28- April-2, 2015	1	0.8	1	0.6	3.4
Week 8	April 4-9, 2015	1	0.8	1	0.8	3.6
Week 9	April 11-16, 2015	1	0.8	1	0.8	3.6
Week 10	April 18- 22, 2015	1	0.8	1	0.8	3.6

Table 4.4- S3 SEISO

S4 SEIKETSU RATING

Week No.	Duration	Total Rating = (S1+S2+S3) /3
Week 1	Feb. 14- 19, 2015	2.333
Week 2	Feb. 21-26, 2015	2.333
Week 3	Feb. 28- March 5, 2015	2.533
Week 4	March 7-12, 2015	2.667
Week 5	March 14-19, 2015	3.000
Week 6	March 21-26, 2015	3.000
Week 7	March 28- April-2, 2015	3.067
Week 8	April 4-9, 2015	3.267
Week 9	April 11-16, 2015	3.4
Week 10	April 18- 22, 2015	3.467

Table 4.5- S4 SEIKETSU

S5 SHITSUKE RATING

Week No.	Duration	Total Rating = (S1+S2+S3+S4) /4
Week 1	Feb. 14- 19, 2015	2.333
Week 2	Feb. 21-26, 2015	2.333
Week 3	Feb. 28- March 5, 2015	2.533
Week 4	March 7-12, 2015	2.667

Week 5	March 14-19, 2015	3.000
Week 6	March 21-26, 2015	3.000
Week 7	March 28- April-2, 2015	3.067
Week 8	April 4-9, 2015	3.267
Week 9	April 11-16, 2015	3.4
Week 10	April 18- 22, 2015	3.467

Table 4.6- S5 SHITSUKE

EFFICIENCY OF 5S SYSTEM

Week No.	Duration	$(S1+S2+S3+S4+S5)*100 / 25$	Efficiency
Week 1	Feb. 14- 19, 2015	$(2.8+1.4+2.8+2.33+2.33)*100/25$	46.64%
Week 2	Feb. 21-26, 2015	$(2.8+1.4+2.8+2.33+2.33)*100/25$	46.64%
Week 3	Feb. 28- March 5, 2015	$(3+1.8+2.8+2.53+2.53)*100/25$	50.64%
Week 4	March 7-12, 2015	$(3.2+1.8+3+2.667+2.667)*100/25$	53.366%
Week 5	March 14-19, 2015	$(3.4+2.2+3.4+3+3)*100/25$	60%
Week 6	March 21-26, 2015	$(3.4+2.2+3.4+3+3)*100/25$	60%
Week 7	March 28- April-2, 2015	$(3.4+2.4+3.4+3.067+3.067)*100/25$	61.336%
Week 8	April 4-9, 2015	$(3.6+2.6+3.6+3.267+3.267)*100/25$	65.336%
Week 9	April 11-16, 2015	$(3.8+2.8+3.6+3.4+3.4)*100/25$	68%
Week 10	April 18- 22, 2015	$(3.8+3+3.6+3.567+3.467)*100/25$	70.14%

Table 4.7- efficiency of 5S system

5. Result & Discussion

Time Analysis of Implementation Of 5S

Time analysis or Time comparison is play an important role in a company or industry to improve working and productivity efficiency. Time analysis nothing but comparison of operation time means how much time take by the process, manufacturing of product, searching of tools and materials, etc., In our filter Company we have implement 5S, we have work on each stages of 5S and we recorded all data and compare it with before implementation of 5S data we have improve it after implementation of 5S, that comparison shown in below table.

Sr. No.	PROCESSES	BEFORE	AFTER
1	Material Searching Time	0.7	0.9
2	Tool Arrangement	0.6	0.8
3	Tool Sequence	0.5	0.7
4	Material Arrangement	0.4	0.5
5	Process Path Cleaning	0.4	0.8
6	Working Environment	0.5	0.8
7	Safety	0.7	0.8
8	Working Efficiency	0.6	0.7
9	Overall Change In Percentage	55%	75%

Table 5.1- Time Analysis

Time comparison of Y-strainer



Fig 5.1- Y Strainer

After applying 5S we analysed a product called y- strainer and studied that how much time is required for making a product before implementing 5S and after 5S and we made graph on that.

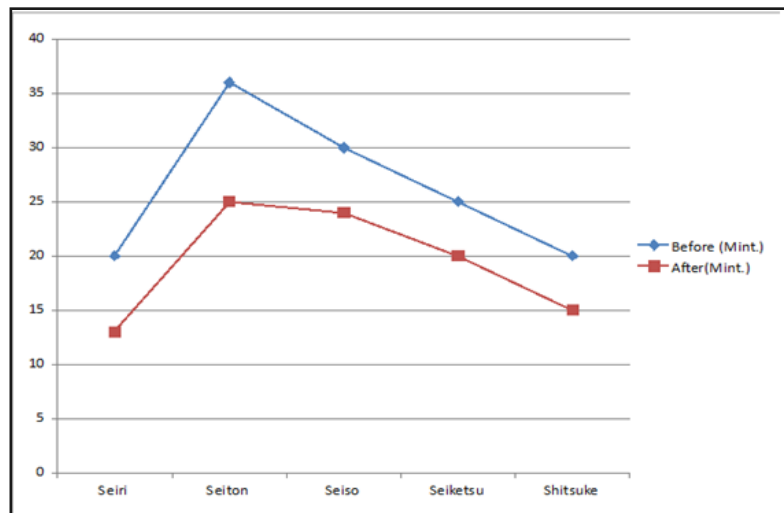


Fig 5.2- Line Graph

In above Line Graph diagram, we did time comparison of industrial product "Y STRAINER". Before implementation, it takes more time for production of one product. But after implementation of all phases of 5S, it takes less time for production of Y Strainer.

6. Conclusion

By implementing 5S we could improve the quality, productivity and efficiency of industrial organization. The 5S is an effectiveness to manage tools and materials which can improve housekeeping, environmental conditions and health and safety standards and increase productivity and quality. 5S sort stage eliminates unused, unwanted material from the storage room which reduces clutter. Set in order allocates space for components, due to this it give more space for storing more material and tools and results in reduction in searching time. 5S reduce the searching time and improve the production and quality of the products and employees and organization become self disciplined. It also has positive effect on overall performance.

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8. Paper Published

Review of 5S Technique

¹ Prof. Saad Shaikh, ² Ansari Noor Alam, ³ Khan Naseem Ahmed, ⁴ Sawant Ishtiyak, ⁵ Sayyed Ziaul Hasan,

¹ Faculty of Mechanical Engineering, Anjuman-I-Islam Kalsekar Technical Campus School of Engineering, Panvel, Mumbai University, Maharashtra, INDIA

^{2,3,4,5} B.E. Mech.(Students), Anjuman-I-Islam Kalsekar Technical Campus School of Engineering, Panvel, Mumbai University, Maharashtra, INDIA

Abstract:

There are certain fields which are very demanding in today's trend. Small Scale Industry is one of the fields. It plays an important role in Indian country. It has emerged as powerful source in providing relatively larger employment after agriculture. It contributes more than 50% of the industrial production in vast field of engineering. 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 lean manufacturing technique for cleaning, sorting, organizing and providing necessary improvement in work place. This system helps to organize a workplace for efficiency and decrease waste and optimize quality and productivity via monitoring an organized environment [1]. 5S offers good results for required improvement. This method can be used in all companies; by this we can get good improvement in the production process of company. Consequently, 5S techniques would strongly support the objectives of organization to achieve continuous improvement and higher performance.

Keywords: 5S, Effective Organization, Lean Manufacturing, Productivity

Implementation of 5S Practices in a Small Scale Organization: A Case Study

¹ Prof. Saad Shaikh, ² Ansari Noor Alam, ³ Khan Naseem Ahmed, ⁴ Sawant Ishtiyak, ⁵ Sayyed Ziaul Hasan,

¹ Faculty of Mechanical Engineering, Anjuman-I-Islam Kalsekar Technical Campus School of Engineering, Panvel, Mumbai University, Maharashtra, INDIA

^{2,3,4,5} B.E. Mech.(Students), Anjuman-I-Islam Kalsekar Technical Campus School of Engineering, Panvel, Mumbai University, Maharashtra, INDIA

Abstract:

A small scale industry plays an important role in Indian economy. In an organization the prime importance is given to the quality and productivity. Since a problem come across due to the defects in materials, down time in production, working conditions, house keeping etc. This case study deals with the 5S implementation in an industry, Implementation of 5S can result in considerable improvements in environmental performance beside with improved housekeeping and health and safety.5S can improve the quality, productivity and working conditions in organizations.

Keywords: 5S, Strategic Planning, Down Time, Change