

A PROJECT REPORT
ON
“IMPLEMENTATION OF 5S METHOD”

Submitted to
UNIVERSITY OF MUMBAI

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN
MECHANICAL ENGINEERING

BY

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UNDER THE GUIDANCE OF
PROF. JAVED KAZI



DEPARTMENT OF MECHANICAL ENGINEERING
Anjuman-I-Islam's Kalsekar Technical Campus
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Plot No. 2 3, Sector - 16, Near Thana Naka,
Khandagaon, New Panvel - 410206

2018-2019

AFFILIATED TO
UNIVERSITY OF MUMBAI

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CERTIFICATE

This is certify that the project entitled

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is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Mechanical Engineering) at *Anjuman-I-Islam's Kalsekar Technical Campus, Navi Mumbai* under the University of Mumbai. This work is done during year 2018-2019, under our guidance.

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Project I Approval for Bachelor of Engineering

This project entitled **IMPLEMENTATION OF 5S METHOD** by **ALI MOHAMMED AFREED (15ME62), SIDDIQUI MAHEFUZUR REHMAN(15ME115), SOJAR HUSSAIN ALI ASGAR (15ME76), YADAV RAVIPRATAP SANATAN (15ME120)** is approved for the degree of **Bachelor of Engineering in Department of Mechanical Engineering**.

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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.

The watermark is a circular logo for AIKTC. It features a central illustration of a building with a dome and minaret. The text around the circle reads "ANJUMAN - I - ISLAM'S KALSEKAR" at the top, "ENGINEERING & TECHNOLOGY" on the left, "TECHNICAL CAMPUS, NEW JERSEY" on the right, and "PHARMACY" at the bottom. In the center, the letters "AIKTC" are prominently displayed. Below the circle, it says "NAVI MUMBAI - INDIA".

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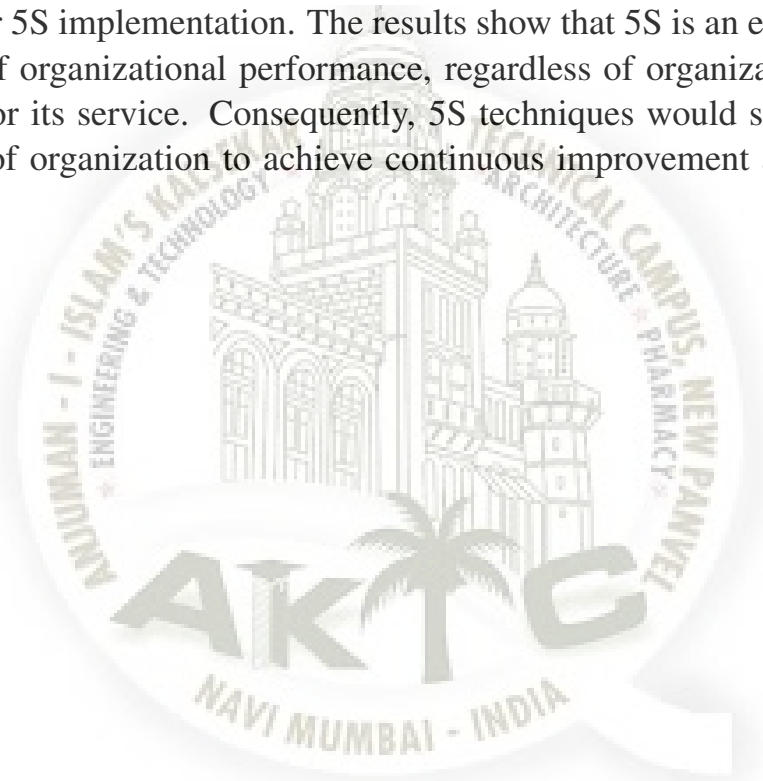
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ABSTRACT

The main desire of this project is to study remedy the productiveness, efficiency and housekeeping of available resources at Mechmann Engineering Pvt. Ltd. And try to reducing variation and decrease the material waste. This project focused on the step by step administration ground rule demanded for robust practice of 5s as a part of the daily management. It describes the idea to implement each and every base of 5s methodology- Seiri, Seiton, Seiso, Seiketsu and Shitsuke in the industry in continuity to bring about a broad perfection in its performance. 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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Chapter 1

Introduction

1.1 Introduction

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.

1.2 Background of the project

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 attrac-

tive 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 ensure the program is success.

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 Mechamann engineering pvt ltd 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 is describes about introduction;which is includes the project background, problem statement, objective of the project and scope for the project.

Chapter 2, it will stress on the literature review of related issues and philosophy.

Chapter 3 is about the methodology.

Chapter 4 consists of present work. Lastly , it will state the result discussion followed by conclusion and references.

1.7 Company Profile

1.7.1 Mechamann Engineering Pvt Ltd

MECHMANN is an Engineering and Fabrication company specializing in innovative turnkey Filtration, Separation Purification Solutions, serving the diverse needs of customers across the globe. Company's main goal is developing, designing, manufacturing and installing environmental friendly air, gas water treatment and air purification systems for the industry - world-wide.

With over 15 years of experience, and more than 10000 installations world wide, we have grown into one of the leading engineering and construction partners for Oil , Gas, Petrochemical, Pharmaceutical, Textile, Chemical, Coating, and allied industries.

1.7.2 Eastablishment

Year 2014

1.7.3 Products

1. Cartridge Filters
2. Coolant Filters
3. Air Filters
4. Sand Filters
5. Bar Filters Slot Tube Filters
6. Basket Filters
7. Belt Filters
8. Strainer Filters

1.7.4 Vendors

1. BARC
2. LT
3. GODREJ GENESIS
4. ADANI
5. VOLTAS LIMITED

1.8 Problem faced

At the start of our project we were mainly involved with searching the problems which was related to the manufacturing department because it forms the base of any Industry. After observing for two to three weeks we finally realized that the main problem was the Space Consideration and workers safety equipment's in the industry. Now, we were involved in thinking that how can we fix this problem which was a major issue. After consulting with the company's director, engineers, and our guide and with the help of published paper or researches we come up with 5s method.

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.

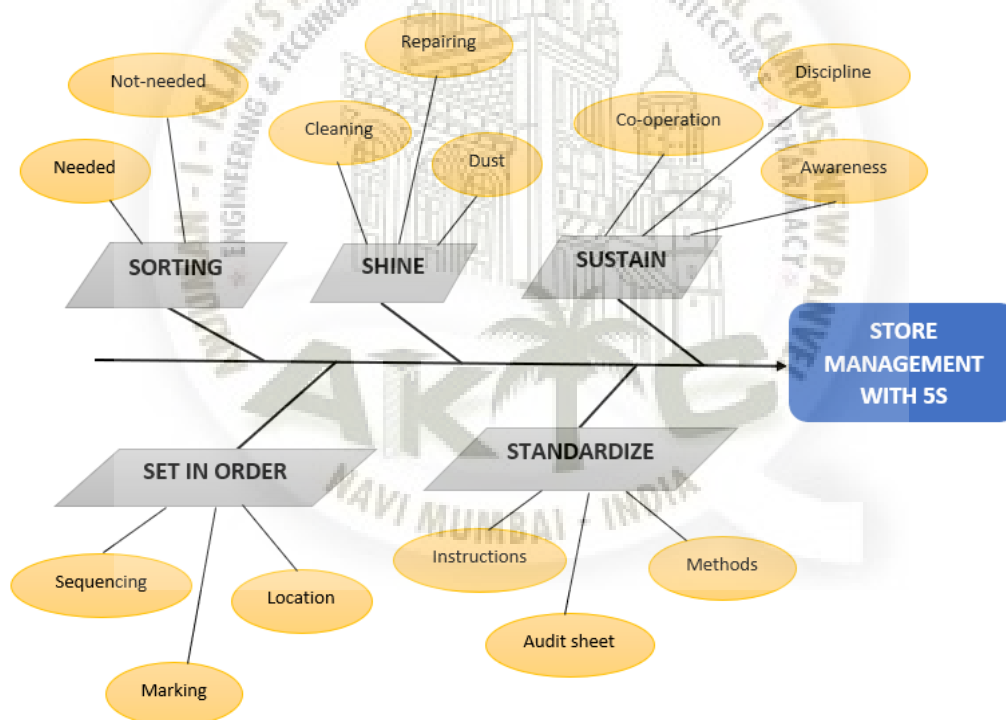


Figure 1.1: Fishbone Diagram

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 Survey

2.1 Introduction

This chapter will proceed with referenced review from the relevant literature. It is included 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.

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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.

2.4.2 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.

1. On the first stage one should answer to so-called Control
 - (a) Are unnecessary things causing the mess in the workplace?
 - (b) Are unnecessary remainders of materials thrown anywhere in the workplace?
 - (c) Do tools or remainders of materials to production lie on the floor (in the workplace)?
 - (d) Are all necessary things sorted, classified, described and possess the own place?
 - (e) 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”.

C) 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.

Red Tag

Datum: _____ Aussortiert von: _____

Elementname: _____

Ort: _____

Kategorie:

<input type="checkbox"/> Equipment	<input type="checkbox"/> Rohmaterialien
<input type="checkbox"/> Instrumente	<input type="checkbox"/> Work-in-Progress
<input type="checkbox"/> Maschinenteile	<input type="checkbox"/> Konsumgüter

Andere: _____

Grund:

<input type="checkbox"/> Wird nicht gebraucht	<input type="checkbox"/> Alt
<input type="checkbox"/> Defekt	<input type="checkbox"/> Extrateil

Andere: _____

Tag-Nr: _____

Red Tag

Kategorie:

Zurück zu: _____

Weiterleitung zur Red-Tag-Area

Weiterleitung zu: _____

Recyclen

Entsorgen

Andere: _____

Kommentare:

Tag-Nr: _____

Figure 2.1: Red tag

2.4.3 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 operators 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.



Figure 2.2: Seiton-Set in order

2.4.4 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 oils 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?



Figure 2.3: SEISO-Shine

2.4.5 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.



Figure 2.4: Seiketsu-Standardise

2.4.6 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.

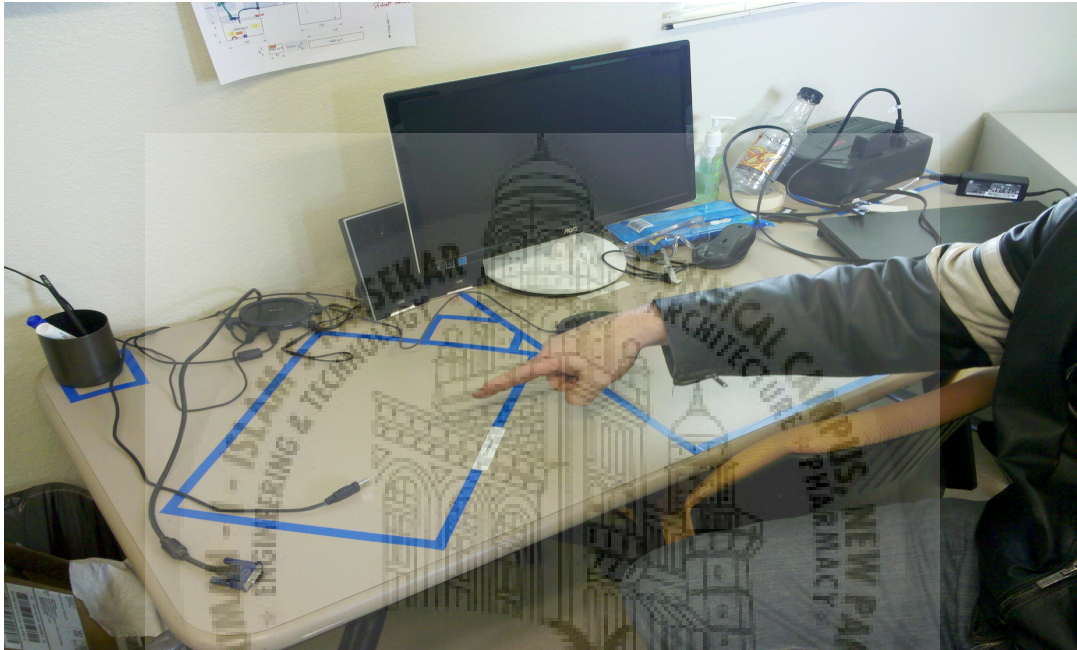


Figure 2.5: Shitsuke-sustain

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 companys 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 work space systems such as those provided by List 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.



Figure 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.



Figure 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.



Figure 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.

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.



Figure 3.4: - 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.



Figure 3.5: 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.

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

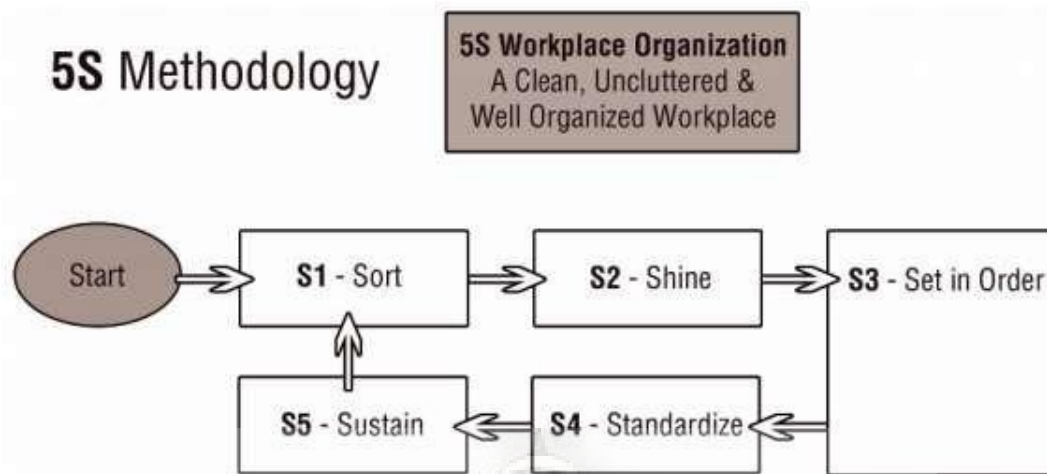


Figure 3.6: 5S Methodology

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.

Chapter 4

Implementation of 5S

4.1 Introduction

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.

4.2 Implementation of 5S in Mechmann Industry:

As MECHMANN INDUSTRY is not a large-scale industry and it is also situated in a small place so it lacks in systematic manner of processing the given work orders. This lowers down the efficiency of the company.

To overcome this problem we came up to the solution of implementation of 5S method. 5S comprises of – :

1. Seiri-Sort
2. Seiton-Set in order
3. Seiso-Shine
4. Seiketsu-Standardize
5. Shitsuke-Sustain

Now we will implement each S one by one

4.3 Seiri-Sort

Seiri is sorting through all items in a location and removing all unnecessary items from the location. This method can be implemented by sorting all the machines tools, materials and scrap in 5 categories that are-

- Not needed
- Needed but not now
- Needed but not here
- Needed not so much quantity
- Always needed

Sorting the items was a major task involved in our project. After observation we found out that the major space was occupied by the objects which were type of needed but not now and which were needed but not here.

So we started sorting the objects. Sorting of project are as follows:

	A	B	C	D	E	F
1	MACHINE	NOT NEEDED	NEEDED BUT NOT NOW	NEEDED BUT NOT HERE	NEEDED NO SO MUCH QUANTITY	ALWAYS NEEDED
2	1-LATHE MACHINE					
3	5/8 Right tool					✓
4	5/8 Boring tool					✓
5	5/8 Groove		✓			
6	Threading vernier		✓			
7	Hobbing boring box					✓
8	Span					
9	plate		✓			
11	Sample			✓		
12	Scrap					
14	Bottom			✓		
15	Threaded pipie			✓		
16	Top			✓		
17	Top handle			✓		
18	File		✓			
19	Tap tool		✓			
20	Die					
21	Strainer			✓		
22	Strainer vessel					
23	Oil box				✓	
24	2-DRILLING MACHINE					
25	40 Drill tool					
26	32(2)mm		✓			
27	25(2)mm		✓			
28	19mm		✓			

	A	B	C	D	E	F
28	19mm		✓			
29	26mm		✓			
30	17.5mm		✓			
31	50mm		✓			
32	21.5mm		✓			
33	50mm		✓			
34	21.5mm		✓			
35	mAW		✓			
36	22.5mm		✓			
37	14mm		✓			
38	15mm		✓			
39	24mm		✓			
40	18mm		✓			
41	15.5(2)mm		✓			
42	16.5mm		✓			
43	Scrap drill tool	✓				
44	11mm		✓			
45	10.5mm		✓			
46	8(2)mm		✓			
47	6mm		✓			
49	5mm		✓			
50	Eye ball			✓		
51	Benchvice		✓			
52	3-WELDING MACHINE					
53	Holder					✓
54	Electrode					✓

	A	B	C	D	E	F
55	Helmet					✓
56	Wire brush					✓
57	E7012 Electrode				✓	
58	E3601				✓	
59	4mm type					
60	TIG welding					✓
61	CO2				✓	
62	MAW				✓	
63	4-SURFACE GRINDING					
64	Bid plate		✓			
65	Brush		✓			
66	BOB type plate				✓	
67	120mm				✓	
68	220mm				✓	
69	300mm				✓	
70	400mm				✓	
71	Brush					
72	120mm				✓	
73	220mm				✓	
74	300mm				✓	
75	400mm				✓	
76	Scrap	✓				
77	5-GRINDING MACHINE					
78	Wheel				✓	
79	5 inch				✓	
80	4inch				✓	

Figure 4.1: Sorting Excel Sheet

By observing the list we can say that there are many item which are a type of needed but now and needed but not here and scraps as shown in fig



Fig.1 Needed but not now



Fig.2 Needed but not here



Fig.3 Needed but not now

Fig.4 Needed but not here

We sort the material as per need so we decided to make a SHELF in that we will place all the material of needed but now and also needed but not here. This will make a systematic pattern of keeping all the tools, materials and scrap at a specific place. A shelf can be used to keep the items accordingly as per their sorting order. A red tag is also use for the items that are scrap and cannot be moved from the place where it is placed. This will help the workers for a smooth working and easy availability of tools at the time of use. Also working space will get increased.



Figure 4.2: Scrap



Before



After

Figure 4.3: Sorting

4.4 Seiton - Set in order

Seiton is putting all necessary items in the optimal place for fulfilling their function in the workplace. By observing we found that the common tools such as spanner, hammer, measuring tape, calipers, jigs and fixtures etc. were not used and placed properly, no proper arrangement was made for the placing of common tools and due to this there was major time consumed in finding the tools Which causes various problems. This can be implemented by making a shadow board and a token board. Shadow board is a board which will consists of different types of common tools which are commonly required to the workers in their respective specified works.



Figure 4.4: Shadow Board

Token board is board which will consists of name tokens of every individual worker in the company.



Figure 4.5: Token

How will this work?

Let us understand with an example. Ram is a worker who needs hammer so what he will do is, he will put his name token in the place of hammer. Now Raju is another worker who also needs hammer but by seeing on shadow board he will come to know that the hammer is with ram so he will directly contact ram. This will save time as well as space of keeping tools.

As suggested use of shelf and bin for resolving the space consideration problem.

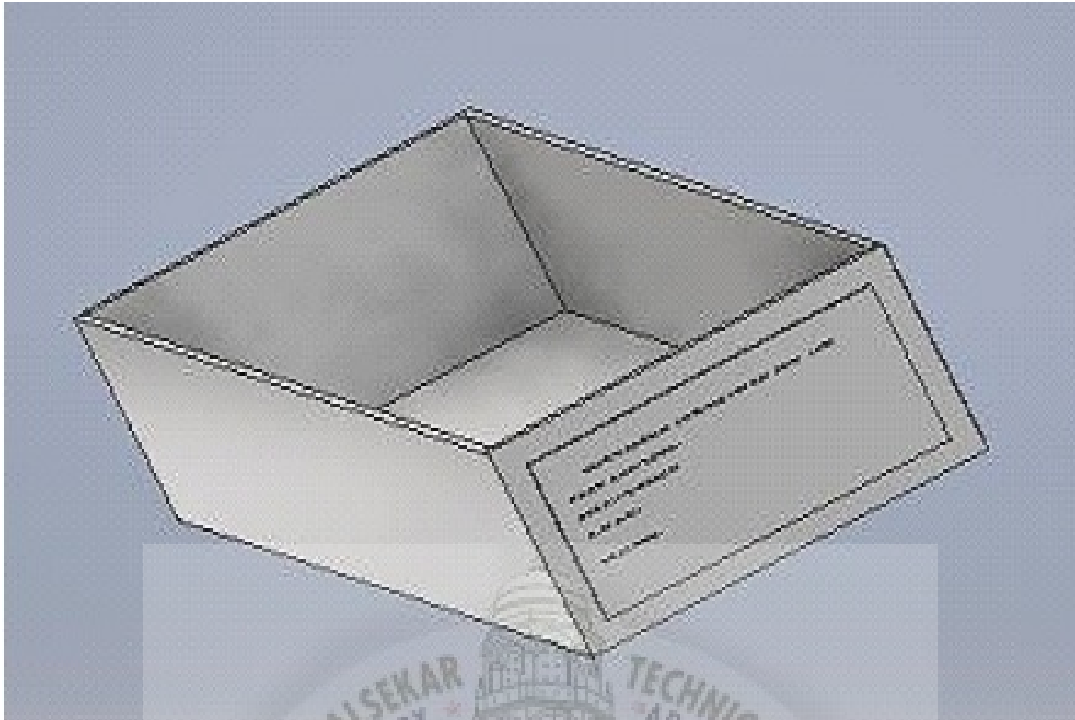


Figure 4.6: Bin

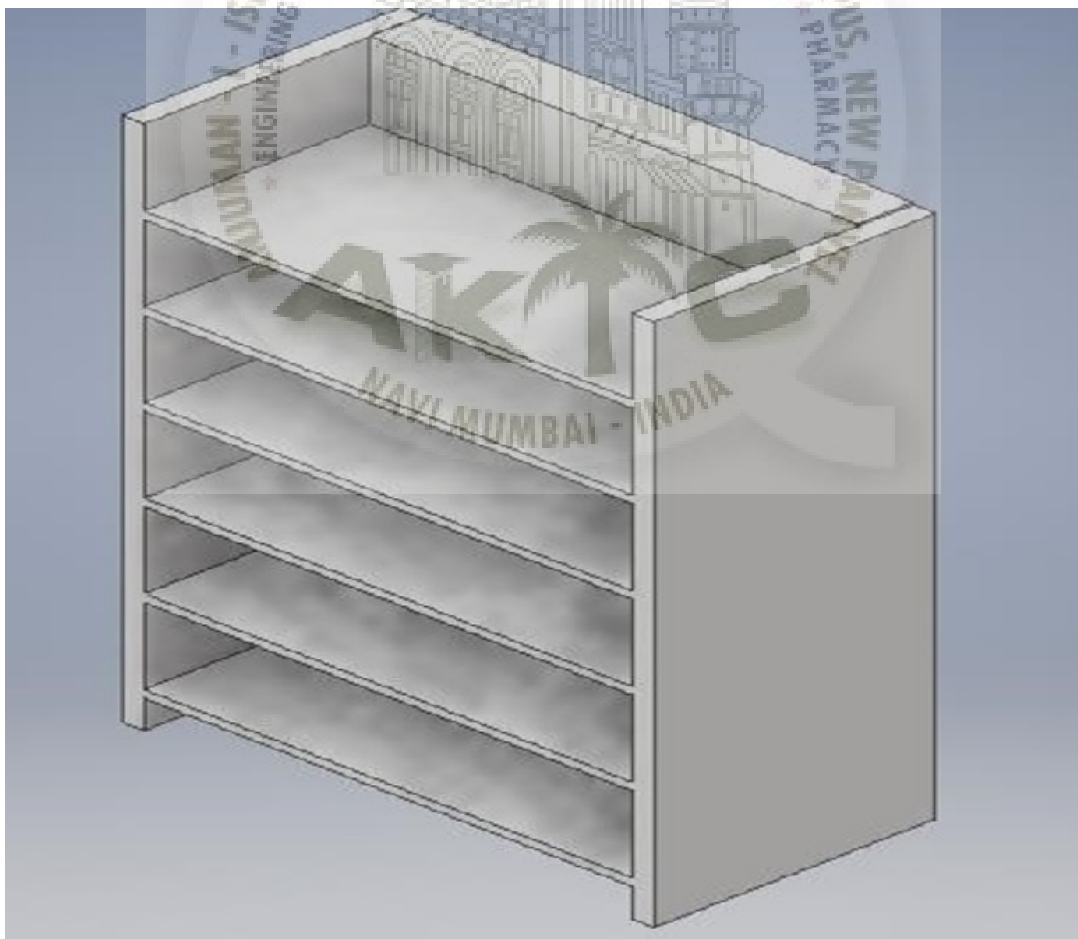


Figure 4.7: Shelf

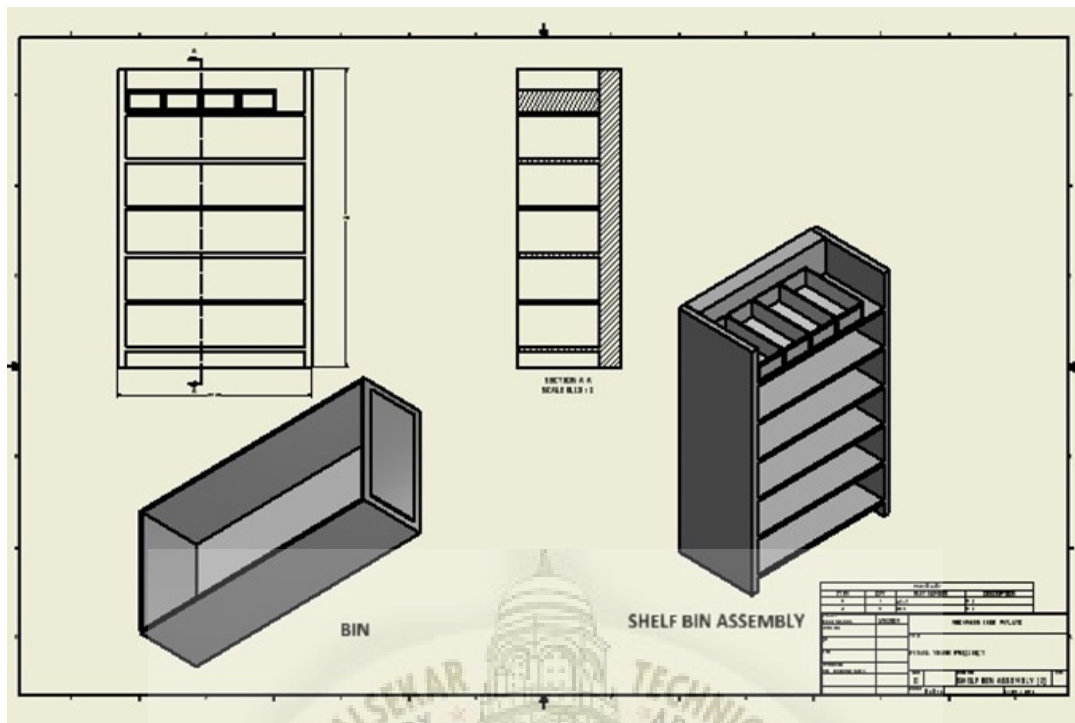
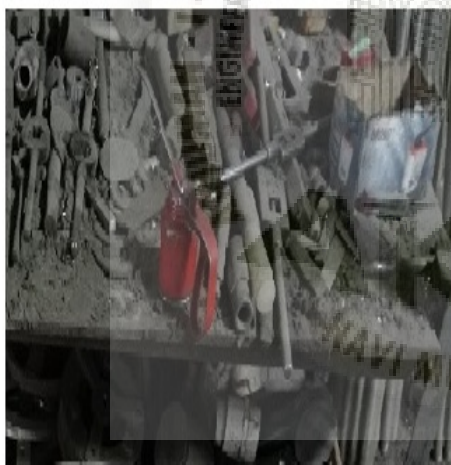


Figure 4.8: Shelf Bin Assembly



Before



After

Figure 4.9: Set in order

4.5 Seiso - Shine

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 pipes.



Before

After

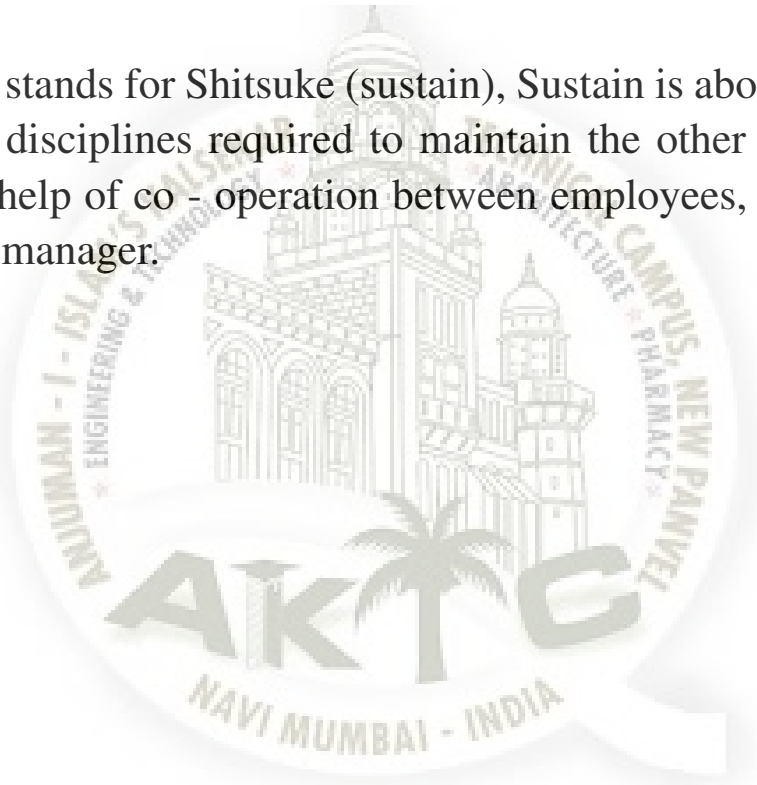
Figure 4.10: Cleaning

4.6 Seiketsu - Standardize

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.

4.7 Shitsuke - sustain

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.



Chapter 5

Industrial safety tools and Equipment

5.1 Introduction

Industrial workers are exposed to various risks at the workplace. Hence, they should be provided with the required tools and equipment for their safety at the workplace. The requirement differs from industry to industry.

A worker involved in welding or burning operations and a worker in a chemical or petroleum industry will require different sets of tools and equipment. However, even if they belong to two different industries, they require certain common tools and equipment.

For e.g. A flame-resistant work clothing or leather gloves or gloves made using any other suitable material should be used to protect your hands. To protect the whole body during heavy duty work, a leather apron is ideal. While leather is considered as a suitable material for safety in industries, laminated fabric containing polyurethane sponge should be avoided. Unlike leather, they easily ignite and burn. Apart from leather, heavier wool or cotton fabrics can be used. Always use heavier materials which won't ignite easily, and avoid lighter fabrics. A respirator is another tool that is worn by workers if their work environment lacks natural, mechanical or local exhaust ventilation.

5.2 Common tools and equipment

5.2.1 Protective Equipments

Safety Glasses: They are the most important piece of safety equipment worn by workers to safeguard themselves against dust and debris created by power tools.

Respirators and Face Masks: While using routers and other power tools that generate a lot of dust, a dust mask is used to prevent fine particles from entering the lungs. Respirator is worn while spraying varnish or paint. It protects workers from the harmful effects of chemicals.

Face Shield: In addition to safety glasses, clear full-face shield is used while using a lathe, which generates a lot of flying chips. A face shield is easy to use as they are comfortable and can be flipped up when not in use.

Personal Protective Equipment: Lab coats, overalls, eye and hearing protection, dust masks and safety shoes, all come under Personal Protective Equipment (PPE). These protective gears are used wherever necessary.



Figure 5.1: Protective Equipments

5.2.2 Safety Tips for Industry

Safety Tips for Every Industry: Plenty of resources exist to help you through the process, which can be broken down into five basic steps:

1. Economics of safety
2. Culture of safety
3. Awareness of surroundings
4. Training is essential
5. Provide visual aids

Economics of safety :

Employers in every industry should know how workplace injuries can impact not only productivity but also the bottom line. In 2016 alone, nearly 3 million non-fatal workplace injuries were reported to the U.S. Bureau of Labor Statistics by private industry employers. The U.S. Occupational Safety and Health Administration estimates that employers pay almost \$1 billion per week for direct workers' compensation costs alone.

Direct costs associated with workplace injuries include workers' comp, medical expenses, legal fees, and higher insurance premiums. Indirect costs can include emotional damage to the team, the cost of training a new employee, OSHA fines, overtime hours to cover the loss of an employee, and damaged equipment, among others.

Culture of safety :

All of this adds up to a simple bottom line for businesses: You can't afford not to have a safety program.

To make it work, safety must become your top priority. When thinking through your strategies, sharing them with employees, and implementing them in the workplace, you must clearly communicate your commitment at every step of the process.

Establish a written policy signed by top management that details the organization's commitment to in-house employees as well as contractors and vendors. Then, the more you emphasize safety frequently in casual conversation—and lead by example—the better results your program will create.

Define your program's goals—reducing injury-related absenteeism among employees, lowering insurance premiums and workers' comp payouts, etc.—and allocate sufficient resources to achieve them. Not every step you take needs to be a major expenditure, of course, but don't cut corners to save a few dollars.

Plan carefully and update often. A good way to begin is by downloading a safety checklist and following it item by item. The federal Occupational Safety and Health Administration also publishes a small-business handbook that provides a wealth of information for establishing safety protocols.

Awareness of surroundings:

Once you have the basics of a safety plan in place, fill it out by accounting for any special challenges that your environment poses. Take frequent safety walks of your premises to hunt for hazards, collect ideas on how to control them, and implement the best suggestions. Involving rank-and-file employees can give them a sense of ownership in the process of promoting safety.

Implement training:

Require employees to wear work-appropriate clothing, including hardhats, steel-toed boots, and safety goggles as necessary. Keep first aid kits stocked and medications up to date.

Another important consideration is reducing workplace stress. Employees who feel an extra burden to make deadlines or fill quotas are more likely to work recklessly and without regard for their safety or that of their co-workers. Those who feel it necessary to work repeated overtime because of low salary can be pushed to the limit much of the time. Tips: Push, don't pull. Pushing allows you to use your body weight and larger muscles to move a load.

Provide visual aids:

Posting signs advocating safe behavior may seem obvious to the point of cliché, but its importance cannot be overstated. Such signage keeps eyes busy and brains alert and active. Even better than employing tried-and-true but tiresome slogans (“Safety Begins With You!”), try having employees keep track of and record daily safety information—such as a running total of injury-free days—in their particular departments. Hands-on participation can be a major catalyst in changing safety culture.

Chapter 6

Result and conclusion

6.1 Result

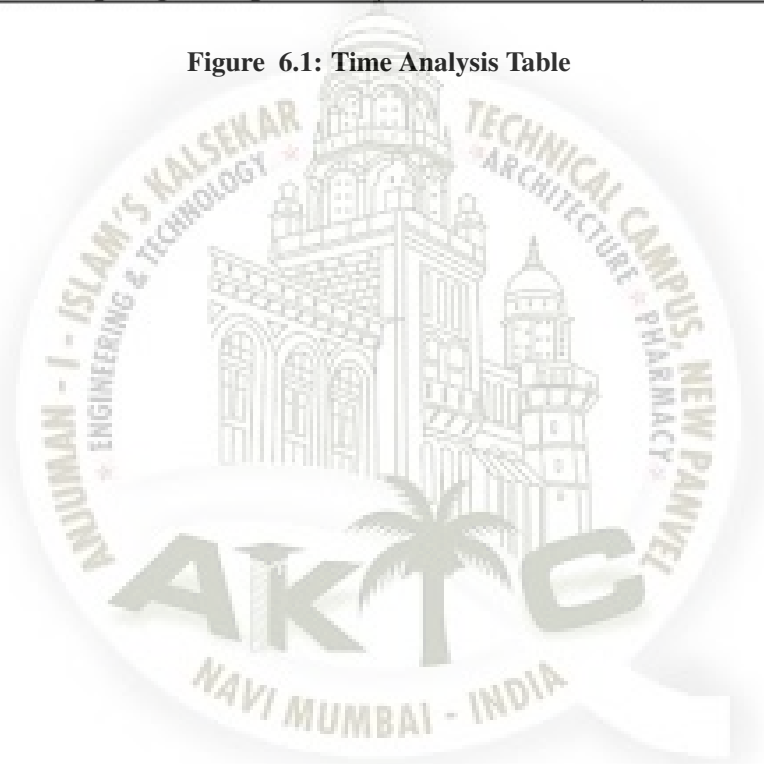
We researched on 5S method and safety guidance through published paper, internet and case study and tried to resolve the problems on the basis of 5S methodology, which were observed by us. We gave our best by implementing each S in MECHMANN INDUSTRY successfully and also gave some useful safety tips about the equipment's to the workers.

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 MECHMANN INDUSTRY 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.	PROCESS	BEFORE	AFTER
1.	Material searching time	0.7	0.8
2.	Tool searching time	0.6	0.8
3.	Tool arrangement time	0.5	0.7
4.	Material arrangement	0.4	0.6
5.	Process path cleaning	0.5	0.7
6.	Safety	0.6	0.8
7.	Working environment	0.7	0.8
8.	Working efficiency	0.6	0.8
9.	Overall changes in percentage	57.5%	75%

Figure 6.1: Time Analysis Table



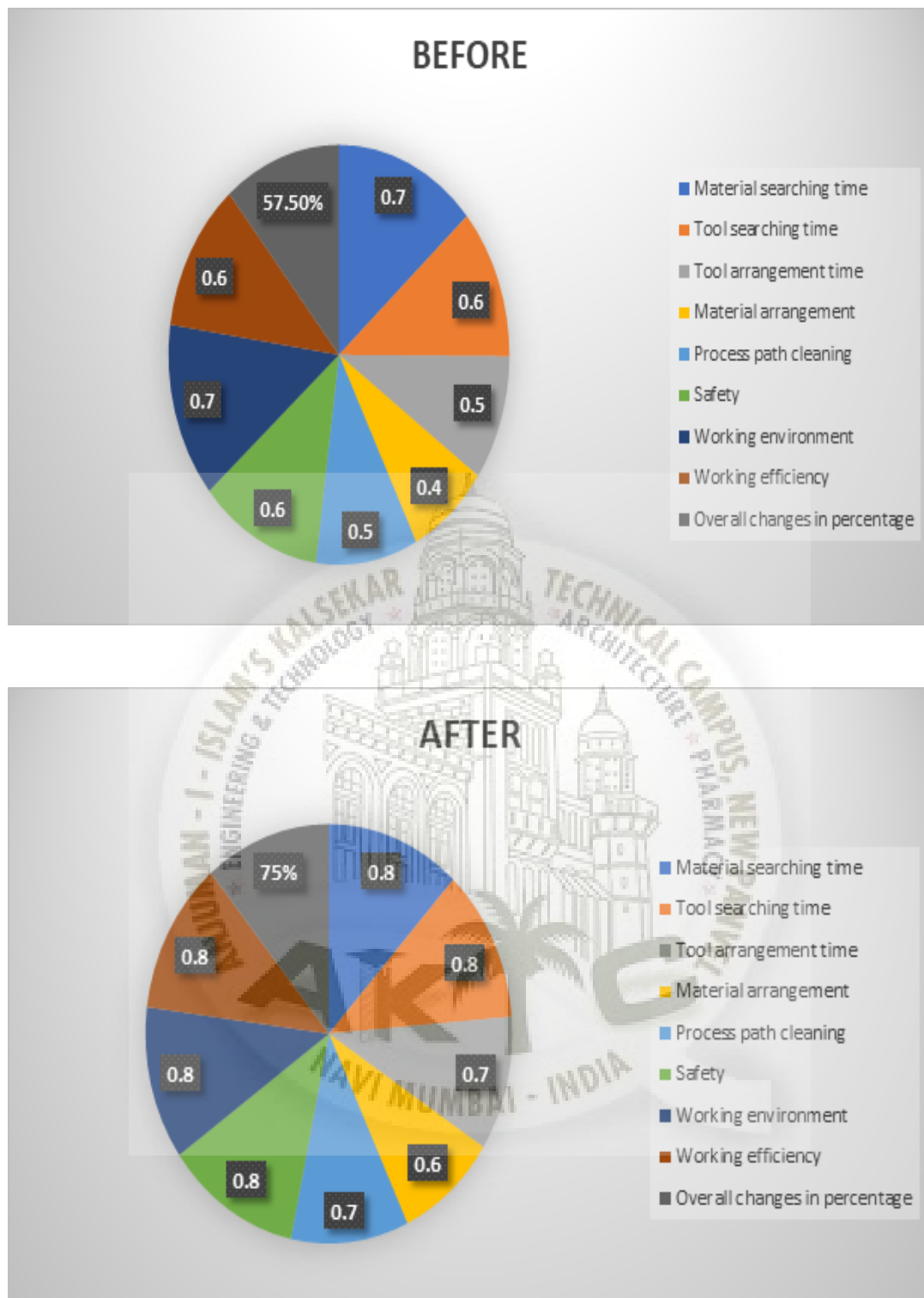


Figure 6.2: Pie Chart

6.2 Conclusion

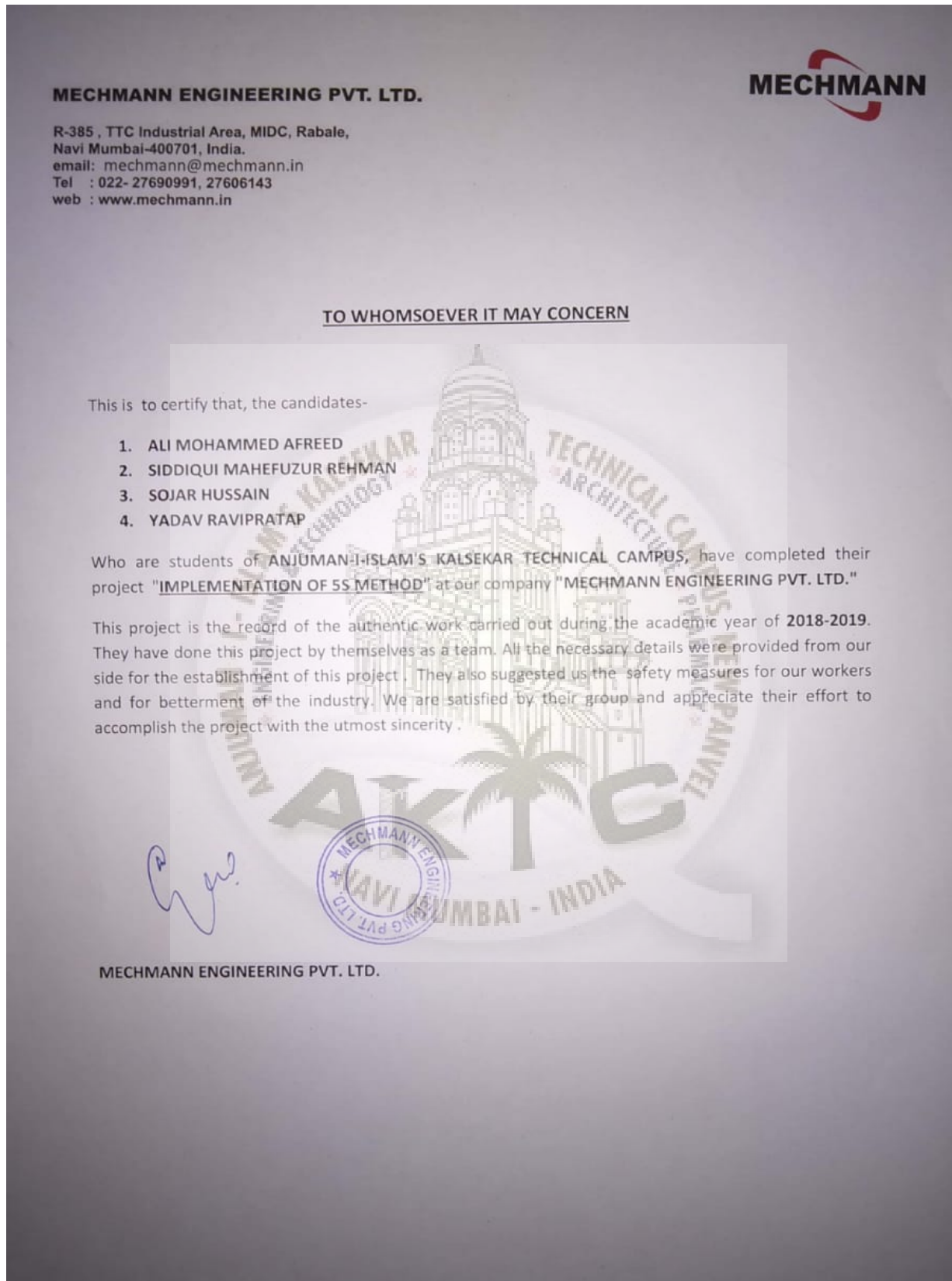
As observations done at MECHMANN INDUSTRY the major Issues that found were regarding the space and management of time. Major of the time was wasted on finding of tools that were required at the same time by the different workers.

In order to make the industry more efficient in terms of providing space and time management strategies we implemented 5s method in MECHMANN INDUSTRY. In 5s method we suggested them to use of shadow board that accommodates all the common tools that are required by the workers. Every worker should be given a batch or a token that has a no. Or name or a code written on it when the worker takes the required tool from the shadow board the worker is expected to put his token at the board. That will help the other worker to know that the required tool is with that particular worker and that will in turn reduce the workers time in finding the tools.

For space consideration we have suggested them to use shelves this helped for manage the work in a systematic manner and helped in best use of the space in industry.

The other major issue that needs to be considered was use of safety equipment. The workers should be provided templates regarding the safety measures that they should undergo in order to keep themselves safe throughout their working hours as there are a lot of electrical wires that may be dangerous if not taken care of. We are done with implementation of 5S method in MECHMANN INDUSTRY successfully and also give the safety tips about the equipment's to the workers.

6.2.1 Project Completion Certificate



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Achievements

1. Publications

(a) *TITLE OF PAPER : Study and implementation of 5S method at Mechmann Engineering Pvt. Ltd.*

AUTHORS: ¹Yadav Ravipratap, ²Siddiqui Mahefuzurrehman, ³Sojar Hussain, ⁴Ali Mohammed Afreed, ⁵Kazi Jawed,

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(b) **TITLE OF PAPER** : *Study and implementation of KAIZEN method at Mechmann Engineering Pvt. Ltd.*

AUTHORS:¹*Kazi Jawed*,²*Yadav Ravipratap*,
³*Siddiqui Mahefuzurrehman*,⁴*Sojar Hussain*,⁵*Ali Mohammed Afreed*,

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