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Process improvement by using '5S' in manufacturing unit: A case study

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Abstract
The 5S tool originates from Japanese philosophy, namely from the five basic elements of the system: Seiri (selection), Seiton (systematization), Seiso cleaning), Seiketsu (standardization) and Shitsuke (self-discipline). The 5S method is a structured program to implement workplace organization and standardization. A well-organized workplace motivates peoples. 5S improve safety, work efficiency, improved productivity and establishes sense of ownership.
This article presents the case study of studying on implementing 5S in small manufacturing unit.
From this project, the impact of 5S implementation are reduce inventory, efficient on workplace usage, reduce time for searching spare part, reduce water spilled, reduce un stabilization, cleaning and checking machine condition, improve working condition, increase discipline, follow procedure, and better relationship among employee.

Keywords: 5S, seiri, seiton, seiketsu, shitsuke

Introduction
The introduction of the 5S methods requires the whole team's commitment. The activities to be implemented are going to serve the common good – both the employees and the company. The appropriate definition of the objectives and tasks the crew is faced with is the key to the effective implementation of the 5S tools. The management, along with the employees, plan and implement the various steps of the method. Shared responsibility, as well as a vision of a more comfortable and efficient workspace, motivate people to take action and make changes. All employees, without exception, must view the 5S Program as a tool helpful in daily work. Proper training and the right attitude of the employees result in the sense of joint effort and the satisfaction of both the company and the workers, bringing them all closer to the objectives. The 5S's are: Sort (Seiri), Straighten (Seiton), Sweep (Seiso), Standardize (Seiketsu) and Sustain (Shitsuke).

Sort
This means going through the work area and making sure only essential items are present. This is eliminating tools, materials, fixtures or any other items not used in the process. Everything else is stored or, preferably, discarded.

Straighten
Straighten focuses on setting the workplace in order to focus on efficiency. This is more than just arranging the tools and equipment where they will be used and in the sequence they will be used.

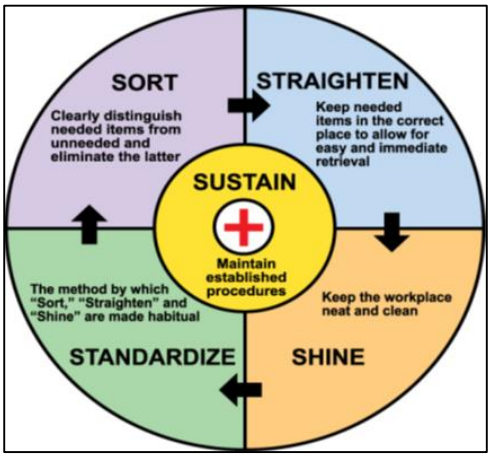

Fig 1: The 5S principles

It is "straightening" the work path for materials, tools and the work process. Of all the steps this is the one that typically produces the greatest cost reductions. Straightening the work process can include changes in dies or tooling that reduces finishing labor, for example. It may include interaction with the customer to implement design changes that result in cost reduction or quality improvement. It is also the step that bears the most repeat visits to implement continual improvement.

Sweep
This is just what it says: keeping the workplace clean as well as neat. At the end of the shift, the work area is cleaned and everything is restored to its proper place. In straighten, the workplace is clearly marked where things go and gives confidence in the ability to find what is needed when it is needed. The key point here is that cleanliness is a regular part of the daily work effort, not an effort initiated when the workplace gets too messy.

Standardize
Standardizing the work practices means operating in a consistent and standardized fashion. Everyone knows their role and exactly what his or her responsibilities are. Actions are taken the same way – the right way – every time.

Sustain
This means more than just maintaining what has been established. Five S becomes a way of life and a new way to operate. It is important that management does not allow a gradual decline back to the old ways of operating. Sustain also means that when an issue arises a suggested improvement, a new tool becomes available, or a new output requirement – the process is reviewed for improvement.

Problem statement
The small scale industry occupies a prominent position of unique importance in economy of India. It has emerged as powerful tool in providing relatively larger employment next to agriculture. Global markets are continuously changing and demanding product of high quality and low cost. In India, the survival and the growth of small scale industry largely depends on its ability to innovate, improve operational efficiency and increase productivity. Many businesses have been trying to adopt new business initiative in order to stay alive in the new competitive market place. 5S is one of these initiatives that focuses on the cost reduction by eliminating wastes, non-value adding activity, time for searching spare parts, physical effort and improves environmental performance.

Literature
It is a collection of 5 simple rules and at the same time it is a tool that allows you to control the workplace visually [1]. In the first step, sort, removing expired, broken, or recalled items from the work areas can increase safety by decreasing the chance of using improper items. In the set in order step, frequently used items will be easily accessible, thus improving ergonomics. Walkways will be clear, which reduces the risk of trips and falls. The third step, shine, ensures that all items, areas, and equipment are clean and properly maintained, which prevents contamination and equipment being out of service. Standardize, the fourth step, improves safety by allowing all providers to quickly assess when items are unfit for use, not in their proper place, or not properly cleaned or maintained. Standardization also allows providers to find items quickly. The last step, sustain, creates mechanisms for maintaining the first four S's over time [4, 5]. 5S is a set of straight forward steps towards continuous improvement. 5S helps in minimize waste and increase productivity also. It promotes cleanliness in raw material, in storage and in finished products. It helps in increase in coordination between workers [2]. It is important that all participants of trainings will understand the need of using the 5S rules on the own workplace and will agree on the changes. During trainings it is essential to train the usage of all rules on the clear example, so that every participant can understand the methodology of realization of the 5S's elements [5].
In a highly competitive global marketplace of decreasing profit margins, waste reduction has become an essential element in companies' effort to thrive and in some cases to just survive. 5S is a lean method and a system of process improvement that is adopted to reduce waste, clean workplace, and improve labour productivity [3]. The 5S method requires the whole team's commitment. The activities to be implemented are going to serve the common good – both the employees and the company [1]. 5S lean technology is utilized for achieving project diagnosing the production process, streamlining the workflow, removing/reducing process waste, cleaning the production environment. The work is a combination of both culture changes and tangible/physical changes on the shop floor. The "5S" technique represents a fundamental technique which allows the enhancement of efficiency and productivity, while ensuring a pleasant organizational climate [3]. Each stage of a 5S project has an impact on safety, from sort where broken or expired items are removed, to sustain where ongoing cleaning, maintenance, and quality checks are routinely conducted [4].
To make the 5S study the top management has to give its full support to practice this activity in their company. In order to make the top management aware of the effectiveness of the 5S they have to be shown the performance indicators relating to the costs involved, sales, profits and product quality of this approach [6]. A typical 5S implementation would result in significant reductions in materials and space needed for existing operations. It also would result in the organization of tools and materials into labeled and color coded storage locations such as bins and kits. Such conditions provide the foundation that imperative to a successful implementation of other lean methods such as TPM, cellular manufacturing, and just-in time production [7]. Lean manufacturing is one of the options to reduce non value-added activity (wastes) and improve operational efficiency of the organization. The efficient implementation of 5S technique leads to subsequent improvement in productivity of the manufacturing plant. The 5S improves environmental performance and thus relate primarily in reduction of wastes in manufacturing. It promotes neatness in storage of raw material and finished products [8]. The implementation of the 5S concept can bring improvements in compliance and efficient workflow due to lesser machine breakdowns, lower defect rates, reduced inventory and effective problem visualization and addressing them before they aggravate [9]. The 5S implementation leads to the improvement of the organization in many ways for instance like visible results within a short period of time (2-3 weeks), workers get used to order and discipline, labelling draws attention to change that is about to occur, reduction of physical effort, less accidents during the production process, increase of the workers professional training, better organization of activities [10].

Case study
The objective of the study is to apply the 5S methodology in a small manufacturing unit, Prabha Engineering Product Ltd. at

Rabale, Navi Mumbai. The unit is experiencing problems related to a disorganized floor space of materials, machines and storage spaces which could be re-organized using 5S implementation in the affected areas. It is intended that the study were serve as a reference for the small manufacturing unit process and be a model for continuous improvement to other manufacturing unit. The 5S implementation is to evaluate the current situation and propose alternatives to improve flow of people, material, and work. In the long run, it is expected that unit staff will benefit by learning what an impact 5S can have on their workstation and workflow.

The 5S as a name refers to the five steps required to fully implement all the assumptions of the method:

Seiri

In Prabha Engineering Product Ltd. manufacturing unit the selection of inventory item is done with ABC analysis. Inventory is sorted in a raw material, semi-finished, finished hardware categories. Mostly finished hardware is required in regular basis in unit, which is difficult to handle in large varieties. So with ABC analysis all finished hardware is sorted, and coding is allotted.

Seiton

The Systematic will be ineffective if there are too many items organized and labeled unnecessarily. So after speed identification of objects, it gives labeling, drawing lines and outlining the highlight/shadow areas. Tools, materials and other apparatus is aligned for quick approach in the efficient way.

Seiso

Tasks in the workplace get it done by washing, vacuuming and dirt/dust/waste removal. An important element at this stage is the responsibility and common involvement of all the team members participating in the process. So for all are work together after shift if over. 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.

Seiketsu

Now one can stand back and look at the accomplishment. Someone will need to repeat this exercise again regularly by creating the guidelines for Sort, Set in order, and Shine and this is called Standardize. To create awareness about 5S among the worker the training and seminar is conducted.

Shitsuke

Sustain is having the discipline and keeping the 5S processes going. It is also important to understand the need of executing the routine inspections of usage the 5S rule. This inspection is executed by helping of so-called Check List which serves to estimation of the workplace and which is give the previously started tasks is constantly be improved or not

Recording the Present Situation

After identifying problem, the very first thing to do was to start recording the present situation by taking photographs. It is one of the important steps of the implementation. The photos of the existing surroundings within the area were taken and dates recorded before 5S activities were implemented. The photographs help in locating the problem areas provided, more detail, as well as in provided the basis of differentiating before and after states of 5S implementation.

Fig 2: Pictures before implementation of 5S

Fig 2: Pictures before implementation of 5S

Conclusion

In conclusion, the 5S system implemented in this manufacturing unit is found to be adequate due to the many benefits such as the wastes, scraps and losses were minimized, over production stocks were controlled with flexible work stations. The factors that manufacturing unit from implementing the 5S system are identified as ineffective inventory management, lack of quality improvements and quality control and lack of employee participation and top management commitment. Implication of this study suggest that further research needs to be done on more manufacturing unit so as to have more conclusive findings on 5S implementation and barriers faced by the that manufacturing unit entrepreneurs. Other than that, the manufacturing unit must develop standard operating procedures for all processes involved in production line by improving the existing policy in order to make production process more efficient in future.

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