

5S Methodology Implementation in the laboratories of University



Kshitij Ranjan Srivastava, Ravi Kant Gupta, Manu Khare

Abstract: This paper represents an overview of 5S practices and its implementation in university laboratories to improve the quality of the laboratories. It also, highlights the contributions of 5S initiatives towards improving the maintenance of laboratory resources. It shows how learning, improvement, control and maintenance of the resources and activities are performed by reducing non-value added time, reduced cost and most importantly, laying the foundation for continuous improvement. Apart from these, implementation of 5S also increase the efficiency in terms of productivity by reducing the capital input. Furthermore, the involvement of faculty and laboratory staff in daily improvements is also critical for the success of implementation of 5S. It thus contributes to lean leadership which is a way of sustaining and continuously improving performance in the laboratory of the university. This paper shows how 5S is beneficial and why it is the foundation stone for any laboratory that wants to sustainably grow and become a benchmark.

Keywords : Lean manufacturing, continuous improvement, concurrent engineering, leadership

I. INTRODUCTION

5S is a continuous improvement and effective space management technique which emerged in Japan as a consequence of the application of the kaizen culture (continuous improvement in personal, family, social and professional life). Takashi Osada developed the 5S technique in the early 1980s, which helped the industrial revolution of Japanese manufacturing at that time. 5S is defined as a low-cost technique to clean, order, organize, and standardize the workplace. The outcomes of implementing 5S in educational laboratories and manufacturing industries include organization, safety, efficiency, cleanliness, visual workplace, storage space utilization, cost reduction, improved workflow, reduced inventory and reduced waste. The technique consists of five steps, stated in the Japanese language as: -Seiri (sort), Seiton (set-in-order), Seisou (shine), Seiketsu (standardize),

and Shitsuke (sustain) Lean manufacturing is always associated with 5S, in the simplest terms lean manufacturing can be described as the elimination of waste. The top management can play a major role in the implementation of the 5S in any industry or educational institutes laboratories. Regular audits and a “gemba team” must be made to ensure regular monitoring of its implementation and thus, continuous improvements can be accounted for. The gemba team takes a gemba walk which is important aspect of the lean management philosophy. A strong leadership can bring in the change and this can only be done by the top management and as well as each and every employee working in the company with the determination to improve every day. The commitment of the top leadership in the lean transformation is highlighted in every university. The leadership as, a cornerstone for engaging the faculty and staff in continuous improvement initiatives, something that they consider as, a critical factor for introducing a lean leadership system. The present research work, developed in the university responds to the continuous improvement process implementation and the need to optimize available resources used in different laboratories for trials and practice.

2. Development and Methodology

The 5S technique is used in every type of laboratories (mechanical, biological, pharmaceutical, etc.) in all kind of university throughout the world (Altamirano, 2013; Ananthanarayanan, 2006; Chitre, 2010).

The technique used for the 5S implementation involves two phases and several stages for every part of 5S, so it is especially important that all the laboratories of the university system have been integrated in the process. The 5S are the initials of five Japanese words which represent each of the five stages that make up the methodology (Osada, 1989; Kobayashi, 2005):

Seiri (organization, sorting) – Involves organizing the tools and materials.

Seiton (setting an order of flow, streamlining) – Involves setting of the tools and materials in the orderly fashion in the order of requirement.

Seisou (shining, cleaning) It involves cleaning and maintenance of the tool and materials.

Seiketsu (standardize, visual control) It makes Standard Work Instructions (SWIs) for 5S. Once standardized and sustained,

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these standard operating procedures (SOPs) and SWIs become the basis of experiments on how to further improve them, thus leading to continuous improvements.

Shitsuke (sustain, discipline and habit). Laboratory in-charge need to actively participate, as working staff available in the laboratory for experimental work or fabrication work, or in the office. Sustain is about making 5S a long-term program, not just an activity or short-term project. 5S becomes a part of university and with time setup will start to notice continuous positive results. Table 2.1 shows the action plan regarding the implementation of 5S, what and how action to be taken. Table 2.2 shows that the how to do improvement plan by using SIPOC tool. SIPOC tools defines the different operations or activities performed in the laboratories.

TABLE 2.1 ACTION PLAN

What?	How?
(Action to take)	(Action steps)
Check with leadership to conduct 5S.	Meet with the supervisors.
Identify the processes that are used in the laboratory.	Take regular visits to learn.
3Make a 5S team to regularly follow up.	No process should be missed.
Establish scope of the system.	Accordingly set the plans.
Establish project plan and milestones.	Draft plans according to what is required.
Identify and map laboratory process.	The regular visits will help with this process.
Identify and devise continuous improvement plans.	Learn the flaws from last plan to improve on.
Implement plan.	Clear up with permissions to implement.
Implement continuous improvement plans.	Find out if it is all set rightly.
Internal Quality Audit support.	Meet with the supervisors.
Management Support.	Meet with the supervisors.
Conduct regular audits.	Meet with the supervisors.
Check the checklist regularly.	Checklist should be ready every day.

Table 2.2 SIPOC (Supplier - Input - Process - Output - Customer):-

Supplier	Input	Output	Customer
University Department	Wood, Metal, equipment's, items required to perform experiment.	Finished job as per the curriculum	Students, staff, teacher

Operation or Activity
 Collect of Tools, materials.
 Preparation of specimens and jobs using tools
 After preparation of specimens and jobs, Keep the tools back in the allocated location.
 Keep the specimens and jobs made in the destined location.

Table 2.3: Operation in SIPOC

Operation or Activity
Collect of Tools, materials.
Preparation of specimens and jobs using tools
After preparation of specimens and jobs, Keep the tools back in the allocated location.
Keep the specimens and jobs made in the destined location.

3. Process and Procedure (High level):

Process and procedure to implement 5S has been as follows:

1. To implement the 5S in the laboratories of the university first step to obtain the commitment from the Leadership of the university about the duration and level of the project.
2. Decide team and their work:
 - a. A team of laboratory in-charge, staff and faculty involved in the laboratory
 - b. A middle management representative to provide and arrange documents, training and other facilities.
3. Selection of a laboratory for pilot study.
4. Implementation of 5S in selected laboratory and learn the methodology and develop an improvement that shows as model study to implement in the other facilities of the university.
5. After successful implementation in model laboratory, 5S has been start Implementation other laboratories of the university.

The aim of 5S methodology implementation is to achieve the aim towards zero defects and cleanliness.

4. Leadership and Management for Lean
 Lean manufacturing implementation in the university laboratory is a challenge for the management. The major error made by the management while implementing lean can be summarized as follows.

- i. Not realizing the urgent need
- ii. There is no powerful guiding coalition
- iii. Absence or lack in vision.
- iv. Unable to overcome obstacles for achieving vision.
- v Declaring successful or victorious.
- vi. Neglecting to anchor changes firmly in the corporate culture.

Lean leadership helps an organization to improve the employees performance from within and benefit organization. Lean leadership can be described through five principles

- a. Culture improvement
- b. Developing oneself,
- c. Qualification
- d. Policy implement
5. Team

A team of faculty, laboratory in-charges and students were involved in the 5s technique implementation in the laboratory.

The team will function to give suggestion regarding 5S technique implementation, collection and analyzing the information, proposing and developing new ideas for improvement and finding better solutions with a teamwork approach. Tracking and analyzing the 5S board indicators.

The implementation of the 5S system is shown by before and after images in the various laboratories.

6. Result

Implementation 5S in the laboratories of the university improve the efficiency of the laboratories in terms of productivity as well as improvement in the workplace. This technique only be successful because of the cooperation the staff, teachers, laboratory in-charges and leadership. This technique saves the 20% time in job preparation, reduce the inventory and 15% more space is available to setup other equipment and facilities. Also removed materials and unnecessary tools in the system. Figures shows the changes before and after 5S implementation.



Fig 5.2 - This shows us the implementation of the 2nd step in 5S that is Set in Order which is the practice of sequentially storage the right item, right time , right place can be picked effectively and efficiently and easy to access for everyone.



Fig. 5.1 - This is the 1st step of 5S Sort, which is identifying between necessary and unnecessary items, and removing of what you do not need.

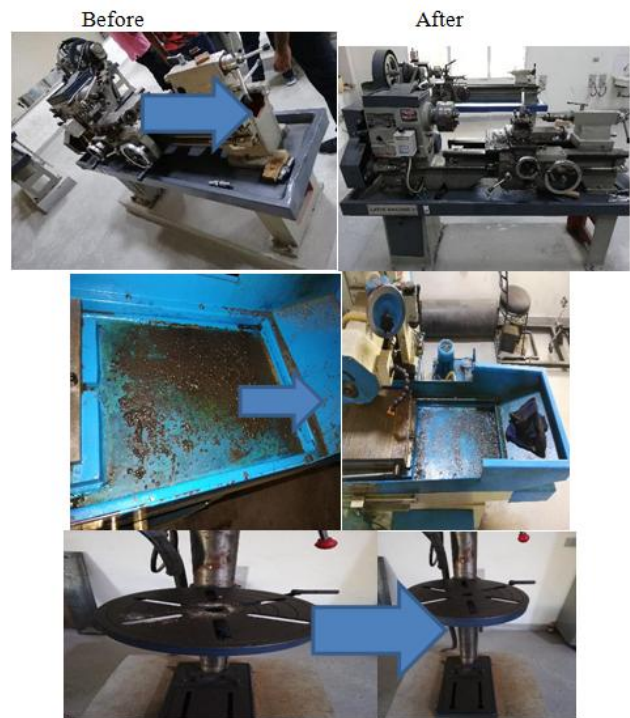


Fig 5.3 - Here we see an example of the 3rd step Shine that is to develop a clean workstation/table without unwanted items, dirt and dust, so problems can be more easily identified.



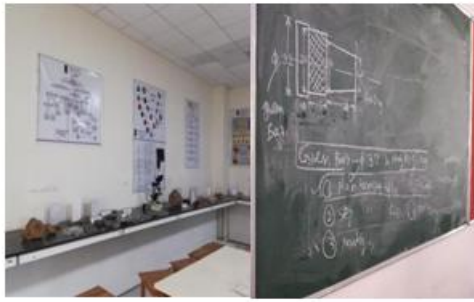


Fig 5.4 - The 4th step of 5S is Standardize that is setting up standards for a neat, clean, workplace. There are visual signs set up as well as the items are properly placed in between floor lines or arrangements and the job work has been made on the boards so, that students can perform easily.

Now, we approach the final step, which is the toughest phase and needs regular audits and regular data of everyday practice on every job of all the laboratories.



Fig 5.5 - The 5th step in the 5S System is to sustain with continuous improvements. Here we see, how regular audits and walks can help us identify problems before they arise and how to find solution and keep all running immediately.

II. CONCLUSION

Here we see the implementation of the 5S and its different

phases in the laboratories in the University. This technique applies both in the processes related to the student, teacher learning as well as laboratory staff activities. Implementation of 5S improve the moral and working environment and develop new culture in the university that motivates faculty, students and staff. Also a natural phenomenon to reduce the accidents, develop a systemic working procedure and improvement in the overall development of the university.

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