



# Analysis of Housekeeping 5s (Seiri, Seiton, Seiso, Seiketsu and Shitsuke) in Laboratory

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This study aims to analyse the implementation of housekeeping in the Laboratory of the Faculty of Engineering, Brawijaya University so as to provide improvements to laboratory work areas that are used by workers and students. The method used in regulating the repair of laboratory work areas is the basic 5S concept approach (Seiri, Seiton, Seiso, Seiketsu and Shitsuke). The main focus of this research is manufacturing laboratories that are not good at applying 5S work culture concepts. Manufacturing laboratories have a total score of 36% in the 5S checklist form, which indicates that their 5S implementation is bad. The results of the observations were analysed with fishbone diagrams to find out the causes of the problem and a SWOT analysis is done on internal/external workplace safety and health management. Recommendations for improvements include: good implementation of 5S in laboratories, work instructions that oblige to maintain occupational health and safety, and periodic supervision.

**Key words:** *Housekeeping, 5S, occupational safety and health, laboratory, fishbone diagram, SWOT analysis.*

## Introduction

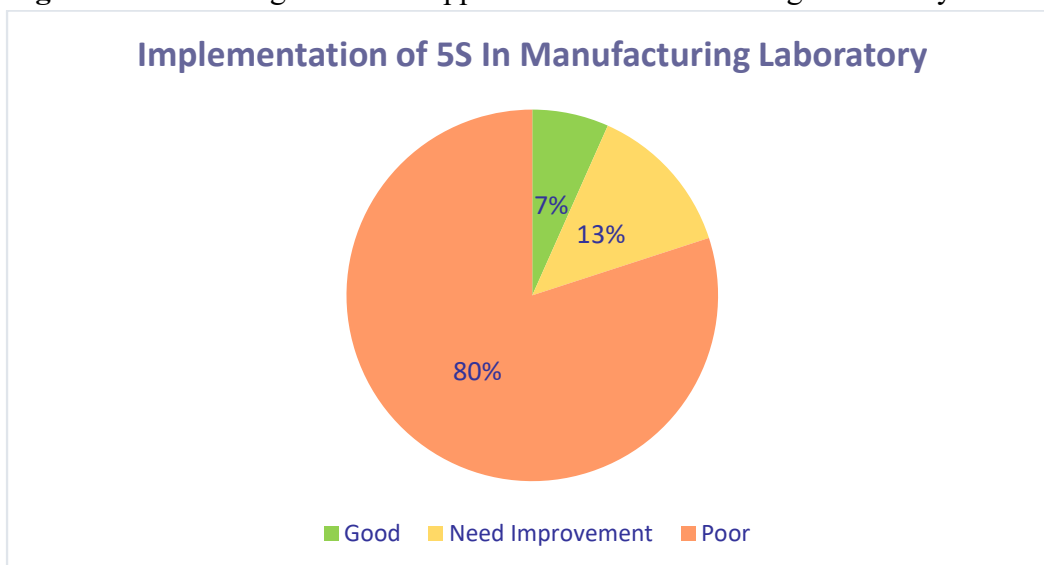
A laboratory is one workplace that has potential hazards in education. Users of a laboratory cannot necessarily be separated from the risk of work accidents. There are many factors that can cause work accidents, such as a poor working environment, the wrong way of working, equipment that is less than ideal, human error, etc. The impact of work accidents also varies from minor accidents such as bumps or cuts, to severe accidents such as fires or explosions. Various causes of work accidents can be directly identified by observing the work environment and looking for causes of work accidents that can be eliminated.

According to Bird and Germain (1990), work accidents are unexpected events that result in pain (injury or loss of life) to people, damage to property and loss in the process that occurs when work is done. To avoid work accidents in the laboratory work area, proper housekeeping control is needed.

Housekeeping is considered as a control effort. Good housekeeping needs to be implemented from the start of the design process, developed according to changes that occur, monitored and evaluated continuously through the support and cooperation of all parties involved, especially in laboratories. One of the housekeeping concepts applied to improve the quality of the laboratory work environment is the 5S work culture (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke). 5S work culture is not only good for making improvements in the work environment but can also improve the way individuals think about their work (Viviyanti, 2008).

From the various types of laboratories that are found at the Faculty of Engineering, manufacturing laboratories have the greatest risk of work accidents. The following data is obtained from the results of interviews conducted with students of the Faculty of Engineering, Universitas Brawijaya, regarding the application of housekeeping 5S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke) in manufacturing laboratories.

**Figure 1.** Circle Diagram of 5S Application in Manufacturing Laboratory



From the diagram it can be seen that 80% of respondents stated that the application of housekeeping 5S (seiri, seiton, seiso, seiketsu, shitsuke) in manufacturing laboratories is still poor, this is detrimental to health and increases the risk of work accidents for workers and students. Therefore, it is necessary to analyse and improve 5S in the manufacturing laboratory work area.



## Literature Review

5S is a workspace management method that emerged in Japan as a consequence of the application of the kaizen culture (continuous improvement in the personal, family, social and professional life). (Kobayashi, 2005).

The 5S methodology has been used in all kind of laboratories (mechanical, biological, pharmaceutical, etc.) in different parts of the world (Altamirano, 2013; Ananthanarayanan, 2006; Chitre, 2010; Mallick et al., 2013; Pentti, 2014; Purdy et al., 2013).

The methodology used for 5S implementation involves two phases and several stages for each element of the 5S; all organizational levels must be integrated into the process. As stated above, 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):

1. Seiri (organization, sorting). Remove all unnecessary tools and parts. Go through all tools, materials, and so forth in the plant and work area. Keep only essential items.
2. Seiton (setting an order of flow, streamlining). Arrange the work, workers, equipment, parts, and instructions in such a way that the workflows free of inefficiencies through the value-added tasks with a work division necessary to meet demand.
3. Seiso (shining, cleaning). Clean the workspace and all equipment, and keep it clean and tidy ready for the next user.
4. Seiketsu (standardize, visual control). Ensure procedures and setups throughout the operation promote interchangeability. Normal and abnormal situations are distinguished, using visible and simple rules.
5. Shitsuke (sustain, discipline and habit). Make it a way of life. This means commitment. Ensure disciplined adherence to rules and procedures.

## Methods

The steps to solve the problem in this study are as follows:

1. Identify problem-solving methods.

The method used in this study is the supervision of the implementation of 5S in the Manufacturing Laboratory.

2. Identify the laboratory area.



At this stage a survey was conducted, as was an observation of the laboratory work area, starting from activities in the practicum process, work environment, item layout, and communication process between lecturers and laboratory assistants, so as to make a checklist with conditions in the laboratory work area.

### 3. Design the 5S checklist.

At this stage a checklist sheet will be designed which contains a list of questions arranged according to points that must be considered in the 5S concept. The results of the design can be seen in Table 1.

**Table 1: 5S Checklist**

**5S CHECKLIST**  
**Manufacturing Laboratory**

**Evaluator** :  
**Date** :

Part	ITEMS AND STANDARDS ASSESSMENT	LEVEL SCORE				
		1	2	3	4	5
<b>A</b>	<b>APPLICATION 5S (SEIRI)</b>					
	1. All items in the work area has been disaggregated and classified, and consistent in keeping					
	2. There is already a procedure / procedure dispose of unnecessary items (worth and not worth), which are known, understood and implemented correctly by personnel in the area segment					
	3. This work area is not store items that are not needed, and the necessary items are in accordance with the needs of the area					
	4. The maximum dosage amount all the necessary items have been determined taking into account the frequency of use of the goods and has been standardized correctly					
	5. The storage location of all items specified items as well as easy and quick to get and return it					
	<b>AVERAGE AVERAGE VALUE SEIRI</b>					
<b>B</b>	<b>APPLICATION 5S (SEITON)</b>					
	1. Lay out the work area is applied to each work area clearly and correctly, and adhered to by each member in the area					
	2. All items in the area of the work area has been put in place in accordance with the standards and classifications have been determined					
	3. Boundaries between areas well defined and adhered to by each member					
	4. Already there is standardization and identification for each item of goods and facilitate the work					
	5. Method of placement of goods has been carried out effectively and efficiently, making it easier to work					
	<b>AVERAGE AVERAGE VALUE Seiton</b>					
<b>C</b>	<b>APPLICATION 5S (SEISO)</b>					
	1. Tools and means available and in accordance with the hygiene standards of work and its placement in accordance with the provisions of					
	2. There is already a schedule of cleaning work area and work tools while checking the condition of their status, along stadar its cleanliness and PIC					
	3. Signs, labels and color in each area, items, shelf space and equipment is evident according to the standards					
	4. There is a business venture that has been programmed and periodic in eliminating dirty sources, which have been implemented properly					
	5. The condition of the work area, working facilities and working tools clean well maintained, and in a comfortable and safe conditions for workers					
	<b>AVERAGE AVERAGE VALUE Seiso</b>					

**Table 1: 5S Checklist (Continued)**

Part	ITEMS AND STANDARDS ASSESSMENT	LEVEL SCORE				
		1	2	3	4	5
<b>D</b>	<b>APPLICATION 5S (SEIKETSU)</b>					
	1. Standard operating procedures have been implemented and practiced for the entire work area					
	2. 5S information boards placed at strategic places and information disclosed is relevant and not expired					
	3. Visual control mechanism has been applied to all the tools, machines and means of work, and always made continuous improvement					
	4. Had not found another mistake the work done by the workers, because the existing systems and procedures are adhered to and understood by workers					
	5. Meeting and routine and periodic evaluation has been done to address program improvement work area, immediately followed up and be reevaluated (PDCA)					
	<b>AVERAGE AVERAGE VALUE Seiketsu</b>					
<b>E</b>	<b>APPLICATION 5S (SHITSUKE)</b>					
	1. The attitude of all personnel working in the work area is already showing positive habits (job attributes, timely, discipline, etc.).					
	2. All personnel are actively and creatively provide suggestions for improvement both groups and individuals.					
	3. Target / target / objective quality departments / sections / groups / individuals have been socialized and achievements have been recorded, monitored, evaluated, acted upon and disseminated.					
	4. Already there are activity boards that provide information on their respective areas (Kaizen results, efficiency, productivity, audit results, etc.)					
	5. Activities / 5S implementation has been incorporated / associated with K3 / job description.					
	<b>AVERAGE AVERAGE VALUE SHITSUKE</b>					
<b>FINAL SCORE 5S {(A + B + C + D + E): 5}</b>						

Malang, .....  
Evaluator,

(.....)

Note:

**RATING SCALE FIGURES** uses 1 - 5:

Excellent	5
Good	4
Needs Improvement	3
Poor	2
Unacceptable	1



#### 4. Determination of the 5S auditor checklist.

The selected auditor is the assistant coordinator who understands the condition of the manufacturing laboratory and is responsible for the laboratory's internal audit process. Auditors will be given an explanation in advance about the audit process, and how to fill out a checklist. After an explanation is given, the auditor is given a checklist to do the scoring in the laboratory area that is to be audited.

#### 5. Scoring Stage

At this stage, scoring is done using the 5S checklist that has been compiled. The total score for perfect conditions is  $5 \times 25 \text{ items} = 125$ .

#### 6. Analysis of the causes of problems with fishbone diagrams

Based on the results of the scoring on the 5S checklist sheet, an analysis of the causes of the problem was done with a fishbone diagram to find out the causes of the problem that occurred in the 5S factors. Fishbone diagrams are made through a brainstorming process conducted with laboratory assistant coordinators.

#### 7. Proposed improvement.

The proposed improvements are given based on the needs that have been previously identified, so as to provide a better 5S implementation in the manufacturing laboratory.

### **Result and Discussions**

#### ***Scoring Results***

A 5S Checklist sheet is given to the auditor to make an assessment according to the condition of the laboratory work area; the results obtained are in Table 2.



**Table 2:** Results of 5S Scoring Checklist

Part	Items and Standards Assessment	LEVEL SCORE				
		1	2	3	4	5
<b>A</b>	<b>Application 5S (SEIRI)</b>					
	1.All items in the work area have been disaggregated and classified, and are consistent in keeping		V			
	2.There is already a procedure to dispose of unnecessary items (worth and not worth), which is known, understood and implemented correctly by personnel in the area segment		V			
	3.This work area does not store items that are not needed, and the necessary items are in accordance with the needs of the area	V				
	4.The maximum dosage amount of all necessary items has been determined, taking into account the frequency of use of the goods, and has been standardized correctly	V				
	5.The storage location of all specified items is easy to access and quick to get and return it		V			
	<b><i>Average Average Value SEIRI</i></b>	<b>8</b>				
<b>B</b>	<b>Application 5S (SEITON)</b>					
	1.Lay out of the work area is applied to each work area clearly and correctly, and adhered to by each member in the area		V			
	2.All items in the area of the work area has been put in place in accordance with the standards and classifications that have been determined		V			
	3.Boundaries between areas are well defined and adhered to by each member		V			
	4.There is standardization and identification for each item of goods and it's facilitation of work		V			
	5.Method of placement of goods has been carried out effectively and efficiently, making it easier to work		V			
	<b><i>Average Average Value Seiton</i></b>	<b>10</b>				
<b>C</b>	<b>Application 5S (SEISO)</b>					
	1.Tools and means available are in accordance with the hygiene standards of work and their placement is in accordance with the provisions thereof		V			



	2. There is already a schedule of cleaning work area and work tools while checking the condition of their status, along with cleanliness and PIC	V				
	3. Signs, labels and colour in each area, items, shelf space and equipment are evident according to the standards	V				
	4. There is a business venture that has been programmed and is periodic in eliminating dirty sources; this has been implemented properly		V			
	5. The condition of the work area, working facilities and working tools is clean, well maintained, and in a comfortable and safe condition for workers	V				
<b>AVERAGE AVERAGE VALUE Seiso</b>		<b>7</b>				

**Table 2:** Results of 5S Scoring Checklist (Continued)

Part	Items and Standards Assessment	LEVEL SCORE				
		1	2	3	4	5
<b>D</b>	<b>Application 5S (SEIKETSU)</b>					
	1. Standard operating procedures have been implemented and practiced for the entire work area		V			
	2. 5S information boards are placed at strategic places and information disclosed is relevant and not expired				V	
	3. Visual control mechanism has been applied to all the tools, machines and means of work, and always made continuous improvement		V			
	4. Has not found another mistake in work done by the workers, because the existing systems and procedures are adhered to and understood by workers		V			
	5. Meeting, routines and periodic evaluations have been done to address program improvement work areas; is immediately followed up and be re-evaluated (PDCA)	V				
<b>Average Average Value Seiketsu</b>		<b>11</b>				
<b>E</b>	<b>Application 5S (SHITSUKE)</b>					
	1. The attitude of all personnel working in the work area is already showing positive habits (job attributes, timely, discipline, etc.).		V			
	2. All personnel actively and creatively provide suggestions for improvement for both groups and individuals.		V			

	3. Targets / objective quality departments / sections / groups / individuals have been socialized and achievements have been recorded, monitored, evaluated, acted upon and disseminated.		V			
	4. Already there are activity boards that provide information on their respective areas (Kaizen results, efficiency, productivity, audit results, etc.)	V				
	5. Activities / 5S implementation has been incorporated / associated with K3 / job description.		V			
	<b>Average Average Value Shitsuke</b>	<b>9</b>				
	<b>Final Score 5S (A + B + C + D + E)</b>	<b>45</b>				

The final result of the 5S implementation score in the manufacturing laboratory is 45. The scoring results are as follows:

$$\frac{45}{125} \times 100\% = 36\%$$

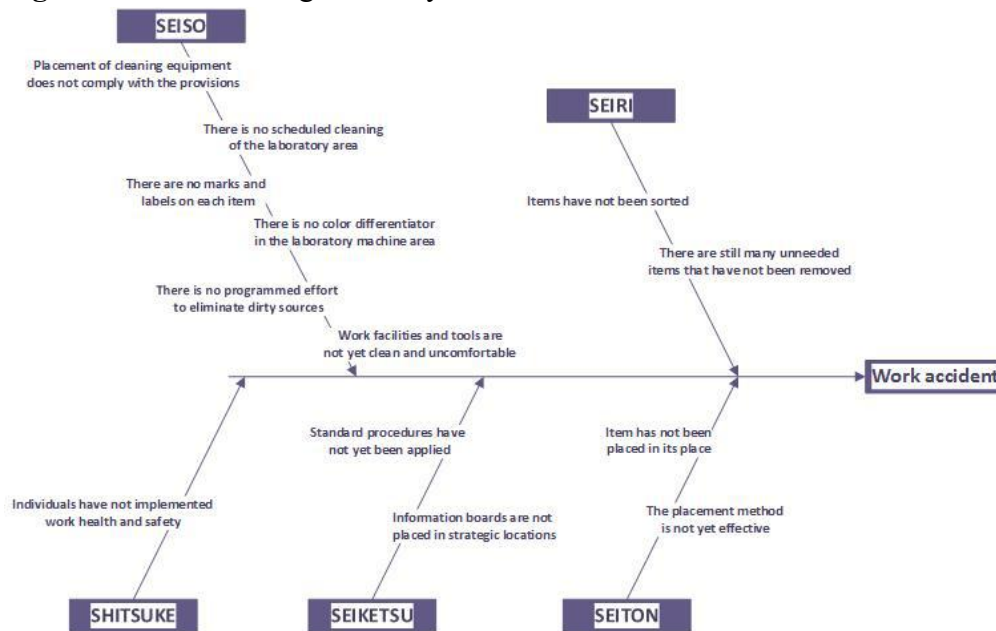
<p>5S Program Evaluation Criteria (5S Score):</p> <p>0 - 20% = Very Poor,  21% - 40% = Poor,  41% - 60% = Enough,  61% - 80% = Good,  81% - 100% = Very Good</p>
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Based on the evaluation criteria of the 5S program, the final assessment results in manufacturing laboratories show the implementation of 5S in the laboratory is still poor at 36%.

### ***Analysis Fishbone Diagram***

The following will be an analysis of the data held using fishbone diagrams so as to obtain output on various 5S problems in the laboratory. A fishbone diagram analysis is seen in Figure 2. below.

**Figure 2.** Fishbone diagram analysis



### ***Proposed Improvements***

The 5S evaluation results achieved are low, therefore improvements are necessary and must be made by first identifying needs. The identification of design requirements is based on the problems that occur in the fishbone diagram. The necessary repairs are as follows:

1. Procedures for eliminating unnecessary items;
2. Tagging damaged and servicable goods;
3. Label storage areas;
4. Goods are to be located in an easily accessible place;
5. Locations between machines and coloring on the work floor are to be distinguished;
6. Trash bins to be placed in all work areas;
7. Picket a schedule, with punishment for non-compliance;
8. Cleanup checklist to be made;
9. Socialization of the role of 5S to laboratory assistants; and
10. Work Instructions and a 5S standard poster to be provided.

Figure 3. Poster example with QR Code



## Conclusion

Based on the 5S scoring results, the implementation of 5S by manufacturing laboratories recieved a score of 36%. This score is poor and needs improvement to prevent work accidents at the Faculty of Engineering, Universitas Brawijaya.

Based on the fishbone diagram analysis, the Seiso factors present the biggest problems; the laboratory needs to fix all aspects of 5S, but special consideration must be given to Seiso.



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