

WORKSHOP STORE ROOM IMPROVEMENT WITH 5S: A CASE STUDY

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ABSTRACT: Implementing the 5S technique at workshop store room to solve the problems observed is the main focus of this paper. In order to achieve the main purpose of the study, four specific objectives have been defined. First, is to understand the concept and theories of 5S. Second, to observe the problems occurred in the workshop store room. Third, implement 5S technique which consists of 5 pillars: sorting, set in order, shines, standardizes and sustains to solve the problems occurred at the workshop store room. Finally, measure the improvement at workplace area after implementing 5S technique.

KEYWORDS: 5S, Visual Management, Continuous Improvement.

1.0 INTRODUCTION

Low level of skills among the workers in the workplace has been become the focus for many studies, especially in the era of globalization and information technology. If workers' skills do not meet with their job requirements, then their low level of skills will became a barrier towards the company's development. Workers are exposed to do work in inconvenient places with all the equipments put everywhere and unsystematic workplace condition which might cause accident. Hence, it is not only increase the employer's budget but also caused the safety issues in a workplace. So, these situations will not bring any profits to the company. A scientific approach is needed to solve and improve the problem solving close to its source and root cause [1]. Every problem is an opportunity to improve the process and environment

and every problem is also an opportunity to develop people surround. In order to overcome these problems, 5S which is relatively simple and inexpensive technique for employers to assess the possibility of present and future mismatches between the skills of their own workers and their working area is proposed. 5s framework was originally developed and introduced by international consultant and just-in-time expert [2]. This technique is adapted from Japan, which is also related with some other concepts such as SMED, Total Productive Maintenance (TPM) and Just in Time (JIT) as well [3].

5S is a tool for organizing and improving a workplace especially a shared workplace and keeping it in organized conditions. It is a process of creating more productive people even employer and employees and more productive companies through high education, motivation and good practice of 5S. It involves the creation of a strong corporate culture filled with the spirit of high productivity [4]. 5S was derived from the Japanese words; seiri, seiton, seiso, seiketsu and shitsuke. In English, they can be roughly translated as sort, set in order, clean, standardize and sustain [5], [6], [7].

In the case of this paper, the workshop store room does not do any 5s implementation. There are 1279 various types of parts stored in the store room such as bolts and nuts, spare parts used for Crusher Plant and Premix Plant, hardware, spare parts used for excavator, shovel and water/diesel truck, electrical parts, greases, batteries and backing compounds. There is lacked of housekeeping in the workshop store room and high cost occurred because waste of defects. For instance the received spare parts are placed on the floor and not properly placed on the compartment. These unarranged boxes of parts are blocked the way for the workers to get the spare parts and caused the sudden fall or tripped on the floor by the workers. The tools and spare parts are left on the cabinet besides of the main door of workshop store room. Moreover, the pump hoses are unarranged on the compartments. There is also lack of safety importance in the store room. The boxes on the top of the compartment are unarranged. The boxes are still containing components inside. There are unused lubricants documents racks outside of the workshop store room. Those racks are basically functioning to place the safety alert and first aid proper procedures documents for the workers but the racks were unused.

2.0 LITERATURE REVIEW

2.1 5S Principles and Philosophies

The 5S principles and philosophy refer to Manufacturing Management. 5S is initially acronym of five Japanese words which stands for *seiri* (organization), *seiton* (neatness), *seiso* (cleanliness), *seiketsu* (standardization) and *shitsuke* (discipline) [8]. The 5S practice is a technique that used to establish and maintain the quality environment in an organization effectively and promised the employees to be more self-discipline [9].

Considered that 5S to be an industrial formula that differentiates a company from its competitors [2]. The company is being as benchmarking for the competitors. A difference has been made and distinction between 5S as a philosophy or way and 5S as a technique or tool by doing comparison between the framework [10], [11], [2]. Furthermore, confirmed that 5S is an effective technique that can improve housekeeping, safety standards and environmental performance in a systematic way [12]. Much of western literature still acknowledges 5S as “housekeeping”. 5s is encourages the employees to improve their working place conditions and helps them to learn how to reduce the waste, unplanned time and in-process inventory [13]- [17].

2.2 Sort (SEIRI)

Seiri (sort) the first pillar of the visual workplace which focuses on eliminating and removing all unnecessary items from the workplace that are not needed for current production operations. Sorting the items is according to three categories such as useful, useless and unknown. The useless items are disposed immediately because they just jamming the workplace lead to loss of time. For items unknown, the frequency of using them not clear, they can be kept with monitoring in order to make a decision by red tag strategy. Red-tagging is literally define as attaching red tags on items and parts in the work place that need to be evaluated as being necessary or unnecessary[2]. Red tags are created by red color card which is purposed to catch employee’s attention because red is color that stands out.

2.3 Set In Order (Seiton)

Set in order process can be defined as essential material and items are organized in order to minimize wasted employee motion, walking and material movement. Besides that, set in order focuses on creating efficient and effective storage methods in order to arrange the items and

parts, so that they are easy to use [18]. Forming a regular workplace, avoiding time loss while searching for material and improving the efficiency are the main objectives of set in order process [19].

2.4 Shine (SEISO)

Once the clutter at work areas is eliminated and remaining items and parts are organized nicely, the next step is to thoroughly clean the work area. It is the component that emphasizes the removal of dirt, grime and dust from the workplace [2]. In order to realize the effective tasks, it is essential to create a clean and regular working and living environment [19]. Shine is the systematic cleaning or the need to keep the workplace clean as well as neat [20].

2.5 Standardize (SEIKETSU)

It refers to the practice of standardizing in the working area by developing methods in order to maintain the achievements of the first three. The workers need to ensure their effort to tidy, organize, clean the work area and new found disciplines are not slowly lost. Standardize is a result that exists when the first three pillars are properly maintained [2]. 5S regular duties, 5-Minutes 5S periods, cycle charts, visual cues and check lists should be integrated into regular work duties in order to maintain the improvements that were achieved through the first 3S's [21].

2.6 Sustain (SHITSUKE)

The last step of 5S program is covering the improvement of the methods directed to the adaptation of 5S activities as habits by all personnel. Sustain can be define as to make habit of properly maintaining with the correct procedures [2]. The last pillar is requires discipline. Without discipline, it is really impossible to maintain consistent standards of quality, clean production, and safety and process operations at the workplace [22]. The errors, defects, wastes and accidents will be reduced if the workers are able to follow the manufacturing standards, procedures and rules. There are three keys to successfully sustaining 5S such as commitment, top management support and performance measurement and reward system.

3.0 METHODOLOGY

The research method used is an exploratory, illustrative the study of 5S implementation the workshop store room. A visit to the company

is arranged with the company's manager. In the visit, the manager has explained the current situation of the workshop store room and the problem of time wasted for searching, waiting, motion, and high cost and lack of safety importance. Information on how to carry out 5S implementation has been generated. Before 5S implementation is started, few types of data are collected such as below:

1. The numbers of items, their name and size in the store room.
2. The historical data of cost for waste of defects before 5S implementation from September 2011 until December 2011 and recent data of cost for waste of defects after 5S implementation from January 2012 until April 2012.
3. The data of time studies for one worker to search ten different items in the store room before and after set in order implementation.
4. The historical data of accidents before 5S implementation from September 2011 until December 2011 and recent data of accidents after 5S implementation from January 2012 until April 2012.
5. Data analysis has done to measure the improvement after 5S implementation processes. 5S weekly audit data is obtained based on 5S audit checklist for thirteen weeks and analyzed with line chart to evaluate the overall 5S implementation, measure the improvement and improve 5S condition at the store room. There are three improvement measurements have been done during these 5S implementation activities.

4.0 RESULTS AND DISCUSSION

4.1 5S Implementation

First of all, 5S organization has been developed before proceed to the further steps of 5S implementation activities. As planned, 5S organization is consisted with 5S leader, 5S secretary, 5S training consultant and three teams that are involved directly in the 5S implementation process which are 5S implementation team, 5S action team and 5S audit team. 5S implementation plan has been established to develop the proper arrangements of 5S implementation process at workshop store room. There are three main problems that occurred in the workshop store room which are waste of time for searching, waiting and motion, and high cost caused by defects, waste, and lack of safety importance. 5S campaign materials are created at workshop store room which included face-to-face meetings between the 5S leader

and 5S organization committee members. Two languages Malay and English 5S posters have been provided to the members in order to lead them gain the information about 5S technique and implementation. In-house education is purposed to make a continuous education about 5S technique, encourage independent thinking, and encourage motivation, skill-building and participation of the workers. 5S implementation process started with sorting and end with sustain.

4.3 Sorting

Sorting has been focusing on eliminating and removing all unnecessary items from the workplace that are not needed. During sorting, the items are categorized into three sections which are useful items, unknown status items and useless items. Useful items are placed on their previous place, unknown items are red tagged and useless items are disposed. Red-tag holding area is created in order to implement the red-tag strategy effectively. Red tag is attached on unknown status items in the store room and evaluated as being useful or useless items. Table 1 shows 23 items have been tagged with the reason of defected, obsolete, and unknown, it has moved to red-tag holding area. After two weeks, 11 defected items and 3 unknown items are resolved and returned again to the previous place while 6 obsolete items, 1 defected item, 1 unknown and 1 obsolete item have thrown away and discarded. Red tags item log is created in the logbook to document the results of red tagging activities which is included tag number, name of item tagged, reason for tagging and notes or remarks. This logbook has been used as references for the red tag activities to allow the company measures the improvement and savings produced as a result of the red-tagging effort that has been done.

Table 1: Results of the red tag

Tag Number	Item Tagged	Reason for Tagging	Notes / Remarks
1	Backstop	Defect	Resolve
2	4" Rubber Mounting	Obsolete	Throw away
3	Oil seal TC 230x260x15	Defect	Resolve
4	Hardener UT-B20	Defect	Resolve
5	Oil Seal F-280	Defect	Resolve
6	V/Belt B-84	Obsolete	Throw away
7	Bearing UCT 208D1	Defect	Resolve
8	Sleeve H317	Unknown	Return

9	3" Strainer	Unknown	Discard
10	Regulator	Defect	Resolve
11	Clutch Disc	Obsolete	Throw away
12	Fuel-Filter F-2303	Obsolete	Throw away
13	Saw Blade	Obsolete	Throw away
14	4" Grinding Disc	Unknown	Return
15	Radiator Stop Leak	Obsolete	Discard
16	Grinding Stone	Obsolete	Throw away
17	Water Pump Mounting	Defect	Resolve
18	Ball Valve	Unknown	Return
19	King Pin Bearing	Defect	Throw away
20	Gear Shaft	Defect	Resolve
21	Air Release Valve	Defect	Resolve
22	Engine Mounting	Defect	Resolve
23	Bushing 209-70-62141	Defect	Resolve

4.4 Set in Order

The 5S implementation process is continued with second pillar, set in order where essential material and items are organized neatly in order to minimize wasted employee motion, walking and material movement. Racks and items arrangement have been done. All the received items and tools on the cabinet near main door have cleaned up and stored on the six respective racks. Items that are used most frequently are stored closest to workers and at easily reached height. Each rack is consisted of five compartments. The most frequent used items have stored on the lowest compartment and followed by less frequent used items until the top compartment. Pump hoses have arranged properly on the rack to avoid the parts fall down. Paper boxes on the top of the rack have placed properly since the boxes are containing parts inside.

Racks are arranged according to the usage of items and items are labelled by their name and size. Color-coding strategy is used to show clearly which parts and tools are to be used for which purpose. There is totally 1256 items were labelled according their categories. There were 259 items have been labelled for Crusher Plant rack, 233 items for Excavator rack, 225 items for Water/Diesel Truck rack, 210 items for Premix Plant rack and 329 items for Hardware rack. Next, the rack where the bolts and nuts been stored is replaced with new rack and has neatly labelled. Then, 14 different types of document files are labelled systematically according to their purposes. The floor of store room has been tapped to

indicate the walkway path in the store room. The lubricant documents racks at outside of workshop store room are renovated where by the new plate is welded on the top of the documents rack to avoid the water from fall on the documents.

4.5 Shines

The shine process is implemented where the systematic cleaning has been done in the store room with the co-operation by the workers and contractors. During the shine process, workers get rid all the dirt using the top down cleaning method which is cleaning from the ceiling to the floor. They corrected any issues uncovered by cleaning up such as a bumpy floor make the transportation of product difficult and they pin pointed the root cause of dirt and done the corrective measures. Finally, for the daily cleaning habit purpose, the shine areas are specifically divided to workers by using a 5S schedule. 5S schedule is created which shows in detail who responsible for cleaning which areas on which days. There are three workers assigned in the shine schedule who responsible for cleaning and shining the store room and their tasks have been rotated every day. The 5S schedule is pasted in the workshop store room.

4.6 Standardize

Methods that have applied in the standardize step; 5S Job Cycle Chart and Five-Minute 5S. First, 5S Job Cycle is an essentially schedule for the regular maintenance of the 5S implementation and it typically done with the use of chart in appropriate location in the store room. This chart is consisted with 12 different 5S jobs related with the first three 5S activities which are sorting, set in order and shines and these jobs are followed and maintained by their job cycles which consisted with six different types such as continuously, daily (morning), daily (evening), weekly, monthly and occasionally. The sorting job is maintained continuously, the set in order jobs are maintained daily (evening) and the shine jobs are maintained daily (morning). Second, Five-Minute 5S is a review of five pillars in 5S for five minute every morning and updated on a signboard. The 5S activities are reviewed for five minutes from 8.30 until 8.35 every morning and regular maintenance and improvement are done by assigned workers.

4.7 Sustain

This is the final step 5S implementation methodology. In order to prevent the 5S condition from deteriorating, 5S audit is conducted weekly to evaluate the 5S implementation, measure the improvement

and improve 5S condition. The line chart and radar chart are used to plot all the scores obtained from every week's assessment for thirteen weeks. The results of weekly 5S audit are discussed in the data analysis section.

5.0 DATA ANALYSIS

Data analysis has done at workshop store room in order to measure the improvement after 5S implementation processes. 5S weekly audit data is obtained for thirteen weeks and analysed with line chart and radar chart to evaluate the overall 5S implementation. There are three improvement measurements have been done during these 5S implementation activities which are improvement in term of cost of damaged parts, improvement in term of time for searching, waiting and motion, and improvement in term of safety importance.

5.1 5S Evaluation and Scoring

The audit process at the workshop store room is enabled the organization to identify the potential level of improvement. The 5S auditing criterion that is used is relevant to the working environment. The 5S weekly audit is done by 5S Audit Team. The 5S audit checklist was structured in which a specific assessment criteria and control point based on five pillar of 5S. Each assessment criteria has its own score which is 0 = very bad, 1 = bad, 2 = average, 3 = good and 4 = very good.

Table 2: 5S weekly assessment scores

5S Activities (weeks)	Sort score	Set in order score	Shine score	Standardize score	Sustain score	Total score	Average score
1	0	1	0	1	0	2	0.4
2	3	1	2	1	2	9	1.8
3	8	3	2	1	2	16	3.2
4	11	4	4	2	4	25	5.0
5	12	9	4	2	4	31	6.2
6	12	13	8	3	5	41	8.2
7	13	11	12	3	5	44	8.8
8	14	14	16	6	8	58	11.6
9	17	16	19	8	8	68	13.6
10	17	18	21	12	9	77	15.4
11	19	17	22	13	12	83	16.6
12	20	23	24	17	13	97	19.4
13	20	24	24	20	20	108	21.6

From the 5S audit process, the weekly scores for every pillar of 5S are obtained which is shown in the Table 2 above.

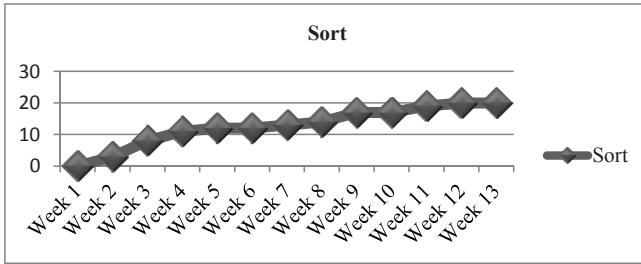


Figure 1: Sort score variation graphic

The compliance of the workers to the activity of recovery at the workshop store room formed through the regular and continuous sorting of the unnecessary parts from week 1 to 13 has been assessed as shown in Figure 1. The curve shows the classification score has a very vertical curve in incremental level till the week 13 where the sorting activity is done systematically where the useful items placed on their previous place, unknown items moved to red tag area, and useless items have disposed. When compared to the initial status, the improvement recorded in each week shows that the classification activities as of the week 13 have been accepted as work discipline by the workers.

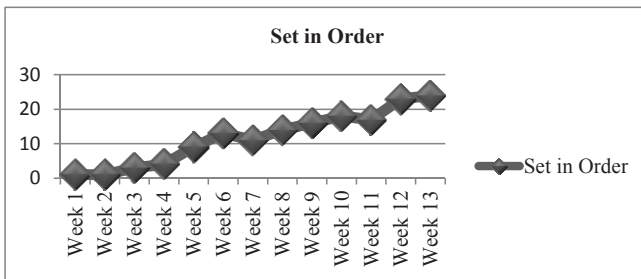


Figure 2: Set in order score variation graphic

Set in order has been established successfully till the week 6 as shown in Figure 2. It is regarding the performance of the activities such as rack arrangements for all items at workshop store room, items arrangements based on specific rack and categories, systematic labelling system for racks, items and document files, systematic floor tapping and renovated document racks. The fluctuation observed in the graphic on week 7 and 11 can be assessed as the delay of the set in order activities such as items arrangement and labelling system following the monthly received new parts in bundle and increase of the work load within the workers during the same weeks.

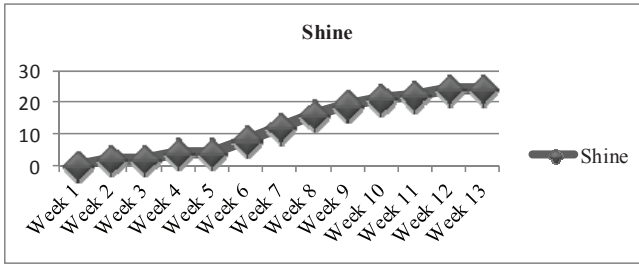


Figure 3: Shine score variation graphic

The cleaning activities initiated through the removal dirt, dust and debris from floor, wall, compartments and materials at the store room have been continued by the workers in a regular and systematic manner during 13 weeks (Figure 3). The curve showing the classification score which is indicate a very vertical curve in incremental level till the week 13 since the shine activity is done systematically by setting the cleaning as a habit and daily routine. The shine is improved continuously with the application of proper shine schedule where the shine areas are specifically divided to workers by using a 5S schedule.

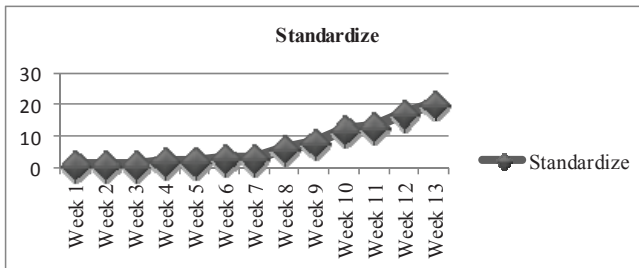


Figure 4: Standardize score variation graphic

It is observed that the standardize scores had a stable process between weeks 1 to 3, week 4 to 5 and week 6 to 7 in Figure 4. The success level has increased rapidly from week 8 till week 13. It is thought that the increase here reflects the constancy in the application of the accepted rules and conducted arrangements of 5S job cycle chart and five-minute 5S signboard application. Since the scores do not show great differences between weeks, this reflects that the first three criterion activities conducted under 5S activities are applied in a well manner. Thus, the continuous improvement of the established regime and that the regulation criterions have been adapted as habit by the workers.

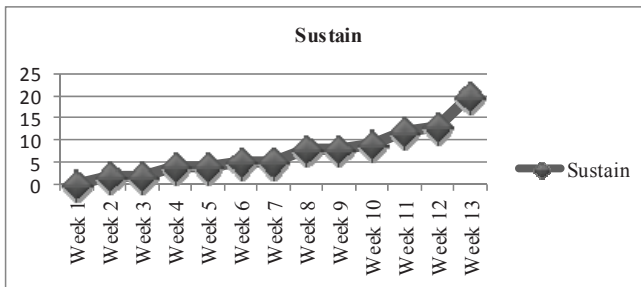


Figure 5: Sustain score variation graphic

The graphic curve of the sustain scores progresses in Figure 5 is increasing with no great differences between weeks. Since the scores do not show great differences between weeks, this reflects that the 5S activities have applied very well. The application of rules and procedures, utilization of appropriate equipment and materials and interaction between workers achieved good progress. In the graphics of the set in order criterion, the fluctuation observed has been revealed although the continuous performance of the discipline and training activities has done. As it can be seen from the charts above, an output has been obtained in all applications starting from the first week to the week 13 and a success has been obtained. This success has been protected and no regression has occurred. The reason of the drop that has been experienced in the set in order activity on week 7 and 11 is the delay of the set in order activities such as items arrangement and labelling system following the monthly received new parts in bundle and increase of the work load within the workers during the same weeks.

5.2 Improvement Measurement in Term of Time

Waste of time for searching items, waiting and motion are occurred because of the increasing in delay during the parts searching where the workers need to move around to find out the items needed among unnecessary items. The proper labelling system has been done for every rack based on the respective categories in order to reduce the delays. Thus, the time study has been done in order to measure the improvement in reducing the delays and waste of time for searching, waiting and motion by a worker by 50%. The time study has been conducted to measure searching time for ten different items in the store room before and after 5S implementation and the data collected as shown in the Table 3.

Table 3: Data of time study to measure the improvement in reducing time for searching ten different items by a worker before and after 5S implementation process

No.	Items	Time (s)		Percentage of Time Reduced (%)
		Before	After	
1	Saw Blade (Hardware)	390	105	73.08
2	V/Belt B-68 (Premix Plant)	385	93	75.84
3	½" x 1" NC Bolt (Bolt & Nut)	513	54	89.47
4	Hydraulic Filter 912.0129 (Crusher Plant)	583	115	80.27
5	Pulley 6151-61-3321 (Excavator)	350	57	83.71
6	7" Grinding Disc (Hardware)	468	108	76.92
7	Bucket Cylinder Pin (Excavator)	557	165	70.38
8	Dust Seal Ring (Crusher Plant)	702	169	75.93
9	Fuel Filter F-2303 (Water Truck & Lorry)	315	154	51.11
10	Sleeve H317 (Premix Plant)	473	130	72.52

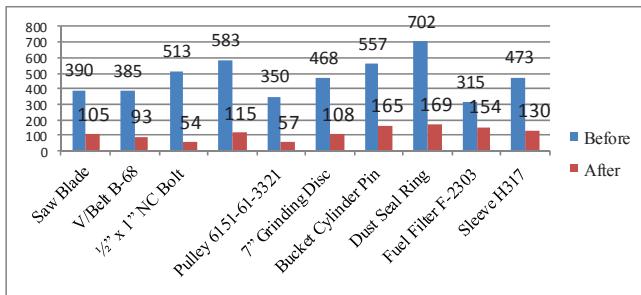


Figure 6: Bar chart of the difference of time for searching ten different items by a worker before and after 5S implementation process

The time taken for searching all ten items before 5S implementation are measured more than two minutes where the lowest time is 315 seconds to search Fuel Filter F-2303 from Water Truck & Lorry category and the highest time is 702 seconds to search Dust Seal Ring from Crusher Plant Category as shown in Figure 6. While the time taken for searching all ten items after 5S implementation are measured less than two minutes where the lowest time is 54 seconds to search ½" x 1" NC Bolt from Bolt & Nut category and the highest time is 169 seconds to search Dust Seal Ring from Crusher Plant Category.

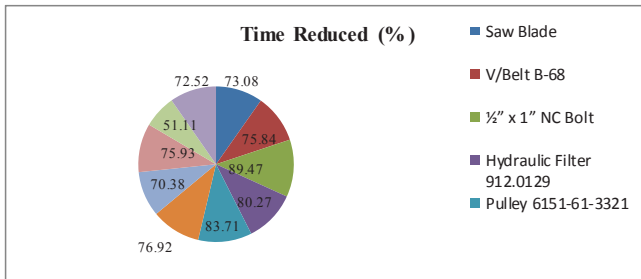


Figure 7: Percentage of time reduced for searching ten different items by a worker before and after 5S implementation process

The highest percentage of time reduced for searching items in the store room before and after 5S implementation is 89.47% which is to search 1/2" x 1" NC Bolt from Bolt & Nut category as shown in Figure 7. While, the lowest percentage of time reduced for searching items in the store room before and after 5S implementation is 51.11% which is to search Fuel Filter F-2303 from Water Truck & Lorry category. Thus, the improvement in term of time after 5S implementation is successfully achieved by reducing the delays and waste of time for searching items, waiting and motion by worker at the workshop store room by 50%.

5.3 Improvement Measurement in Term of Cost

High cost is occurred by waste of defects caused by damaged parts. The costs for waste of defects are analyzed. The improvement measurement in term of cost by 50% has been done by doing the comparison of historical data of cost before 5S implementation from September 2011 until December 2011 and after 5S implementation from January 2012 until April 2012. The highest cost for waste of defects was in October 2011 with RM941.00 as shown in Figure 8. Five parts were damaged in this month with the highest cost of part damaged which is water pump shaft RM477.00. September 2011 is measured as the second highest with RM 198.00 and November 2011 as the third highest cost with RM 181.00. It followed by December 2011, RM107.00 and January 2012, RM34.00. There are no damaged parts on February, March and April 2012. Total cost for historical data before 5S implementation from September 2011 until December 2011 is RM1427.00 while total cost for recent data after 5S implementation from January 2012 until April 2012 is RM34.00.

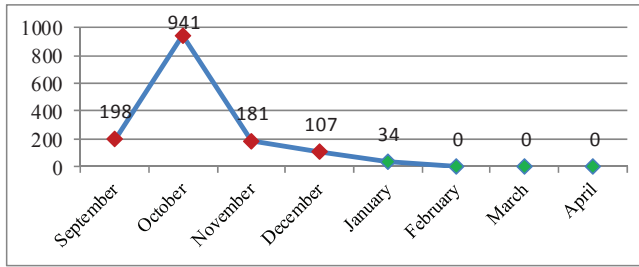


Figure 8: Line chart of cost versus month for defective parts before 5S implementation from September 2011 until December 2011 and after 5S implementation from January 2012 until April 2012

The improvement in term of cost after 5S implementation has been made successfully by reducing the cost occurred by waste of defects caused by damaged parts from RM1427.00 to RM34.00. The cost has been reduced more than 50% which is 97.62%.

5.4 IMPROVEMENT MEASUREMENT IN TERMS OF SAFETY IMPORTANCE

Safety importance is lacked in the workshop store room due to sudden accident, felled and tripped by workers because of their careless. It caused by the items that are placed on the floor without proper arrangement and jammed the work area. The store room is packed and messy consisted with necessary and unnecessary items. The improvement measurement in terms of safety importance by 50% has achieved. Comparison for historical data of number of accidents in the store room before 5S implementation from September 2011 until December 2011, and after 5S implementation from January 2012 until April 2012 illustrated in the Table 4 below.

Table 4: Data of number of accidents before 5S implementation from September 2011 until December 2011 and after 5S implementation from January 2012 until April 2012

Year	Month	Number of Accidents	Total	Percentage Of Accidents Reduced (%)
Before 5S Implementation. 2011	September	2	8	87.5
	October	4		
	November	0		
	December	2		
After 5S Implementation. 2012	January	1	1	
	February	0		
	March	0		
	April	0		

The highest number of accidents was in October 2011 with four accidents and followed by two accidents on September and December 2011 as shown in Figure 9. Four accidents occurred on October due to the sudden tripped by workers in the store room.

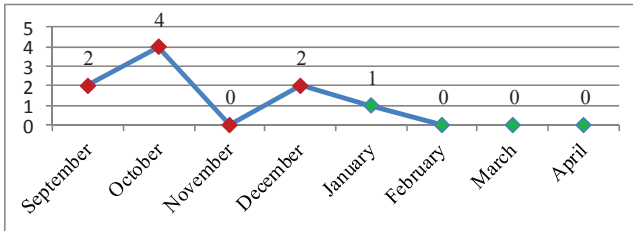


Figure 9: Line chart of number of accidents versus month before 5S implementation from September 2011 until December 2011 and after 5S implementation from January 2012 until April 2012

Improvement in term of safety importance after 5S implementation achieved successfully by reducing the number of accidents in the store room. The percentage of accidents has been reduced more than 50% which is 87.5%. By sorting activities, unnecessary items which are stored on the rack are sorted and removed out based on red tag strategy.

6.0 CONCLUSION

The objectives of the study of implementing 5S in the workshop store room have successfully achieved. The concept and theories of 5S have understood based on relevant references. Problems occurred in the workshop store room has observed where the store room's current conditions and problem faced have discussed and the possible sources that caused the problems collected. 5s technique which consists of 5 pillars: sorting, set in order, shines, standardizes and sustain is greatly implemented to overcome the problems at the workshop store room. From the implementation, the improvement in term of time, cost and safety importance after implementing 5s technique are successfully measured. The improvement in term of time after 5S implementation is successfully achieved by reducing the delays and waste of time for searching the items by 50%. The cost has been reduced more than 50% which is 97.62% and the percentage of accidents has been successfully reduced more than 50% which is 87.5%. In overall, the improvement in terms of working efficiency and workers morality at the workshop store room has successfully developed. The working efficiency is improved due to the removal of clutter, dirt and debris. High working efficiency is directly improved the quality due to standardized ways of working

and basic maintenance of tools and equipment. Finally, morality of workers has improved due to their involvement in improving their own workspace to their own benefit making their work easier and less stressful.

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