

IMPLEMENTATION OF 5S IN JUTE MILL: A CASE STUDY

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ABSTRACT

This research deals with recommending the implementation of 5S in a jute mill in Bangladesh with the goal of solving waste related problems while improving the productivity and efficiency of the mill. The main objective of this research is to reduce the amount of waste and create an outline to carry out the day to day activity in any jute mill in Bangladesh. Photographic views of problematic situations where 5S can be implemented to improve the situation are taken and how those problems can be solved is recommended. The proper situations in which each of the 5S steps can be implemented are taken into considerations. This research also points out which 5S step has to be implemented in right way. In a word this research deals with everything concerned with implementing 5S in Aleem Jute Mill. Of all the actions that were recommended only two were implemented by the workers and the management namely employing dustbin and red tags. Finally, by implementing only those two steps the total cycle time was reduced by 27 seconds.

Keywords: 5S, Efficiency, Productivity, Waste related problems

1. INTRODUCTION

Patel *et al.* (2014) define 5S technique as a structured program to systematically achieve total organization cleanliness, and standardization in the work place. It include five Japanese words Seiri, Seiton, Seiso, Seiketsu and Shitsuke, which means Sort, Set in order, Shine, Standardize and Sustain respectively. The benefit of 5S technique lies in improvement of productivity, quality, health and safety. According to (Deshpande *et al.*, 2015) every organization aims for profit. In today's global market of decreasing profit margins, the profit made from the waste as well as through proper workplace management is mandatory. To sustain in competitive business arena it is of utmost important to win hearts of customer though quality and cost of the product or service. It is also crucial to have sustainable production with continuous improvement. Singh (2010) focuses on the present need of the organization is to deliver high quality product through continuous improvement. Miller *et al.* (2010) points out that manufacturing organization throughout the world is under great pressure to reduce the cost and meet the challenge of maintaining global quality standards. 5S is part of lean manufacturing process and the goal of lean manufacturing is to minimize all types of waste or non-value added activity through incorporating less human effort, less inventory, less time to develop product and less space to become highly responsive to customer demand, while at the same time producing good quality products in the most efficient and economical manner. Many manufacturing facilities have opted to follow the path towards a "5S" workplace organizational methodology as part of a continuous improvement program or lean manufacturing process. Shahryar *et al.* (2012) argued through 5S methodology, the management can create an environment where quality work is comfortable, clean and safe in the organization and it can ensure the compliance to standards and will further foster continuous improvement.

In order to understand how 5S works and which action is responsible for which step of 5S, each element of 5S is described here. Sort refers to the practice of going through all materials, tools, machines etc. in work area, identifying needed and unneeded items from them and keeping only the essential/needed items. Patel *et al.* (2014) argues that systematic arrangement of tools or equipment is achieved by implementing Seiton. Rojarsa *et al.* (2013) argues that the main objectives of Seiton are forming a regular workplace, avoiding time loss while searching the material and mistake proofing work. According to Agrahari *et al.* (2015), Once the unneeded is thrown away and set in order has taken place, it will be time for the sanitize phase. A clean workplace improves the morale of the workers so the workers feel better while working in the workstation. This has a direct positive impact on the performance of the workers. So in turn it helps increasing productivity and decreasing precious downtime. Chi *et al.* (2011) says that Standardization is the way to help the company to set the normal and it is possible to change these rules if it can be done better when they truly run first three Ss. So standardization or seiketsu is basically setting the normal condition of the organization and sustain or shitsuke is the 5S step introduced for raising awareness amongst workers. When the company has incorporated this criterion, it is easy for the new workers to get involved when they first come and try to be familiar with the structure in the company and also it is easy for the old workers to lead the new employees. Korkut *et al.* (2009) argues that the goal of this step is keeping and standardizing the present state and prevent the organization from going back to the past state. The necessary systems are formed in order to maintain the continuance of these good practices at the workplace.

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According to Michalska *et al.* (2007) implementation of 5S can result in increased efficiency. Furthermore safety can be ensured and reduction of the industry pollution can occur because of implementing 5S. This research clearly shows that training of workers regarding 5S rules is very essential. The so called check list for using inspection was executed and radar graph was used for the purpose of evaluating the workplace. According to Sheppard *et al.* (2008), the improvement requirement in different organizations may be affected by different complexity of systems. Furthermore, it is really important to know which method can help us begin the process of continuous improvement in order to achieve increased productivity and safety of the workplace through participation and knowledge of the involved staff. Engineers need to assess the conditions of a particular industry to find out the suitable plan of action. According to Zielenski *et al.* (2005), Japan emphasizes 5S as a strategy for business excellence, requiring participation both at work and in the home; in the other hand, 5S in the UK and US is viewed as a system or tool for the workplace only. In some countries, the implementation of 5S methodology is a simple way to comply with the minimum requirements for health and safety in the workplace. This relationship has led to the possibility of extending the scope of the 5S through the incorporation of a new S, 'safety and health'.

Lixia *et al.* (2011) pointed out the main misunderstandings and errors of Chinese enterprises in implementing 5S via investigations in manufacturing enterprises. This resulted from the failure of 5S management and proposed steps to carry out 5S programmers successfully, namely how to make 5S a culture. Ab Rahman *et al.* (2010) discussed the how implementation of 5S can vary in different companies based on their geographic location. According to Rojasa *et al.* (2013) small scale industries play an important role in the improvement of Indian economy. It has emerged as powerful tool in providing relatively larger employment next to agriculture. It contributes more than 50% in India's revenue. The small scale business can be benefitted in manufacturing and distribution sector if 5S is applied as an evident it is shown that the production increases. Salunkhe *et al.* (2009) discussed the effect 5S can have in a spare parts industry which can be easily contemplated. According to the paper implementation of 5S has saved as much as 10 minutes per hour. From their findings it is evident that setup time and town time have decreased to a great extent because of 5S. Kaushik Kumar *et al.* (2012) deal with the problem of how to implement 5S in general in a workplace. According to Khedkar *et al.* (2013) the implementation of 5S methodology in the S. P. Plastic Industry MIDC, Nagpur has improved the condition for the better. Photos of different parts of the industry are taken before and after the implementation of 5S which clearly show the improvement achieved by implementing this lean tool.

The main motivation behind this paper was to devise a process to decrease the amount of waste and waste related problems and thus helping to bring back the glory days of jute and stop the unemployment problem. The main objective behind this paper is to identify some waste related problems in Aleem Jute Mill to recommend 5S related process to solve the particular problems. What this paper aims to achieve is to not only recommend on how to implement 5S in Aleem Jute Mill but also point out when using these processes will be feasible. Another main reason behind this paper is to understand which 5S related process is appropriate for solving which waste related problem.

2. METHODOLOGY

According to Osada *et al.* (1989) the methodology used for the 5S implementation involves two phases and several stages for each element of the 5S, so it is especially important that all the organization levels have been integrated in the process. As we said above, the 5S are the initials of five Japanese words which represent each of the five stages that make up the methodology. Before diving into the problems and the solutions, the place where the study takes place needs to be described. Aleem Jute Mill is a government run Jute Mill in Khulna. It is situated on a vast land inside close to Fulbarigate in Khulna. It is infested with several waste related problems that factor into its annual loss of 170 million taka. Those problems can be attributed to using old fashioned processes to carry out daily work. Before implementing 5S in the Mill, it needs to be made sure that the 5S processes can actually make a difference by solving these waste related problems.

2.1 Current scenario of Aleem Jute Mills

Aleem Jute Mills is infested of several problems. But among them only a few were related to waste, some of those problems' photos along with their descriptions are described in the followings. To be perfectly candid these were just a few of the problems that were witnessed in Aleem Jute Mill. But these problems are to be mentioned in particular because these waste related problems and 5S can help take care of the problems. In Figure 1(a) it can be clearly seen that there is a bicycle inside the workstation. Having a completely unrelated object inside a workplace hinders productivity by wasting valuable space. However, one might argue that how does one bicycle cause so much trouble? Well this was just an example. There were several unrelated objects inside the workstation and their culmination is what causes the efficiency to decrease. In Figure 1(b), it is shown that unwanted objects are kept in an unordered fashion inside the workstation. Because of keeping those things

there the workers feel inconvenience while moving or conducting their daily business. In Figure 1(c) the transportation area inside the workstation is completely unmarked. This creates several problems in itself.

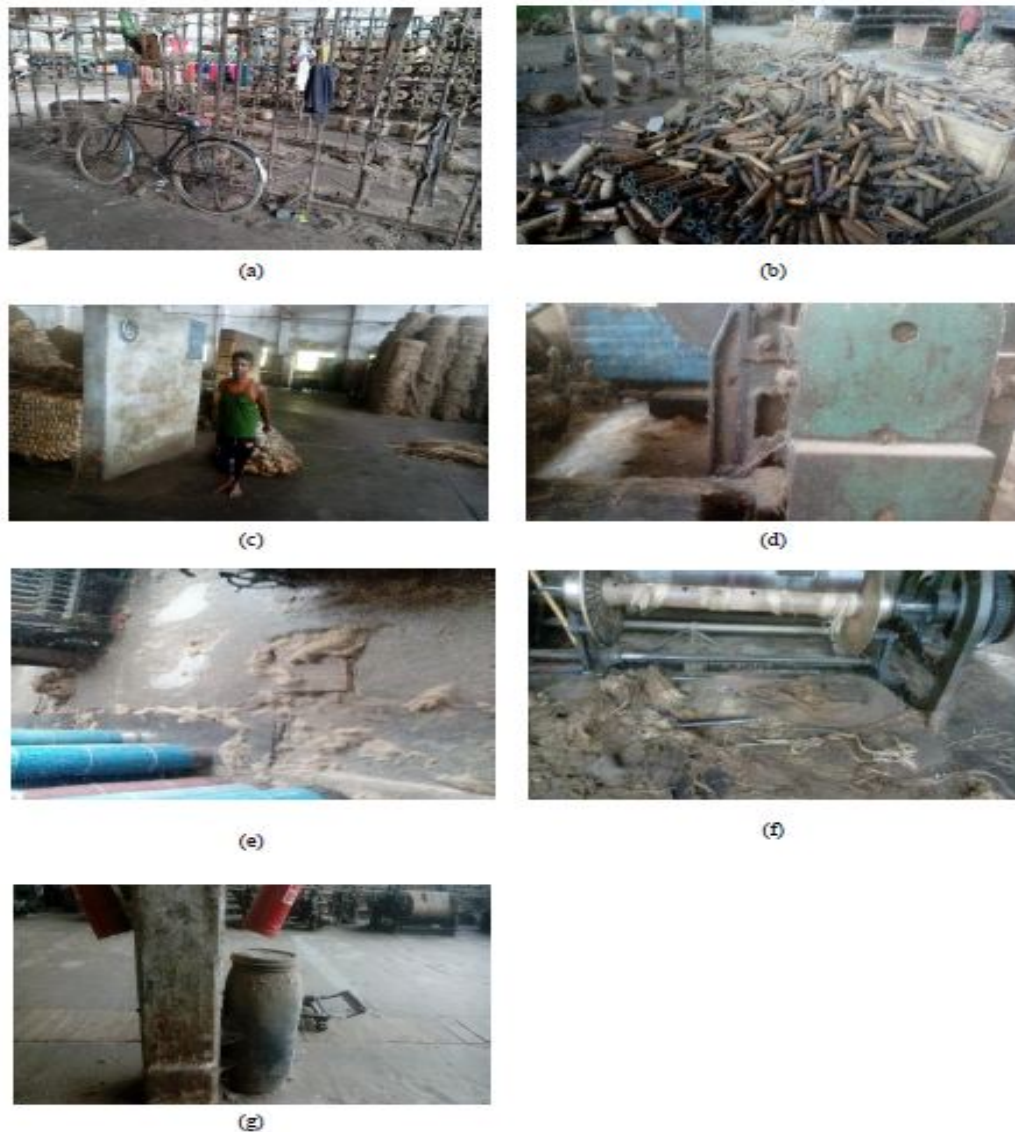


Figure 1: (a) Unrelated object in a workstation (b) Waste inside the workstation (c) Non highlighted transportation area (d) Unlabeled machine (e) Uncleansed floor (f) Waste close to a machine (g) Poor state of dustbin

Workers sometimes run into each other while transporting products. This may even cause accidents. An unlabeled machine as shown in the Figure 1(d) an unlabeled machine cause time loss for new workers who take a while to get used to machines. An unlabeled machine delays training which in turn hinders productivity. As it can be seen from Figure 1(e), the floor of Aleem Jute Mill was quite dirty. Now the dirt doesn't affect the production in a direct manner but it is a matter of common sense that a workspace with a dirt floor cause harm to the morale of the workers and which then results in catastrophic decrease in productivity. From Figure 1(f) it can be seen that the space where workers need to work in front of the machine is quite dirty and residual waste in front of the machine has stacked and rendered it almost useless as moving in front of the machine has been extremely difficult. Because of that the workers take a long time to do simple things with the machine in the picture. So naturally a bottleneck is created in that particular workstation. Which in turn decreases productivity. From Figure 1(g) it can be seen that the dustbin situation has been a disaster for Aleem Jute Mill. Only one dustbin has been kept for both liquid and solid waste. That has made the dustbins almost unusable. And because of that the workers don't feel obligated to dump their waste in the right place which decreases moral and thus decreases productivity to a certain extent.

The methodology adopted for the research work is a mixture of scenario analysis and action research. The idea at first was to identify the problems that can be solved using 5S and then recommending the proper 5S steps for solving said problems. And after the execution of said recommendations, the aim was to compare the state of the industry before and after implementing 5S to show that 5S is a practical tool. The workers and the management section of the industry were both questioned to determine which of the 5S steps are to be implemented in Aleem Jute mill.

3. IMPLEMENTATION OF 5S

The real scenario inside the jute mill is monitored in previous section. A survey has been done among 100 employees under some specific conditions respective to the each of 3S. This question has been arranged in such way that if response of any questions is found negative then we proceed to the implementation of that S. In all cases survey results found negative at least one of each questions in favor of the respective S. So even if one of the first 3S steps need to be implemented in a workplace Seiketsu and Shitsuke needs to be implemented.

Table 1: Survey Questions

5S	Survey Questions	Response
Seiri (Sort, Clearing, Classify)	Is this material needed?	
	Is this material needed at this quantity?	
	Does this material have to be located here?	Negative
Seiton (Straighten, Simplify, Set in order, Configure)	Are the machines in the sequence of production?	Positive
	Can the workers concerned with a machine reach it easily?	Negative
	Can all the materials be fit inside their allotted place?	Negative
Seiso (Sweep, shine, Scrub, Clean and Check)	Can the whole function of all the machines be implemented?	
	Do the workers take part in at least cleaning the machines?	
	Does the workplace seem healthy?	Negative
Seiketsu (Standardize, stabilize, Conformity)	Depend upon first 3S	
Shitsuke (Sustain, self-discipline, custom and practice)	Depend upon first 4S	

Workers were asked the questions under the 5S step seiri about every material on their workstation. The questions about a high percent of the materials on the workstation were negative. So the response was recorded as negative. The questions about the other two 5S steps were asked about the whole industry not just their own workstation. Whatever the majority of the workers answered was recorded as the response. For example 100 workers were asked if the machines were in the sequence of production according to them. Everyone answered in the positive. While workers were asked if the machines they worked with had worked properly. 94 out of 100 workers answered in the negative. So negative is recorded as the response for those questions. And similarly survey took place for all the questions and the responses were recorded.

3.1 Seiri (Sort, Clearing, Classify)

It is known that Seiri deals with unwanted objects inside the workstation. The main objective of Seiri is to get rid of unproductive things from the workplace. Unproductive objects may be of several kinds. The object may not be needed at all, may not be needed right away or may not be needed at the quantity it is present. In order to implement the red tag method for Seiri in Aleem Jute Mill A “red tag” needs to be stuck to the unrelated material in the workspace and after a certain amount of time the objects with the red tags need to be brought to a central red tag area where they are processed as in it is determined if they are needed at all. The purpose of red tagging was to identify unnecessary items that occupied space in the storage department. The strategy is to create more space by better organizing the items and equipment in permanent storage places or disposing of the item if it is not needed. More space means more area for production so evidently more space means more profit.



Figure 2: Sample of typical Red Tag

3.2 Seiton (Straighten, Simplify, Set in order, Configure)

Sequencing machines doesn't need to be implemented in Aleem Jute Mill as the machines are already sequenced according to their work sequence. For easy recognition of each machine, it is mandatory that each and every machine is properly labeled. Sometimes their operating process is also schemed with the machine. In Aleem Jute Mill none of the machines are labeled. The machine names and a brief working procedure of machines should be written on the machines for saving valuable time.

Choosing a place for hand tools helps workers preserve time. Shadow board fulfils this need by containing outlines for every tool. So it can be easily understood if a tool has been replaced or lost. Implementing shadow board technique is extremely important in Aleem Jute Mill. There is several hand tools used throughout the workstation and they are not kept in an organized order. Keeping a couple of shadow boards inside the workstation could help the worker easily to reach the machine. Furthermore, if the transported area is highlighted, there is little chance of being interrupted by other workers on the way.

3.3 Seiso (Sweep, Shine, Scrub, Clean and Check)

The major reason behind a dirty workplace is the workers' lack of knowledge on the subject of cleaning tools and where they are situated. So in order to keep the workplace clean and healthy workers must be taught where the cleaners are situated. In Aleem Jute Mill, dusters and dustbins should be well marked for the workers to see in case they need to clean. Also the workers of Aleem Jute Mill should be given special training in cleaning delicate machine parts. Proper dustbins may help to get rid of problem regarding uncleansed floor and poor state of dustbin.

Workers may argue that they are not paid for cleaning the workplace but in reality they are most suited for performing the cleaning job on the machines as they are well experienced on that field. So they must be persuaded to clean the workplace and the machines. In Aleem Jute Mill, workers don't take part in cleaning the machines, which in turn may cause loss of property worth several thousand taka. In order to persuade workers in cleaning, Aleem Jute Mill should introduce incentive for workers to make sure they go through with the cleaning.

Shine won't really come in handy if it is not done in the right process. Every organization is different and their workstations are also vastly dissimilar. So every workstation needs to have its own cleaning process. The cleaning process must be set up according to the followings that can help to get rid of the problem related to waste close to machine.

- Organizations
- Product produced
- Recycle policy
- Machines used however in Aleem Jute Mill, these few actions must be taken to implement Seiso
- About 5 minutes should be given behind the cleaning of each machine
- Machines that have lower productivity should be given more emphasize at the time of cleaning
- Every worker should be provided a thorough cleaning schedule
- The cleanliness standard must be set beforehand

3.4 Seiketsu (Standardize, Stabilize, Conformity)

Everyone must know exactly what they are responsible for doing and exactly when, this is a very important step in standardizing and Aleem Jute Mill already implements it well. In order to make sure that the workers are performing according to 5s instructions, the management has to check on how well working conditions are being maintained Audit must be done at regular interval to check the working condition. In Aleem Jute Mill frequent rounds by management are made but they are more concerned with knowing how the machine is working rather than how 5S is being implemented.

Table 2: Using 5W2H process to solve a problem

What	Is wrong? (What the problem appears to be)
Who	Is charge? (Regarding whom the problem has appeared)
Where	Is the problem? (As in which workstation does the problem occur)
Why	Did the problem occur? (knowing what went wrong and needs to be fixed)
When	Did the problem first take place? (knowing whether time has anything to do with the occurrence of the problem)
How	Can the problem be solved? (possible solutions)

How much Could it cost? (choosing the most economically profitable solution)

Obviously workplaces are far from being in ideal conditions. So workers must be taught what the ideal condition is so that they can distinguish between ideal and existing condition. After that the workers will try and find a way to improve the working condition to ideal conditions. In Aleem Jute Mill workers could implement the 5W2H process to tackle difficult problems. An example is given below:

3.5 Shitsuke (Sustain, Self-discipline, Custom and Practice)

Workers may be reluctant to use 5S methodology in their day to day life. Because they might think that it will increase their workload. They have to realize that 5S is not only a good way of doing the job but in the long run it will decrease the workload.



Figure 3: A typical 5S poster

Verily, Workers of Aleem Jute Mill work according to their common sense. What they should do is use motion study in favor of them to do jobs more efficiently. Workers of Aleem Jute Mill must follow the following guidelines:

- Start and end each motion with both hands moving at once
- Both arms have to move symmetrically and in opposite directions
- Movement must be done with a steady rhythm
- Materials and tools should be kept in front
- A comfortable posture must be maintained.

3.6 5S RECOMMENDED SOLUTIONS FOR THE IDENTIFIED PROBLEMS

5S Recommended Solutions for the identified problems are given in table 3.

Table 3: Summary of problem solving via 5Simplementation

5S step needed to solve the problem	Explanation
Seiri	➤ By employing red tags which is a Seiri process, the workplace can be less congested with unrelated materials. So the problem in Figure 1(a) will be solved. ➤ By employing JIT in the organization, the amount of waste will decrease to an extent. Thus solving the problem shown in Figure 1(b).
Seiton	➤ If transportations area was highlighted, the movement of the workers would have been swifter. ➤ By labeling the machines properly, the organizations save precious setup time. Also new workers find it easy to work when all the machines are labeled.
Seiso	➤ If the cleaning tools such as brooms are kept nearby, the floor would not be filled with dirt like it is shown in Figure 1(e). ➤ If the workers took part in cleaning the place in machine's proximity wouldn't be filled with waste like it is in Figure 1(f). ➤ The problem described in Figure 1(g) is related to properly using the dustbin and using one for wet and one for solid waste would get rid of the problem.

This is a summary of recommendation for using 5S in Aleem Jute Mill. What this section aims to do is to link the previously identified problems with the 5S steps. Meaning this section actually shows which 5S steps will get rid of which waste related problems. However in order to sound less repetitive Seiketsu and Shitsuke's role hasn't been revealed. That is because those two steps (Seiketsu and Shitsuke) play a vital role in solving all 7 problems. Because of employing Seiketsu each problem will fail to appear on a repetitive basis and because of Shitsuke using 5S will become a habit to the workers and that will have a great impact in solving the above mentioned problems.

4. CONCLUSIONS

Another name for 5S is the house cleaning tool. But it is far more than that- if properly implemented it has the potential to reduce floor space, waste, setup time and down time. The aim of this research work was to find out which of the problems in the factory (Aleem Jute mill) can be solved using 5S. After that a survey was conducted to find out which of the 5S steps need to be implemented in the factory. Then the research paper aimed to recommend several actions to solve the aforementioned problems. Which of the actions can directly impact which problem is discussed in the report. Although very few of the recommendations were executed, slight improvement was observed in the overall condition of the factory after the implementation of 5S.

5. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORK

The biggest limitation was that not all the recommended actions were implemented by the workers and the management. It would be highly recommended for the future to male cost analysis of the implementation of 5S. For example finding out how much implementation of 5S could cost the factory and how much profit can be achieved by the execution of 5S.

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