Implementing 5S Strategy in an Assembly Line

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Abstract

In today's competitive world of manufacturing, the companies take on a number of policies and methodologies in order to make their workplace more effective and efficient. One of the major tools among them is 5S. The first step to making an organization more productive is the implementation of the 5S methodology. 5S is a housekeeping and workplace organization method which stands for 5 Japanese words which mean Sort, Set in order, Shine, Standardize, Sustain. It was developed in Japan so as to facilitate just-in-time manufacturing. 5S, though had started in manufacturing, is now applied in a myriad of workplaces and organizations like schools, hotels, hospitals, corporate offices and so on. "A place for everything and everything in its place" is a popular quote that serves as a guideline in implementation of 5S. This paper explains the concepts of 5S in detail. The paper considers a particular problem in a construction equipment assembly line and explains the difficulties caused by the problems. Later, the problems are dealt with by illustrating the types of solutions that help us achieve 5S in a workplace and discuss how the particular solution can be successful in eradicating the problem present.

KeyWords: *Lean5S, Assembly line, Layout, Total Quality Management, Productivity.*

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1. INTRODUCTION AND LITERATURE SURVEY

Modern day manufacturing companies thrive to reach maximum productivity through a myriad of tools, techniques and policies. One of the major tools used by most of the leading manufactures in the world is "Lean". The ideology of lean is reducing any sort of waste in any company in order to satisfy the customers' needs. The application of lean in manufacturing is called "Lean Manufacturing". Lean manufacturing makes use of variety of tools, one of which is the 5S approach. Takashi Osada[1] et al defined the 5S's as seiri, seiton, seiso, seiketsu, shitsuke which translates to sort, set in order, shine, standardize, sustain.

Sort: Keeping only the essential materials that are needed and getting rid of the unnecessary materials.

Set in order: Keeping all the required materials and tools in its place for easier accessibility.

Shine: Keeping the work area neat and tidy to ensure effective work environment.

Standardize: Setting standards for the processes.

Sustain: Maintain the implemented practices by conducting audits and inspections regularly.

1.1 Construction Equipment:

Construction Equipments are automobiles and locomotive machines used for construction purposes. The organization under study manufactures Road Machinery and Excavators.

1.1.1 Pavers: Pavers are concrete paving equipment used in the even distribution of concrete during the construction of roads.

1.1.2 Compactors: Compactors are road machines used to compact the materials laid over for the construction of roads.

1.1.3 Excavators: Excavators are Earth moving Equipment used to dig the ground during the initial stages of construction.

2.PROBLEM ENVIRONMENT

2.1Excavator Assembly Line

The assembly line of Excavators at the organization under study consists of a total of 9 stations and 15 feeders which consists of further sub-assemblies. Owing to the massive size of excavators, the plant is significantly big. The layouts of stations are aligned in a line with the feeders on each station's side wherever the component is necessary. A detailed flow chart of the plant is shown in Fig. 1.

2.2Problem Statement

The problem is observed in two following areas:

2.2.1 Tool Box

In various stations and feeders in the Excavator Assembly line, particularly in the station 6 where the upper frame is assembled to the lower frame, the tools are used highly frequently. The tool boxes are very compact and there are unused items in the tool box. In addition to that there is not enough space to keep certain tools. This is leading to frequent misplacement of tools and also in some cases dropping of the tools. This can lead to defects in the machine parts leading to repairs, which is a Non-Value Added Activity. When the tools are misplaced, there arises a delay in the process which decreases the productivity of the plant significantly.

2.2.2 Feeder Box

Excavator assembly involves usage of a myriad of fasteners such as bolts, nuts, screws, etc. Moving to the inventory stand every time to collect fasteners is inefficient. Hence the workers have made themselves a small box known as feeder box. The feeder boxes are very helpful as it significantly reduces movement of workers. But the feeder boxes present at the moment are made by the workers in a very primitive manner without proper sections. The parts are tending to get mixed together and this leads to additional delay in finding the parts. The current feeder boxes are not clean and do not have a particular place for each part. This causes the parts to be frequently dropped while searching for them which lead to defects.

3.EXCAVATOR ASSEMBLY LINE FLOW CHART

The following figure shows the flow chart of the excavator assembly line.

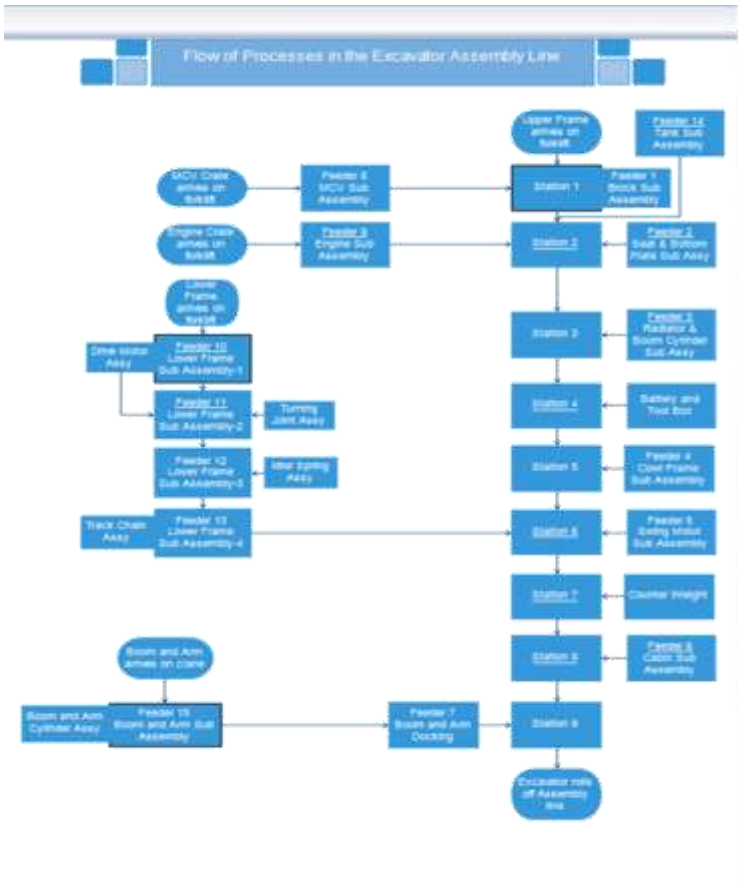

Fig. 1 Process flow in Excavator Assembly Line

4. OBSERVATIONS OF PROBLEMS

One of the major problems observed is the lack of organization of tools and inventories in the tool box and feeder box that are being used by many industries. This lack of organization leads to chaos in the middle of production or assembly. This violates the "Set in Order" strategy under 5S.

4.1Tool Box

The following are the problems observed due to unorganized tool boxes in industries

• The movement of workers is increased because there isn't enough space to hold all the required tools.

• There are no proper compartments to hold all the tools in place.

• The height of the tool box is less and therefore the larger tools cannot be carried in them.

• The tools are all stacked on top of each other and hence the worker spends more time in looking for the tool.

• The handle for the tool box is not stable and hence the tools may be dropped causing a safety issue.

Fig. 2 Present Tool Box

4.2 Feeder Box

The following are the problems observed due to unorganized feeder boxes in industries.

• There is no proper space for accommodation of parts and hence causing the worker to move multiple times to acquire more parts.

• The compartments in the tool boxes are not sufficient for accommodating all the parts.

• The height of the tool box is less and therefore larger parts cannot be carried in it.

• The tool box handle is not comfortable to carry and hence causing fatigue to the worker.

Fig. 3 Present Feeder Box

5. SOLUTIONS PROPOSED

Based on the observations made, the following are some of the solutions proposed in order to raise the standards of 5S and improve productivity.

5.1 Tool Box

Designing a new and improved tool box can eradicate the problems that are occurred.

• Sufficient space to accommodate all the required tools so that the worker does not have to move multiple times to gather tools.

• Proper compartments to hold all the tools in place.

• Providing sufficient height to accommodate the larger tools.

• Providing a stable handle to carry the tool box to prevent dropping of tools.

Fig 4. Proposed Tool Box

5.2 Feeder Box

Designing a new and improved feeder box can eradicate the problems that are occurred.

• Sufficient space to accommodate all the required parts and hence reducing the workers movement.

• Providing larger compartments to accommodate more number of parts.

• Increasing the height of the feeder box which allows the worker to carry larger tools.

• Providing a stable handle for the feeder box to avoid fatigue to the worker while carrying it.

Fig 5. Proposed Feeder Box

CONCLUSION

All the problems caused due to the lack of organization in the tool box and the feeder box can be eradicated by implementing the solutions that have been proposed and therefore eliminating the non-value added activities and in turn increasing the productivity of the manufacturing industry**.**

REFERENCES

[1] Osada, Takashi (1995). The 5S's: Five keys to a Total Quality Environment. US: Asian Productivity Organization.

2. Maciej Piekowski's paper on "Waste Measurement techniques for companies" December 1st of 2014

3. Prof. Rene T Domingo's paper on "Identifying and eliminating the seven wastes or MUDA"

4. D. Rajenthirakumar and P.R. Thyla's paper on "Transformation to Lean Manufacturing By an Automative Component Manufacturing Company" – December 2011.

5. K.Hemanand and S.Chidambara Raja's paper on "Improving Productivity of Manufacturing Division using lean concepts and Development of Material Gravity Feeder – A Case Study" – December 2012

6. Rahul and J.S. Kaler's paper on "Eradication of Productivity Related Problems Through Lean Principles In Integrated Manufacturing Environment" – June 2013