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Review Paper on "Productivity Improvement using Kaizen - MUDA Elimination"

Sudhanshu Shrivastava[1], Hemant Jain[2]

[1]PG Scholar, IEM, Department of Mechanical Engineering, Babulal Tarabai Institute of Research and Technology, Sagar 470002, Madhya Pradesh, India

[2]Assistant Professor, IEM, Department of Mechanical Engineering, Babulal Tarabai Institute of Research and Technology, Sagar 470002, Madhya Pradesh, India

Abstract: ***Today industries are looking to grow by drastic speed by using number of new facilities and mordern developments available. Every organisation needs to enhance productivity and it is possible either by identify the wastages in current working processes and try to eliminate them by employing several new technologies or equipment in good condition with man power itself.To execute this, industries should totally wipe out the wasted or non-value adding and avoidable activities from different processes. MUDA elimination is one of the techniques of doing this. This paper focuses on the application of this muda elimination technique in bulk coal handling (unloading of coal) at a CHP of a thermal power station. As a study of the application of MUDA elimination in CHP on coal unloading method, to remove the unusable activities to optimize the existing unloading process and increase the productivity by decreasing different types of muda.***

Keywords: Productivity**,** manpower, Avoidable non-value adding activities**,** MUDA, Bulk Coal Handling**,** CHP, Thermal Power Station.

1. Introduction

In Japanese "Kaizen" means continuous improvement, which applies to all, both managers and employees. Kaizen is a philosophy of management, in the center of which is a continuous, systematic and implemented step by step improvement that takes place with the involvement of all employees [1].Lean management is the way to achieve the perfect level of organization through gradual and ongoing processes, which is characteristic for continuous improve approach, eliminate waste and losses in all aspect of business.[2] Lean Management is currently the most acceptable and dominating management philosophies, both in industrial and service sectors. The main and appropriate reason for such a success is its simplicity in implementation. Its whole concept is laid on a common sense idea of so called waste (Muda). "Muda Elimination" is one of technique of lean management. Which is used to identify the waste, eliminate waste, optimize delivery time and reduce the cost of operation or process. Muda elimination is a dynamic and systematic approach of identifying and reducing / eliminating waste in processes by continuous improvement for reducing the cost of operation by doing everything more efficiently. Eliminating muda is one of the important philosophies of Kaizen. In this way muda elimination is one of the tool of lean management or kaizen by which, optimization of production processes and overall improvement of organizational productivity can be achieved.

1.1 Muda

Muda means "Waste".Muda is any constraint or impediment that causes waste to occur. So muda elimination can be easily understood by an "on going" and systematic reduction or elimination of waste. [3].
There are two types of Muda:

a) **Muda Type I:** Non value-adding, but necessary for end-customers. These activities are usually harder to eliminate because while classified as non-value adding, they may still be necessary.
b) **Muda Type II:** Non value-adding and unnecessary for end-customers. These contribute to waste, incur hidden costs, and should be eliminated. [4] These are those activities which need to identify from different processes and tries to eliminate by adopting new techniques.

Examples: -

Example 1: -
In metal cutting operation when the work piece is ductile and perfectly heat dissipated in nature while the cutting tool is not sufficiently heat dissipating. So during cutting operation, operator uses coolant to perform operations.

Figure 1: Coolant using while cutting

In this process the starting of coolant flow operation not a value adding activity to the end product of the process but it

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is necessary to maintain the cutting tool at or below a certain temperature while operation that's why operator uses to use coolant in cutting operation to maintain the tool life.

This is the example of **Muda Type I**. In which flow of coolant is non value-adding, but necessary operation.

Example 2: -
In an organization operators and workers are allowed to take an one half an hour lunch break and two 15 minutes tea breaks in a working shift. During breaks operators used to go to canteen area and take their tea and snacks there. In this he wanders here and there and also disturbs others to perform operations. As a result of this the management decided to appoint a tea distributor in these two tea and snack breaks and also to close canteen in this time of tea breaks. As this decision, the unwanted motion of an operator got limited which on the other hand also improves the work actual timing in a shift.

This is the example of **Muda Type II**. In which wandering of operators during break timing is non value-adding and unnecessary for end-customers. These contribute to waste, incur hidden costs.

2. History

Muda is a Japanese word meaning 'futility' uselessness, wastefulness and is a key concept in lean process thinking like Toyota Production System as one of the three types of deviation from optimal allocation of resources .waste reduction is an effective way to increase profitability. From an end customer point of view, Value added work is any activity that produces goods or provides a service for which a customer is willing to pay. [1] [5]

The origins of MUDA, OPTIMUM or seven wastes were from the Toyota engineer Taiichi Ohho who, in Toyota Production System – Productivity Press 1988, described what he felt were the key wastes that occurred in manufacturing. The original title used by Ohno were the waste of overproduction, inventory, waiting, motion, transportation, defect and processing but hopefully using OPTIMUM may make the seven titles a little more memorable.

OPTIMUM – The Seven Wastes (Muda)
OPTIMUM or MUDA can be defined as ;

a. The waste of Overproduction
b. The waste of Processing
c. The waste of Time/Waiting
d. The waste of Inventory
e. The waste of Motion
f. The waste of Unacceptable items (defects)
g. The waste of Movement (transportation) [6]

a) Overproduction muda – Means producing more product than need to make.

b) Processing muda - Waste of processing items beyond what the customer desires. Selection of inappropriate manufacturing process leads to increase this waste.

c) Time/Waiting muda - In an organization, waiting is prone to happen in several areas such as marketing, production, design and administration. This waste is called waiting or time muda.

d) Inventory muda –All types of inventories occurs in industry are consider as a waste unless the inventory translates straight into sales.

e) Motion muda - The unneeded movement of workers searching for materials, tools and components or around the working machine called and motion muda.

f) Unacceptable items muda - This waste is generally called defect or scrap. Product having any defect also a type of waste.

g) The waste of Transportation - This is the waste happens when finished products are transferred to the customer and between processing of production steps, when products or parts moving around the production line.

3. Need

Kaizen, a Japanese term formed by two words, i.e., 'Kai' denoting 'change' and 'Zen' denoting 'good' that is, good change. Kaizen philosophy was introduced by Sakichi Toyoda, founder of Toyota in the year 1930. The philosophy emphasizes upon innovative practices at work place by continuous improvement in quality, technology, processes, company culture, productivity, safety and leadership. The Key to Japan's Competitive Success which gave a popular meaning to kaizen that is, a continual and incremental improvement process. Imai summarized the kaizen concept in terms of kaizen pillars and kaizen umbrella. Kaizen pillars include three standardized tools namely, housekeeping (5S methodology), muda/waste elimination and standardization. [7]

It is obvious that all types of wastes are dependent. Every one of seven wastes influences or vary the other six wastes. Similarly, each type of waste is influenced by others and resulting in increasing the production cost. [8]

For example, if our existing production process or operation contains more number of non-value adding processes than, it

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is sure that over-processing will come to provide the product the required working ability like shape, size or functionality.

Just like this the waiting time and processing time to complete one job increases automatically. So by this it is clear that the complexity of relation between each muda is depends on the type of organization and its working process and management activity. Muda elimination is one of the "good" presentations kaizen, or continuous improvement Because of its preventive nature. A muda Device or solution is a mechanism or an idea that or avoid the waste of being done either eliminate the wastes or minimizes it to the negligible values.

4. Literature Review

Every organization is working to improve its productivity in this competitive world. Lean method of management is one of the best methods to minimize unwanted activities or wastes for doing this. Muda elimination of this lean management is one of the techniques adopted by an automobile parts manufacturing company like some critical components of an IC engine. In this study, main objective was to identify key areas of non-value added activities and then to propose required changes to reduce throughput time based on the principles of lean manufacturing. Researchers did this study by the use of muda elimination and proposed some changes that can minimize the throughput time and increases the productivity as well. [9]

In a pump manufacturing industry researchers want to reduce manufacturing lead time and by that to improve productivity by doing this. they used lean manufacturing and Basic MOST technique to identify non value adding activities and found various muda like idel muda, transport muda, processing muda and overproduction muda in an existing process after analyzing the recorder data They suggested a solution to remove these muda to reduce lead time and improve productivity. In this way by the use of muda elimination technique the suggest a new improved process with some changes in the existing one to gain more productivity. [10]

5. Research Methodology

Each and Every organization is continuously working to find and remove the unwanted or non-value adding activity from their working process. Like that I found a process of coal unloading in a thermal power plant which is responsible for loss of some revenue in terms of unused labor and exceeding by the given time to unload coal from the rail rack. This study is being in the Coal Handling Plant (CHP). In this unloading process company using wagon tippler technique to unload the rack in which one by one each box of the rack unclamped from the rack and fitted to the tippler to tilt it at the required angle. After the box get tilt at the required preset angle the coal inside the box dumped to the mesh and the remaining coal inside the box is being unloaded by man power or labor. When all the coal from the box get empty to the grid the labor broke it to the perfect size so that all the coal of the box get into the underground inventory and conveyor area. Parallel to this the box of the rack moved to the previous situation and fitted to the rail rack again, after this the rack moved forward and the next box of the rack come to unload. And same process continues till the whole rack to get unloads. In this unloading process when the movement of the box of coal from unclamping from the rack and to the re-clamping to the rack the labor is free from work and company is not able to use this man power in this period along with this, the timing of the rack unloading is depends on the quality of coal because some parts of it is pulled and break by labors. Sometimes it take more time to unload the rack that's by it costs to company to use of railway rack more than the given time limit. So we are identifying and eliminating the non-value adding but avoidable activities from this process and want to minimize wastage percentage by using lean management or muda elimination method.

6. Expected Overcome

The aim of Muda method is to eliminate or minimize unwanted or non-value adding activities or waste in manufacturing processes and management. The main idea of this method is preventing causes, which may result in producing waste in the existing process and use or suggest relatively simple solution system to eliminate the waste from the system. According to the advantages which we found on the study we can easily increase the CHP revenue by 10-15 crores by using this technique. The muda is also helping us to decreasing the amount of work need to implement or finish any process. We expect that muda elimination will help to improve the process or operational time which lastly improves productivity of the coal handling plant itself and of overall plant as well.

Step by step approach.

1) Identify the Process need to be examined – First step is to choose the process seems having any waste or other faults. Then we marked or pick this process to study.
2) Measurement and record the related data – After selection of the process, we measures different types of data related to that process like time taken by different activities, material consumption, machine utilization and other factors as well.
3) Analyse the recorded data – In this step we starts analysing the pre-recorded data and understand the process thoroughly.
4) Identify the waste (muda) in this existing system – After proper understanding of the process we starts to identify the muda inside the selected process.
5) Find the best way to eliminate muda – In this process we gone through all available ways to reduce or eliminate these wastes identified in previous step.
6) Proposal of redesigning of the system or process – If needed, we suggests the redesigning of process or layout to eliminate muda.

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Author Profile

Sudhanshu Shrivastava received the B.E. degree in Mechanical Engineering from Shri Ram Institute of technology Jabalpur in 2015. During 2016-2018, He worked as quality engineer in tata consultancy services. He is now pursuing his PG course in industrial engineering and management from BTIRT sagar470002 (M.P.).

Hemant jain BE (Mechanical) MTECH (IEM) working as a Astt. Prof. In Mechanical engineering department in BTIRT Sagar M.P. since 2008.

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