Managing a Manufacturing System with Integration of Walking Worker and Lean Thinking

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Abstract—A product goes through various processes in a production flow which is also known as assembly line in manufacturing process management. Toyota created a new concept which is known as lean concept in manufacturing industry. Today it is the leading model in manufacturing plants through the globe. The linear walking worker assembly line is a flexible assembly system where each worker travels down the line carrying out each assembly task at each station; and each worker accomplishes the assembly of a unit from start to finish. This paper attempts to combine the flexibility of the walking worker and lean in order to quantify the benefits from applying the shop floor principles of lean management.

Keywords—Toyota Production System, TPS, Lean Manufacturing, Walking Worker, Lean Management, Management, Linear Assembly Lines, U-shaped Assembly Lines, Shop Floor Management

I. INTRODUCTION TO LEAN CONCEPT

LEAN Manufacturing refers to a term/concept promoted by Toyota company (Japan), which emphasizes on the “flow” of work/smoothness of the work during the manufacturing processes. “Mura” is a Japanese expression which represents “Unevenness”. Lean Manufacturing processes, adopted and promoted by Toyota, ensure to eliminate “Mura”, thereby, increasing the efficiency at the workplace. The term was originated by John Krafcik in 1988 during his thesis at MIT. Based on his research, a program titled as (International Motor Vehicle Program) IMVP was initiated at MIT [1]. A second conception about Lean Concept of Management is about the generalization of this term for many professionals, which stand for identifying tools and eliminating them steadily and slowly, in order to increase the efficiency at the workplace. The difference between these two concepts lies in the implementation of each of them. Quality problems are exposed as a result of application of an even process flow, which results in eliminating of waste. Improving quality refers to finding and eliminating waste in a process flow. However, at the other end, focusing on waste and bypassing the process flow at the first stage may shift the focus to another direction and does not allow the same quality to be achieved.

II. SHOP FLOOR MANAGEMENT

A. Importance of Shop Floor Management

Rainer Shmueckle, of DMC stated, “With Shop Floor Management, we stabilize our processes and bring leadership and co-operation in production to a new level.”[2]

Shop Floor Management ensures the:

- Basis for the deployment of lean concept of management
- Dialogue between worker and the manager
- Manager being in control of the floor

B. Principles of Shop Floor Management

Effectiveness of the Shop Floor Management is due to its effective and simple techniques. Once, put into action, the principles become the gateways to the elimination of waste from the workplace and increasing efficiency of the workforce. Shop Floor Principles are as follows:

- Shop Floor is the Core
- Manage at the shop floor, not at the office
- Make data visual and transparent. Commit to action plans
- Control standards and improve systematically
- Managers check critical processes and offer support to the workers
- Managers Support problem solving through escalating process
Multi-tasksed workers are the heart and soul of the lean manufacturing system. They are required to staff the manufacturing facilities in order to improve the work performance as assured by the lean concept of manufacturing. Designing facilities for Lean necessitates an arrangement in which only few people can perform their tasks. This requires all of them to be multi-tasked and perform duties simultaneously in a way that concept of implementing lean management is not lost. Multi-skilled workers can be explained as the core of flexibility promised by Lean concept of manufacturing. [3] A normal western manufacturing plant conceives problems as a thing to hide or shred off. However, at Toyota, the lean manufacturing concept follows an entirely different technique towards problem solving. Line operators are allowed to full down the entire assembly lines, once a problem is highlighted. Problem solving is conceived as a way to improve the system at TPS. And the whole process of escalation of problem to its remedy can only be achieved through multi-skilled workers, trained effectively in a lean system in the given meline set by TPS.

IV. Analysis of Linear Assembly Lines and Walking Workers

Above discussion highlights the emphasis of multi-tasking in a Lean Manufacturing Environment. However, in order to successfully implement Lean Environment and develop multi-tasked teams, we have to carefully analyze the role of linear walking assembly lines.

A study by Qian Wang, Sylvain Lassalle, Antony R. Mileham, and Geraint W. Owen showed the impacts of Mileham, and Geraint W. Owen showed the impacts of walking workers and linear assembly lines on the production time improvements in relation to the workers with equal and
A. Walking Workers and U-Shaped Assembly Lines

Advocates of the lean manufacturing and just-in-time (JIT) viewpoints state that U-shaped assembly systems present more advantages than a few benefits over conventional straight-line layouts. Especially, upgrading in labor efficiency. U Assembly Lines have turned up toadmirable placethrough offering the keyadvantages of evened workload, multi-skilled workforce and other standards of the JIT way of life. Numerousinvestigators have the same opinion that U-lines are one of the most imperative constituents for a triumphant execution of JIT production systems. U-line is alike the straight line for any distribution of jobs or machines to workers so long as a worker does not work mutually with their stations (avoid crossing the loop). The quantity of workers involved on a U line is never additionalto that to the straight line for any distribution of jobs or machines to walking workers over fixed position workers include: [8]

- Faster processing time, less material handling, less work-in-process inventory, and reduced setup time, all of which reduce costs.
- Providing some degree of increased flexibility. This aspect is greatly enhanced with FMSs
- More autonomy and job ownership.

V. CONCLUSION

Lean Manufacturing Process invented by Toyota, also known as TPS has become a standard in vehicle manufacturing industry. Many western vehicle manufacturers including Mercedes-Benz, BMW, Ford, etc. are applying TPS techniques of Lean Concept of Management in manufacturing and have increased their efficiency many folds through this technique. Shop Floor principles are the basis of implementation of Lean manufacturing concept and they allow the managers and teams to perform with highest interaction as well as highest efficiency. Lean Manufacturing utilizes the concept of multi-tasked workers, who work across a linear assembly line to produce the finished goods, also called Walking Workers. These Walking Workers play a key role in the execution of the system through their multi-tasking. Their job descriptions and skillset, applied under the Lean concept of manufacturing as allowed the companies to substantially gain additional benefits and save huge costs during the manufacturing processes. It has allowed the company to enjoy faster processing times and reduce cost of inventory and time required for manufacturing a material with highest degree of customizations as in the case of Dell, USA. Lean Manufacturing concept has also been applied in other manufacturing industries apart from automobiles and has shown substantial results. On the other hand, it has improved the communication between managers and workers as well as allowing the workers to get rid of their boring routines and repetitive functions and perform in the production process on a wider scale. Also, it has helped enhance the skills of the workers and have allowed the manufacturing processes to enjoy maximum utilization of workers’ abilities through reducing time wastage and fast communication infrastructure.

REFERENCES