A Review on Investigation and Enhancement in Productivity in Manufacturing Industry through Lean Principle

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Abstract: In competitive environment lean manufacturing is necessary in every industry. Lean production is a standard manufacturing mode of the 21st century. Lean manufacturing have various synonyms like lean management, lean production, It is very use full techniques for reduce the flow of non-value added time. Lean manufacturing is a philosophy to reduce the time between customer order and products are ready for the delivery by eliminating waste. Waste (muda) is a serious problem in to the industry it is creates a non-value added services and poor quality of the product. Wastes are seven type occurs in industry 1) transport,2) inventory,3)motion,4) waiting,5) over production,6) over processing,7) defect. It is eliminate with the help of lean manufacturing. It is an integrated system that gives production of goods/services with minimum buffering costs. This paper describes a preliminary study in developing a conceptual model to measure leanness in manufacturing industry. Literature survey, books and report analysis contribute to the main preliminary analysis of this study. The most common tools or techniques and their usefulness have been investigated.

Keywords: lean manufacturing, kaizen, kanban, JIT, Productivity, Waste elimination.

Introduction

Manufacturing firms operating in rapidly changing and highly competitive markets have embraced the continuous process improvement mind set. They have worked to improve quality, flexibility and customer response time using the principles of Lean thinking. To reach its potential, lean must be adopted as a holistic business strategy, rather than an activity isolated in operations. The lean enterprise calls for the integration of lean practices across operations and other business functions. As a critical component for achieving financial control, management accounting practices (MAP) need to be adjusted to meet the demands and objectives of lean organizations. Our aim is to help both researchers and practitioners better understand how lean MAP can support operations personnel with their internal decision making, operations executives and business leaders in their objective of increasing lean operations performance as part of a holistic lean enterprise strategy. One can document that, the extent of lean manufacturing implementation is associated with the use of lean MAP, and further that, the lean MAP are related in a systematic way: simplified and strategically aligned MAP positively influences the use of value stream costing, which in turn positively influences the use of visual performance measures. One can also find that, the extent of lean manufacturing practices is directly related to operations performance. More importantly, lean manufacturing practices also indirectly affect operations performance through lean MAP. These findings are consistent with the notion that, lean thinking is a holistic business strategy.

Lean Manufacturing Tools

There are various type of lean tools are available and use this tools and principal, like cellular manufacturing, JIT, continuous improvement, production smoothing, standardization of work, total productive maintenance(TPM), SMED, etc.. We are understood about lean tool one by one in shortly.

Cellular manufacturing

Cellular manufacturing reduce the transportation waste. And reduce the inventory. Cellular manufacturing also says "one piece flow" process. It is difficult to fulfil the customer requirement with traditional product line, so using the U- shape product line replace traditional product line.

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Just in time (JIT)

Just in time is a heart of the lean manufacturing. It's associated with lean techniques. Just in time production gives right part at the right place at right time.

Kanban system, Production smoothing, and setup time reduction are component of any JIT system. "kanban" is a Japanies word which means card or signal. Which process is running and give the basic information about manufacturing.

There are two types of kanban.

- Single Card Kanban System and
- Double Card Kanban System

Single Card Kanban System

In a single card kanban system parts are produced and brought according to a daily schedule and deliveries to the user are controlled by c- kanban.

Double card kanban system

- C- kanban and
- P- kanban.
- C- kanban: Gives signal for deliver more parts to the next process.
- P- kanban: Gives the signal for require more parts.

Production Smoothing

Production smoothing is the process of the balance the work load over different time period. It provide flexibility to respond rush order. It is help to eliminate over production.

Total productive maintenance (TPM)

Total productive maintenance is the techniques for reducing the machine down time and eliminates the defect and scrap. TPM is a fundamental pillar of lean. It is introducing awareness of self-maintenance and also introducing the preventive maintenance of machine.

Continuous Improvement

Continuous improvement such as improve the quality of product and customer satisfaction. Kaizen and 5s are the component of continuous improvement.

Kaizen

Kaizen is a Japanese word kai means continuous and zen means improvement, so its English translation is continuous improvement. Its main focus on completely improve the product and satisfy the customer.

5s

It has a five stage of the improvement of the process. It has five "S" all "S" gives the different meaning and activity. Seiri, Seiton, Seiso, Seiketsu, and Shitsuke. Is a Japanese word and translate into English these 5S is: Sort, Set (in place), Shine, Standardize, and Sustain.

Value stream mapping

Value stream mapping(VSM) is a paper pencil tool it is identify the value of added and non-added. It is visual representation of material flow and information flow. Value stream mapping creates a two maps starting with current state map it gives the snapshot of assembly which process running. And after second one is create a future state map for the improvement of the process.

What Is Lean Manufacturing?

Lean manufacturing is a system that integrates the daily work of producing and delivering products, services, and information of the problem identification and process improvement to eliminate waste and reduce production lot sizes.

Lean manufacturing is the main aim of the high quality, low cost, and just in time delivery by shortening the production flow by eliminating waste. Lean manufacturing is a team base structure. It breaks down organizational barrier and develops highly trained and motivated employees who investigate problems and find solutions as a part of their job.

Lean manufacturing is an integrated socio technical system whose main objective is to eliminate waste by concurrently reducing and minimizing supplier, customer, and internal variability.

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Why It's Needed

In today's competition is very increase in business. And customers are more and more aspect for the quality in product so that, standing with other competitors; it is needed to implement the lean manufacturing technique. Because it's give the better quality of product and customer satisfaction. Without any investment and Also it's excess of inventory and reduce the cost or non-value added activity with the help various lean tools, lean manufacturing also reduce the seven type waste occurring in industry. Like (1) Transport (2) Inventory (3) Motion (4) waiting (5) over processing(6)Over production (7) Defect. It is reducing with the help of various lean tools and principal are listed following.

5s, OEE (over all equipment effectiveness), 8 step practical problem solving (PPS),Pareto analysis, elimination of waste, kaizen, setup time reduction, process mapping, value stream mapping(VSM), quick and easy kaizen, SPC/control charting, 5 why, automation, continuous improvement, continuous flow, visual control, design for six sigma(DFSS), cellular manufacturing, production levelling, kanban, line balancing, voice of the customer, Jidoka, Anova, Work standardization, work simplification, fish born diagram, six sigma, take time, pokayoke/ mistake proofing, it is all lean tools are depend on the industry and industry problem which tools are apply and get a maximum benefits.

Method Of Lean Manufacturing

Method for lean manufacturing is implementation in industry consider some steps are to be taken as following.

(1) Select the target or product.

(2) Gembawalk, for the collecting data and all the data from product line and industry

(3) Prepare a chart or map for the analysing data and take decision where is the maximum waste or non-value added flow, with the help measuring lead time, cycle time, number of workers, and inventory, we are also used the current state map method from VSM.

(4) And after completely understand about the waste or non-value added, so that decide the lean tools which lean tools apply and give maximum result, depend on the waste. like tools are 5s- for the decrease the waiting time, cellular manufacturing focus on industry, SMED- reduce the time consuming by change over time and setup. JIDOKA- set of practice, mistake proofing and automation, kaizen for continuous improvement.

(5) And last one step is improving the problem and gives continuous improvement in future for industry and get increase profit of the industry.

Literature Review

As a lean manufacturing is a technique to reduce human efforts and produce defect free product. According to Jafri MohdRohani et.al. are production line analysis via value stream mapping for color industry, in this article identify and eliminate waste by using team formation, product selection, conceptual design, and time frame formulation through take time calculation. And use the some lean techniques change over time and 5s and decreased lead time from 8.5 days to 6 days and value aided time decrease from 68 minutes to 37 minutes.

Tomas Rohacet,al.(2015) to demonstration with value stream mapping on the plastic product of health care to applying lean tools are 5-why & Ishikawa chart, and reduce the lead time and inventory control.

Pravin shaswat at, el.(2015) apply the value stream mapping on bearing industry and reduce the work in process and inventory and lead time. In this article gives the information about value stream mapping and gives the methodology for the implementation of VSM. In this case study paper to apply the 5s and kanban system for the reduction of work in process inventory and lead time.

According to Taho yang yiyokag (2014) suggested and implement lean production system for fishing net manufacturing, use the various lean tools and Simulation method and make to order (MTO) process are apply for the regular shipment. And also use the VSM tool and produce future state map and increase service level and reduce lead time, also says that gives the guide line for the implement the value stream mapping. How to implement VSM and which factor to be consider, and after says that lean manufacturing are apply in any manufacturing industry successfully and reduce cost by elimination of waste.

According to K. Venkataraman(2014) says that various organizations are implement lean manufacturing in recent year for reducing and eliminate waste. In this article use the value stream mapping for reducing cycle time of crank shaft. Various type of tools are apply and get benefits, create a current state map of the crank shaft assembly line and also creates a future state map for improving process of crank shaft assembly, here is a three assembly available for producing a crank shaft. And improve the process and reduce waste so that apply three type kaizen, and also used the analytical hierarchical process(AHP) for decision making which process are apply and after than get result of the crank shaft assembly to reduce the inventory, and apply the single piece flow for crank shaft manufacturing and give quick response to the customer demand.

P. Arunagiri et, al. (2014) identification of high impact lean tool in auto mobile industry using weighted average method and they study about 91 industry and using 30 or more lean tools used get a result by weighted average method to maximum useful tools in automobile industry, first one is 5s lean tool are preferred to elimination waste.

Also Ratneshwarsinghet,al.(2013) . TPM implementation in machine shop and reduce break down time and improve performance efficiency. TPM depend on various piller, like 5s, jishu- hozen, planned maintenance, quality maintenance, kaizen office, and safety, health & environment are apply one by one and improve the quality of product with over all equipment effectiveness.

Boppana v. chaudhary et, al. (2012), implement the lean manufacturing in a pharmaceutical company, in this paper take a case study of the product line is creams and ointment. Also in industry problem was fixed operating cost and inability to supply products. In this paper improve the operation with help of lean manufacturing so detect the problem where is the waste are occurs, and use the lean tools is VSM. VSM is a mapping method, with the help of detecting value added and non-value added process. Prepare a current state map and use the 5-why method for the collect information. And after create future state map for the improvement with the help of 5s tool. And also used cellular manufacturing and after get the result is reduce inventory, and customer satisfaction, and on time delivery, total cycle time reduced , non-value added time has been decrease. And reduced the floor space area.

Summary of Literature Review And Discussion

There are different papers are referred on lean, and selecting the some papers from all areas to apply lean manufacturing like automobile industry, pharmaceutical company, color industry, cotton seed oil industry, health care hospital, and 5 paper discussion for the lean manufacturing and this study concludes from this literature review to various lean tool apply in different industry as per requirement but Value stream mapping techniques and 5s tool are much effective and use full tool for the detection of waste and improvement of the process. And also lean manufacturing techniques are applying in any industry and derive benefits.

Conclusion

Lean concept focuses on eliminating non value-added activities while agile detecting and responding to uncertain changes of the market. Challenges for competing in the business environment makes lean and agile as vital capabilities of a manufacturing organization. Both concepts are able to achieve strategic objectives (competitiveness, productivity, profitability, and survival) through improving the overall performance. Many researchers suggest that, combining lean and agile via decoupling point increases the organization benefits. This paper redefines lean and agile, and describes a comprehensive methodology for performance analysis at enterprise level based on both concepts. Including, a hierarchic framework is built to encapsulate the factors that affect the organizational performance. Then, another terminology is introduced, healthy enterprise, which simplifies the application of such proposal. Therefore, we can accumulate the practices of lean and agile in a practice list for the healthy enterprise. However, the success of an enterprise depends on understanding the real business environment particularly the threats that may face the organization. Finally, the authors suggest four points for future research. First best location and multiplicity of the decoupling point for leagile. Second, introducing overall cost and benefit functions to measure the impact of migration to lean and/or agile. Third, possibility of identifying a general term as proposed in this paper. Fourth is of applying the proposed methodology to different manufacturing organizations.

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