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A review on the importance of lean manufacturing in various manufacturing sectors

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ABSTRACT

Globalisation and emerging technologies are having enormous impacts on the manufacturing industry around the world. This scenario has seen the exponential upsurge in new entrants to the market environment, prompting stiff competition in the market place. This Contemporary competition has forced companies to innovate innovative things on day by day process to change their manufacturing culture. For this reason the enterprises are moving towards the advanced manufacturing techniques like lean manufacturing, supply chain management, agile manufacturing concurrent engineering are most popular in nature to satisfy the customer requirement competitively. In this regard reducing waste in manufacturing process will definitely results in good productivity with shorted cycle time. Among all the technologies, the lean manufacturing is most popular waste reduction technique in manufacturing process. Lean is not a just waste eliminating process but built with three strong commandments like be change, live the change and Worship the change.

Keyword: Kaizen, Lead Time, lean manufacturing, VSM, work in process inventory.

I.INTRODUCTION

It is always seen that the production business is mainly focused on produce good things with minimum cost and high profit. Market status and Economic crisis suggest that it is necessary to focus on cost. To reducing the overall cost of production system, it is done by different technique and modification of process or plant layout. In any manufacturing process scarp or waste is too high that shows the unused raw material whose value is now zero. To utilization of waste and avoid or least waste there are many manufacturing techniques like Agile manufacturing, Supply chain management, just in time, concurrent engineering and lean manufacturing. Among these manufacturing techniques Lean manufacturing is best because lean manufacturing is more popular waste reduction concept in the manufacturing process. Lean or lean production or lean manufacturing is step by step process of waste management without affecting the productivity. The word lean is first used by John Krafcik in his 1988 article, "Triumph of the Lean Production System", based on his master's thesis, which produced the international best-selling book co-authored by Jim Womack, Daniel Jones, and Daniel Roos called World. In language of engineer lean is the set of "tools" that assist in the identification and steady elimination of waste. As waste is eliminated quality improves while production time and cost are reduced. There are total 7 types of waste in the production system they are Overproduction, Waiting, Transporting, Inappropriate Processing, Unnecessary Inventory, Unnecessary / Excess Motion, Defects.

There are many tools in the lean manufacturing which are assist to improve waste management and reduced cost. A non exhaustive list of such tools would include: SMED, value stream mapping, Five S, Kanban (pull systems), poka-yoke (error-proofing), total productive maintenance, elimination of time batching, mixed model processing, rank order clustering, single point scheduling, redesigning working cells, multi-process handling and control charts (for checking mura/waste).

Apart from tools here is another approach to lean manufacturing, which is used and promoted by Toyota, called "The Toyota Way". In this approach our focus is upon improving the flow or smoothness of work. Therefore steadily eliminating waste (unevenness). Techniques to improve flow include production levelling, "pull" production (by means of kanban) and the Heijunka box.

Basic concept and Idea of tools of lean manufacturing are:

Cellular manufacturing: Cellular manufacturing or cell manufacturing reduce the transportation waste and reduce the inventory. It is says "one piece flow" process. Some time it is found that difficult or uneconomically to fulfil the customer requirement by using traditional product line, so with the use of cell manufacturing the U-shape product line replace traditional product line.

Just in time (JIT): Just in time is a soul of the lean manufacturing. It's associated with lean techniques. Just in time production provides desired part at the required place on time.

Kanban system, Production smoothing, and setup time reduction are the basic component of any JIT system. "kanban" is a Japanies word which means card or signal. Which means 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 used according to a daily schedule and deliveries to the operator or manufacturer 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 requirement.

5s : It has a five stage of the improving the process. It has five "S" all "S" gives the different meaning and activity. These 5S is: Sort, Set Shine, Standardize, and Sustain.

- First S : sort Sorting out of the necessary parts
- Second S: set all the parts arrange of its proper place.
- Third s : shine all working area keep clean
- Forth s: standardize it is standardize clean up
- Fifth s: sustain keep discipline

Value stream mapping: Value stream mapping (VSM) is a paper pencil (drawing) tool it is identify the value of added and non added. It is graphical 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.

II.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 in all sectors even it is production or service. the objective of the lead manufacturing is improve quality, reduce cost, and shorten delivery period by shortening or reducing the production flow through eliminating or minimum waste. Lean manufacturing is a team base structure. It breaks down the any organisation into organizational barrier and develops highly trained and motivated employees who investigate problems and find solutions as a part of their job and service.

Steps for implementing the lean manufacturing

There are some steps and Method for lean manufacturing implementation in industry as following.

- Define: create problem definition, objective and scope of the project
- Measure: analyze existing or historical data and draw a chart or map (vsm)
- Analyze: used lean tools to calculate bottleneck in current system, lead time, takt time etc.
- Improve: identify the area of improvement and expansion in industry and get increase profit of the organization.

III.LITERATURE REVIEW

Seyed Mojib Zahraee et.al. Studied and analysis the production line via Value stream mapping for colour and paint industry. According to his article, they identify and eliminate the waste by using conceptual design, team formation and time frame formulation through takt time calculation. By implementing the lean tool, value aided time shorten by 31 minutes (decreased from 68 minutes to 37 minutes) and lead time 8.5 days to 6 days.

Preetinder Singh Gill work on the use of lean manufacturing tools in the emergency rooms and department of health care service organization like hospitals. In this research paper effort involves a review of existing literature pertaining to application of the VSM tool in hospital. Analysis will the will present the potential benefits emanating from application of VSM along with assessing its effectiveness, And concluded that VSM is an invaluable tool in eliminating waste from an emergency room. However, the practitioners and doctors must ensure that the VSM should be used to: identify waste, plan waste reduction, revaluate the level of waste in the improved process, in an organization [11].

An scholar Shahram Taj, investigate the adaptation of lean production and its tools in selected plants in electronics, telecommunication, wireless, computer, food/beverage, garment, pharmaceutical, chemical, petroleum, printing, A/C and heating, and a few others sector in China. The objective of this study is find out the actual lean manufacturing processes and their performance in Chinese plant for this An assessment tool is used to evaluate actual manufacturing practice like team approach, processes; maintenance; layout/handling; suppliers; setups; quality; and scheduling and control in total 65 manufacturing plants. And conclude that lean manufacturing and its tools improves operation and customer satisfaction [15].

Bhim Singh et.al. presented the paper, The purpose of paper is to discuss the lean implementation process and its quantified and qualitative benefits for the production industry via lean tool value stream mapping (VSM).here Both current and future state maps of shop floor are discussed using VSM techniques for highlight the improvement areas and to bridge the gap between the existing state and the proposed state of organization's shop floor. After proposed improvement in shop floor they found that reduction in lead time, processing time, work in process inventory, manpower requirement are respectively 83.14%, 12.62%, 89.47%, 30%. And there is rise in productivity per operator was 42.86%. Finally all the results show that the VSM can be done in the same way for practically any business activity and expanded either upstream or downstream. This study provided following lessons for the researchers and practitioners that VSM is a very powerful tool to identify gap areas and facilitate lean implementation for production industry [3].

Serrano et al. (2008) used multiple case study approach and concluded that VSM can be used as redesign tool for manufacturing apart from enumerating the differences between theoretical concepts proposed by VSM and real world applications [14].

V. R. MurugananthanS et al. proposed the implement of lean manufacturing in foundry using value stream mapping. In this paper there is evidence of valid advantage in shop floor when applying lean principle. Here. Analysis through 5s technique resulting effective organization of the workplace, reduction of work's environment and elimination of losses connected with failures and breaks targeted the improvement of the quality and Safety of work. And by applying VSM to remove the non-Valued activities during manufacturing

which results reduce manufacturing lead time. The Proposed process in study will overcome the drawbacks of the existing process with complete functionalities and quick respond time [17].

According to Harwinder Singh and Amandeep Singh the application of lean manufacturing using value stream mapping (VSM) as tools in an auto-parts manufacturing organization gives the both current and future states maps of the organization's shop floor scenarios for identify sources of waste between the existing state and the proposed state of the selected organization for improving its competitiveness. In this paper after analyzing the current and future state mapping it is found that reduction in cycle time, work in process inventory and lead time are 69.41%, 18.26% and 24.56% respectively [7].

Dushyanth Kumar KR et al. Discuss about the increasing interest in the leaner and more responsive operations along with reduction in Cycle time to improve performance across any entire business network. In his research work they implementing the leans tools such as VSM and kaizen are implemented in pump assembly of medium scale enterprises to identify and reduce the wastes. Here they make a visual map via VSM where they found waste affecting the cycle time .after VSM mapping they apply the kaizen principle for reducing the waste and create future state mapping. By applying lean tools there is reduction in through put time is 241.7 hours to 148.3 hours. This shows that any delay can be analyzed through value stream mapping. And concluded that VSM and kaizen is the effective tool for identifying and reducing the process wastes in manufacturing and suggested that tools to induct for the medium scale enterprises confidently [5].

Azharul Karim et al. Presented the paper according to this article develop an effective methodology for implementing lean manufacturing strategies. In this paper Based on five lean principles, a systematic lean implementation methodology has been proposed for any manufacturing organizations. Here also use the simplified leanness evaluation Metric which consisting of both efficiency and effectiveness attributes of manufacturing performance were Developed for continuous evaluation of lean implementation. According to researcher proposed methodology is able to systematically identify manufacturing wastes, select appropriate lean tools, identify relevant performance indicators, achieve significant performance Improvement and establish lean culture in the organization. They conclude that Continuous performance measurement (CPM) matrices in terms of efficiency and effectiveness are proved to be appropriate methods for continuous Evaluation of lean performance [2].

A case report is presented by Y Sujatha et al. The purpose of this report is to investigate the effect of adoption of lean manufacturing tools and techniques in the silk production Industry of Andhra Pradesh. During the investigation researcher ask the question in shop floor operator and different level organization individual for 14 different areas of lean implementation such as scheduling, inventory, material handling, equipment, work processes, quality, employees, layout, suppliers, customers, safety and ergonomics, product design, management and culture, and tools and techniques. After analyzing the results they conclude that many companies in the Silk Production industry are committed to implement lean manufacturing. Generally, most of them are "moderate-to-extensive" Implementers [18].

Taho yang yiyo kag et al. suggested and implements lean production system for fishing net manufacturing industry, by using various lean tools and Simulation method and make to order (MTO) process are apply for the regular shipment. And use the VSM tool for future state mapping and increase service level and reduce lead

time through eliminating waste and conclude that lean manufacturing are apply in any manufacturing industry successfully and reduce cost by elimination of waste [16].

According to K. Venkataraman et al. Says that various organizations mostly auto mobile sectors are implement lean manufacturing in recent year for reducing and eliminate waste. In this study the value stream mapping lean tool is used for reducing cycle time of crank shaft. Here Various type of lean tools are also apply to get benefits, while by VSM create a current and future state map of the crank shaft assembly line for improving process of crank shaft assembly, improve the process and reduce waste. so that can 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 [9].

IV.DISCUSSION AND CONCLUSION

For any organization even it is service providing or manufacturing field customer satisfaction is essential in present days the customer satisfaction with varied verities and volume of products with competitive price is more. Generally in shop floor identified or elimination of waste and reducing delay time may reflect in market price and customer satisfaction. In this paper our objective is to find the benefits of implementing lean manufacturing or its tools. For this there is number of papers are refereed on lean and its tools implementing on every sectors viz. Auto parts industry, health care, pump industry, foundry, colour industry, automobile sectors, silk production industry and small and medium scale industry and its tools like VSM, 5s, Kaizen etc. These paper discussions conclude that lean manufacturing and lean tools gives the beneficial results for the improvement of organization by reducing process time and eliminating waste from shop floor area. Value stream mapping techniques and 5s tool are much effective and used tool for the detection or elimination of waste and improvement of the process. So, use of lean manufacturing and its tool are essential in manufacturing growth and desired output.

REFERENCES

[1.] Andrea Chiarini. *International Journal of Lean Six Sigma Vol. 2 No. 2, 2011 pp. 96-117 q Emerald Group Publishing Limited 2040-4166 DOI 10.1108/20401461111135000.*

[2.] Azharul Karim and Kazi Arif-Uz-Zaman Business Process *Management Journal Vol. 19 No. 1, 2013 pp. 169-196 Emerald Group Publishing Limited 1463-7154 DOI 10.1108/14637151311294912.*

[3.] Bhim Singh S.K. Garg S.K. Sharma Chandandeep Grewal International Journal of Lean Six Sigma *Vol. 1 No. 2, 2010 pp. 157-168 Emerald Group Publishing Limited 2040-4166 DOI 10.1108/20401461011049520.*

[4.] Dinesh Seth, Nitin Seth, Deepak Goel. Journal of Manufacturing Technology Management *Vol. 19 No. 4, 2008 pp. 529-550 q Emerald Group Publishing Limited 1741-038X DOI 10.1108/17410380810869950.*

[5.] Dushyanth Kumar KR, Shivashankar GS, Rajeshwar SK (2015) Application of Value Stream Mapping in Pump Assembly Process: A Case Study. *Ind Eng Manage 4: 162. doi:10.4172/2169-0316.1000162*.

[6.] Girish.C.Pude, Prof.G.R.Naik, Dr.P.G.NaikIOSR *Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278-1684, PP: 07-12.*

[7.] Harwinder Singh and Amandeep Singh *Journal of Advances in Management Research Vol. 10 No. 1, 2013 pp. 72-84 Emerald Group Publishing Limited 0972-7981 DOI 10.1108/09727981311327776.*

[8.] Jannis Angelis, Bruno Fernandes. *International Journal of Lean Six Sigma Vol. 3 No. 1, 2012 pp. 74-84 q Emerald Group Publishing Limited 2040-4166 DOI 10.1108/20401461211223740.*

[9.] K. Venkataramana, Vijaya Ramnath, V.Muthu Kumar, C.Elanchezhiand Procedia *Materials Science 6 (2014) 1187 – 11963rd International Conference on Materials Processing and Characterisation (ICMPC 2014).*

[10.] P. Arunagiri and A.Gnanavelbabu(2014) *12th GLOBAL CONGRESS ON MANUFACTURING AND MANAGEMENT, GCMM 2014.*

[11.] Preetinder Singh Gill *Global Journal of Medical Research Volume 12 Issue 6 Version 1.0 Year 2012 Online ISSN: 2249-4618 Print ISSN: 0975-5888*.

[12.] S. santosh kumar, M. pradeep kumar. *Procedia Materials Science 5 (2014) 1853 – 1862 international conference on advance materials and engineering AMME 2014*.

[13.] S. Vinodh, K.R. Arvind and M. Somanaathan *Journal of Manufacturing Technology Management Vol.21 No.7, 2010pp.888-900 Emerald Group Publishing Limited1741-038XDOI 10.1108/17410381011077973.*

[14.] Serrano, I., Ochoa, C. and de Castro, R. (2008), "Evaluation of value stream mapping in manufacturing system redesign", *International Journal of Production Research, Vol. 46 No. 16, pp. 4409-30.*

[15.] Shahram Taj *Journal of Manufacturing Technology ManagementVol. 19 No. 2, 2008pp. 217-234 Emerald Group Publishing Limited 1741-038X DOI 10.1108/17410380810847927*.

[16.] Taho Yanga, Yiyo Kuob, Chao-Ton Suc, Chia-Lin Houa. *Journal of Manufacturing Systems 34 (2015) 66–73* .

[17.] V. R. Murugananthan1, K. Govindaraj2, D.Sakthimurugan *IJIRSET Volume 3, Special Issue 3, March 2014.*

[18.] Y Sujatha and K Prahlada Rao IJMERR ISSN 2278 – 0149 Vol. 2, No. 4, October 2013.