

REDUCING PRODUCTION CYCLE TIME OF JAW CRUSHER (42x30) THROUGH LEAN MANUFACTURING CONCEPTS

¹Solanki Manan V., ²Prof. Bhavesh Mewada, ³ Ass. Prof. Sanjay Shah

¹M.Tech Student, ² Professor, ³ Assistant Professor

¹Dept. of Mechanical Engineering,

¹Parul University, Vadodara, India

Abstract: On the basis of improve productivity and reduce cycle time of jaw crusher (42x30) or B1050 here lean manufacturing concepts concerned with the implementing plans, i.e. the detailed scheduling of jobs, assigning workload to machine, people and actual flow of work in production area. Production is an organized activity of converting a raw material into finest useful product. Production area includes the natural resources like Men, Machine, money, time and material. By use of Gemba walk Scan and plan and VSM (Value stream mapping) which are very useful functions to identify the problems occurring in all stages in production area and also help to investigate the value added activities and non-value added activities which help to reduce the non-value added activities, the over process which is not worthy. This all helps to reduces the unwanted wastes and improve the productivity and production cycle time. This review paper represents the lean manufacturing concept which help to reduce unwanted wastes and improve the cycle time and productivity.

Index Terms - Lean Manufacturing Concept, Gemba walk Scan and Plan, Value Stream Mapping (VSM)

I. INTRODUCTION

In the current mining scenarios, jaw crusher's the one of the principle to reduce large rocks into smaller rocks, raw dust and gravel. Crushers are mainly used to reduce the size of rocks, change its form of waste material which is also used to recycled and easily disposable.

Gujarat Apollo Industries pvt. Ltd. Is manufacturing company which established in 1988 as pioneered in as the manufacturing of various sizes and with various capacities of Impactors and crusher equipments and it has specializing in different product lines for mining and construction industries over four years. Also it has various types of model in each product like screening, crusher, Impactors with various sizes, feeding rate and different output and with the equipment technology is refined through over forty years of experience as part of company's continuous product improvement, focus, large, manufacturing facilities.

By application of Gemba walk (Scan and plan) which is helps to see and observe the processes which are currently going on in company that evolves the area of understanding, product movement, process timing, men hours, waiting time and also helps to investigate the problems occurring in company. most of observation completed with the help of Gemba walk after that Value stream mapping is used to calculate the non-value added activities which is also used to reduce waste in current scenarios. Also that shows the reduced time and how much time is can be reduce by observing the overall process and non-value added activities which is helps to improve the flow of product..

This literature review can be use to understand application and effectiveness of Lean manufacturing concept such as VSM, Gemba walk and brainstorming process etc., in order to apply them for improvement in productivity and reducing the production cycle time.

II. LITERATURE REVIEW

Anders Segerstedt et al. [1] shows cover-time planning and takt time planning technique, which is used to analyze the production time and also the module for semi machinery industries. MTO creates no problems but inventory and work in progress for WIP for every item are restricted. CTP is a type of reorder system, with time instead of quantity as a decision variable. CTP avoids reorder system's disadvantage, forecast for every item and no future visibility.

Shun Yang et al. [2] analyzed the whole structure includes four element, which are basic production system, customer order forecast, uncertainties, KPIs. A Production planning and control, Objective function is max. OTD $2 < \text{Batch Size} < 10$ & $2 < \text{Parts per arrival} < 10$ is based on the optimization results. In this situation, the production process can achieve the best performance on-time delivery.

George Kasakow et al. [3] Set up an experimental simulation is based on turbo charger manufactory. The experimental setup contains six variants of turbo charger with variation in size. Additionally its objective is to improve the reaction time can be achieved by using the method odd event-driven production planning and control, Based on placing and individual customer order. The production can be derived from the according individual bill of material. This also helps to understand the future set up of the simulation which will reduce the time or not that really helps to understand the future step. The reaction plan can be as simple as

list of instruction given which will need to be followed by engineers, workers and helpers when things go wrong. These are printed in procedure book and also posted on wall so it can be easily noticed.

Koechling et al. [4], this paper shows and introduces us to a procedure which enables a virtual design review of a planned layout in HD visualization center. This means the production planner have the opportunity to do a virtual inspection of the production system including the visualization of material flow and also the product and process flow. This is the main goal of the presented procedure in this paper to optimize the material flow of a production system and proof of result in virtual inspection. It extends the standard approach of material flow optimization with and interactive. This system also helps to identify the problems occurring in current section or area in production system that involves the non value added activities and other unworthy processes.

Deepak Sharma et al., Deepa Sharma et al., Jaiprakash Sharma et al., [5] shows the basic concept of production planning and control which is also includes its objectives, function, factors affecting the production planning and control etc., the affecting factor like seasonal variations, test marketing, after sales service, loss due to unpredictable factors, production of products and loss due to the predictable factors also the design changes and the rejection and replacement are the factors which are affecting the production planning and control. This research paper allowing the definition of planning which evolves the area of planning which that consist in the whole productive system that can be improve. Its major priority is to identify the system and how it's going on after knowing the system this also helps us to how to reduce the waste or how to eliminated that wastes in current scenarios without affecting any processes or procedures.

Joaquim Fernandez et al. [6] shows the concept of the lean production system which also consists the production planning and control by using different lean tools and to eliminate the wastes like over processing, Overproduction, work in progress, transportation, unnecessary inventory, unnecessary motion and defects these are total seven wastes in lean manufacturing and these all wastes can be reduce by lean manufacturing system or concept. This all show how it will work in different area in production and in small or medium industries there is no need of push system because it will take time for planning. Even though, it must be remarked that not all the environment are suitable to apply lean methodology.

J Praveen Kumar, B Indhirajith and K Thirupati et al. [7] examined the quality of grinding operation using process capability studies. This research paper show how to find causes currently going on in grinding operation by measuring of grinding process and these process parameters such as wheel head grinding speed, work head RPM, grinding wheel grade, dressing frequency, coolant filtration, coolant ration, coolant temperature, feed rate, machine repeatability, hardness of material, burr in center , dressing parameters and its norms and wrong offset settings. This all shows how to identify the process affecting parameters while observing and after further analysis for how to improve it.

Christina Reuter, Felix Brambring, Thomas Hempel and Phil Kopp et al. [8] ensured the benefit orientation through process taking into account different PPC methods as well production analysis, PDA-system and information current state target to collect data. After collecting the data through the module, the Specific characteristics and data need of each module ratio account so that the last result will be highly oriented. PDA-analysis refers to Production development analysis which enables in which type of development needed in the design, process or work, so it's the prior part when any kind of development needed in an industries. It also helps to analyze the whole production system or simply we can go for only selected product which depends on us to which product is to be developed.

David Gyulai, Botond Kadar, Laszlo Monosotori et al.[9] States that the equations for production planning, capacity planning and flexible assembly line so we can analyze whole data of planning, capacity and assembly line to make them flexible in terms of including the constraints the fulfillment of all customers orders, calculations set up, volume, capacity restrictions and extra cost of late delivery and inventory holding. These all constraints can be analyzed by data and observation and also can be eliminated by analyze them and to make the flexible assembly lines and capacity for storing material and also for produced products.

Chen-Fu Chien, Runliang Dou, Wanhan Fu et al. [10] optimize the demand uncertainties and reduce the loss in capacity and production planning by use of strategic capacity planning for smart production. They made multi objective decision framework under uncertainties to evaluate the delay in delivery to customer and customer's demand to reduce loss from inventory and improve the capacity planning. By use of expert method for no historical data and the model optimization they identify the problem definition and how to evaluate them after this resulting into improvement in strategic capacity planning for smart production and demand uncertainties.

Daniel Cichos, Jan C. Aurich et al.[11], in this research paper it is introduce existing production planning and control methods to change manufacturing in the industries. In detail, the tasks of production, planning and control, the task of engineering changes required in manufacturing and demand, planning and control of engineering by use of precedence diagram, integrating production, planning and control, overview of analogies between different tasks in manufacturing systems. Planning consists arranging work steps and another is time scheduling, in first one, filtration and strategic grouping. In Second arranging work steps and time scheduling after that controlling comes which includes monitoring, event-driven process chain and follow-up processing.

William Faulkner, Fazleena Badurdeen et al. [12]states that the sustainable manufacturing involves the use of sustainable process and the system to reduce waste occurring while processing and also produce more sustainable product that improve the production of company. By using physicals work metric it helps to capture and physicals ergonomics of the workplace. By collecting data, analyze the collected data and observation helps you to get affecting factors to the process and production but this will not work for those companies which are using traditional processes to produce the products.

Rahani AR, Muhammad al-Asharaf et al. [13] conclude that the method to improve the production flow rate and process flow rate by use of value stream mapping. Prior to lean production implementation the data of cycle time, data of change over time, initial data collection on overall cycle time, waste time, delay time, in process queue time, data gathering for % rejection and work in progress, Gemba walk, monitoring and improvised. This all steps used to make VSM and analyses the flow of process and the affecting factor of process or product in particular area.

L.F. Romero, A.Arce et al. [14] states that it is based on systematic approach and it covers available literature published in referred journal, providing valuable information about respective area's application and performance of value stream mapping in manufacturing area. It also defines different fields which can be applied in different kind of field like construction and transport, architecture and software production lines, production development and innovation management. This study gives the importance of sharing valuable ideas about the positive result that this technique offers..

Satish Tyagi, Alok Choudhary, Xianming Cai, Kai Yang et al. [15] conducted that the improvement by use of VSM to reduce lead time. This uses the brainstorming activities and Gemba walk for identify the actual problem going on and which type of problems are affecting the production of industry. From CS (Current state) value to FS value (Future state) we can identify or determine the no. of value added activities and no. of non- value added activities, steps, percentage of value added steps, the value added time, what type of changes should be made related to affecting problems or causes this all uses to analyze the problem and helps to get the final result after implementation

Rahani AR et al. [16] Conducted analysis improved the approach in LP initiatives as it reveals obvious and hidden waste that affected the productivity of D45T production. There is a significant amount of the time products spent on the production system usually was waiting and non-value added. Quantitative evidence showed that many of the Lean tools have an expected impact Related to the reduction of this waiting time. The evaluation of these improvements through the use of the CT evaluation highlights the economic impact of time improvements. The VSM applied to assess the expected impact of a change in the production process resulted in savings (lower rejection rates) and to a certain extent.

DMGMORI Co et al. [17] Conducted analysis shown (1) Smart manufacturing enables us to efficiently manage the quality of machine tools before shipment in the factory. (2) Remote monitoring enables us to efficiently perform maintenance work for customers' machines after shipment. (3) Sensing enables us to improve functions of preventive maintenance.

John Bessant et al. [18] conducted analysis addressed the question of CI largely as a set of routines for doing what we already do better. But there is emerging evidence that this capability, once established, can also contribute to doing new things — to 'innovation' routines. Many of the characteristic behaviors at the higher levels of our model are essentially similar to those routines identified in work on innovation— for example, experimentation in R&D.

III. RESEARCH GAP

From the study of research papers it is observed Lack of motivation and proper training of work and awareness of value added and non-value added activities and another thing is the impact of 5s methodology onto the productivity is very large. Apart from that another tool is VSM that highlighted the cycle time of each process involved in whole manufacturing process and it also include the implementation of lean tool ideally Indicates the differences between lean theory and lean practice, the employee's needs for feedback and direct involvement in the company.

IV. CONCLUSION

The following major conclusions are drawn from the review of application of VSM and 5s methodologies to improving manufacturing and maintenance fields:

- Most work targets reduction in throughput time.
- These tools also help in improve the maintenance process.

REFERENCES

- [1] L. Wilson, How to Implement Lean Manufacturing, McGraw-Hill Professional, 2009.
- [2] M. Imai, Gemba Kaizen: A Practical Approach to a Continuous Improvement Strategy - Second Edition, Kaizen Publishing House, București, 2013.
- [3] V.C. Patel, H. Thakkar, Review on Implementation of 5S in Various Organization, International Journal of Engineering Research and Applications, Vol. 4, Issue 3 (Version 1), 2014, pp.774-779.
- [4] S. Sorooshian, M. Salimi, S. Bavani, H. Aminataheri, Experience of 5S Implementation Journal of Applied Sciences Research, 8(7), 2012, pp. 3855-3859.
- [5] K. Kaushik, K. Sanjeev, Step for implementation of 5S, International Journal of Management, IT and Engineering, Volume 2(6), June 2012, pp. 402-416.
- [6] D.S. Korkut, N. Cakıcıer, E.S. Erdinler, G. Ulay, A.M. Dogan, 5S activities and its application at a sample company, African Journal of Biotechnology, Vol. 8 (8), 20 April, 2009, pp. 1720-1728.

- [7] P.M. Rojasra, M.N.Qureshi, Performance Improvement through 5S in SmallScale Industry: A case study, International Journal of Modern Engineering Research (IJMER). Vol.3 (3) May - June 2013, pp. 1654-1660.
- [8] S.B. Khedkar, R.D. Thakre,Y.V. Mahantare, R. Gondne, Study of Implementing 5S Techniques in Plastic Moulding,International Journal of Modern Engineering Research, Vol.2 (5), Sep.-Oct. 2012, pp. 3653-3656.
- [9] D.Sarkar, "5S for service organizations & offices a lean look at improvements"ASQ Quality Press Milwaukee, Wisconsin, 2006.
- [10] Achanga, P., Shehab, E., Roy, R., & Nelder, G. (2006). Critical success factors for lean implementation within SMEs. Journal of Manufacturing Technology Management, 17(4), 460 – 471.
- [11] Bane, R.(2002), "Leading edge quality approaches in non-manufacturing organization", Annual Quality Congress Proceedings, ABI/INFORM Global, pp. 245-50.
- [12] Bateman, N., & Rich, N. (2003). Companies perceptions of inhibitors and enablers for process improvement activities. International Journal of Operations & Production Management, 23(2), 185-199.
- [13] Choi, T.Y., Rungtusanatham, M. and Kim, J.S. (1997). 'Continuous improvement on the shop floor: lessons from small to midsize firms', Business Horizons, Vol.40, No.6, pp.45-50.
- [14] De Lange-Ros, E. and Boer, H. (2001). 'Theory and practice of continuous improvement in shop-floor teams', International Journal of Technology Management, Vol. 22, No. 4, pp.344-358.
- [15] Palmer,V.S. (2001). Inventory Management Kaizen. Proceedings of 2nd International Workshop on Engineering Management for Applied Technology, Austin, USA. 55-56.
- [16] Rose, A.N.M., Deros, B.M., & Rahman, M.N.A. (2014). Critical success factors for implementing lean manufacturing in Malaysian Automotive Industry. Research Journal of Applied Sciences, Engineering and Technology, 8(10), 1191-1200.
- [17] Jay Lee, Machine performance monitoring and proactive maintenance in computer-integrated manufacturing: review and perspective, International Journal of Computer Integrated manufacturing, 4/3/2007.
- [18] R. Teti, K. Jemielniak, G. O'Donnell, D. Dornfeld, 2010, advanced monitoring of machining operations, CIRP Annals, 59/2:717-739.
- [19]WIKIPEDIA/ELMEX
- [20]Concept business excellence pvt ltd DIAGNOSTIC STUDY REPORT.

