

Analysis of Production Processes in a Small Scale Foundry Industry

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Abstract- The foundry industry, small to medium sized plant, has the difficulty of implementing improvements in its internal logistics systems, and, it has to deal with the problems arising in the industry. Lean manufacturing (LM) is seen as major breakthrough process and is widely used by major industries all over the world. The LM is demarcated as a manufacturing system that concentrating continuous flow within supply chain by removing all wastes and execution continuous development towards product excellence. This paper addressed the various production processes that can be used in Small scale foundry, finding the problems existing in these processes and implementing the various Lean Manufacturing tools and analysing the result.

Keywords- Small scale foundry, production processes, problems identified, lean manufacturing tools and analysis

1. INTRODUCTION-

Steel Alloys foundry is an ISO 9001:2000 certified manufacturer and supplier engaged in the Manufacturing of world class CI Castings including Pulleys, Fly Wheels, Housings, Casings, Ginning Parts, etc. Lean manufacturing (LM) is seen as major breakthrough process and is widely used by major industries all over the world. In a continuous process industry like casting the main approach of implementing the lean manufacturing is to reduce the production cost by eliminating the non-value added activities. In a recent survey, approximately 36% of US-based manufacturing companies have implemented lean or are in the process of implementing lean. An LM facility is capable of producing product in only the sum of its value added work content time. [1].

According to industrial point of view Lean Manufacturing is an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer and internal variability [5]. Namely LM, is a philosophy of production that emphasizes on the minimization of the amount of all the resources used in the various activities of the enterprise with keeping in mind the requirements the product has to meet. It involves identifying and eliminating non-value-adding activities in design, production, supply chain management and dealing with customers. Lean manufacturers employ teams of multi skilled workers at all levels of the organization and use highly flexible, increasingly automated machines to produce volumes of products in potentially enormous variety. It contains a set of principles and practices to reduce cost through the relentless removal of waste and through the simplification of all manufacturing and support processes

The significance of a LM model include: production of only one unit at a time; non-value added time eliminated; production of the job within time pre decided; relocation of required resources to the point of usage; and all processes must be completed within the time as scheduled. Lean Manufacturing technique has a great importance with Indian small scale Industries. In India Small and medium

Scale industries play a very important role in Indian Economy.

There are number of production processes carried out by various machines at various departments in small scale foundry and I studying and analyzing these production processes to finding the problems if any facing by the industry.

2. RESEARCH METHODOLOGY

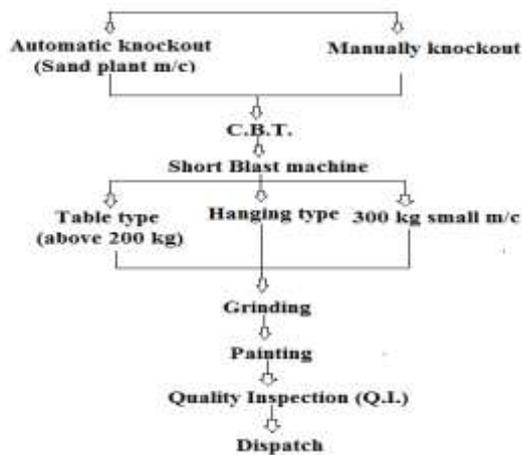
The purpose of this study is the application of various lean manufacturing tools in small to medium sized foundry industry.

The main steps of work:

- Study of production processes in a small scale foundry.
- Identification of problems arising in the foundry.
- Analyzing the various causes of problems.
- Implementing the various lean manufacturing tools
- Observation table about production rate
- Result of measurement.

3- PRODUCTION PROCESSES FLOW CHART





4-PROBLEM IDENTIFIED IN FOUNDRY

Production rate is lowered as per company specified target of the day, they achieves only 71% production in a day and remaining 29% production is completed in next day. E.g. If they make production plan of 17 metric ton per day but they are able to achieved only 14 or 14.5 metric ton per day regularly further only 11 or 11.5 metric ton production or casting are transfer/knockout.

5-CAUSES OF PROBLEM

- Raw material shortage.
- Man power problems.
- Breakdowns.
- Assembly line problems

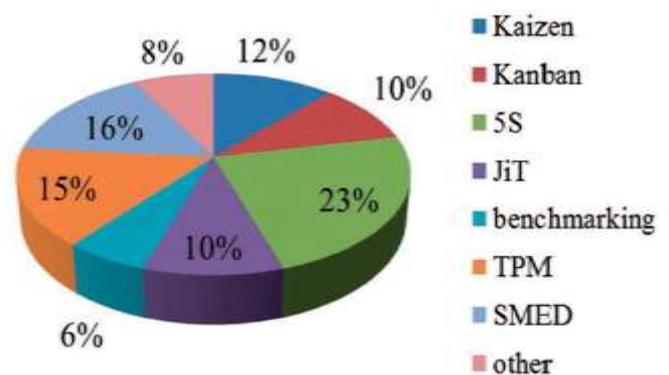
6-Lean Manufacturing tools have been implemented in foundry

List of the most common lean tools, such as

- Kaizen (Japanese for “improvement” or “change for the better”) – A strategy where employees work together proactively to achieve regular, incremental improvements in the manufacturing processes.
- Kanban (Japanese for “signboard” or “billboard”, which is a scheduling system for just-in-time JIT production)- A method of regulating the flow of goods both within the factory and outside suppliers and customers. Based on automatic replenishment through signal cards that indicate when more goods are needed.
- 5S (the name of a workplace organization method based on five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke, translated into English as sort, set in order, shine, standardize and sustain).

- Benchmarking (standardized work)- Eliminates waste by consistently applying best practices. Forms a baseline or future improvement activities.
- TPM (Total Productive Maintenance)- Creates a shared responsibility for equipment that encourages greater involvement by plant floor workers. In the right environment this can be very effective in improving productivity (increasing up time, reducing cycle times and eliminating defects)
- SMED (Single Minute Exchange of Die)- Enables manufacturing in smaller lots, reduces inventory, and improves customer responsiveness.
- Six big losses- Six categories of productivity loss that are almost universally experienced in manufacturing: Breakdowns, setup/adjustments, small stops, reduced speed, startup rejects and production rejects.

7-USAGE OF LEAN MANUFACTURING TOOLS



It is visible that the 5S system is the most popular. It is also the simplest and often a no-cost approach.

5s stands for-

- Set in order (organize remaining items)
- Shine (clean and inspect work area)
- Sort (eliminate that which is not needed)
- Standardize (write standards for above)
- Sustain (regularly apply the standards)

That is it eliminates waste that results from a poorly organized work area.(e.g. wasting time looking for a tool)

8-ANALYSIS AND OBSERVATIONS

In company the work is carried out in three shifts/day (man power shift) from 7.00 am -3.00 pm, 3.00 pm-11.00 pm and 11.00 pm-7.00 am with two breaks of half an hour. There are 26 working days per month. The five months analysis of company about the demand rate, planned rate and production rate are carried out and given below

Sr No.	Demand rate (tons/month)	Planned rate (tons/month)	Production rate (tons/month)	Total scrap (In %)	Ok production rate (tons/month)	Production efficiency (In %)	Delivery efficiency (In %)
1	560	610	507	2	496.86	81.45	88.72
2	510	560	468	2	458.64	81.9	89.92
3	500	555	442	2	433.16	78.04	86.63
4	560	620	481	2	471.38	76.03	84.17
5	600	670	520	2	509.6	76.05	84.93

9-RESULTS

9.1 Graph of production rates in tons/month

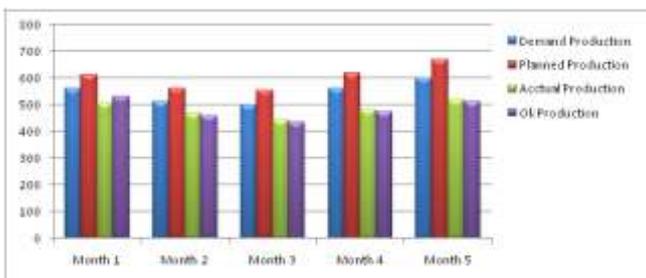


Chart -1: production rates in tons/month

9.2 Graph of Efficiency

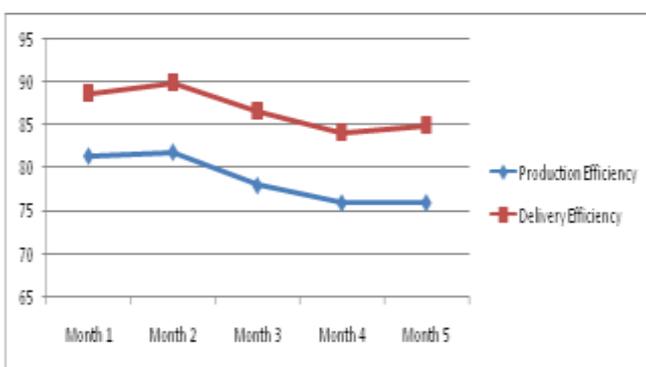


Chart -2: Graph Of Efficiency

10-CONCLUSIONS

In India small and medium scale industries play a very important role in Indian economy expected outcome of

the analysis is to focus on the production rate at small to medium foundry industry. After analyzing the five months data of the foundry industry, in the second month when the demand rate is 510tons/month, planned rate is 560tons/month and production rate is 458 tons/month then greatest production and delivery efficiency is obtained. Because there is less shortage of raw material in inventory management department, Proper precautions are taken to reduce number of breakdowns and Proper sequencing of workstations are done to reduce assembly line problems to certain level.

REFERENCES

- [1] Tandon, Dr. Ajay Tiwari, Shashikant Tamrakar(2014) studies the implementation of lean Praveen manufacturing principles in foundries'.
- [2] Shah, R. and Ward, P.T., Lean manufacturing: context, practice bundles, and performance, Journal of Operations Management, Vol. 21, pp.129-149, 2009..
- [3] Billesbach, T. et.al (2009), Applying lean production principles to a process facility, Production and Inventory Management Journal. p. 5-25..
- [4] A Study of Auto Pour in Sand Casting Process Applied Mechanics and Materials Vol 660 (2014) pp 74-78 (2014) Trans Tech Publications, Switzerland.
- [5] Methew, M.C et.al (2004), Problems and management of small scale and cottage Industries, New Delhi. Deep and Deep publication. Vol. 22 No. 5, 2011, p. 664-678.