

Efficiency Enhancement by Reducing Production and Machining Time

Preet Ramani

Student of BE in Mechanical Engineering from Marwadi Education Foundation

Abstract - In the current 21st century, the demand of global market is rising very day. This demand leads to be reducing machining cost, optimized lead time and perfect manufacturing system to coup with increasing needs of industries. Production is constantly unmistakable factor to be considered as to run and build up an association respectful. Lean assembling assumes a shorten job in methodology of association viability concentrating on waste decrease and improving profitability through utilization of different lean instruments. The prerequisite of lean assembling is high because of waste and occasional increment in the expense of assembling products. Esteem stream mapping is one of the key lean instruments used to distinguish the level of significant worth included, non-esteem included and lead time in procedures. Work institutionalization is critical in all assembling divisions, which will give better work technique, fabricating stream and answer for changeability amid generation. The fundamental goal of this examination is to consider the line adjusting device which is conveyed in CNC machining chambers for adjusting the remaining task at hand among the specialists and expanding the representative's usage.

Key Words: Grey Relation Analysis, Line Balancing, Cycle Time, VSM

1. INTRODUCTION

In production plants across the globe, lean manufacturing techniques are being used to meet increasing demands placed on manufacturers. Originally developed as a methodology to make production processes highly efficient, lean techniques have been adopted by all most very machine shops across the country. For many of these, the techniques have helped them to dramatically increase their competitive edge, while continuing to remove wasteful practices and contribute to the bottom line. Lean manufacturing is a continuous improvement philosophy which is synonymous with Kaizen or Toyota production system. The idea behind lean concept is maximizing customer value while minimizing wastes to increase value of the products. Lean manufacturing focuses on cost reduction by identifying and eliminating non value added activities, by eliminating waste in manufacturing process and thereby reducing work in progress. The chamber requires a standard work procedure which decreases cycle time and is to be displayed in the machine chambers. Work standardization was carried out through time study, video analysis and work study. Line balancing was taken into account for balancing the workload between operators which would reduce the idle time of

operators and for analysis purpose simulation was used. Line balancing was done for maintain workload foe better production and better efficiency.

2. LITERATURE REVIEW

Lean assembling is an act based procedure utilized in assembling ventures to expand benefit and aggressiveness through taking out waste, lessening the process duration and diminishing the segment cost. Esteem Stream Mapping is a procedure for breaking down the current situation and to structure a future situation for confining the succession of exercises that takes an item from its start through to the shopper. VSM is utilized as a fundamental device to recognize the open doors for different lean systems. Distinctive research articles have talked about the different uses of VSM procedure in various assembling enterprises. The objective of lean assembling is to build the benefit and aggressiveness by expanding, diminishing expense by dispensing with waste and lessening process duration. The fundamentals of lean assembling and VSM utilize nonstop improvement procedures to concentrate on the disposal of the seven squanders or non-esteem included exercises inside the ventures. It is essentially a working environment the executives system, which improves the workplace, human abilities and subsequently expanding the profitability. Nallusamy et al. examined about the improvement of exercises that expand the general adequacy of gear, procedures and plants through inflexible constraint of misfortunes. The utilization of VSM and line adjusting in an assembling industry brings a thought of setup time and process duration decrease. Contextual analysis adjusts the remaining task at hand between the administrators by taking out inert time. Manageability is vital factor for accomplishing aggressiveness to fulfill the client need at ideal time. Amid determination of the best provider, numerous criteria are to be viewed as that might be distinctive for various methodologies for assembling. In light of the above mentioned, the VSM think about was done in a CNC machining cell situated at Chennai alongside line adjusting and work institutionalization. Process duration or lead time is only the time between the arrival of a request from the client and the time taken for accepting the completed item by the client. An examination was done for each machine activity by utilizing the strategies of technique study and time ponder which are identified with the subject of mechanical building where each part associated with machining process like employment setting time, device setting time, CNC program stacking time, program running time, speeds, sustains, profundity of cuts utilized for the each task, device life, device evolving time, work emptying time and so on. Work institutionalizations in different creation enterprises prompts

decrease in their lead time, process duration and setup time and furthermore increment the rate of nature of the item. Through a contextual investigation the different deformities in a cast iron assembling industry were reviewed and the required proposals were given to expel the imperfections.

3. PROBLEM DEFINITION AND METHODOLOGY

Issue has been characterized by dissecting on a nitty gritty examination an apparatus box producing procedure and lodging cell was distinguished as the bottleneck for the assembling procedure which needs the improvement. Data accumulation was finished by utilizing stop watch time study and work consider was finished by video investigation. TAKT time was determined dependent on the interest and after that thought about against process duration. Esteem stream mapping was done to break down the lead time utilizing I-Grafix programming and Timer Pro was utilized for waste recognizable proof and video examination. Esteem included and non-esteem included exercises were distinguished and potential measures were taken for development. Line adjusting was accomplished for adjusting the remaining burden among administrators and field bundle was utilized for improving the outcomes. This examination centres in CNC machining cells, where they produce lodgings for wind factory gear box. The cell creates in excess of seven models of rigging boxes and one model has been decided for this examination reason.

4. VALUE STREAM MAPPING

Value stream mapping is a unique sort of stream diagram use with images known as the language of shelter depicts and build up the stream of stock and data. It is a unique kind of stream diagram that used to assess the esteem included and non-esteem included exercises from the procedure stream. The information gathered for structure up of current state esteem stream mapping are incorporates process duration, setup time, change after some time, number of administrators, level of significant worth and non-esteem included exercises, request, stock, data stream. The present state esteem stream mapping with fundamental data and cell perception is appeared in Figure. It was discovered that the absolute lead time is 3012 minutes for a finish of assembling process. Additionally the TAKT time was likewise determined according to the present information as pursues.

The time information and other CNC machining chamber observations were as below.

Customer Demand:	1500/year
Working Day:	5 Working Days/Week
Customer TAKT Time:	5 Working Days/Week
Target Cycle Time:	183 minutes
Tolerance Time:	175minutes
Overall Equipment Effectiveness:	87%

Table-1: Time Information

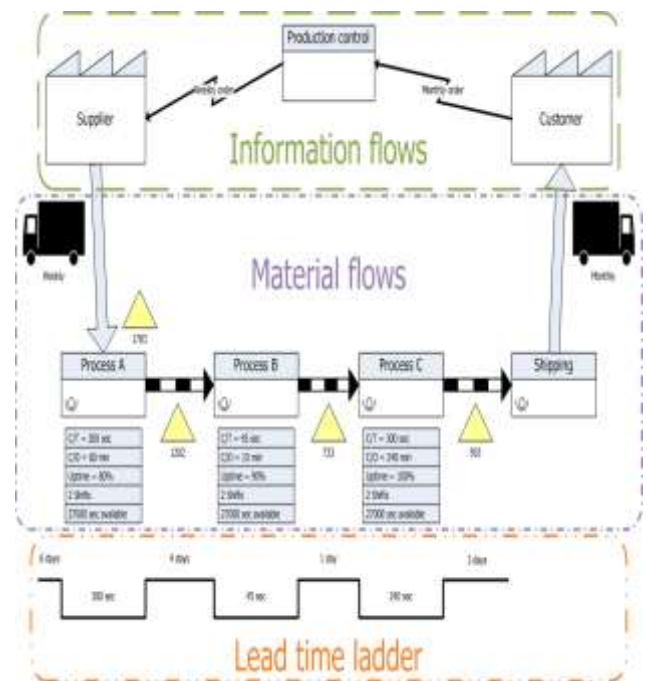


Fig-1: VSM Diagram

5. VALUE ADDED AND NON-VALUE ADDED ACTIVITIES

Process cycle time and video analysis assists to optimize value added activities and to find the percentage of non-value added activities present in the total operations. NVA are classified as Clear Waste, Hidden Waste, Material Handling and Cyclic Activities. The sum of VA and NVA were calculated using video analysis software Timer-pro. Process duration study and video breaking down streamlines esteem included (VA) exercises, which client willing to pay and to discover the level of NVA exercises present in whole activities

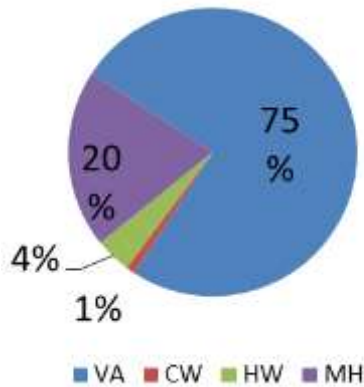


Fig. 2: NVA Diagram during operation 10

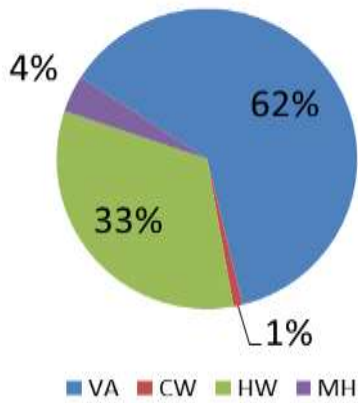


Fig. 3: NVA Diagram during operation 20

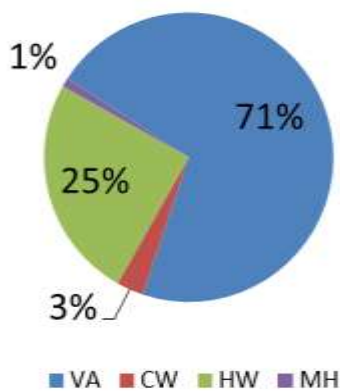


Fig. 4: NVA Diagram during operation 30

Non-value included exercises are presented by obvious waste (OW), which should be dispensed with. Hidden Waste (HW), which should be diminished and these squanders can't be dispensed with from the procedure and changes relies upon man and material. Material Handling (MH) care of need to check whether it can move to coordination or join

the procedure to lessen the process duration. Intermittent exercises are the present state simultaneously. The all out procedure is classified by esteem included and non-esteem included exercises for procedure AA, process BB, process CC and debarring are appeared in Figure 2, 3 and 4 separately.

6. WORK STANDARDIZATION

Work standardization is required for fitting arranging and situating of specialists, materials, machines, supporting components and offices for acquiring flawlessness in assembling condition. As indicated by Toyota creation framework, the execution of institutionalized working methodology will help in diminishing NVA underway stream. In light of work institutionalization approach four cycle of process duration examine were performed amid information accumulation. More than 10 to 20 upgrade thoughts were discovered and Kaizen's was proposed to improve the incentive in procedure. The process duration of 160 minutes got decreased from current process duration and potential measures for upgrades were recommended. By adjusting institutionalized working method in lodging chamber 20% of NVA has been decreased in the present procedure.

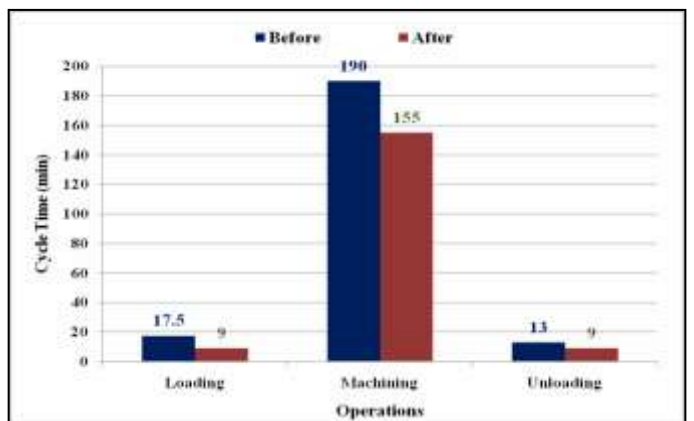
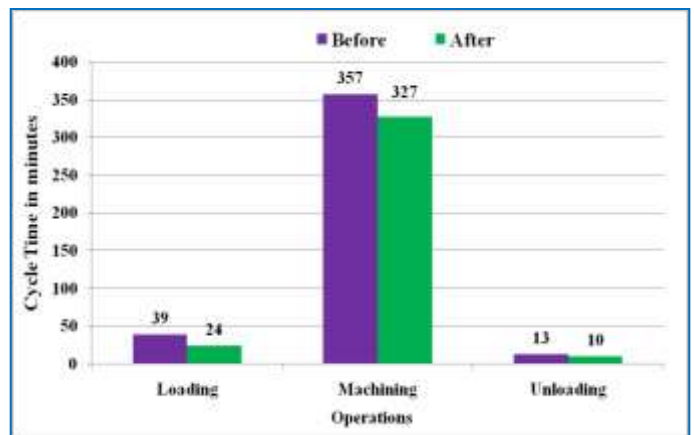
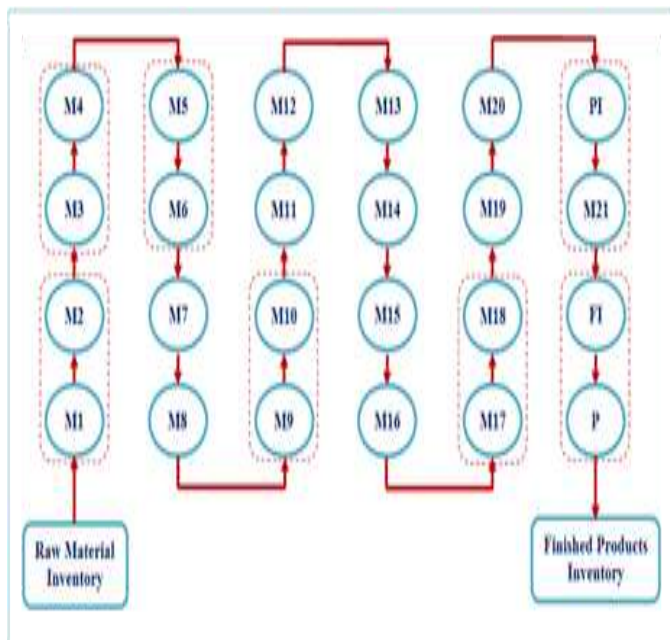


Fig. 5: cycle time Diagram for processes A,B

7. LINE BALANCING

Line balancing is the way toward doling out undertakings to different workstations, with the goal that every one of the workstations have around equal time prerequisites. We used the technique for line adjusting to-limit idle time-balance bottlenecks. Based on the present line adjusting format, the new design was proposed with a portion of the procedures were combined into single station like M1 & M2, M3 & M4, M5 & M6, M9 & M10, M17 with M18, PI with M21 and F2 with P. The proposed line adjusting design is appeared in Fig. 5. Subsequent to executing the proposed line adjusting it was discovered that the development separation of the laborers in the assembling zone was decreased to 104.2 meters through consolidating the distinctive workstations. Eventually, the lead time was likewise diminished by the proposed line adjusting strategy.

The proposed line balancing idea was proposed and reproduction has done after waste decreases in procedure with the distribution of assets are appeared in Figure 16. From this line adjusting idea man inert time is diminished and the man and machine usage is adjusted to 80%. In existing, amid procedure man engaged with work is 2 hours and 18 minutes in the all-out process duration of 5 hours and 35 minutes which is simply around 58% as it were. So the single administrator for two machines can be utilized, which is close-by offset with the man and machine usage. It was seen that around 80% of use by both the machine and man use is expanded up to 72% by the field reproduction.



8. CONCLUSIONS

The application of lean manufacturing tools in machining and production cell was examined and dissected. The goal was to distinguish and evacuate the losses in any exercises

that don't esteem added to the last item in the assembling procedure and furthermore to lessen the general lead time. In view of the investigation and examination the accompanying ends were arrived.

- From the current scenario of VSM, it can be seen that identified the esteem included and the non-value included time for individual procedure.
- The process duration was diminished by distinguishing and disposing of squanders through 5S usage.
- Expanding process has some more non-value movement when contrasted with different procedures after their improvement action usage.
- The development separate was decreased about 11.3 meters through the usage of proposed line adjusting.
- It was crystal clearly seen from the future of state VSM that the total production process duration was gradually reduce 300.45 seconds and monthly demand was expanded as 4350 units rather than 3560 units for every month which is expanded by about 20%.

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