

Value Stream Mapping in Press Shop

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Abstract- This paper focuses on meeting the customer demand by improving the manpower utilization, enhancing the machining capacity and improving material flow. The productivity improvement is to be carried out through modification of shop floor layout supportive multi machine manning as well as streamlining the material flow in between machines. The cycle time analysis and part flow analysis is carried out to group the machines which look more in detail on bottleneck processes. Aim is to have uniform loading of operations work content and this is an important and critical activities to be carried out from organizational perspectives effective utilization of manpower to bring up the productivity. The analysis on machine utilization and layout of machinery will also be made to enhance the capacity of shop floor.

Keywords- Value stream mapping, Lean manufacturing, Kanban.

I- INTRODUCTION

Every organization is striving hard on getting more work done in less time and with greater ease. The fundamental aim of any organization has been to continuously minimize waste and maximize flow which would ultimately lead to customer satisfaction by providing right product at the right time in the right quantity and the right quality at a reasonable price. This can be achieved greatly by adopting lean manufacturing system which is more than a cost reduction program. It aims at eliminating wastes which could be in the form of excess production and inventory, redundant movement of material, waiting and delays, over processing, excess worker motion, rework and corrections.

Lean Manufacturing: In order to compete in the current markets, manufacturing companies need to

review and continuously improve their manufacturing systems. The concept of Lean manufacturing is to eliminate waste in the production that does not create value for the products or customers.

Value-Added and Non-Value Added: Value is defined from the point of view of the customer with regard to lean. It makes to think and analyze whether the activity directly contribute to the customer's product to make it more complete and if the customer is paying for that activity or not. This, in the language of lean is known as value-added and non-value-added activity.

Value Stream Mapping: Steps for Lean implementation must be determined from a well-defined process map in order to estimate the improvement after implementation. Value stream mapping is a lean-management method for analyzing the current state and designing a future state for the series of events that take a product or service from its beginning through to the customer.

Purpose of the Study

The purpose of the study is to identify non-value added activities and waste so that it can be gradually reduced and eliminated, compress production lead time, switch from big batches to small batches and one-piece flow wherever it is possible in the process flow.

II-METHODOLOGY

The objective of this study is to reduce lead time and increase throughput by identifying non-value added activities and striving to reduce and eliminate it that customer demand can be met. Batch processing in full capacity and bottlenecks in the production process are key contributors to long lead times. The results of the research would have direct impact on product lead time and inventory which would aid in reducing cost and meeting customer demand. The research started by taking a three day lean workshop which enhanced the

understanding of lean manufacturing and value stream mapping

1. **Collect data and produce current State map**– Collect data related to production such as material flow, cycle time, changeover time etc. Then create current state map according to the data collected.
2. **Analyse Current state** – Analyse the current data by considering factors such as inventory, waiting time, production, process flow, transportation and motion of product.
3. **Map Future State**–Future state value stream map is an interim stage between current state map and the ideal state that is goal for the whole exercise. It reduces non value added activities.
4. **Create Action Plan and deploy** - Develop action plans for implementation deploy strategy by communication and improving training to the personnel as required.
5. **Measure benefits towards perfection**–Calculate benefits like improvement in production.

III -DATA COLLECTION

The purpose of data collection is to provide a basis for analysis, in other words, to turn data into information that is used by, and useful to, decision-makers. However, before data can be collected, a data collection plan needs to be developed. The data is collected to identify the bottleneck station in manufacturing plant and to analyze and eliminate them. The collected data is of direct observation in shop floor using stop watch by continuous assessment of each Machine. Data collected is shown in (table 1) below.

Table 1. Machine capacity

Sr no.	Machine	Operations	Capacity (Ton)	Cycle time (sec)	Capacity (per day)
1	Machine M1 (Mechanical)	Draw 1	200	14.43	248
2	Machine M2 (Mechanical)	Draw 2	200	13.03	276
3	Machine M3 (Mechanical)	Trimming	160	14.1	274
5	Machine M4 (Mechanical)	Forming	250	14.84	242
7	Machine M5 (Mechanical)	3 Hole Piercing	150	14	257
8	Machine M6 (Mechanical)	Side Piercing	150	18.66	192

The part Non pressure plate (NPP) related to the automotive braking system mostly used in heavy duty vehicle. Company produced NPP on daily basis that the requirement of NPP is 230. Different operations like blanking, drawing, piercing etc are performed on NPP. Firstly, blanking operation is carried out. Then operations like draw 1, draw 2, trimming, forming, 3 hole piercing, side hole piercing are carried out on mechanical Machines M1, M2, M3, M4, M5 respectively. To reduce non value added time it is necessary that flow of material should be in sequence. From Fig 1 Flowchart of material flow of Non Pressure Plate, we can see the sequence of operation

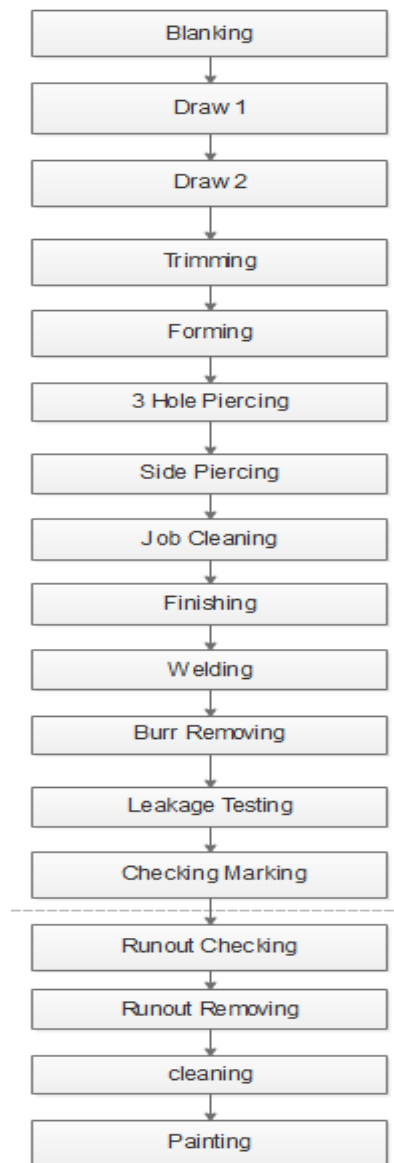


Fig 1- Flowchart of operations on rear body

IV-DATA ANALYSIS

Mapping the value stream always starts with the customer demand. With the product family, specified for the mapping, a product matrix was made which helps see what family of products follow the same manufacturing process. The proper and accurate mapping of the current state map. An understanding of the value stream mapping is enabled with the help of value stream symbols and definitions. Fig 2 show the current state map of press shop.

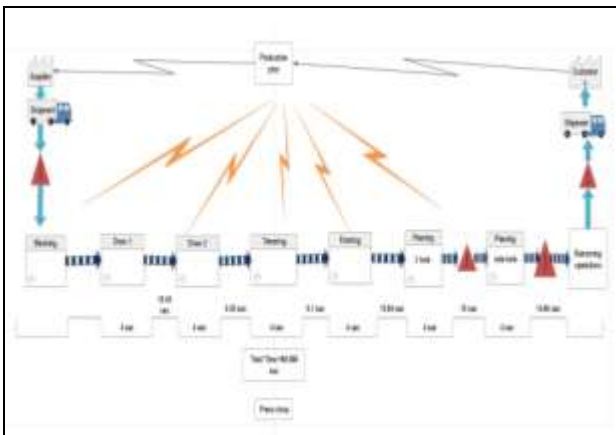


Fig 2 Flow of operations on Machines in press shop

The current state map pictures the existing practices which on analysis would reveal the waste elimination opportunities. After gathering the information of the current state value stream mapping future state map is being developed for production of Rear body per day.

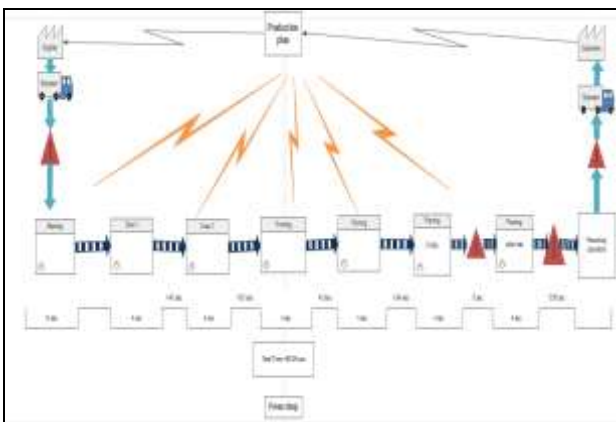


Fig 3 Flow of operations on Machines in press shop (Future Map)

Findings of Cause effect analysis of wastes

Table 2 Cause effect analysis of wastes

Wastes	Reasons
Inventory	Raw materials, Safety stock, Finish goods, Delivery schedule, Minimum quantity requirement.
Waiting Time	Imbalanced layout, Transportation schedule.
Defects	Equipment problem, Material problem.
Transportation	Discontinuous process, Distance between work stations, Improper arrangement of Machine.
Excessive Motion	Layout.

Table 3. Root cause and solution of wastes

Problem statement	Root causes	Solution
Inventory	No formal set of procedures to handle inventory	Kanban.
Excessive transportation	Improper conveyor design and improper conveyor position.	Use roller conveyor from Machine to Machine.
Excessive motion	Improper work sequence & layout	Spring pallet elevator.
Cleaning , rework and insufficient storage	Improper utilization of space and inventory	Rack system.

Drawing the Future State Map target for a lean flow through the production line and the elimination of the root causes of the wastes identified. Once the Key characteristics of the Future State are identified and in progress are reviewed with the top management to obtain input and gain mutual agreement on the direction of the Future State.

Looking at the current state map for SMC several things showed up:

- (a) Intermediate inventories between Machines,
- (b) The difference between the total production lead-time (54 seconds) and the value added time (54 seconds).

Observations showed that stacking of parts on the conveyor after machining completed is one of the major problems that can see in the production line. Stacking effected the part quality as it caused dented and scratches. As a result, a quick fix solution was implemented whereby a warning signage at the area production line was produced as reminder to operators so they are warned not to repeat the action and briefing on the effect of stacking and non-conformance issue with respect to deterioration on quality of product was delivered by the respective supervisors.

V- RESULTS

Drawing the Future State Map target for a lean flow through the production line and the elimination of the root causes of the wastes identified. Once the Key characteristics of the Future State are identified and in progress are reviewed with the top management to obtain input and gain mutual agreement on the direction of the Future State.

VI-CONCLUSION

The developed method of Value Stream Mapping will be capable of systematically visualizing, analysing and optimizing multistage manufacturing processes from a quality assurance viewpoint. The procedure model consists of four consecutive phases: preparation, quality value stream analysis, quality value stream design and implementation. Through this analysis non utilized Machines will be properly used. With this proper utilization net product output will be increased.

The value stream mapping method enables the visualization of manufacturing processes, material handling time that is value added time and non value added time, inventory, bottlenecking of process plant.

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