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Establish the Value Stream Mapping For Lead Time Evaluation by Lean Concept

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Abstract: Toyota started practicing TPS (Toyota Production System) since 1950 successfully. Due to success of TPS Many companies across the world stated using the same. Later in 1990s. M. Womak and Jones gave the name it as a lean manufacturing. Lean manufacturing is now one of the most powerful manufacturing systems in the Competitive world. Numerous organizations around the world have implemented and adopted it to enhance their productivity through reduction and elimination of Waste. This project reports is on understanding and implementation of one of the Lean tools which is; Value Stream Mapping, for Directional Control Valve in Bosch Rexroth (India) Pvt. Ltd. – Sanand Plant, Ahmedabad. Value Stream Mapping is a lean tool to identify the value added and non-value added activity during the production. Using this, identify the Waste and removing it along the processes which is based on the principle of Bosch Production System. (TPS – Toyota Production System) This intends the checking of the Inventory level during the process of Manufacturing and Assembling of the products.

Keywords: Toyota, Lean Principles, Muda, JIT.

1. INTRODUCTION

Lean manufacturing is a philosophy in which it is used for elimination of waste Lean means manufacturing without waste. Waste ("muda" in Japanese) has seven types: waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion, and waste from product defects. The goals of lean manufacturing are to reduce waste in human effort and inventory, reaching the market on time, and managing manufacturing stocks that are highly responsive to customer demand while producing quality products in the most efficient and economical manner The concept of Lean Manufacturing originated from Toyota Production System (TPS) that determined the value of any process of two activities value-added activities from non-value-added activities; and eliminating waste so that every step adds value to the Process. Lean Manufacturing focuses on efficiency, aiming to produce products and services with Minimum or without Waste. [3]

At the lowest cost and as fast as possible. For lean manufacturing, Kanban serves as a tool to control the levels of buffer inventories in the production; in simpler terms to regulate production quantities. When a buffer reaches its preset maximum level, the upstream machine is directed to stop producing that part type. Hence, in the manufacturing environment, Kanban are signals used to replenish the inventory of items used repetitively within a facility.

2. LEAN PRINCIPLES

Basically there are five rules for implement the lean manufacturing.

1) Specifying Value: Value is defined by the Customer. It is only meaning full when it express in terms of specific product or service which meet the customer need at a specific price at a specific time.

2) Identify and create Value Stream: A value Stream is all the actions currently required to bring a product from raw material to customer getting.
3) Making Value flow: product should flow through a lean organization at the rate that the customer needs them without being caught up in inventory.
4) Pull Production not Push: Only make as required. Pull the value according to the customer's demand.
5) Striving for perfection: perfection does not just mean quality. It means producing exactly what the customer wants, exactly when the customer requires.

3. LEAN TOOL

5S:

WHAT	HOW
SEIRI **(SORTING)**	Differentiate necessary & unnecessary items, Discard unnecessary items
SEITON **(SET IN ORDER)**	Placing things, based on the frequency of usage, Arranging things so that it is easy to locate
SEISO **(SELF CLEANING)**	Removing dust, dirt and contamination and keeping cleanliness, Keeping the environment always clean, beautiful and free from trash and dirt
SEIKETSU **(STANDARDIZE)**	Keeping and maintaining the previous 3S on regular basis, Keeping hygienic and clean environment
SHITSUKE **(SUSTAIN)**	Maintain a habit to keep the resolutions rightly and forever. Carryout work in accordance with set standards

GEMBA

The Japanese term for "Actual place," often used for the shop floor or any place where value- creating work actually occurs. The term often used to stress that real improvement only can take place when there is shop-floor focus based on direct observation of current condition where work is done. [4]

JIDOKA

The term Jidoka used in the TPS can be defined as automation with a human touch, as opposed to a machine that simply moves under the monitoring and supervision of an operator. The Toyota term "Jido" (automation) is simply applied to a machine that moves on its own. Jidoka is one of the two pillars of Toyota Production System along with Just in Time (JIT).

JIT

A system of production that makes and delivers just what is needed, just when it is needed, and just in the amount needed. JIT and Jidoka are two pillars of Toyota Production System. JIT aims for the total elimination of all waste to achieve the best possible production and delivery lead times.

KANBAN:

The Kanban System determines the production quantities in every process. In Japanese, the word "Kanban" means "card" or "Sign" and is the name given to inventory control card used in pull system. It is upstream process produce only enough unit to replace those that have been withdrawn by the downstream process.

Muda

Waste is one of the seven wastes identified by Toyota. These are: [6]
1. Overproduction: Producing items for which there are no orders.
2. Waiting Time: Employees standing about. Inventory at stand-still.

3. Unnecessary Transport: Moving material unnecessarily or long distances.
4. Over-processing: Using more steps to produce a product than necessary.
5. Excess Inventory: Retaining unnecessary inventory between process steps.
6. Unnecessary Movement: Any wasted motion by man or machine.
7. Defect: Making incorrect product.

OEE (Overall Equipment Effectiveness)

OEE is defined as a measure of utilization for equipment for the time it is planes to be used. It excludes all planed downtimes, but includes setups or change over losses. In effect implying how effectively planned time was used for producing good parts. OEE typically focuses on six major losses: failure, adjustment, minor stoppages, reduced operating speeds, scrap and rework.

PDCA

Plan: Senior management uses the visioning process in the context of its business plan. Do: Implementation of action plans. Check: On a periodic basis, review the measurement of the outputs, and note what learned can help in the future. Act: Necessary adjustments to plans and priorities to ensure the success of the strategy breakthroughs.

Poka Yoke

It is an Error proofing method. In which error or mistake is easily identify using the signals.

Root Cause Analysis:

It is also known as Ishikawa Diagram or Fishbone Diagram. It is a method to find and derives the all possible causes or root causes behind any uncertainty.

SMED

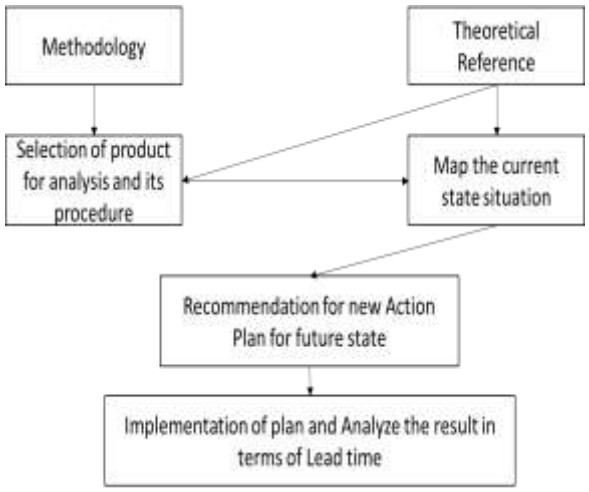
SMED stands for Single Change Exchange Die. It is theory and set of techniques that make it possible to perform equipment setup and changeover operations in less than 10 minutes

VSM

All the actions, both value adding and non-value adding required bringing a product from concept to launch and from order to delivery. These include actions to process information from the customer and actions to transform the product on its way to customer.

These all tool are implementing in your industry then you can say your company is successfully implementation of lean manufacturing. Among them my project report is on Value Stream Mapping. For lean manufacturing in industry so now we discuss on Value Stream Mapping.

4. WORK BOUNDARY



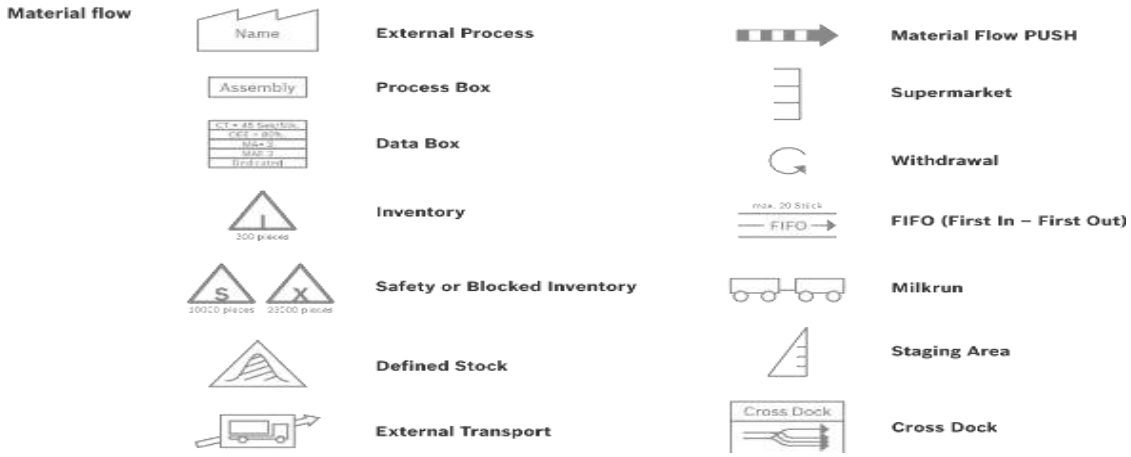
5. VALUE STREAM MAPPING

A Value Stream is all the actions both Value added and non-Value added currently required to bring a product through the main flows essential to every product. There are three kinds of main flows in any organizational setup.

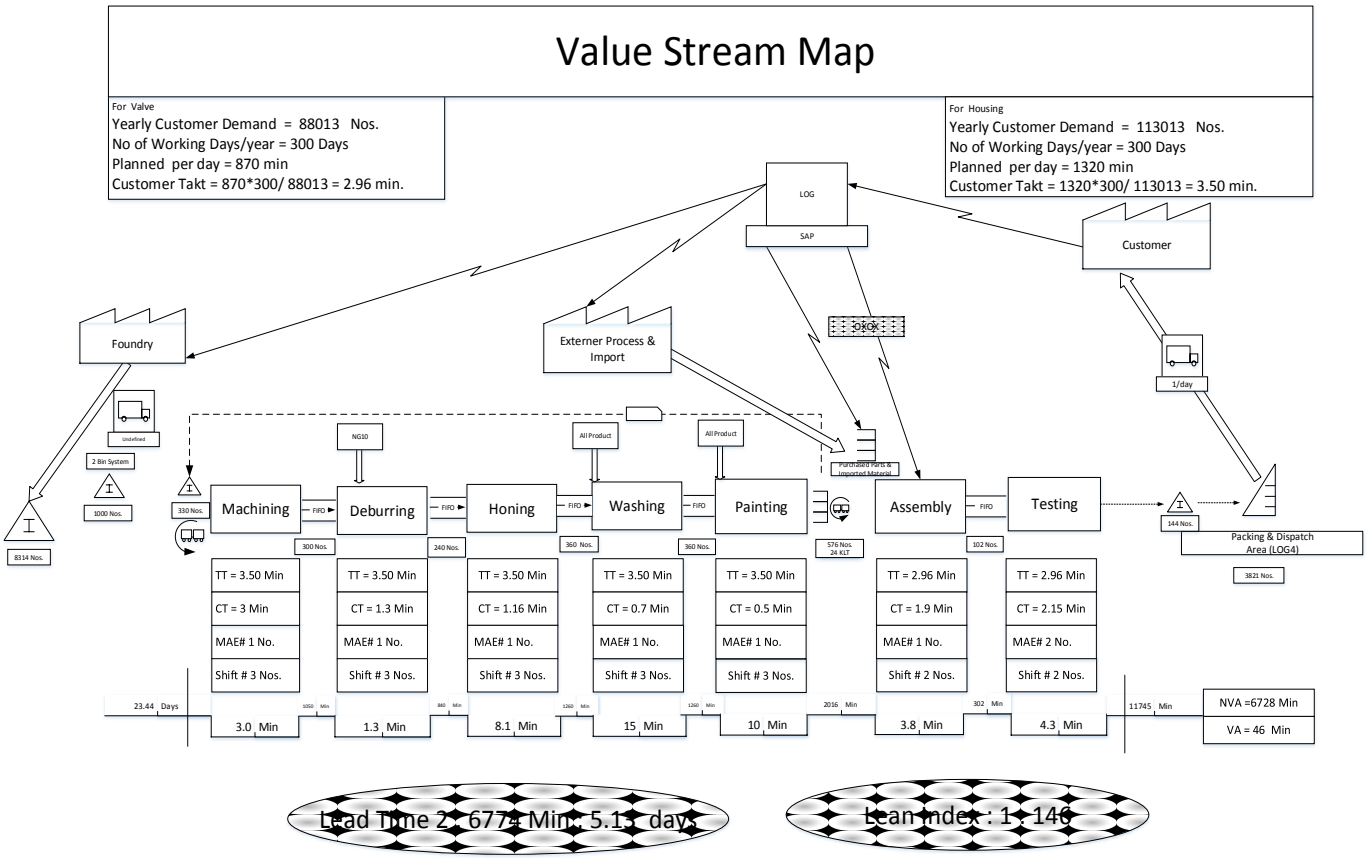
- The product flow from raw material into the arms of the customer.
- The Design flow from concept to launch
- The Information Flow from customer to supplier.

Value stream mapping is a method of lean manufacturing which uses symbols, metrics and arrows to show and improve the flow of inventory and information required to produce a product or service which is delivered to a consumer. A value stream map is a visual representation which enables one to determine where the

6. VALUE STREAM SYMBOL



7. VALUE STREAM MAP



8. VSM CALCULATION

Process	**Value added=** **No of Pieces on Process× CT**	**Non Value added=** **No of Pieces after the Process × TT**
Machining	1 × 3 = 3	300 × 3.50 = 1050
Deburring	1 × 1.3 = 1.3	240 × 3.50 = 840
Honing	7 × 1.16 = 8.1	360 × 3.50 = 1260
Washing	21 × 0.7 = 15	360 × 3.50 = 1260
Painting	20 × 0.5 = 10	576 × 3.50 = 2016
Assembly	2 ×2.96 = 3.8	102 × 2.96 = 302
Testing	1 × 2.96 = 2.96 2 × 2.96 = 4.3 (2 Machine)	-
Total Time	**46 Min.**	**6728 Min**

$$\textbf{Lean Index} = \frac{\textbf{value added}}{\textbf{value added} + \textbf{non value added}}$$

$$= \frac{46}{46 + 6728}$$

$$= 1: 146$$

$$\textbf{Lead Time} = \textbf{Value added} + \textbf{Non Value added}$$

$$= 46 + 6728$$

$$= 6774 \text{ Min.}$$

$$= 6774 / 1320$$

$$= 5.13 \text{ Days.}$$

CONCLUSION

From the literature reviewed it could be clearly seen that lean manufacturing techniques promises to enhance the productivity by reducing the affecting parameters like lead time, inventory level, production cost and material usage to a noticeable extent. It also depicts the amongst the various mapping techniques analyzed, VSM is an approach proves to be more suitable in complex working environments, which not only helps in identifying the wastes hindering the productivity but also helps one to identify the right lean tools to be used for the given situation. Using the Value Stream define Lead time for the direction control valve in current state is a 6774 Min or 5.13 Days, and Lean Index is 1:146.

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