

## APPLICATION OF USING VALUE STREAM MAPPING IN THE HYDRAULIC-PUMP MANUFACTURING INDUSTRY

Karthick Umapathy<sup>1</sup>, Karthik T<sup>2</sup>, Rajenthirakumar D<sup>3</sup>

<sup>1</sup>PG Scholar Department of Mechanical Engineering, PSG College of Technology Coimbatore, India.

<sup>2</sup>Assistant Professor Department of Mechanical Engineering, PSG College of Technology Coimbatore, India.

<sup>3</sup>Professor Department of Mechanical Engineering, PSG College of Technology Coimbatore, India.

<sup>1</sup>karthickumapathi@gmail.com, <sup>2</sup>tkarthik.psg@gmail.com, <sup>3</sup>rajentkumar@gmail.com

**Abstract**— The primary motivation behind the paper is to realize how Value Stream Mapping (VSM) is a useful asset in lean execution and to handle the improvement territories from the present status and to propose the future state which helps in lessening the lead time, cost and conveyance in time without trading off for the nature of the item. VSM causes firms to comprehend and to improve ceaselessly to progress in the direction of turning out to be lean endeavor. A contextual analysis was done and correlation was made between present status and future state where the open door was recognized for upgrades.

**Keywords**— VSM, Lean Manufacturing, current State, Future State, lead Time.

### I. INTRODUCTION

Companies to meet customer requirements about product quality and on-time delivery systems. To maintain good relationships with customers, companies to maintain and do it at a minimal time as well as cost. The lean tool, value stream mapping approach is with lean paradigms is an efficient way to identify and eliminating Muda (waste) in every platform. The reduction of Muda will help to improve the value of the product. Value stream mapping is proven to be the most suitable tool. The main aim is to legalize lean manufacturing approach help us to find out how the muda is validated. Several companies suddenly validated, how lean paradigm is on the way to transform physically *as well as* constructive transformation to practice lean paradigm. Lean paradigm is constructively transformation to implement to eliminate the term muda. The lean paradigm is defined in the book that changed in the world by Womack. Lean paradigm has different endeavour and plan of activities, which are similar to the industrial engineering practices. In simple term Lean paradigm is the simple way to practicing continuous flow in help of pull system as well as by aid to eliminating muda and non-value added activities to the product, reducing product lead-

time, improved inventory controls. The vital objective value Stream Mapping techniques is to spot opportunities for improvement in an exceedingly future amount of your time the paper aims to implement lean practices in pump industry through value stream mapping.

### II. LEAN MANUFACTURING

Lean is Popular from Japan Automobile industries. It is popularly known by the Terms “Lean factory”, “Toyota production System”, “One Piece flow”. Lean was primarily originated in U.S.A. from the early of 19th Century, Henry Ford started in their factories as a one-piece flow of components to originate lean in their Industries. Lean is first practiced in Japan companies they believe in Deming’s principle in 1950’s and then Lean is successfully implemented in Toyota companies and it is revealed as Toyota Production system in 1973 and it is spread all over the world. Lean is a process improvement methodology it is strongly committed to remove the barriers of non-value added activities which are not paid by customers. Lean is primarily focused on establishing and annihilate the seven buried wastes which are typically to both manufacturing and service industries. Since its implementation by Toyota production system (TPS) from 1940-1950 The lean manufacturing paradigm has the one of the most dominant system in manufacturing. The LM paradigm is the essence of making utilization of 6M methodologies. The 6M are man, machine, material, method, measurement, and money. Through adding value-added activities and throughout non-value added activities. Value Stream Mapping could be the most vital tool for lean production and permits companies to grasp and unendingly improve towards lean thinking. In 1980 Tachii Ohno suggest

in their book the main 7 Muda's are primary composer for the lack of productivity of companies. The Deadly wastes are,

1. Motion
2. Over processing
3. Transportation
4. Over production
5. Waiting time
6. Defects and rework
7. Inventory.

### III. LITERATURE REVIEW

According to Chan, et al. [1] Studied Total productive maintenance (TPM) is a methodology that aims to increase the availability of existing equipment, hence reducing the need for further capital investment.

Ishak Abdul Azid [2] proposes an equipment performance and reliability (EPR) model for measuring maintenance performance based on machine effectiveness.

Raffaele Iannone, et al. [3] compared various OEE calculations and how to measure factory performance through OEE and factors affecting OEE of the factories covered.

A. J. Deron, et al. [4] Investigate OEE is the one of the performance metric measurement of the equipment. Also the OEE metric is based on the effective time utilization of the equipment. Abhijeet Digalwar. [5] Covered various Lean tools used in different industries also compared and contrast the tools also discovered TPM is the second best tool over Education and training Tool. The Study is Conducted more than 150 industries over the country.

Xiaoping ZHU, [6] Studied OEE helps to optimize and improve productivity.

S. Nallusamy, et al., [7] Proposes better OEE will improve the productivity metrics by existing machines. They also proved TPM methodology will improve the OEE of factory. This paper also analysis of capital investment reduction by Lean tools such as Jishu Hozen.

S.gholizadeh. [8] describes OEE is the tool to improve the production line improvements. and also it is reliable tool to eliminating the speed losses and break down losses caused by the equipment.

Gamberini Rita et al. [9] author explains alternative methods for compiling OEE calculation between manual and automated line is analyzed and proposed industrial 4.0 based OEE calculation for a manufacturing company.

Shailendra Nigam. [10] Author Analyze various TPM tools and approaches and 7 Deadly Diseases 6 major losses.

Japan Institute of planned maintenance manual. [11] it explains Focused equipment improvement for TPM teams and Describes how TPM implement in Industry and how to identify wastes and what is NVA and NNVA activities and Major Losses and complete instructions for both small and Major industries.

### IV. VSM ACTIVITIES

#### 1 Value Added Activities

Value added activities is a process or an activity that add value to the product or service. Value is proposed by the customer who is willing to pay for the product or service.

#### 2 Non-Value Added Activities

Non-value added activities are the process or activity where it does not need to add value to the products in a sense a customer is not willing to pay for that and it the activity should be eliminated.

#### 3 Necessary Non-Value Added Activities

Necessary Non Value activities that are necessary under the present operating system or equipment. They are likely to be difficult to remove in short term but may be possible to eliminate in medium term by changing the equipment or process.

#### 4 Current State Value Stream Mapping

Current state value stream mapping is the graphic description of what is currently happening on the shop floor. And it allows everyone to visualize the situation CVSM is conducted by cross functional team of the people CVSM data is gathered by existing condition of work floor.

#### 5. The Value stream mapping Construction

1. Identify the product
2. Create current state VSM
3. Evaluate the current map
4. Identify the problem areas
5. Create a future state VSM

6. Implement the final plan.

V. CASE STUDY

A. PROBLEM STATEMENT

Pump manufacturing industries are one of the highest demand industries across the country. Entire the country is solely depending on water and forming aid.so pumps place an essential role in the people's life especially forming and other necessary activities are completely depending on the pumps only. The improvement of the assembly line is to meet the upcoming customer demand. The challenge is to meet customer demand is the existing infrastructure and existing resources. Some

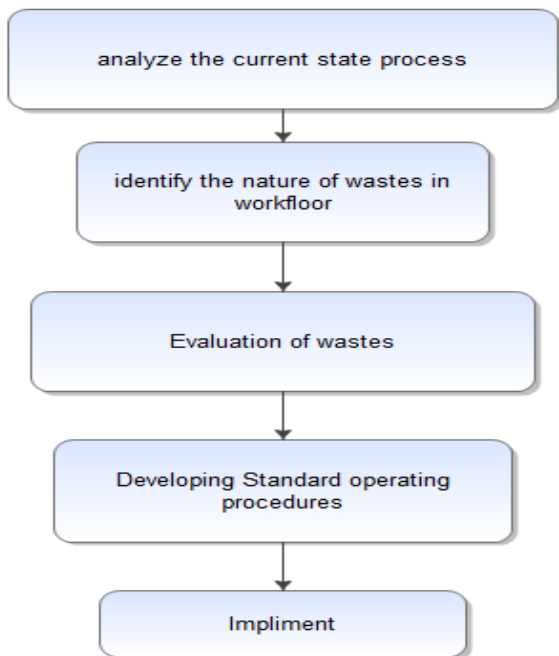


Figure 1.Process Flow

of the initial problems are identified at the assembly line of the pumps section to tackle the customer demand through Gemba walk. The problem is identified through Gemba walk are rework and rejections at work stations. Unavailability of 3m.need of pallets to store WIP.work ergonomics issues at work stations due to inappropriate workstation configuration. The necessity of value stream mapping is to optimizing the lead time and improve the productivity rate of the assembly line.

B. OBJECTIVES

To Analysis Existing production Practice at Pump Industry Determine the critical process of studies and time studies. To enable appropriate and essential Lean tools. To expand a future state Value stream mapping of the Assembly process using E-VSM software.

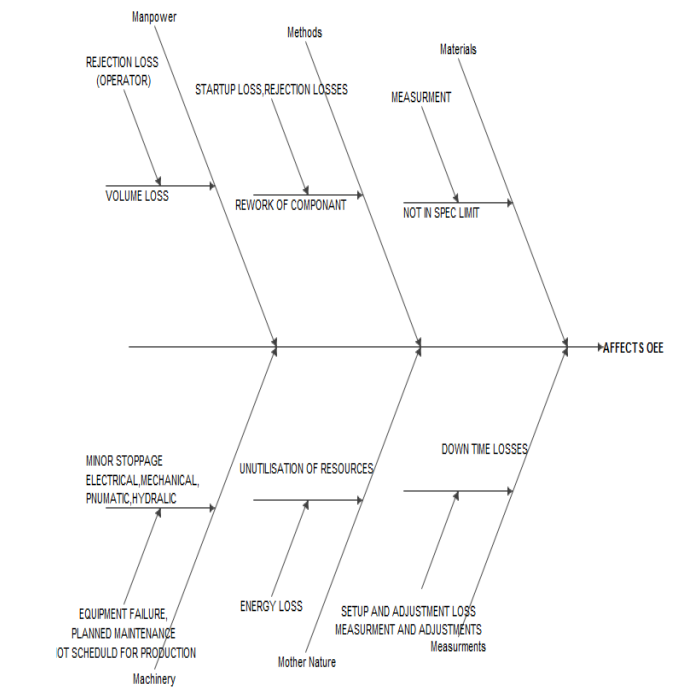


Figure 2. Cause and Effect Diagram

To analyses the current state of assembly line data's and identifying the critical machines, process by using ABC analysis. Identifying 16 major losses caused by 5 M Conditions.Reduce the Assembly Line Current Takt time from 1 min to 0.48 min with the same machines and Equipment.

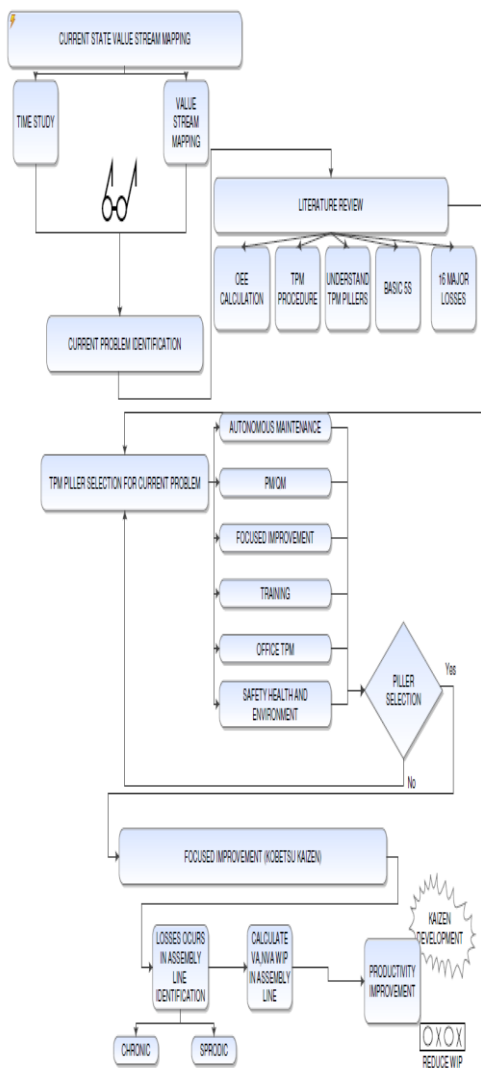


Figure 3..Methodology

Table 1 Loss data in assembly line 1 in Before implimentation

Process	Loss
Material	450
Maintenance	340
Powercut	340
Pressure drop in assembly line	850
Operator un-availability	80
Testing and quality	279

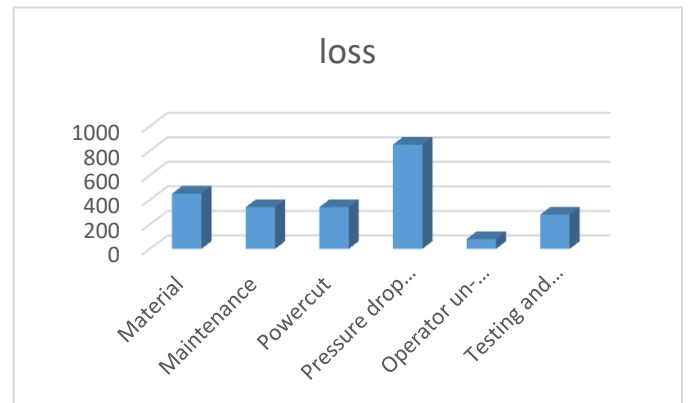


Figure 3..Various Lossesin Assembly Line Before implimentation

## VI DEVELOPMENT OF FUTURE STATE VALUE STREAM MAPPING.

The Future State map shows the assembly organization after the Implementation steps begins. The future State Value Stream Mapping Shows how the flow is organized as well as kaizen brust taken into action are structured. Future state Value stream mapping is help to operators find the effective way to change the of the organization should be made with the continuous improvement brusts.it also help the organization to prevent the upcoming demands and make working on that demand Requirement data.

Table 1 Loss data in assembly line 1After Implementation

Process	Loss (minutes)
Material	150
Maintenance	240
Power cut	40
Pressure drop in assembly line	750
Operator un-availability	70
Testing and quality	79

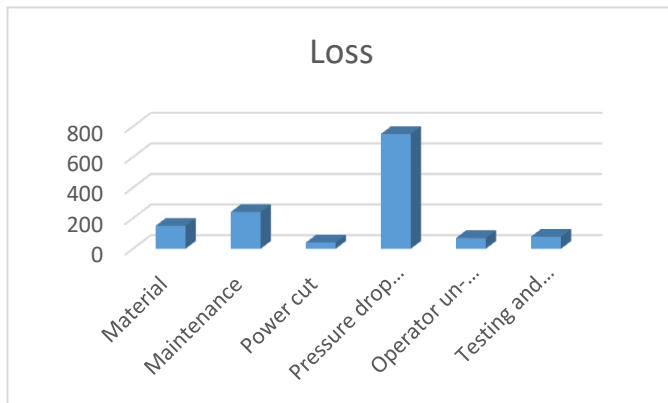


Figure 4. Various Losses in Assembly Line 1 After implementation

## VII. CONCLUSIONS

This paper work contains an evidence of genuine availability while applying lean tools to the assembly shop floor. A special attention is given to this project is eliminating losses which occurring, were taken care. reducing losses likelihood to improve the productivity metrics and OEE of the industry.

### A Benefits for after implementation

The result is obtained from both current and future state map is noted. Improvements in future state is described in percentage. Non value added activities are noted.

The following are the benefits of new kaizen Brust.

- It Moves Fast Compared with old one
- Zero Break downs
- Low capital cost
- Zero maintenance
- Operator waiting time is reduced.

Process	Current State	Future state	Result
Lead Time	30223	25850	15%
Non-value added activities	20.35	13.2	35%

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