INTEGRATING VALUE STREAM MAPPING VALUE ANALYSIS AND VALUE ENGINEERING

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ABSTRACT

The problem under study is “Enhancing the Profit of the industry by improvement in present assembly operations and material handling system by using the principles of Value Stream mapping (VSM) and Value Analysis and Value Engineering”.

In the VSM consist 1) Rejection control 2) Kaizen implement 3) Implementing House Keeping.

VALUE ANALYSIS AND VALUE ENGINEERING consist The systematic effort directed at analyzing the functional requirements of systems, equipment, facilities, procedures, and supplies for the purpose of achieving the essential function at the lowest total (life-cycle) cost, consistent with meeting needed performance, reliability, quality, maintainability, aesthetics, safety, and fire resistance.

KEYWORDS : Integrating VSM, Value analysis, Value Engineering

INTRODUCTION

Value Stream Mapping

“Value stream” to be “all the actions (both value added and non-value added) currently required to bring a product through the main flows essential to every product: the production flow from raw material into the arms of the customer, and the design flow from concept to launch”.

A value stream is a collection of all actions (value added as well as non-value added) that are required to bring a product (or a group of products that use the same (Resources) through the main flows, starting with raw material and ending with the customer. These actions consider the flow of both information and materials within the Overall supply chain. The ultimate goal of VSM is to identify all types of waste in the value stream and to take steps to try and eliminate
these. Taking the value stream viewpoint means working on the big picture and not individual processes. VSM creates a common basis for the production process, thus facilitating more thoughtful decisions to improve the value stream. VSM is a pencil and paper tool, which is created using a predefined set of standardized icons.

The first VALUE ANALYSIS (VA) program was established in the General Electric, USA by about 1947, since then the programme has received considerable attention and many successful applications have been reported. Though the technique started with analysis of purchased items it has been extended to manufactured items as well. The idea behind Value Analysis is not new. The approach to the problem essentially differs from that of the other Cost Reduction techniques. A customer when buying a product weighs its functional and other features (appearance, attractiveness, get up) against its price and judges the VALUE of the product. Manufacturer in turn, in order to enhance the VALUE of his products must ensure that he offers all the necessary functional features at the lowest possible price. This functional approach is the basic criteria of VALUE ANALYSIS. It tries to obtain a “FUNCTION” and “NOT” the “PART”, at a lesser COST.

METHODOLOGY

Value Stream Mapping

All data for the current state map is collected according to the approach carried by [3]. Data collection started from our plant workstation to customer workstation and included data like inventory levels after each workstation, process cycle times (CO), changeover time (CT), available time (no. of shifts) and no. of operators. The timeline at the bottom of the current state map in fig has two components. The first component is the production waiting time (in seconds), which is obtained by summing the lead time numbers from each inventory triangle before each process. The time for one inventory triangle is calculated by dividing the inventory quantity into the customer requirements per second which is estimated at 2000 molding parts per month according to the marketing department.

E.g. Waiting time between ‘release and housing assembly’ and ‘testing’ is calculated as total inventory between two workstations (i.e. 6.04) divided by avg. demand per second of MOLDED (i.e. 0.00243), which comes as 2486.3 seconds.

Total value added time (including wastes during the operation)

\[= 4094+1371+3915+1449+1249+1238+1216 = 14532 \text{ seconds} = 242.2 \text{ min.} = 4.03 \text{ hrs}\]

Total waiting time = 1697.5 + 2486.3 + 462.98 + 925.9 + 908.7 + 1271.4

\[= 7752.79 \text{ seconds} = 129.2 \text{ min.} = 2.153 \text{ hrs}\]

Total lead time = 3.19 + 2.153 = 6.189 hrs

From the results it can be seen that total waiting time per breaker is about 34.8% of total lead time, which shall be reduced in order to reduce the lead time.
Waiting Time of component between the two workstations = Total Inventory between two workstations/Average demand per second of product

**Findings of VSM**

1. Total value added time (including wastes during the operation)  
   \[= 4094+1371+3915+1449+1249+1238+1216 = 14532 \text{ seconds} = 242.2 \text{ min.} = 4.03 \text{ hrs}\]

2. Total waiting time = 1697.5 + 2486.3 + 462.98 + 925.9 + 908.7 + 1271.4  
   \[= 7752.79 \text{ seconds} = 129.2 \text{ min.} = 2.153 \text{ hrs}\]

3. Total throughput time = 4.03 + 2.153 = 6.189 \text{ hrs}\]

4. By referring VSM, it is clear that bottleneck operation is having largest waiting time and hence largest inventory of all and the following workstation i.e. “Over travel measurement and assembly” is starving.

5. Total waiting time is forming a share of 35% of total lead time which gives very high scope of waste reduction

6. Each process is producing its own schedule that means there is ‘Push production’ existing in the system

7. To summarize the VSM, it is showing presence of at least six wastes in the form of
   a) Transport
   b) Inappropriate processing
   c) Unnecessary inventory
   d) Unnecessary motion
   e) Defects

**Standardization of Process**

Standard work establishes clear procedures for the proper performance of jobs. The goal of TPS is to create an efficient production sequence that emphasizes human motion and the elimination of waste. Focused around human movements, standardized work outlines efficient, safe work methods and helps eliminate waste while maintaining quality.

Standardized work is the foundation for *Kaizen*, or process improvement, in production. It organizes and defines worker movements. This is important because, when the work sequence is different each time and/or if the motions are disorganized, there is no baseline for evaluation. The first step in kaizen is standardization.
Standardized work ensures that each job is organized and is carried out in the most effective manner. No matter who is doing the job the same level of quality should be achieved.

Result

Following results occurred due to Rejection control, small improvement and proper House-keeping.

Direct Benefits

1. Reduction in Total Value added time = 209.51-177.03 = 32.48 min = 15.50% of total time.

2. Per-shift output before improvements (excluding defectives and in-process) 
   (time)= (8×60)/65.25= 7.35
   Per-shift output after improvements (excluding defectives)= (8×60)/23.66= 20.28

3. If 35% reduction is considered due to defects,
   Monthly output before improvements (2 shifts/day)= (7.35×2)×0.65×25= 238
   Monthly output after improvements (2 shifts/day)= (20.28×2)×0.65×25= 340

In Direct Benefits

1. Reduction in operator’s in-process fatigue and Material Handling fatigue due to rejection control.

2. Increase in employee morale

Value analysis and value engineering tool is systematic approach to resolve this problem. First we see various phases in VAVE.

1. Information phase
2. Creation phase.
3. Evaluation phase.
4. Planning phase.
5. Implementation phase

The basic plan for VALUE ANALYSIS is:

1. Identify the function - As far as possible one Verb and one Noun only should be used to define the function. In most cases it is possible to do this. This is in order to ensure that we approach nearest to the Basic Function and not get lost in Verbose description.

2. Prepare a Functional Relationship Chart.

3. Allocate Proportional Cost to the Functions in relation to their relative importance.
4. Compare the Actual Functional Costs vis-a-vis the norms thus fixed and establish the Gaps between the Actual and the Norms.

5. Identify those Sub-Systems with higher gaps in the Actual v/s ideal, and Create alternatives to achieve the functions at the ideal costs.

**CONCLUSION**

**A.** The outcomes of different methods which were used to enhance the current Assembly line in Interior Plastic Division are given below

1. Reduction in Total Value added time= 209.51-177.03= 32.48min= **15.50%** of totaltime.

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**B** The outcomes of Implementation of VAVE are-

- Assuming that the subcontractor margin is around 10%, we have a potential of capturing margins worth Rs.4 Mn/yr, which would directly add to the bottom line.
- Assuming a saving of 10% in paint material we have a potential of saving Rs. 2.8 Mn/yr
- The saving in transport and logistics will be over and above this.
Future State map of Transportation
(The Unwanted Movement shown in Red Color)

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