

# Optimization and Implementation of Engine Assembly Line in Medium Size Manufacturing Processes

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**Abstract:-** Now a day production is very important for the company point of view. Increase the production or productivity by the company, reduce the NVA and per product cost of the end product, but it is not easy task. We have discuss in this paper to reduce the assembly line and assembly time in medium size manufacturing enterprise (MSME) with the help of MOST. The problem discusses the real life practical approach in feasibility of workstation load availability, combining and line implementations. The methodology starts from a panel assembly line selection and there after decides suitable cycle times, number of workstation requirement and line implementation for the type of assembly system selected. The end results are the detailed design of a panel assembly line.

**Keywords:-** MSME (Medium Size Manufacturing Enterprise), MDAT (MOST Application Data Acquisition Tools), Panel Line Assembly. MOST (Maynard Operation Sequence Technique).

## I. INTRODUCTION

In the organization under study, the excess work content in an Panel assembly line was the problem of concern, The current production system at TATA plant has some limitations which includes longer material handling, less labor productivity, more floor space, large work-in-process inventory and long setup time. In this work it is proposed to reduce the material handling time at chassis preparation area in stage I to IV of the assembly line. For this purpose the highly practical efficient and cost effective time estimation technique MOST is used.

## II. PROPOSED ALGORITHM

### A. Maynard Operating Sequencing Technique (Most)

- Important Component of MOST.
- Types of Sequence

### ➤ Important Component of Most:- Takt Time:-

Takt is a German word meaning “Conductors Baton”. Takt time matches the pace of the manufacturing process to customer demand. Each manufacturing process works to the takt.

$$\text{Takt} = \frac{\text{Total time available}}{\text{Total customer demand}}$$

### ➤ Types of Sequence

Sequence models represent the sequence of events that occurs when an object is moved or a tool is used. Predefined sequence models represent different types of activities.

- *General Move (Moved Freely through Space)*  
Spatial displacement of an object. The object follows an unrestricted path through the air.
- *Controlled Move (Movement Restricted; Attached or in Contact)*  
The movement of objects along a controlled or restricted path
- *Tool Use (Using Common Hand Tools)*  
Combination of General Moves and Controlled Moves

### B. General Move Phases

Sequence models are structured into phases used to describe the action performed. Each of the predefined sequence models has a different set of phases.

## III. EXPERIMENT AND RESULT

MSME Process planning aims at developing a comprehensive plan for manufacturing a part or a product. The starting-point is the product design to finish processes can determine in a chronological order:

| Op. no. | Operation description  | Most time |       |
|---------|--|-----------|-------|
|         |  | sec       | min   |
| 1       | Loading engine over conveyer,<br>Timer belt tension checking.                    | 132.6     | 2.21  |
| 2       | Timer front cover top,<br>front cover bottom tightening                          | 147.96    | 2.466 |
| 3       | Fitment of hose pipes  | 120.16    | 2.002 |
| 4       | Fitment of clutch plate assembly   | 179.92    | 2.99  |
| 5       | Attachment of manual gear  | 168.4     | 2.8   |
| 6       | Tightening of manual gear box (Base Manual)                                      | 56.52     | 0.94  |
| 7       | Alternator mount bracket fitment and Alternator fitment & belt tightening        | 164.08    | 2.73  |
| 8       | Cat con bracket,<br>Silencer bracket ,<br>clutch cable bracket fitment           | 165.16    | 2.75  |
| 9       | Cat con with heat shield fitment.<br>A mount fitment,<br>B mount fitment.        | 67.32     | 1.122 |
| 10      | "Rotate block by 180 deg<br>AC compressor bracket fitment AC compressor fitment" | 178.48    | 2.97  |
| 11      | All Engine Dressing Operations   | 588.6     | 9.81  |
|         | Total Panel Service Line Assembly Flow Time                                      | 1969.6    | 32.79 |

Table 1:- Panel Service Line Assembly Flow-1

| Op.no. | Operation description   | Most time |        |
|--------|---|-----------|--------|
|        |   | sec       | min    |
| 1      | Loading engine over the conveyor<br>Timer belt tension checking<br>Timer front cover tightening   | 255       | 4.252  |
| 2      | Timer front cover bottom tightening   | 127.32    | 2.122  |
| 3      | Rotate block by 90 deg to bring inlet manifold side in front<br>Fitment of hose pipes and fuel lines<br>Rotate block by 90 deg to bring engine rear side in front<br>CVT driven pulley attachment | 256.88    | 4.28   |
| 4      | Fitment of clutch plate assembly<br>CVT End Gear Box fitment  | 109.6     | 1.826  |
| 5      | Attachment of manual gear box<br>CVT Driven pulley Tightening<br>CVT Driver Pulley Fitment & Tightening   | 140       | 2.33   |
| 6      | Tightening of manual gear box<br>CVT Belt mounting, installation bolt tightening and tensioning<br>CVT front cover attachment   | 292.88    | 4.88   |
| 7      | CVT Front cover tightening<br>Rotate block by 90 deg<br>AC compressor bracket fitment   | 106.88    | 1.78   |
| 8      | Alternator belt tension checking, Oil level checking, Oil sump drain plug torque check, Oil plug bolt torque check, head cover bolt check, damper pulley bolt check, blanking of openings,        | 96.4      | 1.6    |
| 9      | Visual Inspection, History card filling, Loading on despatch trailer  | 155.8     | 2.596  |
|        | Total Panel Service Line Assembly Flow Time   | 1540      | 25.666 |

Table 2:- Panel Service Line Assembly Flow-2

| Op. no. | Operation description  | Most time      |               |
|---------|--|----------------|---------------|
|         |  | sec            | min           |
| 1       | Loading of Engine on Conveyor,<br>Timer belt tension checking,<br>Timer front cover tightening   | 136.25         | 2.27          |
| 2       | Rotation of block by 90 deg,<br>Fitment of hose pipes and fuel lines,<br>Driven CVT pulley attachment  | 266.88         | 4.44          |
| 3       | CVT Driven pulley tightening,<br>CVT Driver pulley fitment & tightening,<br>CVT belt mounting on driver pulley, attachment of driver pulley installation bolt  | 157.96         | 2.63          |
| 4       | Driven pulley adjustment for belt tightening, CVT front cover attachment   | 109.6          | 1.82          |
| 5       | CVT front cover tightening,<br>Alternator fitment,<br>Belt tensioning  | 97.6           | 1.62          |
| 6       | Alternator belt tension checking,<br>Oil level checking,<br>Oil sump drain plug torque check,<br>Oil plug bolt torque check,<br>Head cover bolt check,<br>Damper pulley bolt check,<br>Blanking of openings, | 139.4          | 2.32          |
| 7       | Visual Inspection,<br>History card filling,<br>Loading on dispatch trailer   | 155.8          | 2.596         |
|         | <b>Total Panel Service Line Assembly Flow Time</b>   | <b>1063.49</b> | <b>17.696</b> |

Table 3:- Panel Service Line Assembly Flow-3

| Op. no. | Operation description  | Most time      |              |
|---------|--|----------------|--------------|
|         |  | sec            | min          |
| 1       | Loading of Engine on Conveyor, Timer belt tension checking,<br>Timer front cover tightening  | 180.52         | 3.008        |
| 2       | Rotation of block by 90 deg, Fitment of hose pipes and fuel lines,<br>Driven CVT pulley attachment   | 156.88         | 2.61         |
| 3       | CVT Driven pulley tightening,<br>CVT Driver pulley fitment & tightening,<br>CVT belt mounting on driver pulley, attachment of driver pulley installation bolt                              | 117.24         | 1.954        |
| 4       | Driven pulley adjustment for belt tightening, CVT front cover attachment   | 139.6          | 2.326        |
| 5       | CVT front cover tightening, Alternator fitment, Belt tensioning  | 100.6          | 1.67         |
| 6       | Alternator belt tension checking, Oil level checking, Oil sump drain plug torque check, Oil plug bolt torque check, Head cover bolt check, Damper pulley bolt check, Blanking of openings, | 159.4          | 2.656        |
| 7       | Visual Inspection, History card filling, Loading on dispatch trailer   | 155.8          | 2.596        |
|         | <b>TOTAL PANEL SERVICE LINE ASSEMBLY FLOW TIME</b>   | <b>1010.04</b> | <b>16.82</b> |

Table 4:- Panel Service Line Assembly Flow-4

#### IV. CONCLUSION

We have discussed the above side in this paper to complete assembly line for the panel with the help of MOST and Delmia process engineer. Time of the hole panel assembly line is below the 52 sec and the some station time above the 52 sec two operator is added or some other solution

given and done the work. And line balancing of panel assembly line some problem solved below side

- Reduce process time of the product
- Reduction of Workstations
- Decreased Work-In-Progress Inventory
- Shortening of Lead Time
- Reduction of Capital and Operating Costs

| Sr. No | SHEET NUMBER | DESCRIPTION                      | SEC.    | MIN.   |
|--------|--------------|----------------------------------|---------|--------|
| 1      | SHEET-1      | PANEL SERVICE LINE ASSEMBLY TIME | 1969.64 | 32.89  |
| 2      | SHEET-2      | PANEL SERVICE LINE ASSEMBLY TIME | 1540.00 | 25.666 |
| 3      | SHEET-3      | PANEL SERVICE LINE ASSEMBLY TIME | 1063.49 | 17.696 |
| 4      | SHEET-4      | PANEL SERVICE LINE ASSEMBLY TIME | 1010.04 | 16.82  |

Table 5:- Dressing Line Assembly Flow Reducing Time Analysis Table

| Sr. No. | SHEET NUMBER | DESCRIPTION                      | NO. OF WORK STATION |
|---------|--------------|----------------------------------|---------------------|
| 1       | SHEET-1      | PANEL SERVICE LINE ASSEMBLY FLOW | 11                  |
| 2       | SHEET-2      | PANEL SERVICE LINE ASSEMBLY FLOW | 9                   |
| 3       | SHEET-3      | PANEL SERVICE LINE ASSEMBLY FLOW | 7                   |
| 4       | SHEET-4      | PANEL SERVICE LINE ASSEMBLY FLOW | 7                   |

Table 6:- Reduction of Workstations Table

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