

Redesigning the Layout of Metro Car Body Assembly to reduce Interdependency in Assembly lines.

Mr. Shashank ¹, Dr. S. Bharath ²

¹ Mr. Shashank, M. Tech Student, Department of IEM, MSRIT, Karnataka, Bangalore, India

² Dr. S. Bharath, Associate Professor, Department of IEM, MSRIT, Karnataka, Bangalore, India

Abstract - Productivity improvement is one of the basic needs in any organization in order to fulfill the customer requirement. This work was carried out and it mainly deals with increasing the productivity of Metro Car bodies. The company growth rate has been increasing, however they are falling short with respect to delivery commitments due to space constraints, improper layout design & resource availability. This project was carried out in line no. 13 & 14 of the final assembly of Metro Car Body where there was interdependency noticed due to 1 process i.e. 2nd Straightening, which was a common station for both the lines. The output currently was accounting to 8 car body per month from both the lines, however keeping in mind the supply targets they had to increase throughput by at least 2 car bodies per month per line. This problem prompted us to work in depth to understand the existing method and propose a new method. We accomplished this by increasing the final assembly numbers by 2 metro car bodies per line, proposed a new station for 2nd straightening which helped us to reduce interdependency, utilized man power effectively and finally reduced direct/indirect costs which was going unnoticed due to poor layout design.

Key Words: Cost, Interdependency, Space, Throughput etc

1. INTRODUCTION

In the present competitive world productivity plays an important role. The main element which affects the productivity is the layout. Layout may be of different types, but a good layout will have a better productivity with reduction in unnecessary movement and cost incurred on it.

In this paper we are basically concentrating on assembly line layout which consists of two production lines.

2. EXISTING ASSEMBLY LINE

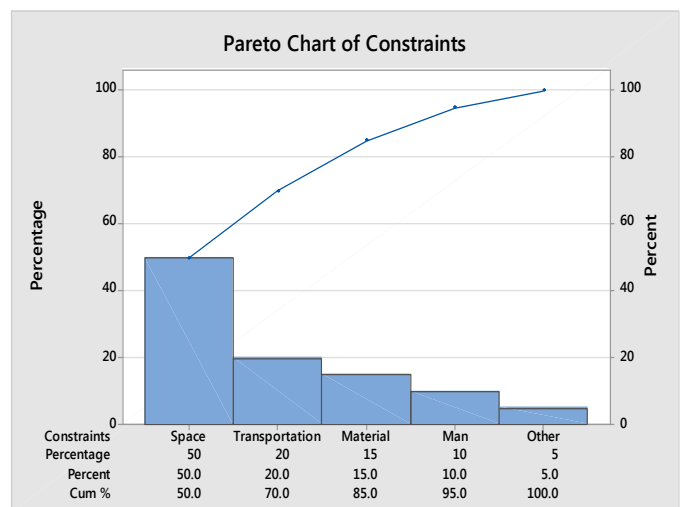


Chart -1: Pareto chart of constraints.

Some of the constraints limiting to the productivity are Space, Transportation, Material, Man, and Power. Space and transportation has 70% impact on productivity, hence these two issues have been considered for problem statement.

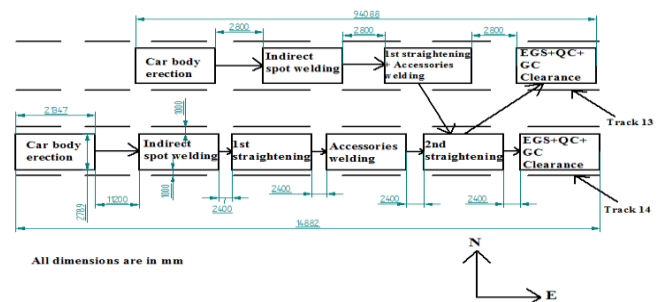


Fig -1: Existing Assembly Line Layout.

The existing layout consists of two assembly lines. Line no. 13 consists of four workstations and line no. 14 consists of 6 workstations. The main problem identified here was in the 2nd straightening process, which consists of only one station for both the lines. If a car body has to be moved from line no. 13 to line no. 14 for 2nd straightening both the car bodies undergoing Electro grinding/ Gel cleaning/ Sealant, Quality Check and General Consultant clearance has to be moved out. This was consuming more time and thus reducing the productivity.

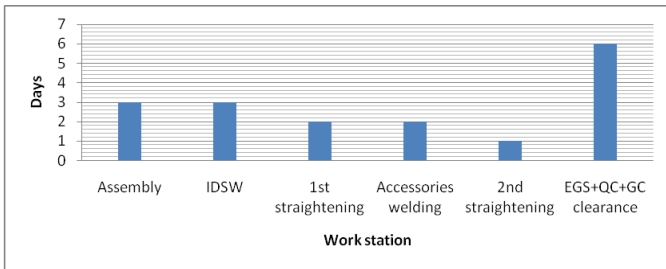


Chart -2: Existing Individual Assembly Time.

Total Throughput time = Total time taken in each station + Idle time.
 = 17 days + 1 day
 = 18 days

3. METHODOLOGY

To increase the productivity the following steps were followed.

3.1 Data Collection

Data collection was basically of three steps

- Gemba Observation.
- Literature review.
- Data regarding previously assembled 50 car bodies.

3.2 Analysis

Movement time and idle time of the workers were calculated. Cost analysis was also carried out for the movement of one car body from line no. 13 to line no. 14. Methods study was done for four workstations in order to reduce the cycle time of each workstation. Process chart was used to record the time and existing activities carried out in each workstation. After the analysis of existing process new method was proposed which reduced the throughput time.

4. PROPOSED ASSEMBLY LINE

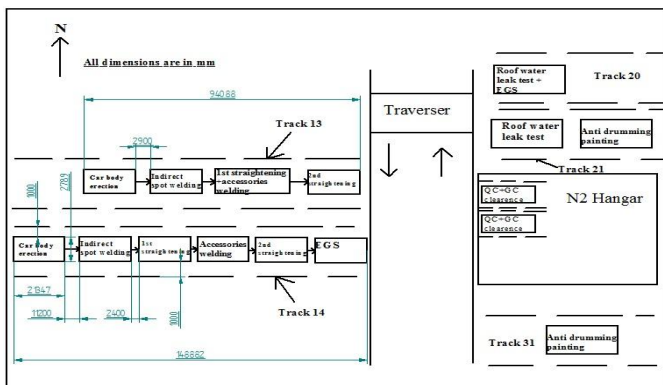


Fig -2: Proposed Assembly Line Layout.

In order to remove the interdependency a new 2nd straightening station was proposed in line no. 13 and Electro grinding/ Gel cleaning/ Sealant was shifted to Roof water leak test area and Quality Check and General Consultant clearance was shifted to Hangar N2.

5. RESULTS

By implementing the above changes i.e. shifting the Electro grinding/Gel cleaning/Sealant to roof water leak test area and Quality Check and General Consultant clearance to Hangar N2 the interdependency was eliminated. Labour Idle time, transportation time is reduced and also waiting time of car body to complete 2nd straightening process was also eliminated and thus productivity was increased.

Table -1: Time taken before and after the method study

Sl. No	Workstation	Existing process Time (in mins)	Existing process Time (in days)	Time taken for proposed method (in mins)	Time taken for proposed method (in days)
1	Car body Assembly	2462	3	2092	2.5
2	Indirect Spot Welding	2440	3	2070	2.5
3	1 st Straightening	1662	2	1237	1.5
4	2 nd Straightening	802	1	415	0.5

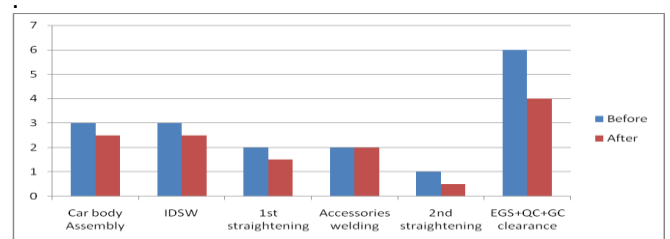


Chart -3: Each workstation time taken before and after Method study and Layout changes.

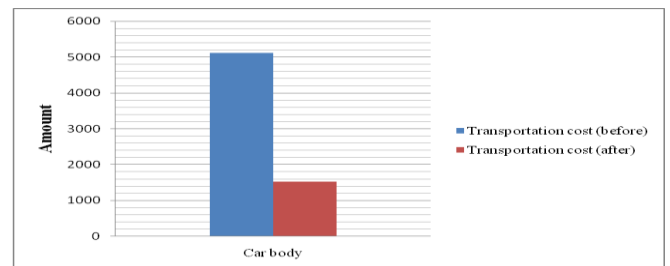


Chart -4: Transportation cost savings for one car body. Transportation cost for Existing Layout was Rs. 5116.8/- for one car body, and for the Proposed layout it is Rs.

1519.2/- for one car body. Total cost savings is Rs. 3597.6/- for one car body.

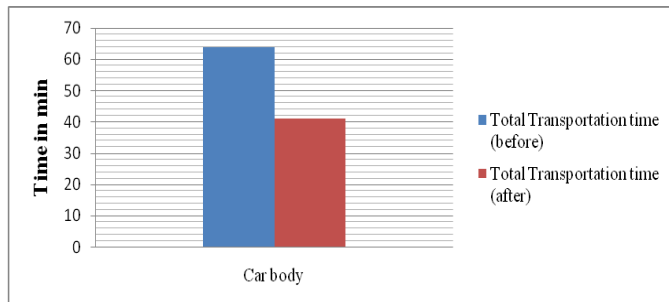


Chart -5: Transportation time taken before and after Layout changes.

For the Existing layout Movement time from line no. 13 to line no. 14 and returning back from line no. 14 to line no. 13 took 64 min. For the Proposed layout the time taken is 41 min thus reducing 23 min for one car body.

6. CONCLUSIONS

From the above changes made it was observed that the interdependency was eliminated and also Method study helped to provide improvements in each stages. By making all these changes the throughput time of one car body was reduced from 18 days to 13 days and thus, increasing the productivity by 2 numbers per line.

7. ACKNOWLEDGEMENT

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