

# Process Study, Cycle Time and Line Balancing of the Scooter Manufacturing Industry

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**Abstract**— The project work contains the detailed study of process of assembly, cycle time and line balancing of assembles line. There are 3 Lines; they are Line 6, Line 7 and Line 8. I carried out my project work in Line 8. In each Line, there are different Zones. They are Sub sub assembly zone, Sub assembly zone, Floor conveyor zone, Main line zone, Repair zone. I carried out my study in the Sub assembly zone. The sub assembly zone has 35 stations; each station has a cycle time of 22 secs. A thorough study of the assembly line process is made and also cycle time study is done by taking 5 trails for each process. Average of the 5 trails is taken as the final cycle time for the particular process. Hence from the above study line balancing, non productive activity elimination and process distribution can be done.

**Key words:** Process Study, Cycle Time, Line Balancing Introduction

## I. INTRODUCTION

### A. Line Balancing:

In the modern's era, process efficiency in manufacturing especially in automotive industry is very crucial in dealing with the demand of the customers. Automotive manufacturer need to be more efficient in producing the vehicles so that those vehicles can be delivered to the customers in shorter period of time without having any quality complaint. In order to achieve higher productivity in mass production environments, assembly line concept had been used in most of the company that involved in manufacturing automotive components. In fact, assembly line can be a determinant in measuring the efficiency in the production operation of automotive manufacturer.

Assembly line had evolved several times since the introduction of the first assembly line. The original assembly line was strictly paced and straight single-model lines. Then, the assembly line had evolved by the needs of manufacturing industry. Nowadays, the assembly line becomes more flexible such as the line with parallel work stations or tasks, U-shape line, customer-oriented mixed-model and multi-model lines. Each type of the assembly line is suitable in different production environments depends on type of product, workload requirement and as well as number of quantity produce per day. Each type of the assembly line had its own advantages and disadvantages. Line efficiency can be define as the percentage of good parts at the end of the line versus the theoretical number that the line should produce in a given time period. Time periods for averaging are determined by the goal of the production. To achieve 100% line efficiency, one station must never be blocked or starved and the station must always operate at its theoretical capability. The higher outputs of the line can be

considered as the efficient line because the line can produce higher outputs in the specific production time.

## II. METHODOLOGY

The study was conducted at Scooter manufacturing industry. Study was carried out for the research started with the knowledge of present line layout, process flow, Manpower deployment and cycle time for every process. After Cycle Time is identified, line efficiency and productivity are calculated. Now idle time of the operators which is a waste in waiting are to be identified and this time is to be utilized to perform other tasks. To increase the line efficiency we perform line balancing technique. The waiting time is used to perform the tasks of other process which reduces the no. of manpower and two different processes are carried out by single operator. This thing is made possible through the ergonomics change in the assembly line which facilitates the combining of two processes. Now some of the tasks of previous operator are shifted to the next operator so that the difference between the cycle times of consecutive processes can be minimized. By reducing this difference we improve the line efficiency.

## III. PROBLEM IDENTIFICATION AND DISCUSSION

The carried out my study in the Sub assembly zone. The sub assembly zone has 35 stations; each station has a cycle time of 22 secs. A thorough study of the assembly line process is made and also cycle time study is done by taking 5 trails for each process. Average of the 5 trails is taken as the final cycle time for the particular process.

In Figure cycle time of all the processes in the present situation of assembly line is shown and their variations are studied in the sub assembly zone. The sub assembly zone is divided in to two zones, Sub assembly zone 1 and Sub assembly zone 2.

### A. Cycle Time Data: Sub Assembly Zone-1

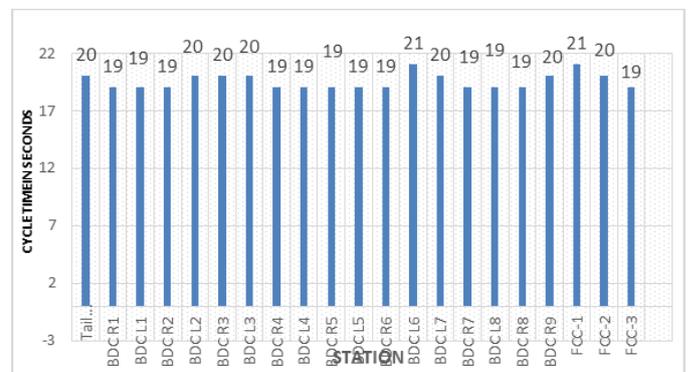


Fig. 1: Cycle Time of the Each Station

**B. Cycle Time Data: Sub Assembly Zone-2:**

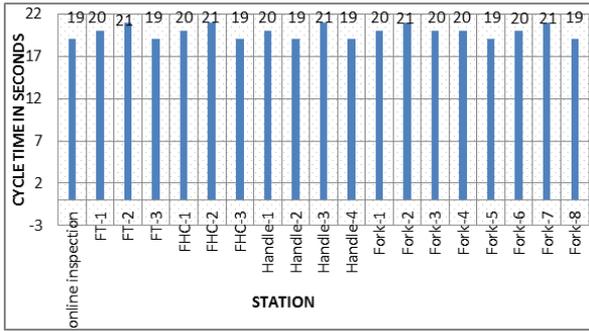


Fig. 2: Cycle Time of the Each Station

**C. Problem-1:**

In sub assembly zone, Body cover assembly (station - RH6), Rear center cover (RCC) to Rear center lower cover (RCLC) is assembled. Operator fatigue is found while the operator picks the part from Marshal Conveyor, since he has to bend and take the part and cycle time consumption is more.

**1) Why-Why Analysis:**

WHY 1	WHY 2	WHY 3	WHY 4	WHY 5
Associate not working according to the Ergonomics.	The person is bending to pick the parts.	Parts location is far from his process location.		

Table 1: WHY- WHY Analysis of the Problem-1

**2) Result:**

The problem can be solved by loading the RCC & RCLC above the electric tray so that they can take it easily and their will not be any physical problem to the worker.

**D. Problem-2**

In Tail light assembly station, when the associate going to take the tail light from the Marshall, the center cover will be obstacle for him, he cannot take it directly sometime, he want to move the center cover or he want to take it slowly and while he keeping the assembled tail light to the Marshall, he should keep it slowly or he must move the center cover from the place & then he must place it. Due to this taking the part & placing it to the Marshall will take extra time.

**1) WHY-WHY analysis:**

WHY 1	WHY 2	WHY 3	WHY 4	WHY 5
Associate is not working according to the process.	Taking the center cover to take the tail light.	Center cover is obstacle for him to take tail light.	Center cover loading is not proper.	

Table 2: WHY- WHY Analysis of the Problem-2

**2) Result:**

This problem can be solved by keeping the center cover reverse, keeping the center cover facing that side, so that he can easily take the tail light and they can also solve the problem of the RCC & RCLC by loading in the front.

**E. Problem-3**

Wire harness cable getting damaged since the cable rubs the handle assembly table also improper handling of the part by associates cause damage.

**1) WHY-WHY analysis:**

WHY 1	WHY 2	WHY 3	WHY 4	WHY 5
cable damage is happening.	Due to the cable protector box & due to cable outside the box.	The cable is struck to the protector box & associate standing on the cable.	The rubbing of the cable to the box & associate rubbing the cable by his leg.	

Table 3: WHY- WHY Analysis of the Problem-3

**2) Result:**

The cable protector box should be changed by rubber or leather protector box as they using in the sub sub assembly zone & associate should see that they are not standing on the cable & cable are not coming out of the protector box.

The Project is still under progress till the line balance should be done.

**IV. CONCLUSION**

In my project work in which I have theoretically studied time study, motion study and ergonomics on the leading Scooter manufacturing company. The result I found in critical analysis is that by the time study and motion study some of the unnecessary operations are combined and modified the flow process in proposed one helps us to reduce time by certain modification in nearby assembly station. These said modifications in workplace layout are designed ergonomically as well. Hence the above result helped us to reduce time and motion ultimately improves production.

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