

Enhancing Productivity at Assembly Line: A Study in Automobile Manufacturing Sector

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Abstract

This paper consists of the study of the assembly line and logistics area held in the RENAULT NISSAN AUTOMOTIVE INDIA PVT. LTD. Plant in Chennai. It was required by the company that new cars (to be launched) production is desired in the same plant with the same infrastructure and same man power available.

As a result, takt time of the workers was calculated and extra inventory near the assembly line was displaced and space for new spare parts (of new cars) made there at assembly line. Analyzing the present work structure, proper time study sheets were made and layout planning was done both of logistics area and assembly line. A final job allocations of workers were changed and allotted jobs in which lag time and other wastage of time was comparatively less.

1. Introduction

Project was assigned in trim and chassis department of the company. This department consists of two assembly lines - LINE 1 and LINE 2. Cars manufactured on assembly line 1 are Renault Duster, Nissan Sunny. Cars manufactured on assembly line 2 are Renault Scala, Nissan Micra, Nissan Sunny. Now the company has decided to manufacture its upcoming cars (EVALIA, DATSUN, TARENNO) in the same plant on same assembly lines with same infrastructure available and within the same space.

Each assembly line consists of TRIM A, TRIM B, UNDERFLOOR, DOOR SUB assembly,

TRIM B- It consists of fitments of only internal parts in the car. Operations such as fitting wiring harness, keyset, mats, headliner etc are done.

The interior is first assembled in a logical order - floor carpets, windshields and door glass, heating and air conditioning, pedals, headliners, lighting, instrument panels, steering columns. The last stage for the body interior is generally the seat installation.

The next stage is the power train installation. Before the body is finished, in parallel time, the engine has been "dressed" with wiring, fuel injection system, and accessory drives - generator, air conditioner, power steering pump. It is then mated to a supporting structure, called a "cradle," mated to a transmission and further work is done to install the exhaust pipes,

injection system, and accessory drives - generator, air conditioner, power steering pump. It is then mated to a supporting structure, called a "cradle," mated to a transmission and further work is done to install the exhaust pipes, drive shafts, front and rear hubs (or solid rear axle, in some cases), brakes, springs and shock absorbers. These are set up in a special fixture to support these components. The fixture will later raise these up under the body, and workers install the "engine cradle" and the attached components to the body, working below the body which is now supported from overhead on a moving conveyor.

TRIM A- It consists of operations like fitment of cockpit module, A/C hoses, brake actuator, glass assembly, chassis assembly (suspension system, transmission system, steering system, road wheels)

The final assembly stage is where the wiring is connected, fuel tank installed, radiator is installed with connecting hoses, all the fluids added, the wheels are installed and the bumpers, grille and external lights assembled

ENGINE SUSPENSION- it consists of subassembly of engine, suspension, front axle, rear axle, drive shafts, transmission, brakes discs and drums,

DOOR SUBASSEMBY- In door subassembly installation of speakers, door locks, handles, absorbers is done.

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2. Literature Review

Logistics have been defined by the many authors in different ways. As per the oxford dictionary, © 2014 Oxford University Press [1], literal meaning of the logistics is the detailed organization and implementation of a complex operation.

According to Wen Long YUE, Program Director Transport Systems Centre, University of South Australia, Eastern Asia Society for Transportation Studies, Vol. 5, pp. 1657 - 1672, 2005 [2] - Since logistics advanced from 1950s, there were numerous researches focused on this area in different applications. Due to the trend of nationalization and globalization in recent decades, the importance of logistics management has been growing in various areas. For industries, logistics helps to optimize the existing production and distribution processes based on the same resources through management techniques for promoting the efficiency and competitiveness of enterprises.

According to research metric [3] Inventory is termed as to be the lifeblood of supply chain in any organization. If it is managed properly and efficiently it brings greater revenues, profits and growth to the organization. Managing the supply chain is a strategic decision based on plans and policies to be implemented efficiently so to get positive results.

According to an essay on study mode [4] Supply Chain Logistics Management establishes the strategic importance of logistics to achieving business success by creating value throughout domestic and global supply chains. This scopes the current business attention to supply chain management. The supply chain provides the framework within which logistical strategies are developed and executed. The concept of integrated logistics is developed by discussing the ways specific work tasks combine to support customer accommodation, manufacturing, and procurement.

According to washing to nunniversity press 2014, MOTION AND TIME STUDY [5] The Goals of TIME Study are Improvement, Planning / Scheduling (Cost), Safety.0

According to Bhupendra Ratha (time and motion study) , Central Library (CLIB: Teaching) Devi Ahilya Vishwavidyalaya, Indore (M.P.) 2014, [6]- Time and motion study is a work measurement technique for recording the times of performing a certain specific job or its elements carried out under specified conditions. For analyzing the data so as to obtain the time necessary for an operator to carry it out at a defined rate of performance.

Applications of time study are determining schedules and planning of work, determining standard

costs of a particular work, Estimating the cost of a product before manufacturing it, Determining machine effectiveness.

According to term paper warehouse, 2014, [7] logistics in business and management is marked very important- During last two decades, the importance of logistics has been noticed around the world. In global markets, the effects and further developments of logistics and supply chain management for corporate success has increased significantly that result in a large amount of companies have taken actual benefits in logistics, such as reducing costs, enhancing customers' satisfaction and increasing sales

According to industrial study, 2012,[8] Time Study is the analysis of a specific job by a qualified worker in an effort to find the most efficient method in terms of time and effort. Time Study measures the time necessary for a job or task to be completed using the best method.

According to RALPH M BARNES, 1940, [9] TERM time study was originated by TAYLOR. It was only used for rate setting at that time but now a days as we see it has been extensively used for enhancing productivity and globalization.

According to WALTER G. HOLMES,1939, [10] TIME STUDY and MOTOIN STUDY in earlier days were used differently but now they have been used collectively to practice and interpret the data collected as whole based on the time needed to perform the operation.

3. Problem

In our project main problem is to minimize the working time of operators and to use available space for new parts of upcoming cars with same infrastructure, same man power and nil additional cost.

Let us examine our problem with the help of examples-

1. The operator is picking more than one parts in Synchro Logistics Area. He is picking parts and keeping in trolley and to be moved in Assembly Line. He is preparing around 3-4 trolleys of different parts and he has to move to different places where these parts are placed. In this job, operator has been dong 2 activities like picking of parts and walking to next stage to part pickup.This is our first problem in which we have to minimize the walking time.
2. There are so many different parts in Logistics Area as well as on Assembly Line. All are placed according to the easiness and convenience of operators and transportation. There are some

trolleys, chutters and racks which are there but not have to place such parts in proper pattern so that we can make space for new parts of upcoming cars with same infrastructure, same man power and nil additional cost.

4. Methods

1. **Detailed analysis of selected parts supply in Logistics, Assembly line and rate of usage of parts in the Line**–It was a manual and very sophisticated study which include very precise and acive measurements and studies. It took 2 weeks to study the present scenario of the work place(logistics area and assembly line), which include time taken by workers, present infrastructure, space being used by workers as well as by parts. Our major concern was to trim out space where there are extra non required parts were placed. It was also required to analysete usage of parts in the assembly line as well.
2. **Preparing Time Study sheet(picking time, moving time, sub assembly time, lag time)**–After detailed analysis of sycro parts in logistics area, time study was done very precisely without gaining any attention of operators. Proper time study sheet was prepared. Time study sheet has been attached.
3. **Comparison of ideal cycle time and operator’s cycle time**–after calculating cycle time, we compare it with the cycle time as per company’s norms.
4. **Utilizing operator’s idle time by allotting them new jobs**–After completing all the above mentioned methods, we came to know that which worker is available for how much time and how much time the operator is wasting in between his job which is allocated to him. When we came to know about free time with operator, we allocate new jobs to those workers so that efficiency and productivity can be enhanced.
5. **Displacing extra chutter and racks from Logistics Area and Assembly Line**–There are extra chutters and racks in logistics area and assembly lie area. After studying the present layout and work environment, we came to know about the extra cutters ad racks. We displace the extra chutters and racks from the logistics area and assembly line as well, and some new space will be created for new and direct parts of new cars.

References

[1]<http://www.oxforddictionaries.com/definition/english/logistics>

- in regular use. We have to learn their usage and
6. **Drafting the complete Layout of Syncro Parts in Logistics Area and Assembly Line** – After the complete study of logistics and assembly line, we draft the complete layout of assembly line as well as logistics area. Layout of logistics area and assembly line are attached.
 7. **Analyzing the changes made through Layout and Time Study Sheet** – New layout made and time study sheet reflect a situation which include many changes in the working environment and methods of operator. All changes are not as easy to make as they look. We make some changes in the jobs allocated to the operators and the logistics area space as well as in assembly line.

5. Conclusion

Trim and chassis production department has made us to work along with their project. This project is based on Space Utilization at main line and logistics area. We have studied the present work structure on the Assembly Line as well as in the Logistics Area. Our study includes space used in logistics area and assembly line and time required by operators per cycle (cycle time).

Our project aims at reduction of walking steps at main line for picking of parts and utilization of man power of logistics by using parts supply system.

We have to plan and modify such a layout for our concerned area so that new parts can be placed and moved by same manpower and same infrastructure.

Various drafted layouts and time study sheets helped us in proper understanding of management of time and space utilization. With the help of these illustrations made, it become easy for us to modify the Logistics Area, so that space can be plotted where new parts would be arranged. And also it becomes easy to calculate time required as well as time used by operator at present, from where we came to know about lag time of operators and new jobs will be assigned to those workers in that time.

Direct parts and synchro parts used in Evalia are large in number and bigger in size. Due to which we were assigned such a project. It was required by the company to make space for the new parts in the same logistics area as well as on the assembly line 1. We were supposed to do time study, present layout study and to modify and replan the jobs allocated to operators as well as layout of the logistics area and space on assembly line.

[2] <http://www.siam.org/journals/plagiary/1657.pdf>

- [3] <http://www.researchomatic.com/inventory-management-through-supply-chain-141049.html>
- [4] <http://www.studymode.com/essays/Supply-Chain-Logistics-Management-939672.html>
- [5] <http://courses.washington.edu/ie337/Motion%20and%20Time%20Study.pdf>
- [6] <http://www.clib.dauniv.ac.in/E-Lecture/Time%20and%20motion%20study.pdf>
- [7] <http://www.termpaperwarehouse.com/essay-on/Logistics-And-Supply-Chain-Management/42854>
- [8] <http://industrialtimestudy.com/time-study-training/>
- [9] <http://www.library.wisc.edu/selectedtocs/ca1645.pdf>
- [10] <http://www.library.wisc.edu/selectedtocs/ca1720.pdf>