



## **Productivity Enhancement of an Indian Tractor Manufacturing Company by Using Industrial Engineering Tools**

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### **Abstract**

The aim of study is to make a review paper on increasing productivity using various industrial engineering tools like work study, method study, time study, flow diagram. Now days increasing productivity is a big challenge for all type of industry. Researchers are trying to make review paper for the same, in this paper numerous research paper has been reviewed and found some grey area. The present study has been done at an automobile industry, a leader manufacturer of tractors. In this study plant layout modification is considered for the same.

**Keywords:** Time study, method study, motion study, work study

### **1. Introduction**

For an association to survive and stay gainful in this high aggressive condition, associations need to work to expand its profitability by ideal utilization of assets accessible inside them.

#### **A. Productivity**

Efficiency can be characterized as a proportion between the yield volume and the volume of data sources. At the end of the day, it gauges how well creation inputs, for example, work, time, material, office capital, are being utilized as a part of an economy to deliver a given level of yield. The articulation for the profitability is as under: -

Profitability/Productivity = (yield/input)

“Productivity isn’t everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker.” said Paul Krugman, The Age of Diminishing Expectations. Profitability is considered as a key wellspring of monetary improvement and aggressiveness.

#### **B. Work Study**

Work Study explores the work done in a firm/organization/association and it intends to locate the best and most productive method for utilizing every one of the assets which are accessible i.e. material, man, machine, cash and so forth. This kind of procedures include Method Study and Time Study Strategies.

#### **C. Method Study**

Strategy examine focuses best case scenario method for taking every necessary step. Strategy examine includes deliberate examination (Which includes recording and basic examination) of the present technique for doing the activity so natural, quick, which makes less weakness the specialist, sheltered, prudent method for taking every necessary step can be produced and introduced at low cost. This is fundamentally accomplished by disposing of the pointless movements which are engaged with a methodology of doing the work and the same can likewise be accomplished by changing the succession of tasks or process itself.

#### **D. Time Study**

Time Study is about a method of work estimation used to build up time for a qualified labourer to complete indicated errand under determined conditions and at characterised level of execution.

#### **E. Objectives**

To recognise the activities which are making bottle neck in the front mechanical production system.

Recognise the issue stations in sequential construction system where bottle neck circumstance emerges by utilizing strategy examine procedure also known as Method Study Technique.

Build up a technique to take care of the issue which are causing sequential construction system to stop or to back off its generation level than anticipated level.

Put the time study in action after implementing the new technique for 10 days of trial period.

Recommend new techniques to the concerned division in the association.

#### **F. Productivity improvement technique**

The system which has been utilized as a part of this investigation is the Work Study Technique in the primary jug neck tasks to recognize the causes diminishing the generation rate by halting the sequential construction system and after that further on to these stations the main driver of the issues is distinguished by Method Study Technique and after that the new enhanced technique was produced and executed for time of 10 days as a trial period. The trial period time study of these stations were

directed and the consequences of the Time Study were pondered over and compared with the prior and post usage of the new strategy.

## 2. literature review

Ashish Kalra et.al (2014) proposed that the fundamental target of this paper is to introduce thoughts to enhance the efficiency of vehicle industry by diminishing the process duration of the activities which are taking additional time than the estimated desired time by utilizing the idea of Work Study and material dealing strategies and techniques.

Ankur Mehta and Darshak Desai (2016) proposed that work study and its application is a very versatile research tool. The application of work study is not limited up to the manufacturing industries but also in service organizations, health care centre, bank and etc. As the main objective of work study is to simplify the method for performing the task with cost reduction and increase productivity. Lean management technique like continuous improvement (KAIZEN) and other techniques must be imposed for achieving better result.

Dr. M. P. Singh and Hemant Yadav (2016) stated "The study of the process of the manufacturing plant, existing processes are examined critically with method study & layout technique. It is observed that the plant is not using optimum layout and there are chances for improvement. Various layout and method study tools are applied and flow process charts, flow diagram and existing layout has been prepared. New technologies are used to reduced production cost, process time, cost and energy consumption."

Rishabh Mishra (2015) stated "The process can be improved based on method study, work procedure and proper utilization of machine and material. It will improve the current process by reducing the transportations, and reducing the worker's fatigue. After implementing the suggested improvement ideas, the firm is able to increase its productivity."

Mayank Dev Singh et.al (2012) proposed that Work Study technique to enhance work process in organization, and the exploration destined towards the accomplishment of this study is to distinguish issues in the generation work process and enhance it in terms of creation time, number of process and generation rate by proposing an effective work process. This utilized efficient perception, stream process and stopwatch Time Study is known as Methodology.

Amir Azizi (2015) stated that the study focused on evaluation improvement of production productivity performance. The implementations of SPC, OEE, and AM have minimized the defect rates of chipping BF and maximize the brushing machine performance, which improves the production effectiveness performance. OEE could measure the machine performance by identifying the loss mechanism of machine. AM was able to be practiced in seeking for higher machine performance which aims to yield a higher production productivity performance.

B.Naveen and Dr.T.Ramesh Babu stated that the generation time is not exactly the takt time for the contextual analysis association henceforth with a specific end goal to take care of the demand it is vital to execute the appropriate mechanical building devices. By executing, it can lessen the process duration and work-in-advance. Diminishment of waste can likewise enhance profitability/productivity. Enhancing quality at the source won't influence any station, yet decreases scrap and revise. Assembling deformity less item will take care of the demand. After accumulation of information the bottleneck station was recognized. Circumstances and end results graph was utilized to recognize the causes which decreases the generation rate and the healing measures has been noted to lessen the causes.

Dr. Abhijit Chakraborty et.al (2016) proposed that the manufacturing unit by doing work study can make effective utilization of resources. Work study which comprises of method study and work measurement will fulfill these requirements. By method study, one can decide the best strategy for playing out the activity, the most consistent format for assembling offices, continuous stream of material all through the organisation will help to finish the activity in slightest conceivable time and at an ideal cost. Work measurement on the other hand determines the time required by an operator to complete the operation of job for the standard method at the defined level of performance. In this way, Work Study is the best apparatus to upgrade profitability/productivity as a result of the way that it is a straightforward method for expanding beneficial effectiveness of the association and considers every one of the elements impacting efficiency.

Nikhil Verma et.al (2015) stated that "This study has not only given an exposure to various techniques employed in production units but also has added the new dimension to vision of knowledge. It has given the basic idea of the working of an industry and core of every industry lie in its fundamentals MAN, MACHINE AND MATERIAL and how the cohesion between them is needed for the smooth running of nay industrial organization. TIME has acted as the main factor to be studied. It is therefore concluded from the study that TIME STUDY AND WORK STUDY are the techniques which can be used to increase the productivity."

Ravikumar Kamble and Vinayak Kulkarni (2014) proposed that the undesirable movement engaged with the activity of get together has been generously diminished by outlining gathering table, latches plate and plan of legitimate work put design. Legitimate technique has been given to the administrators to get the materials from the storage facility. Naming of the work put design has been done, with the goal that materials are put at an appropriate place.

Noriah Yusoffa et.al (2012) stated, "The time study technique is an effective solution in measuring the actual working time. The research outcome shows that the benchmark time was successfully obtained and established. Therefore, to achieve the standard time, a well-coordinated process improvement or kaizen activities must be enforced and essential measures must be taken. Eventually, a well adopted standard time would be established and from there on other kaizen activities can be carried out continually. The work measurement method and techniques is a very versatile research instrument that can be applied in measuring tasks or processes either from service or manufacturing industries."

Patange Vidyut Chandra (2013) proposed that Increment in profitability can likewise impact society all the more comprehensively, by enhancing expectations for everyday comforts, and making wage. They are vital to the procedure

producing monetary development and capital gathering. Profitability/Productivity causes an association to not just in expanding economy at smaller scale level profiting at both budgetary and also work execution yield standard. Yet in the present association I feel that aggregate factor efficiency, by differentiate, catches the commitment to yield of everything with the exception of work and capital: advancement, administrative aptitude, association, even luckiness. Be that as it may, at long last we infer that this procedure embraced depends altogether upon the intricacy of the work-administration relationship that exists in every individual circumstance.

R. Hedman et.al (2013) stated "Manual work tasks are of our most importance even in highly automated production. By using work study input the human resources ability to perform defined activities is taken into consideration based on facts. As a result, neither planning systems nor manager will require the human resources to exceed their capabilities, skill based or personal based, risking personal injuries or product quality defects. Furthermore, work study input such as the results of work sampling enables an enhanced definition of resource utilization beyond using only the ratio between available time and planned time. The utilization of human resources when manufacturing a specific product family can be measured and assessed considering production system design, disturbance, and need based aspects. Consequently, the real capacity of a manufacturing process can be defined based on a valid representation of human resources and manual work tasks."

S. Nallusamy and S. Muthamizhmaran stated that the application of motion and time study based on individual is flourishing. The overall equipment efficiency (OEE) is enhanced by execution of time and motion study of the autoclave process. It also aims for systematic observation, stopwatch time study and process chart as their methodology. It also represents that the time study about is more imperative from the earliest starting point of the assembling procedure in setting standard time and to propel them consistently. Time study and movement study can be connected to different divisions like assembling, administration and therapeutic. The fundamental target of time and movement think about is to distinguish esteem included and non-esteem added exercises to lessen cost and increment the efficiency. It's moreover accommodating to ascertain most precise time for the procedures and consequently discover the correct wrapping up time of item.

B. Suresh Kumar and S. Syathabuthakeer (2012) stated that the lean method, SMED, was actualized and a noteworthy outcome was accomplished. SMED system was connected to set up an ideal standard strategy for changeover tasks on fagor press. Based on a progression of time think about information gathered amid the setup exercises in the fagor press, a correlation of results and accomplishments when the SMED execution was made to gauge the adequacy of SMED to diminish setup time. The objective to lessen machine downtime amid the setup tasks and lessening in setup time makes it conceivable to build fabricating framework adaptability to make an assortment of items. Additionally, contemplates in the office may incorporate 5S and Kaizen contemplates for inward setup. Elective approaches to abbreviate inner setups can be looked in detail. With a specific end goal to wipe out change steps, trial and blunders ought to be limited.

A.P. Puvanasvaran et.al (2013) stated that The discoveries demonstrate that MOST time study can be connected to decide the VA and NVA related with the work components instead of the typical graphical show of results. Through MOST, the level of upgrades to each progression can likewise be measured precisely in view of the foreordain motion time standard. This paper additionally demonstrates a precise advance to apply time study method to enhance the Overall Equipment Efficiency. MOST observed that it would be helpful in streamlines of activities keeping in mind the end goal to distinguish unproductive techniques in the work performed. It is solid as it gives accurate standards and exactness within  $\pm 5\%$  with a 95 % certainty level. Besides, time required for information improvement and standard setting is additionally essentially decreased. The constraint of this examination is the forecast between the two autoclave machines which share their work compel and just directed inside one autoclave machine because of the constraint.

### 3. Conclusion

The main objective of this project is to present ideas to improve the productivity of automobile industry by reducing the cycle time of the operations which are taking extra time than desired time by using the concept of work study and material handling techniques. we are also trying to propose a new layout for the industry to reduce the fatigue level of workers which will positively affect in increase of productivity of the industry.

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