THE IMPORTANCE OF TIME STUDY DONE ON THE PRODUCTION LINE IN THE PAINT WORKSHOP OF AN AUTOMOTIVE FACTORY

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Abstract – Today markets, it has turned into a single global market as a result of the merger of local markets. Therefore, serious competition conditions have arisen among the producers. In this competitive environment, reducing production costs is the most important factor in order to be one step ahead of others. For this reason, manufacturers must keep all production stages under control within the scope of a constantly innovative and improvable production process. One of these processes is work study analysis. Which operation? In how much time? It should be clearly defined by whom it will be made on the production lines. These definitions basically need to be applicable, measurable and sustainable. The study in this paper covers the standard time optimization activity of the time study process, which is one of the work study components in a part of the production lines in the paint shop of an automobile factory. A rotation was applied between workstations to determine the most efficient state. As a result of the time analyzes made on the existing line, the bottleneck factors were identified, and new assignments were made to the production line according to the working experience and physical abilities of the employees, and the production line was rearranged according to the optimum standard time. Although there was no significant difference between the first average standard time of the production line and the last average standard time of the line rearranged, a slight decrease in the production cycle time was detected. It is seen that this process will yield more efficient results if time studies are made and recorded with more advanced equipment such as video recording, instead of using various lean production tools such as Kaizen for continuous improvement and time measurement with a stopwatch. The study also emphasizes the importance of new production methods developed with today's developing materials and equipment.

Keywords – Time Study, Lean Production Method, Automobile Production, Cost Reduction, Production Processes

I. INTRODUCTION

The phenomenon of production is briefly considered as an economic value added to a product or service process. The main reason in Product and Manufacturing activities must meet the requirements of the end customer. For this reason, concepts such as "efficiency", "efficiency" and "productivity increase" are important in order to add value to a product or process. Efficiency, or in other words, the degree of efficiency can be defined as the value that the factors of production provide to the customer and the cost of this value. The other term, productivity, has different meanings for different people, but the basic concept always defines the relationship between the quantity and quality of goods and services produced and the resources used to produce them [1]. Productivity increase in an enterprise is a function and result of management effectiveness. It is synonymous with good management. Increasing efficiency and maintaining this increase is the main goal and responsibility of the management. In this way, they can control their

production costs. The basis of productivity increase is not to work harder, but to work smarter. For this purpose, today, enterprises invest in technoparks, equipment and equipment, and enable their employees to participate in various trainings, vocational courses and seminars. It should not be forgotten that; The most important factor in productivity is people. Use of machinery and equipment, creation of production strategies, etc. Since it will be beneficial to the extent that employees can use their knowledge and experience, the effect of the investment to be made on the increase in productivity gains great importance [2]. When productivity is mentioned, efforts to increase the quality of the product and service obtained, to protect the environment and natural structure, to provide the best living and working conditions for employees and to increase the amount of production per unit input should be considered together.

In terms of the main industry, the automotive sector consists of three groups: automobiles, light and heavy commercial vehicles. Among these, automobile is the sub-group that has the highest share in terms of both the number of units and the share it receives from trade. When the efficiency in the production of vehicles in this segment is increased, the production cost on a company basis decreases.

Thus, the company is one step ahead of the competitors in the global market and provides cheaper products to the market in the same quality of rival companies. In terms of customers, it means purchasing products at a lower cost than products of other companies. Ultimately, both parties gain through increased productivity. Various production techniques are used to increase productivity. One of them is Work study.

Work study is to develop a new method of work and to calculate the standard time of the developed method in order to benefit from the workforce, machinery and equipment at the highest level of efficiency and to determine the most suitable working style for human structure (Akal, 1981).

The basic principles of work study are defined in eight basic stages [3]

- Choose
- Recording
- Examination
- Development
- Measuring
- Describing
- Placement
- Sustaining

The highest level of success in a work study practice requires the support of the top manager within an organization.

In the light of all these explanations, generally, work study can be explained as follows; Work study is a systematic work measurement technique that tries to transform all interactions between human, machine and material into productivity, and improves the quality of work by developing new methods [4].

The aim that is tried to be achieved in work study is to know, regulate and measure the relations between the production factors in order to benefit from the production factors at the highest level. In addition, job analysis is the most accurate way ever developed to set performance standards that are considered the basis for effective production planning and control. It is a tool that can be applied everywhere [5]. It can be successfully applied both in places where handwork is done and where the machine is used. Work study with the definitions mentioned above; It is a field of study related to the design of balanced and economic functioning of human-machine-material systems in both production and service systems.

Purposes of Work Study, The main purpose of using work study in all production systems that produce goods or services is to increase productivity. This result is achieved by the realization of some sub-objectives. While trying to reach the goal, it is assumed that no loss will be allowed in the defined functions of the jobs [6]. Accordingly, the sub-objectives of work study, whose main purpose is to increase productivity, are as follows [7]

• Getting rid of unnecessary activities

• Organizing the necessary activities in the most economical way possible

• Standardizing appropriate working methods

• Setting the right time standards for work

• To increase the rate of benefiting from the factors used in production

• Training the workforce

• Changing from current working conditions to better working conditions

Getting rid of unnecessary activities; It constitutes one of the tangible results expected to be obtained by using work study in production.

Its basic philosophy can be expressed as the principle that the best way to do a job is to do it with the least amount of movement.

This approach is actually generalized as a philosophy of life. The activities that are tried to be eliminated here are those related to labor in general.Such elimination will lead to a reduction in labor costs and increase the competitiveness of products. While doing a defined job, getting rid of unnecessary activities generally increases the amount of production, and indirectly facilitates the transition to mechanization and automation [5].

II. MATERIAL AND METHODS

This study is an outsourced automobile manufacturer operating for a long time with the know-how production method in our country. This includes the work done to increase the efficiency of the paint line of the vehicle manufacturer within the scope of the work study. The company is a global company that supplies products to the foreign market as well as to the domestic market.

In this study, there is a process that can be defined as material. Time measurement of the work study with a stopwatch was made on a vehicle model on a production line in the paint workshop of an automobile factory.

As a method, it consists of making standard time measurements of all work items on the relevant line and then summing them up. During the time study, the following stages were passed.

- Gathering and recording existing information,
- Separating the transaction into its elements,
- Examining the items,
- Measuring with a stopwatch,
- Identification of the shares,
- Determination of the “standard time” of the operation

In the light of these studies, an average value was obtained by measuring each job on the production line five times and taking the average.

III. RESULTS

The factory gives a 90-second time frame to the employees for each station. According to these results, while a bottleneck occurs in the Oil Sealer Application Station, an employee at the Brushing Station has to wait for a while. This waiting also creates a bottleneck. This causes the employees at the Oil Sealer Application Station to spend more effort to get the job done, and in some cases, the line is stopped.

IV. DISCUSION

Considering the data obtained, it is necessary to make some arrangements at the production station. It was thought that this arrangement line should be distributed again both within the scope of the number of employees and the ability of the employee, as well as in the production processes.

V. CONCLUSION

In order to avoid the bottleneck, the results are as follows when a study is conducted on the displacement of the employees between the stations due to the reasons arising from the physical characteristics and work experience of the employees in the stations.

The 90-second working time target offered by the factory to the employees has been approached. By improving the bottleneck in the line, a fair distribution of work was made among the workers and the frequency of stopping the line was reduced. In this way, a gain was achieved for each vehicle in a lower time interval.

The number of stops of the sealer line has been reduced, thus increasing the production time and providing efficiency in the relevant section. It is seen that this type of application will be applied at the workstations of each department where production is made, and the efficiency will be further increased.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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