Literature Review: The Importance of Working Time Measurement in the Manufacturing Industry to Increase Company Productivity (Case in Indonesia)

Annafis Manaruzzaki¹, Bambang Suhardi²*, Hanin Tsimar Andriyani³, Niken Utami Tyastuti⁴
¹,²,³,⁴ Department of Industrial Engineering, Faculty of Engineering, Universitas Sebelas Maret, Surakarta, Indonesia.

Abstract: This paper is an overview of the importance of working time measurement in the manufacturing industry to increase company productivity. The method used was the study of literature on articles, theses, and proceedings obtained through several search engines, including 9 from Google and 21 from Google Scholar. The criteria for national journals are accredited, published in 2012, and above. This research refers to the working time measurement paper which is devoted to the stopwatch time study method. The review conducted showed that more than 50% was used to determine the standard time or standard time. By the standard time, the company can determine the time needed to complete a production process, the optimal number of workers and work schedules as well as reduce the workload while saving costs because production is completed on time, and others.

Keywords: Working time measurement, manufacturing, stopwatch time study, productivity

1. Introduction

Every company, including large, medium, and small scale companies, has a goal to make a profit. The size of the profit that will be obtained by the company is influenced by the way the company optimizes the workforce it has. Calculating productivity is very important considering it aims to determine the level of output of input in the production process. By knowing productivity, company management can plan the production factors needed in the production process and the amount of production within a certain time (Muzakir, 2018).

There are two types of activities carried out by the workforce, namely productive activities and non-productive activities. Productive work activities are activities carried out by skilled workers where workers can produce goods or services following the quality that has been set in a shorter time. In completing this work, the workforce is also given leeway for personal needs, for example relieving fatigue, discomfort, and others. Non-productive activities are working time activities that are used by employees incorrectly which will cause a waste of time, causing delayed production completion time. Non-productive time includes time spent idle, chatting, calling, and others (Aziria, 2017).

In the industrial world, working time is one of the important factors and needs attention for the production system. Working time plays a role in determining work productivity and becomes a benchmark for determining the best work method in completing a job. To compare the best work from the existing work methods, a standard time or standard time is needed as a reference for determining the best work method. According to Schroeder (2007), production standards are also often referred to as time standards. Formally, production standards can be defined as the amount of time required to carry out tasks or activities of trained employees who work at a normal speed with a predetermined method. Standard time is obtained from the measurement of working time. Measurement of working time can be done directly and indirectly. Direct measurement means that the observer will measure or record directly the time required by an operator to complete his work at his place of work. The indirect measurement meanwhile is that the observer does not have to always observe a job directly at the operator’s place of work because the job has been conditioned (Ghozali, 2016).
The importance of measurement in every activity carried out by the company makes an accurate measurement method very much needed. Through accurate measurement methods, accurate information will be obtained on the time required and the efficiency of the movement of each activity to produce products. One of the methods used to measure time for activities used is the time and motion study method. This method can show an increase in the effectiveness of the time and movement of the resources used which will then be compared with the results achieved by the company (Septiyana, 2019). Measurement of working time, in this case, is done by using downtime, especially for short and repetitive work. According to the measurement results, a standard time will be obtained to complete a work cycle. The standard time will then be used as the standard time for completing a job for all workers who will carry out the same job (Wignjosoebroto, 2000).

Based on this description, this paper examines the important role of measuring working time with the stopwatch time study method which aims to increase work productivity in various manufacturing industries through a study of the existing literature in the last ten years.

2. Method

The method used in this research was a literature study in the form of articles, theses, and proceedings obtained through several search engines, including 9 from Google and 21 from Google Scholar. The criteria for the national journal used was accredited with the year published 2012 and above. This research was conducted by identifying the results obtained from past studies related to the importance of measuring working time in the manufacturing industry to increase company productivity. The method used for measuring working time was devoted to the stopwatch time study method. The journals obtained were industrial engineering journals and optimization journals.

3. Findings and Discussion

Through a search of national journals related to the processing of working time measurement tests using the Stopwatch Time Study method, 30 journal sources were obtained from various accredited publishers in Indonesia. These selected journal sources were then analyzed and investigated further to find out if there is an increase in productivity in the Manufacturing Industry after the work measurement test was carried out using the Stopwatch Time Study method.

<table>
<thead>
<tr>
<th>No</th>
<th>Journal Title</th>
<th>Publication</th>
<th>No</th>
<th>Journal Title</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Determination of Standard Time and Optimal Number of Workers in Batik Cap Production (Case Study: LKM Batik Saud Effendy, Laweyan)</td>
<td>Jati Undip: Journal of Industrial Engineering</td>
<td>18</td>
<td>Standard Time Measurement And Workload Analysis In The Filling and Packing Process Of Bath Scrub Products at PT. Gloria Orikita Cosmetics</td>
<td>Scientific Journal of Engineering and Innovation</td>
</tr>
<tr>
<td>Page</td>
<td>Title</td>
<td>Journal/Conference</td>
<td>Volume</td>
<td>Abstract</td>
<td>Journal/Conference</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>--------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Measurement of Working Time Standards to Determine the Optimal Number of Workers</td>
<td>Wahana Inovasi</td>
<td>22</td>
<td>Worker Productivity Analysis Using Time and Motion Study Method (PT. Astra Honda Motor Palembang)</td>
<td>INTEGRATION: Scientific Journal of Industrial Engineering</td>
</tr>
<tr>
<td>9</td>
<td>Measurement of Work Station Standard Time On Sio Type Pipe Using Stopwatch Method At Pt. XYZ</td>
<td>IDEC National Seminars and Conferences</td>
<td>24</td>
<td>Analysis of Polyester Pre-drawing Operator Standard Time To Compare Stopwatch Method And M.O.S.T Method At PT. Apac Inti Corpora (Jln. Soekarno-Hatta Km 32 Bawen)</td>
<td>UMS Library</td>
</tr>
</tbody>
</table>
Many problems are common in the manufacturing industry. One of the common problems in production delays. Afiani (2017) tries to test this problem by calculating the standard time based on the SWTS (Stopwatch Time Study) method to measure the length of time ITC products are made. After calculating SWTS,
it is known that the standard time for the ITC manufacturing process is 4244.5 seconds or 70.7417 minutes per product.

In another study, Muzakir (2018) examined the Measurement of Working Time for Toyota Workshop Employees at PT. Dunia Barusa in Banda Aceh City to analyze the level of employee performance in the car oil change process at the PT. Dunia Barusa. The test shows that the standard time required to complete the car oil change process is 14.61 minutes. The number of standard operators in this workshop is 2 people.

Ghozali (2016) examined the most common sources of waste in the industry in his study "Measurement of the Standard Time for the Finishing Line Process of Volpak Production of Lannate Sp 25 Grams of the Philippines to Increase Productivity (PT. Dupont Agricultural Products Indonesia)." According to the findings of his investigation, the standard time for the finishing procedure before the research was 22.4384 seconds, with a total of 7 operators working. Following the investigation, the standard time for the completing process was reduced to 21.3844 seconds. In this situation, the number of operators is six. The standard time for the finishing procedure fell by 1,054 seconds as a result of this measurement or the efficiency increased by 4,6973%.

A similar study was also carried out by Purbasari (2020) which was aimed at measuring the standard time of the IC program installation process to the PCB using the stop clock method. Data were collected 10 times for 4 work stations (SK) with research subjects consisting of 4 male operators.

Damayanthi's study (2020) aims to produce the proper time in the manufacture of SIO type pipes, ensuring that the product reaches the customer on time. The stopwatch time study is the method used to calculate the standard time. The cycle time was found to be 5.56 hours after data processing for up to 8 observations. The normal time was 5.67 hours when the rating factor was taken into account, whereas the standard time was 6.42 hours when the allowance was taken into consideration.

Saputra's research (2021) on "Measurement of Working Time Based on Stopwatch Time Study and Occupational Health and Safety Analysis at the Tofu Factory Sukri Bukit Batrem Dumai", found that the completion time for 5 work elements was calculated as many as 8 trials with a standard deviation of the average price distribution. the subgroup mean was 0.32 seconds. This stage is followed by a data uniformity test and gives the result that the data is uniform with the data that has been taken. Researchers conducted this data processing using an accuracy level of 95% with a confidence level of 10%. That is, the researcher believes that the accuracy of data collection carried out on the measurement of working time from 5 work elements is 95%. Practice is carried out using 10% confidence which indicates that the researcher believes that only 10% of the observed data have errors/failures. The five elements of work are pouring dough, pouring water, inserting a steam pipe, expanding, and pouring water after the dough has risen. After the calculation, the results of the Standard time needed to complete one cycle of boiling tofu are 507.03 seconds or 8.45 minutes with details of 4.88 seconds for pouring dough, 7.4 seconds for pouring water, 2.03 seconds for entering the steam pipe, 485 seconds for the dough to rise and 7.85 seconds for pouring water after the dough has risen.

Widagdo's research (2018) discusses the Analysis of Standard Time Calculation Using the Downtime Method on Pulley Products at CV. Putra Mandiri Jakarta. This study tries to find the calculation of the standard production time to produce the right time to deliver goods (MTO) to customers to prevent waiting lists. There are 6 work elements examined in the study, which include measurement, machining, welding, finishing, painting, and installation of rubber lagging. The difference between the largest and smallest rating factor is 0.13 which is obtained from the finishing section of 0.33 and 0.2 from the welding section. The difference between the largest and smallest normal time is 70.84 which is obtained from the largest normal time in the painting section (72 minutes), while the measurement section on the left and right covers is 1.16 minutes. In this study, the author can determine the difference between Allowance and the amount of difference in the standard time of the entire Pulley production process. The difference between the largest and the smallest Allowance is 30% which is obtained from the Painting section by 67% and from the rubber lagging section by 37%. The difference between the largest and smallest normal time is 216.04 which is obtained from the largest time in the painting section, which is 218.18 minutes, and the smallest standard time in the measurement section on the left and right covers, which is 2.14 minutes.

Working time measurement not only serves to identify the standard time used in the manufacturing process. Sari (2020) did observations to learn about the workload that workers face. Observations were made at the Purbasari bath scrubs filling and packing sector, where working time data was acquired utilizing downtime and Westinghouse as an adjustment tool. The study included 7 work parts, 10 subgroups, and 6 measurements (placing the pot into the spa machine's mole, closing the pot, adding a shrink label, installing a cap seal, inspecting the shrink label and cap seal, inspecting the sterilizing results, inserting it into a master box). According to the calculation of standard time, it was obtained a workload of less than 100% which covers the process of closing the pot, installing the shrink label, and installing the capital. In this process, one operator
was deducted each, while in the shrinking process inspection process, an excessive workload was found which reached 114%. For this reason, this inspection process requires overtime.

Based on the many publications mentioned above, it is clear that measuring working time may solve a variety of difficulties in the manufacturing industry. Working time measurement can significantly improve industrial productivity by determining the time required to complete a production process, determining the optimal number of workers, determining an effective work schedule, analyzing workloads, and reducing costs because production is completed on time, among other things.

4. Conclusion

Every manufacturing industry relies heavily on the measurement of working time. A stopwatch time study, which is performed briefly and repeatedly on a job, is one approach of directly measuring working time. According to a review of 30 literature studies on the direct measurement of working time in the manufacturing industry, standard time is employed in more than half of the cases. The organization can utilize standard time to determine the time it takes to complete a manufacturing process, the appropriate number of people, work schedules, reduce workloads, and save money since production is completed on time, among other things.

References


INFO

Corresponding Author: Bambang Suhardi, Department of Industrial Engineering, Faculty of Engineering, Universitas Sebelas Maret, Surakarta, Indonesia.