JOURNAL OF AUTOMOTIVE AND MECHANICAL APPLIED TECHNOLOGY

Vol. 1 No 1, 2024, pp. 59-65 https://journal.uny.ac.id/publications/jamat https://doi.org/10.21831/jamat.v1i1.833

The Use of Flow Rack as an Effort to Implement Kaizen in an Effort to Increase the Production of Stepwagon Car Seats at PT YSC Japan

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ARTICLE INFO

Article history:

Received 01.12.2024
Revised 14.12.2024
Accepted 21.12.2024

Keywords:

Kaizen; Efficiency; 8-Step Improvement; Loss Time; Flow Rack

ABSTRACT

This study aims to: (1) analyze the performance data of workers at PT. YSC Japan before the implementation of an innovation involving the addition of a Flow Rack; (2) examine the process of adding the Flow Rack and its impact on worker performance at PT. YSC Japan; and (3) evaluate how the Flow Rack innovation enhances worker productivity at PT. YSC Japan. The study employs the Kaizen concept using the 8-Step Improvement method, with a fishbone diagram utilized for cause-and-effect analysis. Data were collected through observation and documentation, using instruments such as a logbook, observation sheet, and smartphone. Descriptive quantitative analysis was conducted to compare production speeds before and after process improvements. The findings reveal that: (1) PT. YSC Japan required efficiency enhancements, as production on the Line Front Cushion Stepwagon experienced a loss time of 90 seconds per 22 pieces, resulting in a production time of 38.7 seconds per piece; (2) the application of the Kaizen concept, using the 8-Step Improvement method, successfully improved productivity through the addition of a Flow Rack as a storage innovation; and (3) after implementing this change, PT. YSC Japan achieved a 10.3% efficiency improvement, reducing production time to 34.7 seconds per piece.

1. Introduction

The automotive industry is one of the key sectors contributing to the economy [1]. This is evident from the 2023 Statistics Indonesia data released by BPS, which shows that by the end of 2022, there were approximately 125.3 million motorcycles in Indonesia, with an increase of 5.2 million units from the previous year. Additionally, the number of passenger cars also grew by 600 thousand units within the same period [2]. This reflects the continuous rising demand for motor vehicles in Indonesia.

The Indonesian government prioritizes the automotive sector in the implementation of Industry 4.0 due to its significant contribution to the national economy. According to Gaikindo, car sales in 2023 increased by 18.1%, providing significant opportunities for automotive companies to expand. However, to remain competitive, companies must develop effective strategies to enhance their operational efficiency [3].

PT. YSC Japan, a company focusing on the production of car seats, is one of the players in the automotive industry facing this challenge. The company manufactures seats for various car models such as the Honda Stepwagon, Honda Civic, and Honda Civic Type R, and plays a significant role in meeting market demand. One of its production lines, the Front Cushion Stepwagon line, is responsible for installing seat covers, heaters, and tidying up the cables

before the seats are sent to the next line. However, significant loss time was found in this line, where workers one and two had to wait for worker three to return after delivering the product. This not only reduces work efficiency but also increases operational costs due to overtime.

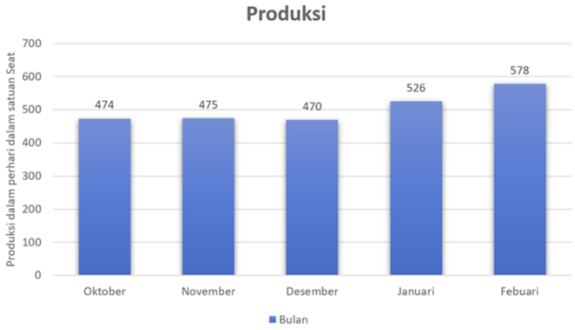

Figure 1. Quantity of seat production per month

Production data (Fig. 1) shows an average of 504 seats per day, with a peak production of 578 seats per day in February 2024. This increase has caused a rise in operational costs and a decrease in work efficiency [4]. To address this issue, the implementation of the Kaizen concept becomes a relevant solution [5]. Kaizen, as a continuous improvement approach, aims to reduce waste, excessive workloads, and improve product quality. One Kaizen innovation proposed is the use of a Flow Rack as a temporary storage area on the Front Cushion Stepwagon line. The Flow Rack allows workers one and two to continue working while worker three delivers products to the next line, thereby minimizing loss time.

The urgency of this research lies in the need to improve production efficiency at PT. YSC Japan through measurable and data-based innovation. This study aims to analyze worker performance before and after the implementation of the Flow Rack and measure its impact on time efficiency and production costs. The results of this study are expected to contribute to enhancing the company's competitiveness in the increasingly competitive automotive industry.

2. Methodology

This research focuses on driving change through the implementation of the Kaizen concept. Kaizen, a Japanese term meaning "continuous improvement," emphasizes the importance of making ongoing improvements to achieve better and more efficient results [6,7,8,9] . To identify and analyze the problems at PT. YSC Japan, the research employs the 8 Step Improvement method, which provides a systematic framework for evaluating processes. This approach enables the researcher to formulate effective strategies to achieve the desired improvement goals.

The 8 Step Improvement method consists of several stages that guide the researcher in systematically addressing production issues [10]. The process begins with defining the research theme, which can be related to quality, cost, delivery, safety, morale, productivity, or environmental impact within the production process. Next, specific, measurable, realistic, and time-based targets are set. An analysis of the current conditions is then conducted through direct observation and interviews, using the 4M+1E approach (Man, Method, Machine, Material, Environment). The data obtained is analyzed using cause-and-effect methods, such as why analysis or the fishbone diagram. Once the problems are identified, a countermeasure plan is developed using the 5W+2H method (What, Why, Who, When, Where, How, How Much). The implementation of the countermeasures is carried out carefully, with discussions on any new ideas that arise during the process. Afterward, the results are evaluated by

comparing the initial targets with the final outcomes. If necessary, revisions are made to the plan. Finally, the effective solutions are standardized into Standard Operating Procedures (SOPs) to prevent similar issues from occurring in the future.

This study is conducted at PT. YSC Japan, located in Saitama, Japan, from January 2024 to April 2024. The data collection techniques used in this research include observation and documentation. Observation involves visiting the production site and closely monitoring the surrounding conditions. Documentation refers to the process of recording and collecting research data in written form or through photographs.

The instruments used for data collection are logbooks, observation sheets, and smartphones. A logbook is used to record the actions taken during the research, particularly for tracking the progress of the 8 Step Improvement process. The observation sheet is a working document used to record the results of the observations made, following the format required by the SOP. Smartphones with stopwatch features are used to track time during the observations.

The data obtained is then analyzed in two key aspects: (1) The implementation of the 8 Step Improvement method is analyzed through the logbook records, which will later be used to develop an SOP at PT. YSC Japan. (2) The results of the improvement are compared by analyzing the data before and after the implementation. The difference in values is then calculated to determine the increase in production capacity. The increase in production capacity is calculated using Equation 1:

$$\text{Average rate} = \frac{X_1 + X_1 + \ldots\ldots\ldots + X_n}{n} \text{ x } 100\% \quad (1)$$

Where :

n = number of data point

X = the test number

3. Result and Discussion

In the final trimester of 2023, PT YSC Japan faced challenges in improving production efficiency due to the increasing demand for the products being manufactured. Fig. 2 shows the layout of the production line for the front cushion process. This figure illustrates the process steps and the areas where inefficiencies were identified. A key issue in the production process was the occurrence of loss time on the front cushion line of the Stepwagon. Loss time is defined as the period when workers are unable to perform their tasks due to delays in the production flow. In this case, the third worker was tasked with delivering and replacing the Daisha when the storage or Daisha reached full capacity. This situation repeated every time the third worker completed a product in multiples of 22. The delivery of Daisha took a significant amount of time, causing workers 1 and 2 to halt their tasks, resulting in additional loss time. The total duration of this loss time was substantial, lasting up to 90 seconds (Table 1). This inefficiency negatively impacted the overall production time, aligning with findings from Faturohman Arief (2016) [11], who stated that companies experiencing frequent production issues tend to have inefficient processes, leading to increased loss time and reduced product quality. The average time to produce one unit on the front cushion line was 38.7 seconds, a duration that could be shortened by eliminating the loss time.

Figure 2. Layout of production

Table 1. Loss time measurement

Trial	Loss Time (s)
1	91
2	90
3	89
Total	270
Average	90

To address this issue, the Kaizen philosophy, which emphasizes continuous improvement, was proposed as a solution. However, Kaizen had not been fully implemented in the production process at PT YSC Japan. To apply Kaizen effectively, the 8 Step Improvement method was employed to identify the root causes of inefficiencies and develop appropriate solutions. Fig. 3 illustrates the systematic approach of the 8 Step Improvement process, which was used to analyze the production workflow and uncover the underlying issues causing loss time. The analysis revealed that the primary cause of loss time was the production method itself. To resolve this, a Flow Rack system with a capacity to store three products was introduced, aimed at eliminating delays caused by Daisha delivery and ensuring a smoother workflow.

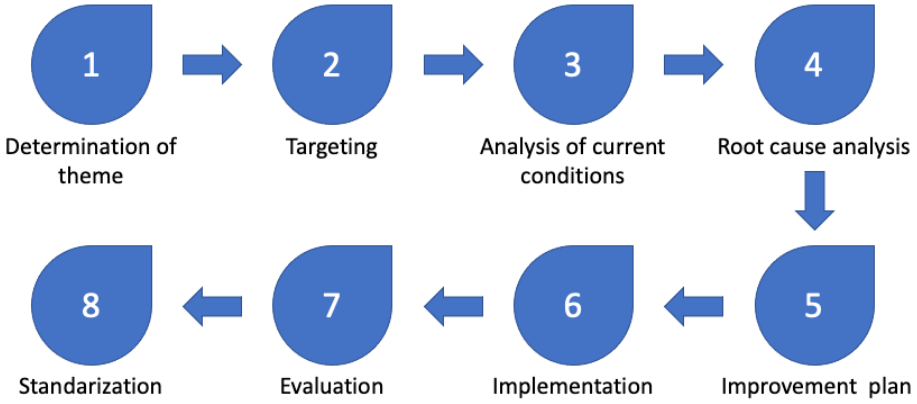

Figure 3. The 8 Step Improvement process

To address the issue of loss time, an innovation involving the addition of a Flow Rack was implemented in the production process. The Flow Rack is designed to store products completed by the second worker, ensuring that the second worker does not need to stop production while waiting for the third worker to return to their position after replacing or delivering the Daisha. The Flow Rack operates efficiently: when the third worker returns, the Flow Rack is filled with up to three products, allowing the second worker to continue their tasks without interruption. The third worker then takes one product from the Flow Rack, leaving two products behind, and the second worker refills the Flow Rack to its full capacity. This cycle repeats every time the Daisha is replaced, ensuring no queuing or waiting time that would otherwise halt production.

As a result, the time required to produce one unit decreased from an average of 38.7 seconds to 34.7 seconds. This reduction demonstrates the significant impact of eliminating loss time on production efficiency. With the implementation of the Flow Rack, production capacity increased as the production cycle time became shorter. Fig. 4 illustrates the comparison between production times before and after the Flow Rack implementation, highlighting the success of this innovation in eliminating loss time and improving productivity.

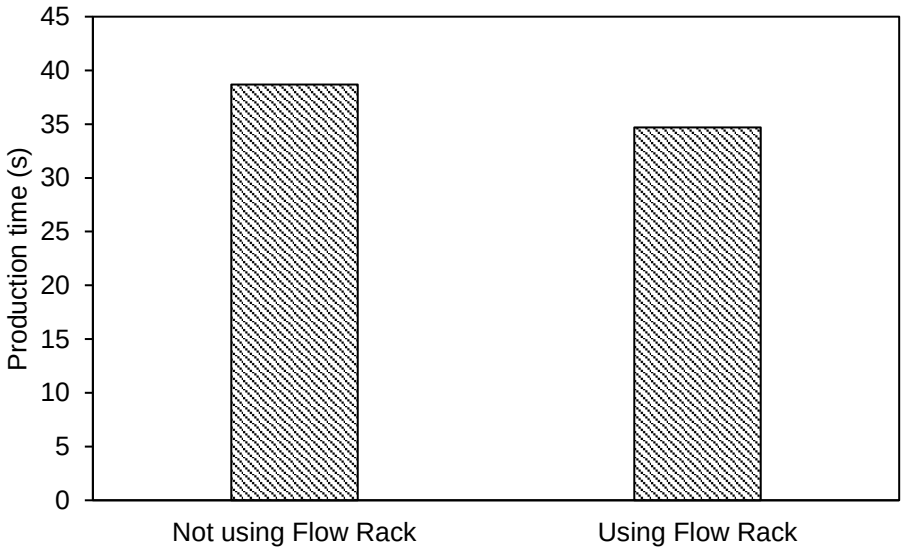

Figure 4. Comparison production time

The implementation of the Flow Rack on the front cushion line not only improved the efficiency of the production process but also contributed to a measurable increase in daily production efficiency. PT YSC Japan experienced a 10.3% improvement in efficiency on a daily basis, as the elimination of loss time allowed workers to maintain a steady pace throughout the production cycle. This efficiency gain aligned with the principles of Kaizen, demonstrating that even small, incremental improvements can lead to significant results. The success of this innovation highlighted the importance of continuously evaluating and improving production processes to meet the demands of a growing market.

4. Conclusion

the production efficiency issues at PT YSC Japan, particularly the loss time on the front cushion line of the Stepwagon, were successfully addressed through the application of the Kaizen concept and the 8 Step Improvement methodology. The primary problem identified was the delay caused by the third worker's task of delivering and replacing Daisha when the storage reached full capacity. This resulted in significant loss time, causing disruptions in the workflow of other workers and ultimately impacting the overall production time.

By implementing the Flow Rack system with a capacity to store three products, the company was able to eliminate the 90-second loss time that had been hindering production efficiency. This innovation allowed the production line to operate continuously without unnecessary delays, reducing the time to produce one unit from 38.7 seconds to 34.7 seconds. As a result, the company experienced a 10.3% improvement in daily production efficiency, which was a significant step toward optimizing production capacity.

The findings of this study demonstrate the effectiveness of the Kaizen approach in identifying and solving production issues through small, incremental changes. By using the 8 Step Improvement methodology, PT YSC Japan was able to pinpoint the root cause of the problem and implement a solution that had a direct impact on production efficiency. This case highlights the importance of continuous improvement in manufacturing processes, especially in the face of increasing demand, and provides valuable insights for other companies looking to enhance their production systems.

Conflict of interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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