IMPROVEMENT OF WORKSTATION TOWARDS INCREMENT OF PRODUCTION RATE

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ARTICLE INFO

Article history:
Received
10 April 2023
Received in revised form
20 May 2023
Accepted
10 June 2023
Published online
10 July 2023

***Keywords**: Workstation, production rate, Genchi Genbutsu*

ABSTRACT

Making the most of space with suitable equipment placement while incorporating the human component into the workplace design, and properly aligning the workplace with the surrounding environment is crucial to an effective workstation design. The following study is done in a frozen food company's production line preparing boneless chicken thigh. Study showed all the workstation involved could not reach the daily production target. The objective of this study is to identify the issues causing the low production rate and implement solutions to rectify the problem. The Genchi Genbutsu technique is used to identify the issues causing the low production rate. To solve this problem, improvements have been made to the existing workstation in terms of worktable design. As a result, the daily production target of 840 kg has been achieved after the improvement of the chicken cutting workstation. The company was also to save overtime cost by 87% per month.

1. Introduction

In order to survive in today's competitive world, companies especially in the manufacturing sector are constantly pushed to find ways to reduce production costs and ensure efficiency in their day to day processes and operation in order to increase productivity and quality product. Companies can also face financial losses due to low productivity ((Rosa et.al., 2018; Kulkarni et al., 2018). These financial losses can occur due to overtime paid to workers, the penalties due to late delivery and customer loss. The loss of customers can have a major impact on business continuity. To avoid this scenario customer's satisfaction is crucial and can only be achieved by delivering quality product at reasonable cost and on the right time. Survival of any business whether manufacturing or service depends on its flexibility to continuously and systematically respond to the customers need and accordingly adds value to the product (Palange & Dhatrak, 2021).

Companies employ various method and technique to improve their daily production or add value to their existing product. Genchi Genbutsu is one of this technique. According to Senior & Hyatt (2015) Genchi Genbutsu is an effective technique to identify problems or issues on a production floor. It is a key principle of the Toyota Production System which refers to as "go and see." The principle proposes that in order to truly comprehend a scenario one needs to observe what is happening at the workplace where the actual work takes place called the

Gemba . It emphasizes on collecting facts and data at the actual site of the work or problem. It maintains that understanding of the problem via this method will produce a viable solution that is really relevant to the problem.

The following research is conducted in a major frozen food manufacturing company in Malaysia focusing on their chicken cutting production line named the boneless thigh section. The research is conducted during the period of November 2021 to January 2022. The purpose of this research is to identify the problems related to low production rate in the boneless thigh section and improve its production rate to achieve its daily production target of 840kg of processed boneless chicken thigh.

2. Materials and Methods

A mixture of qualitative and quantitative methods is used in this research. According to Kabir (2016) this mixed method of gathering and evaluating data will assist to increase the validity and reliability of research. In a mixed method design, each set of methods plays a critical role in achieving overall aim of research and is enhanced in value and outcome by its capability to complement each other failing and benefit (Palinkas et al., 2019).

For the quantitative method; An interview with persons in charge and production personnel in places within the chicken cutting production line is done together with on-site observation using the Genchi Genbutsu technique. Genchi Genbutsu is an investigation technique of going to and directly observing a location and its conditions to understand the root cause of the problem (Kumar et al., 2021; Chiarini et al., 2018). Research is conducted in the company's boneless thigh section that involves three processes. In process one the employees receive whole chicken thighs in quantity of 12kg per crate from the previous process. In the next process the employee picks the crate one by one manually and unload the chicken pieces onto their worktable until the table is full. Finally, the employee cut the chicken pieces into required size and send them to the packing line. During observation and interview with employees five main issue were highlighted:

1. The employees feel tired of picking and unloading the crates repeatedly thus slowing down production;
2. The worktable is open on all sides and has slippery surface that causes the chicken to fell off the table if more than 4 crates of chicken are uploaded onto the table as seen in Figure 1;
3. The employees need to spend extra time to clean or dispose the chicken if it falls to the ground at the workstation;
4. When chicken pieces are disposed due to hygienic reason the employees are short of pieces to work with and need to retrieve the new chicken pieces to complete the batch;
5. A limited number of workers in the section; if any of the employee take emergency leave there will not be a replacement worker.

Figure 1. The workstation before the implementation of solution

For the qualitative method, data collection in terms of daily production output from the production line is collected to evaluate the performance before and after the solution is implemented. The monthly overtime rate was also collected before and after the solution is implemented. Figure 2 shows the production data collected during observation. The data is collected during the period of 8 days starting from 1st December 2021 to 8th December 2021. The data shows that the daily production rate of 840 pieces per day is not achieved 6 out of 8 days. To further understand the trend of the production rate in the boneless thigh section the overtime data is collected. The overtime data is collected from the company's human resource department for the month of November 2021. Data shows in the month of November 576 hours of overtime has been given to employees resulting in an additional cost of RM 4,608.00 in the section.

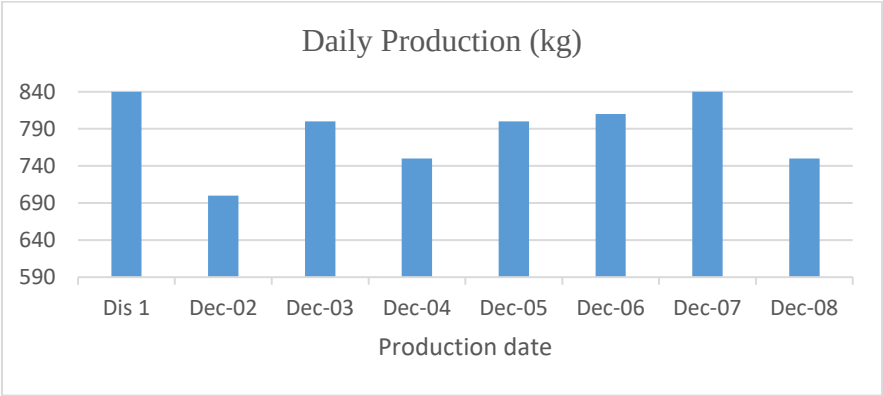

Figure 2. Graph shows the daily production rate of boneless thigh before the implementation of solution

Based on observation and data collected it became clear that the boneless thigh section is experiencing under production and is causing an additional cost for the company. The workstation design has been identified as the main cause of problem. Researcher suggested two possible solutions to the company management as shown in Table 1. The following aspects were taken into consideration; product unloading capacity, installation cost, material and cleanliness. Cleanliness and hygiene in food production is very important not just because it's a business risk, but also it is a legal obligations and there is a very real possibility of causing harm to customers.

After discussion; the company management decided to proceed with solution 2 taking into consideration the cost, maintenance and workspace factor. Solution 2 offered the company fast solution at low cost as the worktable can be fabricated in the company and there will not be any extra workspace consumption. There is also no need for the technical team to do

maintenance as it can be done by the production line worker themselves after the end of every work shift.

Table 1. The proposed solution for improving workstation at the boneless chicken thigh section

	Solution 1	Solution 2
Ideas	Add new conveyer	Worktable with extension plate
Advantages	• Smooth the chicken movement along the workstation. • Maximize product unloading at a time	• Maximize product unloading at a given time • Simple and in-house fabrication • Minimal cost
Weakness	• High starting cost • Need of electrical wiring and power supply • Need schedule / unscheduled maintenance • Need additional space usage	• A need for detail cleaning process in the workstation

After the decision is made a technical drawing utilizing Autodesk Inventor was created and presented to management for approval and fabrication. The completed worktable as seen in Figure 3 was installed on 15th of December 2021 and the feeding angle is fine-tuned to guarantee the greatest possible outcome for this project. The new table is fully stainless steel and comes with extension plates all around to ensure the chicken pieces are all contained within the worktable to avoid felling pieces.

Figure 3. The new worktable for the boneless chicken thigh section

The workers were briefed on usage and maintenance of the new worktable. Data collection on the daily production rate and overtime cost was collected for the month of December 2021 and January 2022 to study the effective of the new worktable in improving the section's production rate.

3. Results

After the implementation of the new workstation the daily production has reached its daily target of 840 kg except of one day as seen in Figure 4. Upon investigation it was noted that the low production rate on 19th December 2021 is due to the staff shortage which was rectified the following day.

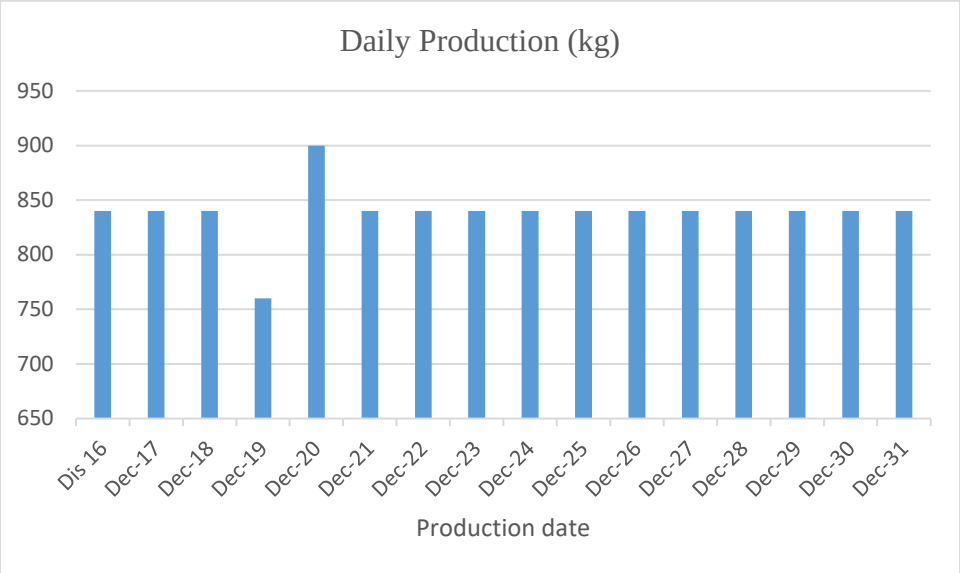

Figure 4. Graph shows the daily production rate of boneless thigh before the implementation of solution for the month of December 2021

The production plan for the month of January 2022 is the same as the previous month, which is 840kg, with a little variation in the output plan from January 10 to January 16, which is increased to 960kg. As can be seen in Figure 5 the daily output is achieved even when the output plan is increased.

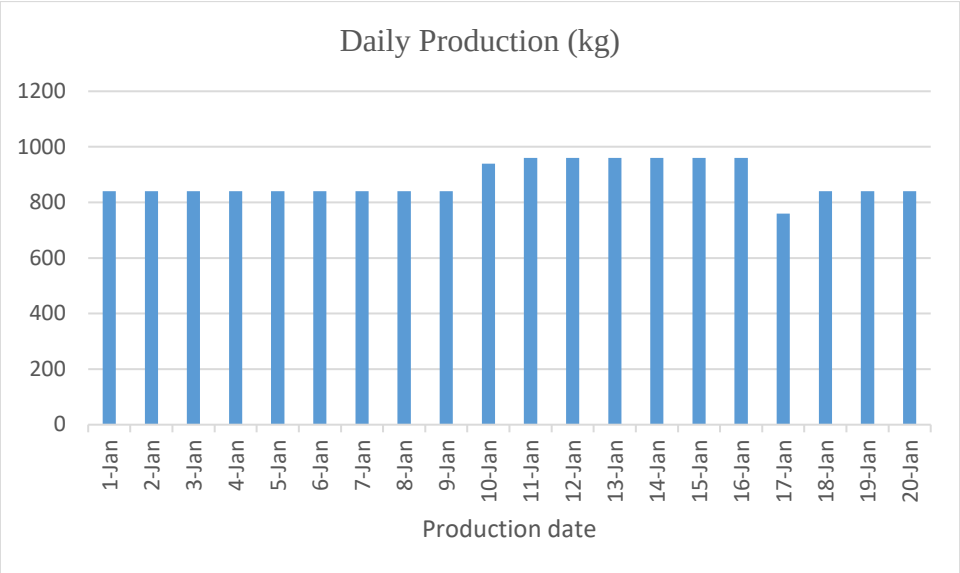

Figure 5. Graph shows the daily production rate of boneless thigh before the implementation of solution for the month of January 2022

With the daily target achieved most of the days, only a total of 4 hours of overtime was needed in the month of January 2022 which amounts to RM 576.00. This overtime cost only existed due to the staff shortage on one day and a slight increase in demand on certain days.

Observation on worksite showed the new worktable has also reduced the number of times the worker need to unload the chicken onto the worktable as the new worktable can safely hold 8 crates of chicken at one go compared to 4 crates previously. This reduces the overall unloading time by 50%. Chicken disposed due to felling on the floor has also been eliminated.

Based on results in Figure 4 and Figure 5 the researcher concludes that the improvement in this workstation has successfully helped the section to achieve its daily production target of 840 kg and save cost for the company in terms of workers' overtime by 87%. The new workstation ensures a cleaner and safer working space for employees.

References

Chiarini, A., Baccarani, C., & Mascherpa, V. (2018). Lean production, Toyota Production System and Kaizen philosophy. *The TQM Journal*, 30, 425-438 . https://doi.org/10.1108/TQM-12-2017-0178

Kabir, S. M. S. (2016). Basic guidelines for research. *An introductory approach for all disciplines*, 4(2), 168-180.

Kulkarni, R. G., Kulkarni, V. N., & Gaitonde, V. N. (2018). Productivity improvement in assembly workstation of motor winding unit. Materials Today: Proceedings, 5(11), 23518-23525. https://doi.org/10.1016/j.matpr.2018.10.139

Kumar, S., Gangadharappa, H. V., & Gowrav, M. P. (2021). Handling of Pharmaceutical Deviations: A Detailed Case Study. *Indian Journal of Pharmaceutical Sciences, 82(6)*, 936-944 .

Rosa, C., Silva, F. J. G., Ferreira, L. P., Pereira, T., & Gouveia, R. (2018). Establishing standard methodologies to improve the production rate of assembly lines used for low added-value products. *Procedia Manufacturing*, 17, 555-562. https://doi.org/10.1016/j.promfg.2018.10.096

Palange, A., & Dhatrak, P. (2021). Lean manufacturing a vital tool to enhance productivity in manufacturing. *Materials Today: Proceedings*, 46, 729-736. https://doi.org/10.1016/j.matpr.2020.12.193

Palinkas, L. A., Mendon, S. J., & Hamilton, A. B. (2019). Innovations in mixed methods evaluations. *Annual review of public health*, 40, 423. doi: 10.1146/annurev-publhealth-040218-044215

Senior, B. A., & Hyatt, B. (2015). 10 Wastes and genchi genbutsu. *Value and Waste in Lean Construction*, 129.