
ABSTRACT

In the pursuit of profitability and competitiveness, more companies are turning to lean manufacturing to reduce or eliminate waste in their production processes. Cycle Time Reduction to increase productivity was the aim of the study. Top two (2) most existing lean manufacturing wastes namely transportation and motion were identified and confirmed after observation. Other tools such as time study, interview, survey and measuring distances were used to obtain the necessary data.

Process activity chart and four different preferred lay-outs in order to minimize transportation were presented to reduce the cycle time in making the plywood-based pallet. Interchanging the nailing section after the cutting section (dice & cube), in line with the faceting section and the assembly line had been proposed. In effect, the company will be able to produce sixty nine (69) units per hour which is equivalent to 552 plywood-based pallets per eight (8) hour of work.

KEYWORDS: cycle time reduction, transportation minimization

INTRODUCTION

In today's competitive business arena, companies require small lead times, low costs and high customer service levels to survive which lead to customer-focused. The result is that companies are putting much effort to reduce cycle time in producing product. Companies that focused on cycle time as a productivity measure can reduce delivery time and improve quality, hence, creating more satisfaction to customers.

This study addressed the implementation of lean manufacturing in the production area of a pallet manufacturing company with focus on activities such as proper rhythm of assembly line and eliminating consuming activities such as transportation. The primary objective is to develop different strategies to minimize the transportation, using lean manufacturing tools applied as method to lead the activities.

Lean manufacturing is a short-hand for a commitment in eliminating waste, simplifying procedures, and speeding up production [1]. Successful implementation of the said tool has brought about significant improvements, such as better quality, increased productivity, reduced lead times, major reductions in inventories, reduced setup times, lowering manufacturing costs and increased production rates [2]. In the local study, recognizing the non-value added activities existing in the particular company named Pedd Manufacturing, it provides awareness of the efficiency of the performance and productivity of the workers in the company [3].

The process of transforming raw materials into finished goods is the objective of any manufacturing company. The processes that make the transformation possible are the result of two different activities those that add value and those do not [1]. Value-added activities involved in the company considered are the actions and the process elements that accomplish transformations and add value to the product from the perspective of the customer. Non-value added activities are the process elements that do not add value to the product from the perspective of the customer such as transportation, inspection, storage of raw materials and avoidable and unavoidable delay. In the past, companies had focused on the value-added steps. Lean manufacturing shows that reducing non-value added component must be first identified to improve as much as possible the value-added component of lead time.

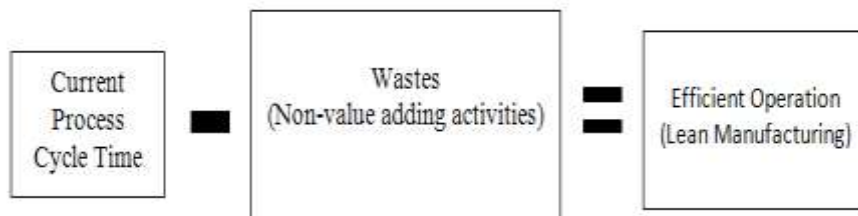


Figure 1. Paradigm of Lean Manufacturing Concept

The variable processed in this study is the cycle time. The current cycle time consists of both value added and non-value added activities. Minimization if not totally elimination of existing non-value added activities specifically transportation through lean manufacturing is the focus of the study. The result after minimizing if not totally eliminating the non-value added activities leads to efficient operation or lean manufacturing.

Objectives of the study:

The main objective of this study is to reduce cycle time by eliminating non-value added activities in the production area of a pallet manufacturing company. Specifically, this study aims to determine the following: (1) non-value added activities that are currently present in the production; (2) possible ways of reducing the cycle time; (3) total cycle time, if the transportation activity is reduced/ minimized; and (4) impact of reducing the cycle time in the output of plywood-based pallets.

MATERIALS AND METHODS

The research utilized the descriptive method of research with the preliminary observation as the main source of data. The descriptive method is viable for the study since the purpose of the study is to generate prevailing conditions prevalent in the setting of the study.

Statistical treatment was applied to the result of surveys and interviews. Simple linear regression was used to determine the effect or impact of an independent variable on a dependent variable. The independent variable (x) of the study is the computed reduced cycle time while dependent variable (y) is the output produced in assembly area.

RESULTS AND DISCUSSION

Results of the study showed that majority of the workers are very much satisfied with the procedures currently implemented in the company. However, in spite of this, the target outputs were not accomplished at the right time. It was found out the most common cause of delay in production is due to transportation. With regards to external factors, majority of the workers confirmed that their performance was not affected by noise but the poor ventilation in their workplace affects their productivity. Also, it can be noted that most of the respondents confirmed that the safety equipment in the production area were not enough. Among all those cited non-value added activities, the most visible lean manufacturing wastes that are present in the production area are transportation and motion waste.

Through the use of Cause and Effect diagram, it was identified that the main contributor of the long distance between work stations are inappropriate route of transporting materials and backtracking of materials and processes. As to the causes of motion waste, bending and reaching for material was observed due to poor work station, poor method design due to improvised small chair used and incorrect posture while working (bended knees). Frequent cleaning of workplace by sweeping wood residues was also observed.

In order to find ways of reducing cycle time, four (4) proposed layout were given to the company. From these four alternatives, cycle time was computed to determine the layout with the highest output. Time study was conducted to determine the value added activity and the non value added activity with their corresponding output using the company's current layout. From the trials made through time study, linear regression was used to determine the slope of the regression line (b) and the y-axis intercept (a). By applying the values to the proposed layout, the researcher were able to predict/impact of reduced cycle time to the output.

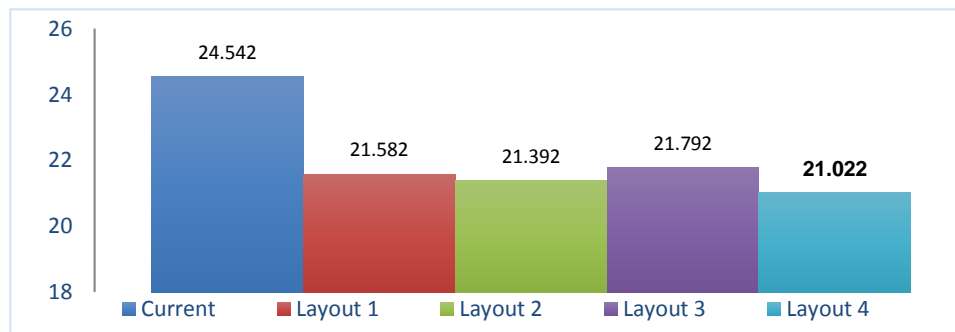


Figure 2. Comparison of reduced cycle time

CONCLUSION

Based on the findings of the study, the most visible non-value added activities present in the production line are transportation and motion. These two are considered as lean manufacturing wastes present in making the plywood-based pallet. In transportation, it can be attributed with the large distance between each station in the production line, inappropriate route of transporting materials, and backtracking of delivering materials. In motion, the factors that were considered were the poor work station layout, poor method design, unnecessary movements, and repetitive non-value added activities done by the workers.

The possible ways of reducing the major contributor of non-value added activity of the total cycle time is revision of the layout.

Table 1. Impact of revising the layout with respect to the output per hour worked

LAYOUT	TOTAL CYCLE TIME	OUTPUT PER DAY
Current	24.542 minutes	357 Pallets
Layout 1	21.582 minutes	462 Pallets
Layout 2	21.392 minutes	469 Pallets
Layout 3	21.792 minutes	455 Pallets
Layout 4	21.022 minutes	483 Pallets

Upon verification and testing the hypothesis through computation using simple linear regression, it was found out that every time the cycle is reduce, their corresponding output increases. There is a big impact of the reducing the cycle time with respect to the output. Hence, it is advisable to the company to continuously improve their production system to increase productivity.

The researchers recommend that there must be a change in the layout of company to improve its production process in order to reduce transportation, if not totally eliminated, increase workers awareness of MSD signs and symptoms, encourage early reporting of any problems, and implementation of 5s in the production. The implementations of 5s can be helpful in sustaining the smooth workflow, maintain the cleanliness of the workplace, and increase the productivity of the workers.

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