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LEAN MANUFACTURING ASSESSMENT IN MALAYSIA SMALL MEDIUM ENTERPRISE: A CASE STUDY

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ABSTRACT

Lean production system has been widely implemented in manufacturing industry. Value Stream Mapping is one of the commonly lean practices that being implemented in lean production system to make the improvement in the production. The objective of this paper is to assess and develop the current state value stream mapping and future value stream mapping. This study performs comparison between current state and future state in the company after implementing lean techniques. Value Stream Mapping used to analyze the flow of materials and information currently required to bring the product to the consumer. The result shows that the company absolutely gets benefit from the lean implementation. Based on the current assessment, the main areas that need to be improving in the company are managing the waste, reduce the lead time and manage value chain to meet customer requirement and satisfaction. The results show that the lead time had been reduced 39.9% from the current state and the number of operators had been reduced from 7 operators to 3 operators.

Keywords: *Lean, Value Stream Mapping, Small Medium Enterprise, Current State, Future State.*

INTRODUCTION

Lean production techniques have contributed to a spectacular improvement in efficiency, speed of response and flexibility in production at many industrial enterprises through elimination of waste and the highly flexible implementation of these processes. Value Stream Mapping is commonly used in lean environments to identify opportunities for improvement in lead time. The goal of the value stream mapping is to identify, demonstrate and decrease waste in the process. As a result, value stream mapping is primarily a communication tool but it is also used as a strategic planning tool and a change management tool. The main trust in this study is examines the applicability of lean manufacturing techniques implementation in Wan Malinja Food Industry Sdn Bhd, Johor, which is one of the SMEs in Malaysia.

LITERATURE REVIEW

Lean manufacturing is a comprehensive term referring to manufacturing methodologies based on maximizing value and minimizing waste in the manufacturing process. Many of the most recognizable phrases, including Kaizen, Jidoka, and Kanban, are Japanese terms that have become standard terms in lean manufacturing. Value Stream Mapping (VSM) was chosen as a tool to gather information on the food supply chain because it has been used successfully by many organisations to plan and identify internal improvements (Dolcemascolo, 2006). Furthermore when used appropriately it can help the process industry eliminate waste, maintain better inventory control, improve product quality, and obtain better overall financial and operational control (Abdulmalek and Rajgopal, 2005).

Womack and Jones (2000) define Value Stream Mapping as “The simple process of directly observing the flows of information and materials as they now occur summarizing them visually and then envisioning a future state with much better performance”. Value Stream Mapping has been used in previous studies by Jones and Womack, 1996 and Rother and Shook, 1999. These studies focused on lean manufacturing and how waste can be reduced or eliminated from the value stream. Further studies have been carried out by other researcher also adopted the lean approach to manufactured and identified the opportunities for lean techniques and product improvements in the manufacturing sectors. (Abdulmalek and Rajgopal, 2005; Seth and Gupta, 2005 and Hines et al., 1998).

METHODOLOGY

The first step in lean manufacturing approach is conducting a self assessment for the operating condition. It will provide feedback regarding the capability. After completing the lean assessment, move on to the next phase which is documenting the current state gap. The current state gap provides the baseline measure of where the company is today. Future state design is the third phase where the project team puts together an overall concept design on how the site should operate. Then the implementation of manufacturing can be conducted through a series of stages via 'Kaizen events'.

For the assessment of current manufacturing system, observation and audit had been made to the shop floor. An interview and site visit to the company has been done to assess the current manufacturing system. The results of assessments were presented by using several types of tools such as Spaghetti Diagram, 5S Audit, Gap Analysis, Fishbone Diagram and SWOT (strengths, weaknesses, opportunities, threats) Analysis.

The Spaghetti Diagram was used to trace the path and distance traveled throughout the process. It exposed unnecessary travel distance between process steps and overall process waste. The Fishbone Diagram was constructed to explore the sources of variation in the process. It displays a few key sources that contribute most significantly to the problems being examined. The SWOT Analysis was used for analyzing the internal value (strength and weakness) and the external value (opportunities and threats) of the company. 5S Audit maintaining on orderly workplace and using visual cues to achieve more consistent operational results. The practice of 5S aims to embed the values of organization, neatness, cleaning, standardization and discipline into the workplace. A few key areas of manufacturing were analyzed used Gap Analysis. It shows the gap between the actual target in current state and the lean targets.

The current state value stream mapping is shown in Figure 1. Developing a current state map involves four stages as describe below:

- a) Gather details about the customer's requirements.
- b) Detail the physical flow with all processes, data boxes and inventory triangles.
- c) Map the supply materials.
- d) Map the information flows and determine push and pull system.

In future value stream mapping, the process for designing the continuous flow will be performed in line balancing which used the Yamazumi board technique. The takt time is determined to find out whether current production meets customer demand. Then, the future state map is to plan and map the flow as shown in Figure 2.

RESULT AND DISCUSSION

The proposed implementation plan was interpreting the relevant lean plan on improving the company's productivity. The implementation plan will reflex to the issues and problems based on the current state manufacturing system assessment.

In production and inventory control, the plan that been proposed are pull system, Kanban, single piece flow, supermarket, and standardized work. The pull system controls the flow of production through the factory based on a customer's demand. It controlled the flow of resources in a production process by replacing only what has been consumed. Kanban is a way to support the pull type method. Kanban are cards attached to the containers and acts as a signal to indicate that more inventories is needed. Single piece flow is combining processes that products can flows from process to process with no interruptions and no work-in-progress (WIP). Meanwhile, the supermarket functioning at each process as controlled the inventory by holds an amount of each product it produces. Each process simply produces to replenish what is withdrawn from its supermarket. Detailed work instructions are state in standardized work sheets. It should be posted in the work area.

To ensure the quality of the product, the quality systems and techniques such as quality checking and Andon system were proposed. Quality checking will be available at the end of each process or cell. One of the quality tools that can be implemented is check sheet. Andon system can be used as a signal assistant in cell 1 because it involves machines and operators. The signal when machine was down can be triggered by pushing a button or a cord or even by the equipments itself.

In this study, human resources were among the issues that have been analyzed. From the analysis, the value stream manager and trainings were proposed. Besides that, total productive maintenance was the implementation plan for machine. It ensures that every machine in a production process is always being able to

perform its required tasks. In environment of the company, 5S was suitable to be implemented to the whole production and operation as a housekeeping approach.

The benefits of the assessment will gain through the implementing of lean technique to the company. The benefits that gain in this study were reduced the lead time, reduced manpower usage, and balanced the workload. Based on the calculations shown in Table 1, the lead time reduction is about 39.9%. Meanwhile, there was also reduction in manpower usage as shown in Table 2. The total operators were reduced from 7 operators to 3 operators. By implementing Yamazumi Board Technique, workload is balanced within the takt time. These will avoid long idle time and improved the manufacturing efficiency. Figure 3 and Figure 4 show the workload balancing for cell 1 and cell 2.

The discussion about the current and future manufacturing system in the company is focusing to the production. The production will be fully utilized by implementing lean manufacturing. This is not designed to threaten the operators, but to reinforce the principle that standardized work allows and encourages change as well as continuous improvement. Meanwhile, to implement successfully lean manufacturing, the project teams must be disciplined and should follow the standardized approach as action plan. They must understand how lean concepts are used and how improvements are reported and monitored. Therefore, company is really needed to invest in their human resources to create lasting change.

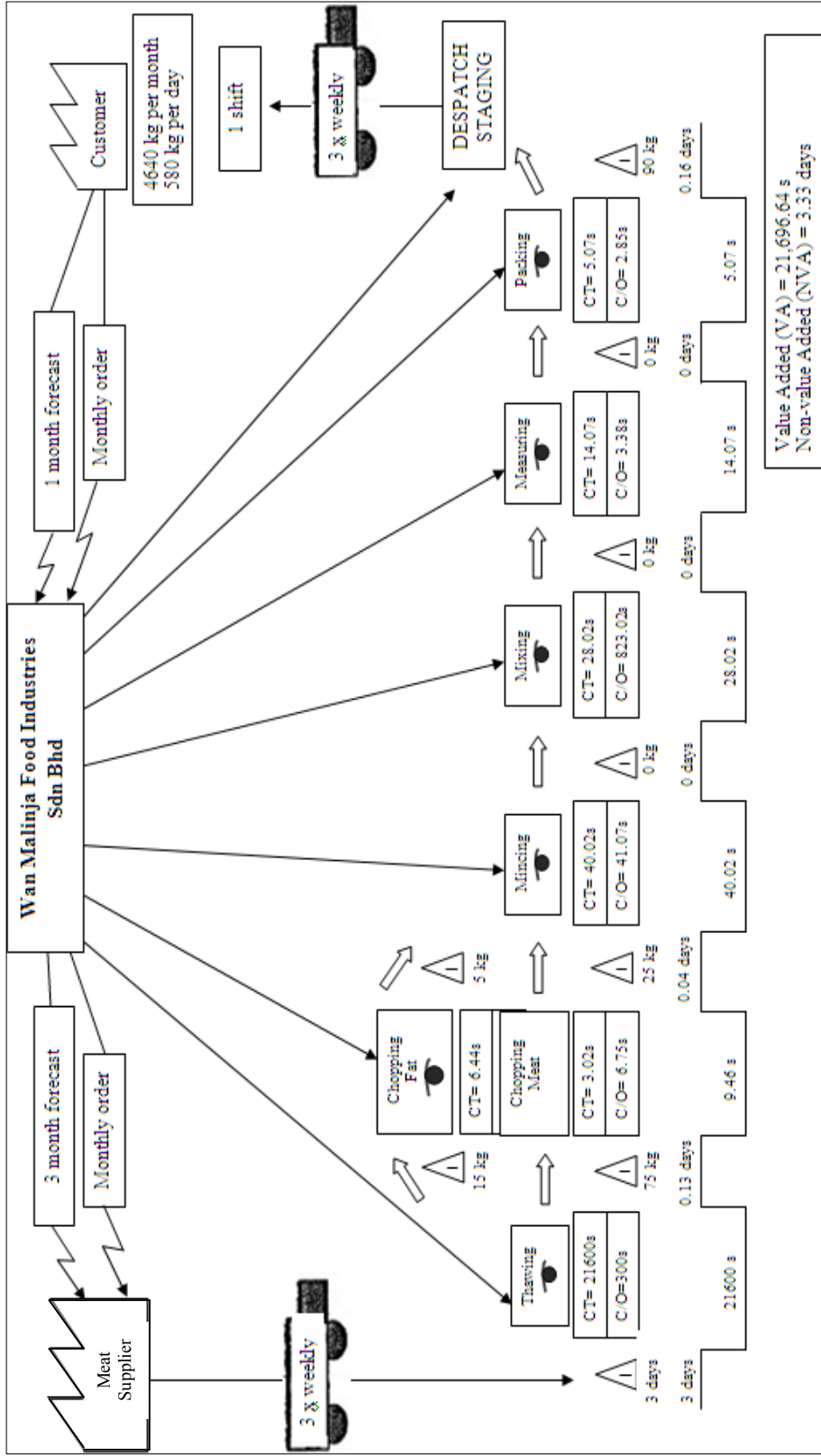


Figure 1: Current State Value Stream Mapping

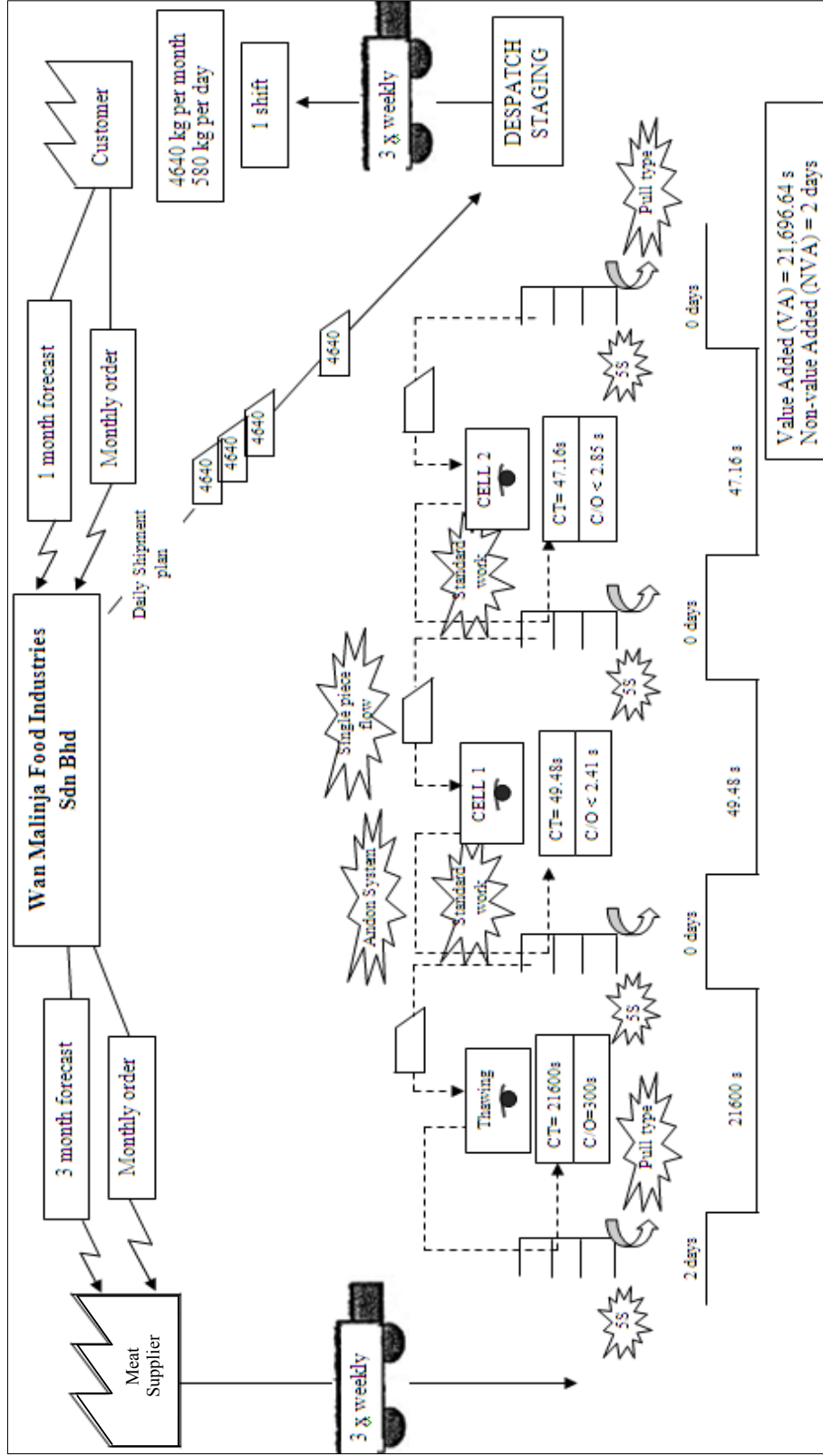


Figure 2: Future State Value Stream Mapping

Table 1: Comparison of current lead time and future lead time

| | Thawing | Cell 1 (Chopping & Mincing) | Cell 2 (Mixing, measuring, packing) | Total Lead Time (days) |
|----------------------------|---------|-----------------------------------|---|---------------------------|
| Current State Lead Time | 3 | 0.17 | 0.16 | 3.33 |
| Future State Lead Time | 2 | 0 | 0 | 2 |

Table 2: Comparison of manpower usage

| | Thawing | Cell 1 (Chopping & Mincing) | Cell 2 (Mixing, measuring, packing) | Total Operator |
|---------------|---------|-----------------------------------|---|----------------|
| Current State | 1 | 3 | 3 | 7 |
| Future State | 1 | 1 | 1 | 3 |

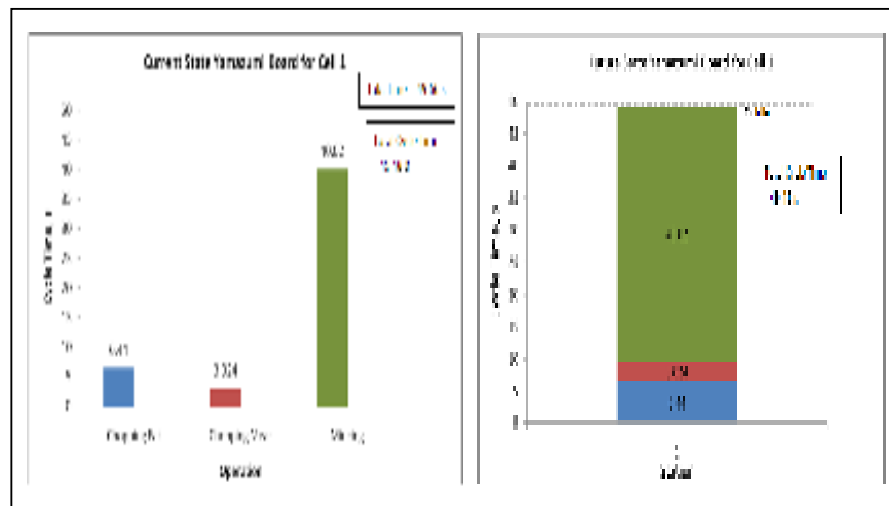


Figure 3: The workload balancing for cell 1

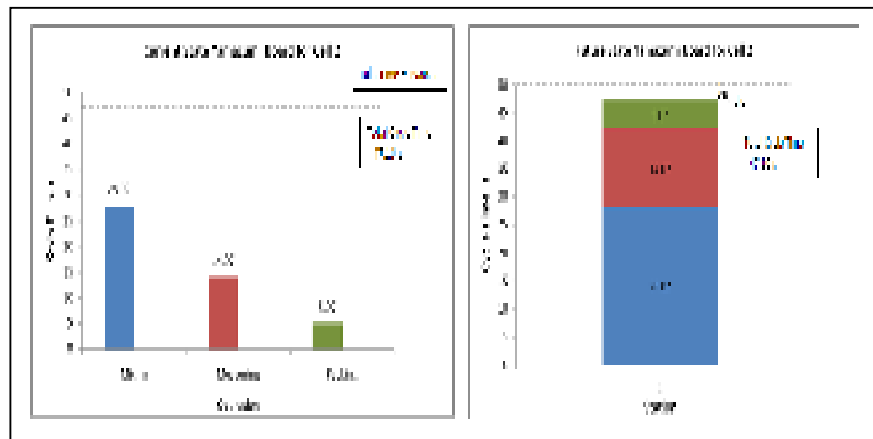


Figure 4: The workload balancing for cell 2

CONCLUSION AND RECOMMENDATION

This study has covered a number of problems faced by the Wan Malinja Food Industries Sdn Bhd for the production of Marinated Kebab Meat. The positive impact of the lean manufacturing implementation was it reduced the lead time 39.9% from the current state which is from 3.33 days to 2 days. Furthermore, the number of operators has been reduced from 7 operators to 3 operators. The problems that company met in their manufacturing process can be eliminated and reduced with several methods of lean tools that have been proposed and discussed. The most significant tools that contributed in this study were implementing of single piece flow, pull system, and standardized work.

The implementation phase of lean manufacturing is a long term strategy. This process will require much more work and total commitment of the organization. A complete lean measurement system, with all of its integral parts, is a key ingredient to an overall lean manufacturing system. In the future, there are some recommendation can be suggested to continue the study of value stream mapping in the company. The method can be implies in different products in the company and investigate the evaluation of future state value stream mapping. If there is a support and change, the study can concentrate towards improvement from all divisions in the company. From that, better result for improvement can be achieved.

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