

An Application of Value Stream Mapping in Ceramic Tile Industry: A Case Study

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Abstract. The purpose of this paper is to increase the productivity of a ceramic tile manufacturing process using lean manufacturing technique. The current system of the ceramic tile manufacturing process has been mapped using Value Stream Mapping (VSM) tool, which is a lean manufacturing tool and the wastages in the current system are identified. Afterwards, future state has been created by using VSM tool, which has enhanced process ration by decreasing maximum possible waste in the manufacturing process. The case study demonstrates how the VSM tool has been used to identify and reduce waste in the manufacturing process by 26%, unnecessary inventory by 8.33% and working time of the color-mixing department by 21.57%. This flexibility enhancement causes 2.67% shorter lead time, 2.70% higher value-added ratio and frequent product delivery leading to more profits.

Introduction

Thai ceramic industry has played a particularly important role in the economic and industrial sector of Thailand. It encompasses the manufacture of tableware, sanitary ware, ceramic tile, ornamental and electric insulators. This industry employs more 80,000 people in Thailand, and exports more than 21 billion baht worth of ceramics products per year. However, ceramic companies in Thailand have rarely developed or upgraded their management and technologies. Most of them are in need of augmenting their productivity and quality. Thus, there is the need for the ceramic companies to look at best practices to improve their performance [1].

Value Stream Mapping (VSM) allows firms to visualize their wastes that helps them propose enhancements in the process flows. In accordance with Rother and Shook [2], the organizations must think about the flow, instead of implementing prudent manufacturing systems or isolated improvement processes. The VSM methodology has proved itself efficient by focusing its attention flow. VSM is a set of methods to visually display the flow of materials and information through the manufacturing process. The objective is to identify and improve value-addition as well as eliminating or reducing non-value adding activities. VSM is prescribed as a part of the lean manufacturing portfolio of tools. The most effective VSM are mapped by a cross-functional team, which has people from several of activities in the value stream being evaluated. The development of VSM additionally be part of the training applied for developing understanding of the application of lean concepts [3,4,5].

This research is a case study of VSM implementation at a company that produces ceramic tile in Thailand. The paper critically analyses the company's manufacturing processes to identify waste streams. An improved future state map is developed, which has improved efficiency. Even though, this project has been limited to a ceramic tile manufacturing company, available literature shows that VSM can also be applied to all other sectors with required adjustments [6]. It will yield results as organizations are seeking ways to enhance the value of their products and satisfy customers by eliminating waste.

Developing Value Stream Maps

Value Stream Mapping (VSM) is based on the fundamental principle of Lean Manufacturing. The tool helps organizations to reduce lead times, inventory, improve quality and achieve better on-time deliveries and utilization resources. Reduction of non-productive activities (i.e., waste) hence save resources and allows reallocation of resources to improve throughput and profitability. Fig. 1 demonstrates a concept of VSM. The value stream map development process comprises of the following two steps: (1) Development of the Current State, and (2) Development of the Future State [5]. The explanation of VSM in detail can be found from the book of K. Martin and M. Osterling [7].

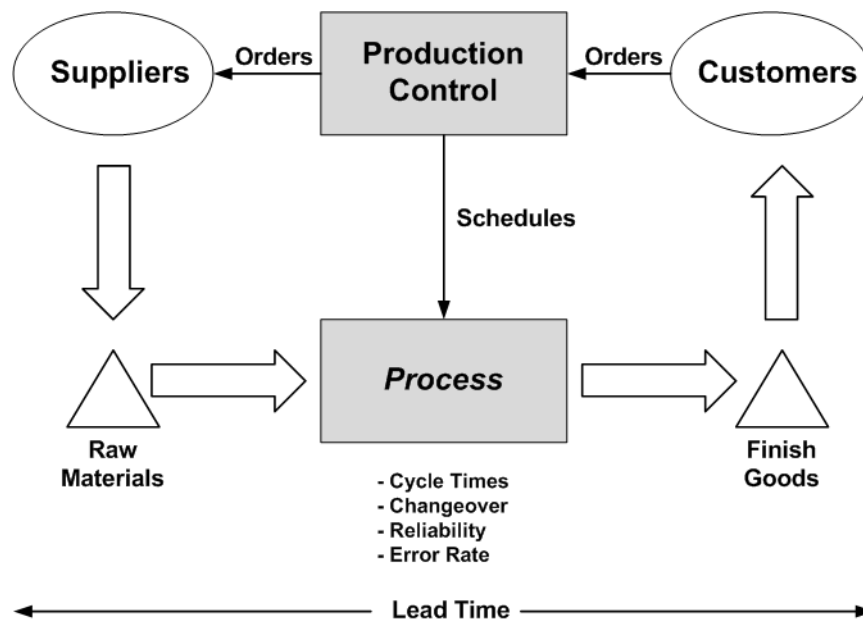


Fig. 1 Value Stream Map Concept [5]

Current State Map. Ceramic tile manufacturing process of a case company is illustrated in Fig. 2 below. The line is a dedicated flow line, and various operations needed to produce ceramic tiles are additionally shown on Current State Map (CSM) demonstrated in Fig. 3. CSM is the baseline view of the current situation from which all improvements are measured. The map demonstrates the movement of the product from suppliers through customers. The timeline at the bottom of CSM shows the Value-Added (VA) and Non-Value Added (NVA) Process Times from entry of raw materials into the line to the end product. The results of this research consist of the production flow, the waste identified and ranked CSM and the Recommended Future State Map. According to prioritizing waste reduction targets, the analysis of CSM in this study can be grouped into three categories namely raw material inventory, production waste and working times of the color-mixing department.

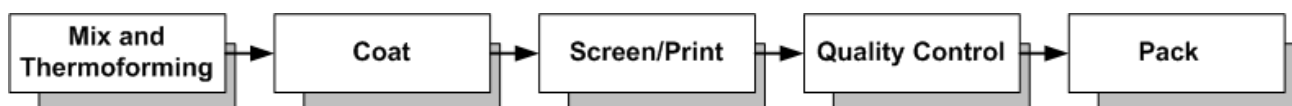


Fig. 2 Product Flow Layout

Future State Map. Future State Map (FSM) of a case company is demonstrated in Fig. 4. The Current State Map serves as the starting point for developing the Future State. The goal in developing FSM is to make the flow continuous and to eliminate as much waste as possible. Lead time is shorted as much as possible by implementing lean techniques. An implementation plan must be developed to convert the Current State into the Future State.

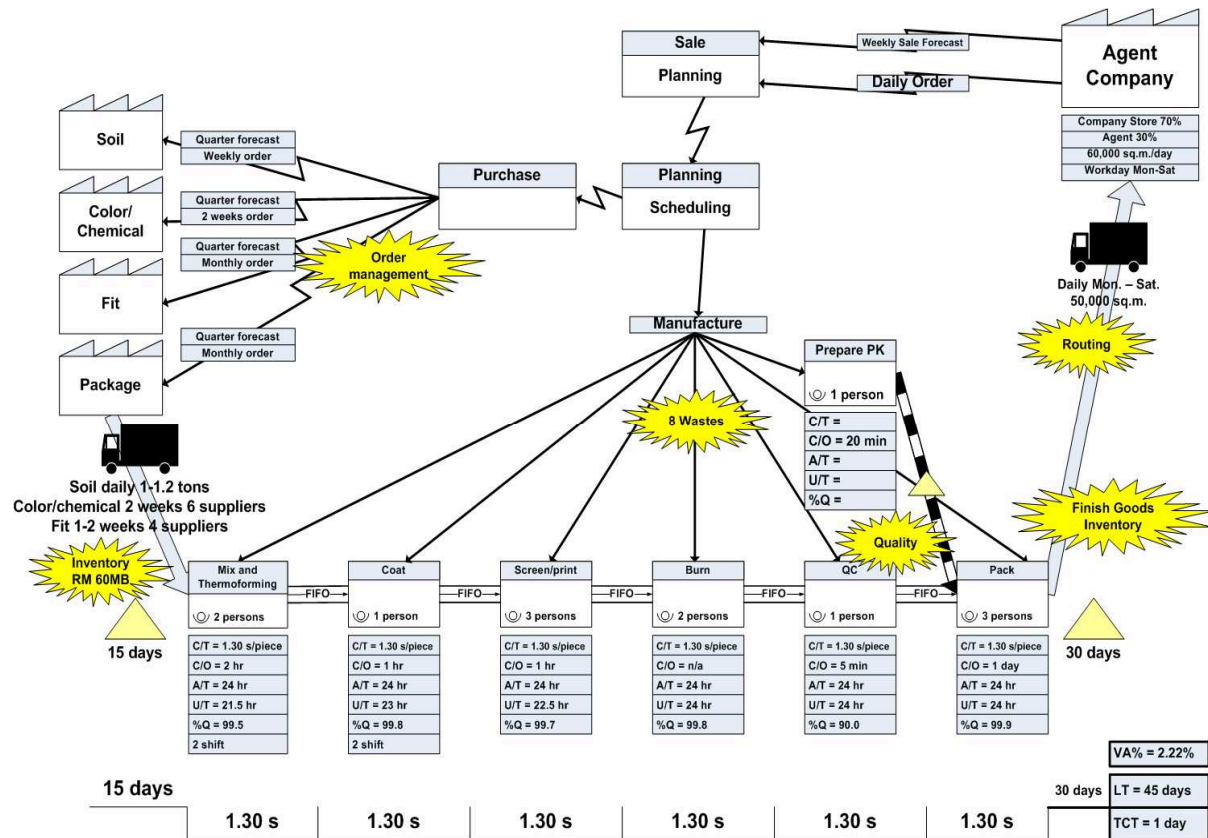


Fig. 3 CSM of Ceramic Tile Manufacturing

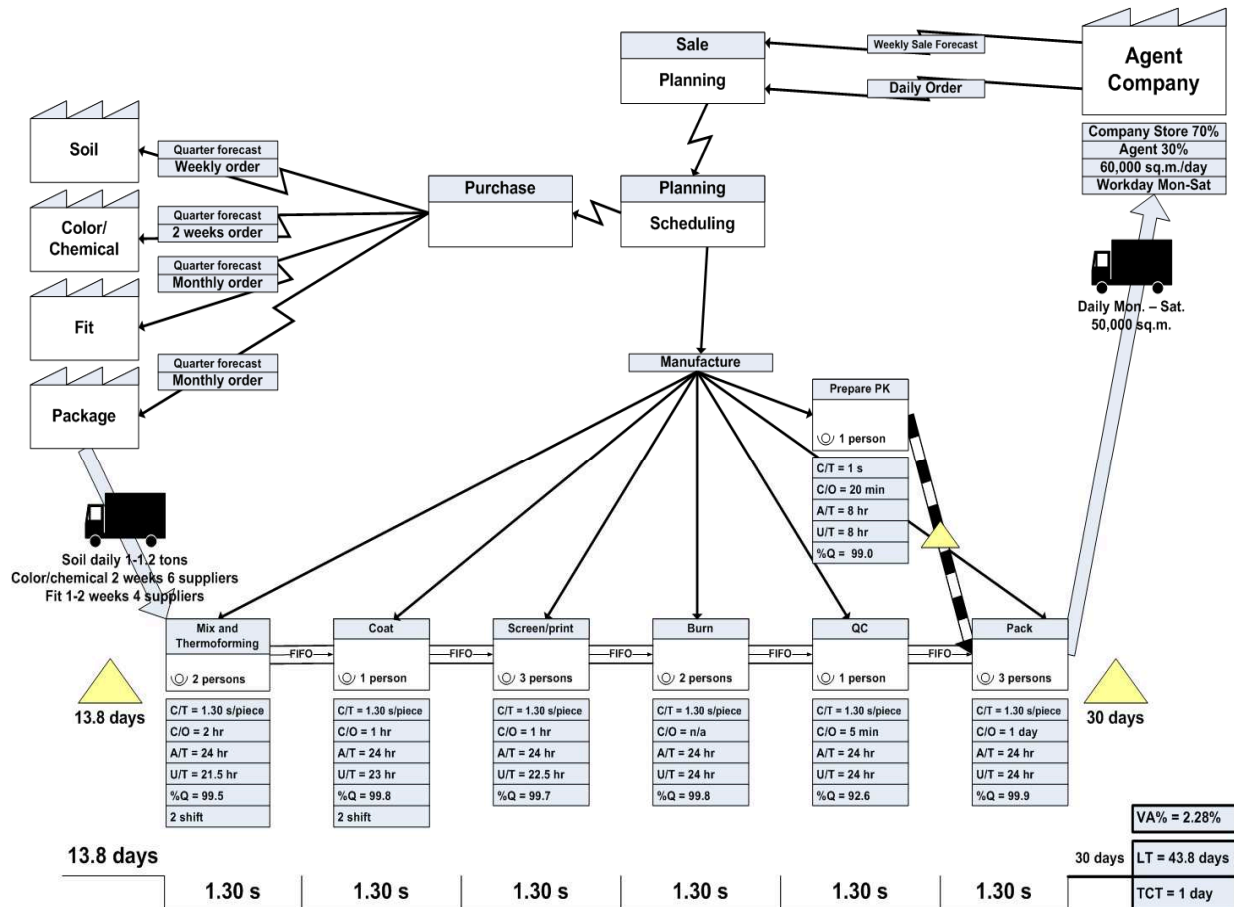


Fig. 4 FSM of Ceramic Tile Manufacturing

Comparison of CSM and FSM. Table 1 demonstrates a comparison of Current State Map (CSM) and Future State Map (FSM) to highlight the improvement in value addition and eventually throughput.

Table 1 Comparison of CSM and FSM

Evaluation Criteria	Lean Tool	CSM	FSM	Improvement
Material Inventory	Inventory Management	60 million baht/month	55 million baht/month	8.33% shorter
Production Waste	Lean Team	10%	7.4%	26% shorter
Working Time of the Color-Mixing Department	Lean Office	102 minutes	80 minutes	21.57% shorter
Lead Time	VSM	45 days	43.8 days	2.67% shorter
Value-Added Ratio	VSM	2.22%	2.28%	2.70% higher

Summary

Value Stream Mapping (VSM) is a valuable planning tool and can be used for a developing and implementing lean improvement of ceramic tile manufacturing projects. The process of mapping the value stream helps to train the team on lean techniques and to reveal opportunities to reduce waste. A Completed Value Stream Map can be used as a visual communication tool and a business planning tool to explain how lean techniques can reduce waste in the value stream. VSM becomes the previous step towards achieving shortened lead times, fast identification of waste in the value stream, and identification of process improvement projects to eliminate the waste and achieve continuous flow.

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