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LEAN LOGISTICS–IMPLEMENTATION OF LEAN METHODOLOGY IN MANUFACTURING PROCESS ON LATTOFLEX

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ABSTRACT

LEAN methodology focuses on optimizing processes, reducing costs, and increasing quality by identifying and eliminating activities that do not add value to the product or service. It is a systematic approach to eliminating waste in a manufacturing process to create more value for the customer and also jointly shifting the mindset and behavior among those involved in the production process, not just enforcing rules. This study focuses on implementing the LEAN methodology in the manufacturing processes of the wood processing industry in Macedonia production on Lattoflex. The benefits have been identified, and a comparison has been made of the quality and quantity of the products before and after the implementation of the LEAN methodology, including the added value of the production process itself. Emphasis is also placed on the involvement of all employees, encouraging them to make suggestions that can facilitate and improve daily operations, thereby increasing motivation.

Keywords: LEAN methodology, value stream mapping, kaizen, eliminating waste, Lattoflex.

1. INTRODUCTION

The main and only request from the company was not to publish its name. The company was established in 2004. Just from the beginning, it specialized itself in producing high-quality molded plywood parts for chairs, like seats, backrests, shells, armrests, and legs. The company has its own beech veneer production and is the main chair and plywood chair components supplier of almost all national chair manufacturers and resellers, and with its around 90% export orientation, it is one of the biggest plywood chair components suppliers in the Balkans, Western Europe, and Scandinavia. It's very well structured and organized manufacturing, but they are always focused on continuous improvement and waste reduction in production processes–kaizen.

As the subject of interest is improvement–the kaizen of manufacturing processes of Lattoflex through the implementation of LEAN tools. Lattoflex is produced in different dimensions according to the client's requirements. The process begins with sorting the veneer sheets into 4 classes, from A to D class. The first three classes are used for this product. Next is the gluing phase, the formation of the veneer boards of 7 sheets. Glue is applied with an automatic gluer. Then comes the stacking of the sheets–their preparation for gluing in a high-frequency press. Depending on the number of sheets, drying and forming the impression is from 3 to 7 minutes. Each of the boards must stand and cool for 24 hours.

The next three phases are mechanical processing of the boards–first they are dimensioned along the length of a formatizer, which cuts to the exact length. Next is the operation of a circular saw, which cuts the sheet to the required width of the latoflex. And the last processing is on a milling machine that processes the edges of the latoflex itself so that they are not sharp. After the milling machine, each latoflex slat is taken by the worker and checked to see if additional manual processing is needed or if there are any other damages and arranged on the appropriate pallet.

The focus is on the last three operations, for which our goal is to synchronize them to work with the same tact time, to reduce the number of employees who will work on this production line, and to reduce waste. The cycle time of all three machines is different.

2. METHODOLOGY

Value-stream mapping (VSM) is *diagraming every step involved in the material and information flows needed* to bring a product from order to delivery. It helps us to see and also understand the flow of materials and information as a product goes through the value stream. In LEAN, bought materials and information are of the same importance. A value stream is all the actions (both value-creating and non-value-creating) required to bring a product from raw material to the arms of the customer. Value stream mapping typically begins with a team creating a **current state map**. This means capturing the actual condition of a value stream's material and information flow. Subsequently, the team draws **a future state map**. That is to say, a target image of how material and information *should* flow through the value stream.

3. RESULTS AND DISCUSSION

Developing a future state begins with an analysis of the current situation. We began with a quick walk along the production process, and after that, from the shipping end and work upstream. Drawing by hand means we are focusing on understanding the flow of information and materials.

Drawing the Current-State Map

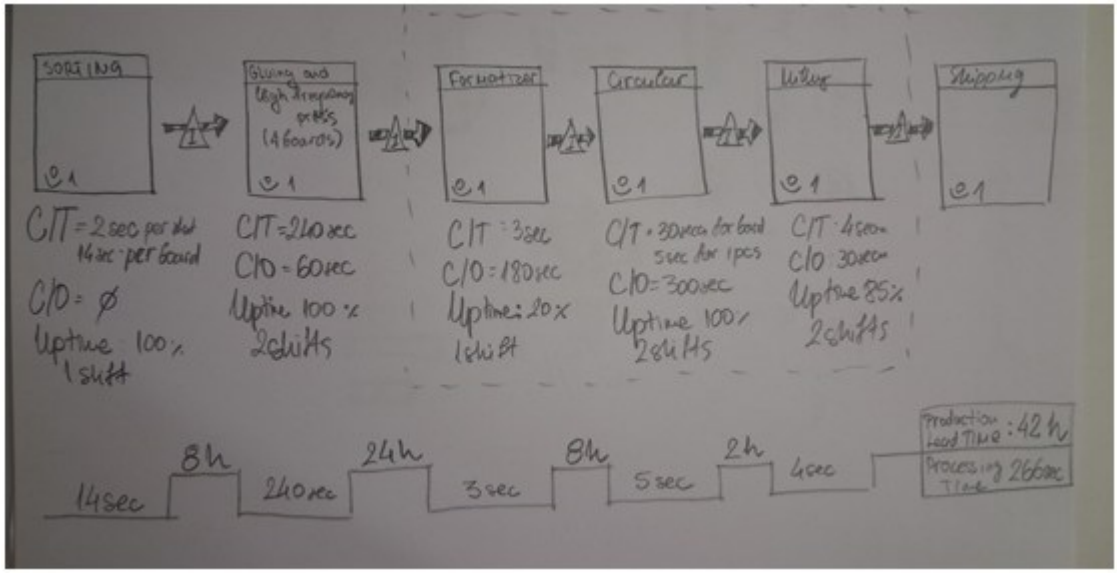


Figure 1. *Current-State Map,*
C/T – cycle time – time elapses between one part coming off the process and to the next part coming off,
C/O – changeover time – switch from producing one product time to another,
Uptime – on–demand machine uptime.

We are focusing on the last three operations. Each process is an isolated island and produces and pushes products forward according to schedules instead of the actual needs of the next process. Produced material is not yet needed and needs to be handled, stored… – muda. Also, defects stay hidden until the next process finally uses the parts and finds the problem. It was a very common situation, and the waste was around 35%. Overproduction is the source of all kinds of waste/muda–extra operators, equipment capacity, storage…

Drawing the Future-State Map

All these problems lead us to find solutions-shorter lead time, higher quality, and lower costs-and to implement LEAN manufacturing by linking these three processes. The main characteristic of a LEAN value stream is to get one process to produce only what the next one needs when it needs it.

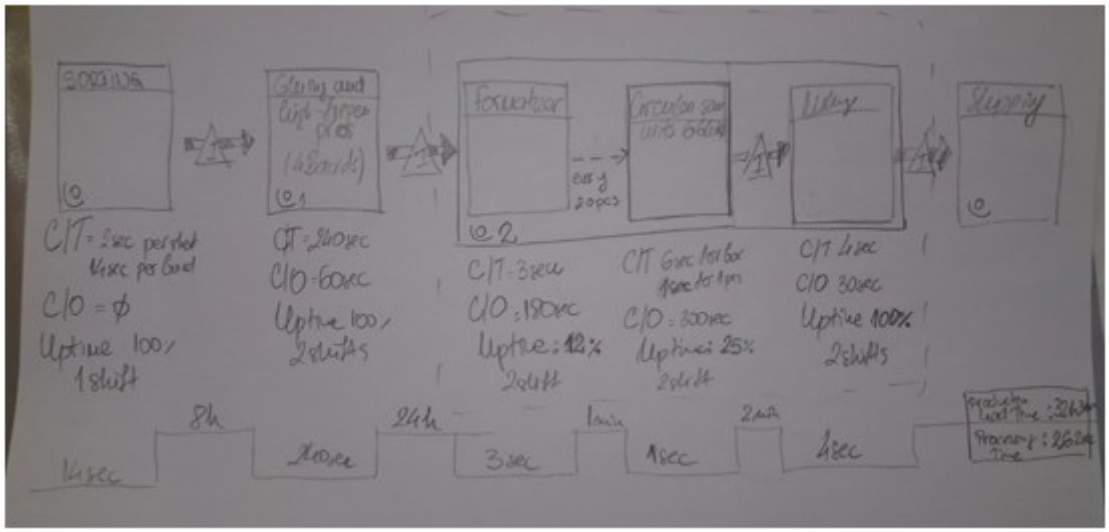


Figure 2. *Future-State Map.*

This future-state map was implemented in this manufactured process. The first thing was changing the regular circular saw with 6 blades to a circular saw. The process was designed to operate with a very slow cycle time. Cycle time reduced from 30 seconds to only 6 seconds for 6 pcs of Lattoflex. We link this process with the previous one, the formatizer, by adding an automatic line and getting continuous flow by FIFO Lane (first in, first out). Think of the FIFO lane like a chute that can hold only a certain number of pieces, in this case 20 pcs.

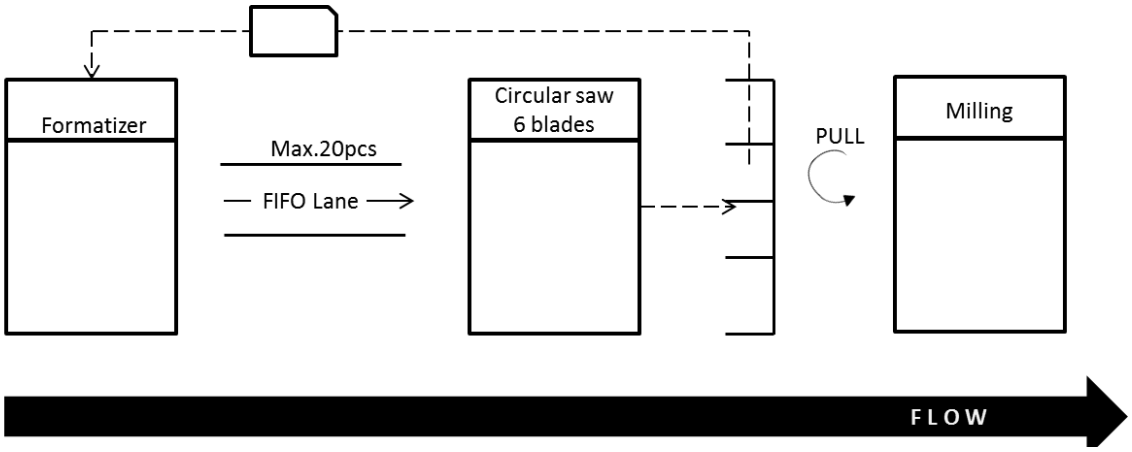


Figure 3. *FIFO lane.*

We reduced the number of workers from 6 to 5 and increased the uptime to last operation from 85% to 100%. It is very important for adding value to the final product. Defects didn't stay hidden until the next process but will be found after a few pieces. By that, the waste is eliminated up to 5%. There is a big difference between the production lead time of 42 hours and almost 32 hours and only 4 seconds in processing time. With all these benefits fulfilling the main point of kaizen-aiming to make small, incremental improvements in processes and systems, leading to significant long-term benefits.

CONCLUSIONS

There are a lot of benefits to the implementation of LEAN in the manufacturing process in production on Lattoflex. All these changes were made, and we got the measurable results. This company has a huge potential for implementation of different parts from LEAN. Some of them are already implemented in other manufacturing processes with excellent results but always have possibilities for improvements.

By systematic support and a long-term vision, this kind of implementation is possible in other wood companies in Macedonia.

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