

Lean & Kaizen methodology for improvement of storage process in furniture industry

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ABSTRACT

Lean &Kaizen concepts are realized in order to solve problems in the operations of storage processes. Company is a leader in wholesale and retail of raw materials (panel material and plywood) for furniture manufacturing. This company has over 5000 different articles in the sales program. The paper describes state of warehouse operations in the company before and after Lean & Kaizen implementation in the main logistics and distribution centre. Key performance indicator named as Time-To-Customer in distribution is reduced from 48 hours to 24 hours.

KEYWORDS: Lean & Kaizen methodology, 5S concept, storage process, time-to-customer

1. INTRODUCTION

The company has experience of 15 years in the field of importing and distributing semi-finished goods for furniture production. By investing in infrastructure, staff and new products, company managed to maintain a network of customers and expand on the all territory of Serbia. Company is one of the most significant manufacturers, which partially or completely supply the plate material. The list of partners is consisted from more than 600 companies. Company have gained leader position in the market primarily, by bringing panels to manufacturer and to the final customer as close as possible, thereby providing the best possible service. The punctuality and timely delivery, quick and adequate response to the needs of customers, continuous education in one direction and timely recognition of market demands in the other are basic characteristics of company business.

Company has two logistics distribution centres (LDC), more than 5000 m² in total, LDCs in the North of country and LDC in the South of country. LDCs are equipped with storage shelves and pallet racks for sorting and simple combining of goods, according to the request of customers, which allows cheap and fast operation. They are dimensioned and designed in order to meet needs of domestic and markets in the region. In company assortment, there is more than 7000 stock keeping units (SKU), such as: chipboard , plywood strips (more than 5000 SKU), OSB panels and QBS panels, waterproof plywood, laminate flooring, laminate moldings, laminate substrate, transition strips, angles and extensions for laminate, mounting clips, dry-fitting doors, entrance doors, dry construction system, roof windows, insulation materials, roof membranes, building chemistry, powder materials and channels for surface water drainage, as can be seen in (Web-1).

The strategy of company is defining of concrete goal and its realization by employees motivation securing, through the management support. Company is aiming towards the process orientation by focusing on specific figures, trends, benchmarks, regular measurements (such as conducting customers' surveys and statistical monitoring) and improvement possibilities detecting. The company has defined number of KPIs for

logistics operations efficiency monitoring. One of the most important indicator of logistics operations productivity is an indicator Time-To-Customer (TTC), which shows how efficient logistics operations are in the products delivery process, i.e. how long clients have to wait for delivery of goods. This indicator is defined as a key indicator because the most of customers are furniture manufacturers, who already have contracts with end customers for furniture delivery. Any delivery postponement or delivery delay initiates situation where manufacturer chooses another supplier. Logistics services specificity of the company is reflected through manipulation with relatively large number of similar items and in the hiring of 3PL providers for transportation services. Before 5S concept implementation, a key indicator TTC in storage operations was more than 48 hours. In order to improve logistics operations, in collaboration with external consultants company has identified problems in the warehouse operations, which caused delivery time increasing:

- Incorrect quantity of commissioned goods and high percentage of replaced items during commissioning,
- Inadequately distributed and unmarked items in the warehouse,
- Inadequately placed pallet racks,
- Lack of system for commissioning and deployment of goods,
- Undefined internal transport routes,
- Lack of dispatch area for commissioned items,
- Slow handling with goods on receiving or in the shipment of goods
- Inadequate system for 3PL carrier planning, due to long delays in preparing goods for shipment.
- Dependence of storage operation system from individuals,
- Improper use of special storage equipment (special forklifts)
- Lack of defined KPIs for employee performance measuring in storage.

The main requirement of company was to create solution that will not jeopardize existing operations and that does not require expensive WMS (Warehouse Management System), i.e. solution must be cheap and functional. Lean & Kaizen methodology, tools and concepts are very well known and aimed at maximization of customer values while minimizing waste. This popular concept is introduced through idea and implementation examples by many books and papers, as can be seen in George (2005), Hobbs (2004), Kilpatrick (2003), Knowles (2011), Leach (2005), Womack and Jones (2010), Zylstra (2006) and others. Lean methodology, i.e. concepts and principles of 5S - visual management are used in order to define solution for solving problems in warehouse operations in the company. Basic rules or principles of 5S concept are (Web-2):

- Sort – to get rid of anything that is not required,
- Set – properly arrange necessary things and restrict supplies,
- Shine – clean all, the outside and inside,
- Standardize – define rules to maintain the first 3S,
- Sustain – ensure respect of the rules.

Implementation of these rules has led to the successful project realization.

2. SCOPE OF PROJECT

Scope of project was very demanding, so it was very difficult to determine point of beginning for lean transformation. As 5S - visual management represents the first tool of Lean transformation, project was initiated by applying the concept of 5S. Working team

was established and it was consisted of project managers from company, several employees from department of logistics, IT technicians and consultants. Within one LDC, there are two separate storage spaces, for panels warehousing and storage of strips and smaller items.

Project team conducted analysis of warehouse for strips and smaller items, and analysis of working operations and found following:

- Orientation of storage shelves was wrong and rack passes were "dead ends". Because of that fact commissioners had to make unnecessarily large number of steps and losses in commissioning time.
- Goods were stored on the rack passes and on transport passes for forklifts. In that way some quantities of goods were trapped, i.e. goods have remained misplaced.



Figure 1: Pallet racks and racks orientation

- Racking shelves with goods were not adequately located, so there was big loss of storage space on the rack shelves.
- Goods on the shelves were unevenly and inadequately distributed. Two or three different items of same colour were stacked one over the other on shelves. Items were mixed. Products were not arranged according to frequency of use or commissioning.



Figure 2: Transportation routes



Figure 3: Mixed and inadequate labels on shelves

- Different labels for items were on the rack shelves. There were many different codes for particular articles, while other items had no any code.
- Sides of shelves were not connected with upper levels of the storage area, so that was a waste of space in higher storage locations.

- All items of similar or the same colour, but different sizes (width, length, height, thickness) were stacked next to each other or on top of each other, so items were often mixed up during commissioning. As the strips for plywood were delivered in defined length, there was possibility of material scrap (loss), due to commissioning error in required length strips cutting.



Figure 4: Goods arranged according to colors

Analysis of second storage area, for panels storing, has shown the following:



Figure 5: Panel materials warehouse

- Panel goods were placed into pallet racks in warehouse according to suppliers and type of goods, i.e. univer on one side and mediapan on the other. That was a big problem during commissioning, because commissioning orders are mixed

and forklift needed too much time to get out from racking pass, to turn around and go back again for commissioning on the other side.

- Orders commissioning in panel materials warehouse lasted too long, in average 45 to 60 minutes for orders up to 30 panels of mixed goods, because rack locations were not marked and items were commissioned according to the "memory". The only known was part of warehouse where needed items were stored.



Figure 6: Panel materials commissioning

- Forklift with bucket had crossing unnecessary long path. For one commission order forklift was entering several times in the pass between racks. Also, there was a special commissioning forklift in the warehouse, which was very old, so waiting time due to forklift failures was significantly long.



Figure 6: Special commissioning forklift for one side of racking passage

- Often, warehouse clerk did not have complete information where the goods are situated, or about commissioning location, and panel materials searching was very long.

Based on recorded state of warehouses, it was concluded that warehouse operations has very serious waste, causing serious threat to the delivery process time. The main waste recognized in warehouse operations were: waste of space, waste of working time of employees, time of equipment working and material scrap (wastage). In order to eliminate wastes incurred as a result of "uncontrolled" processes, it was necessary to gain control of equipment spatial distribution, materials and supplies.

3. PROJECT REALIZATION

Sorting, organizing and cleaning were the first of 5S concept principles, implemented in order to optimize storage process. According to these principles, following activities are realized in the warehouse for panel materials and strips:

- In the strips storage, all items are removed from pallet shelves and listed according to output frequency from warehouse. Articles that represent “dead” stocks are defined. As “dead” stocks are considered articles without any turnover in previous 30 days, 60 days, 90 days or over 90 days.



Figure 7: Stock sorting in the strips warehouse

- Pallet shelves are removed and reoriented in order to increase flow in the rack passages.



Figure 8: New orientation of rack passages in order to increase flow in the warehouse

- Levels for items storage are increased in racking fields.



Figure 9: Racking field with increased number of levels for items storage

- Commissioning locations on the shelves are marked with regal address. In that way is allowed movement through rack passes without return paths. Structure for commissioning location address of item is defined according to the principle of hotel rooms, where guest can stay at the hotel, which is located in a particular area of city, as follow: code for commissioning location of item is B/2/28/4 /2, which means warehouse B, second pass, twenty-eight shelf field on the fourth level and second commissioning location.



Figure 9: Commissioning location address

- Areas of frequency are defined as parts of warehouse, which do not require long commissioning tracks. Articles are located according to output frequency.
- Reception area, reception control area and dispatch areas are defined.



Figure 10: Reception area in the strips warehouse

- Commissioning locations are marked in the warehouse for panel materials and items are arranged on commissioning locations, according to output frequency.

Commission locations in strips storage are defined and placed on shelves in increasing order, criss-cross in one passage. In that way is enabled that employee works equally on the left and on the right side of one rack passage. Commissioning locations, in the plate

material storage, are set in order to allow that special forklift can commissions plate materials on one side of shelves in a single pass. Commissioning location is added as new attribute for article in the information system of company. In accordance with new encoding system, every article has its own code, bar code and commissioning locations code. When order is entered into the system, commissioning order for warehouse is generated in ascending order according to commissioning locations, and commissioner can follow commissioning locations in ascending order. Items with higher output frequency have position closer to warehouse exit.

In the second phase of project remaining principles of 5S concept, standardization and sustainability of existing situation, are implemented. During this phase of project following is defined:

- rules for commissioning locations maintenance, which are very important for the sustainability of entire solution,
- training for employees to use and create new commissioning locations,
- new work organization, responsibility for certain positions and communication paths are proposed,
- procedures and guidelines for working in the warehouse are defined and posted on the visible places in the warehouse,
- set of indicators for monitoring of warehouse workers performances is defined (commissioning time, number of orders, number of errors in commissioning and so on).

4. CONCLUSION

Achieved results of project implementation, i.e. 5S concept implementation in the company, are represented in Table 1.

Table 1. 5S concept implementation effects

Indicators	Before the project	After the project
Time-to-Customer	48 (hardly 24h)	24h
TTC less than 8h up to 50 km	No	Yes, 23% of total No. of deliveries
Picking Time per order (less than 30 panels per order)	45-60 min	15 -20 min
Pick-up orders daily	30	100
Daily No. of load trucks	6	15 to 18
No. working ships (No. of employees)	2 (3+4)	2 (6+6)
Average No. of pick orders per employee	4.2	8.3
Education of storage operations	No	Yes in total for all employees
Culture	Sales + Logistics = No team efforts	Sales + Logitics = Team effrots

Also, according to the competition analysis, company is the only one in this kind of industry that has the organization for warehouse operation described in this paper, and that has shortest time to customer in delivery.

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