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Developing paper and paperboard warehouse

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Description

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Description

The objective of the thesis was the improvement of the current warehousing situation in Kymen Cargo Oy, Finland.

The aim was to explore the forest industry, in particular, the pulp and paper, also, to analyze the current work of the company and to suggest possible improvements to increase the quality of the organization's operations. The thesis is focused on the situation today and possible changes in the future.

The thesis contains such parts as theoretical, description of work processes, interview and possible solution suggestions.

The results of the thesis are carried out in recommendations based on the interview results and the author's thoughts.

Keywords (subjects)

Logistics, Warehousing improvement, Optimization

Miscellanous

Contents

1. Introduction

1.1. Relevance of research

The relevance of the research is determined by the fact that warehouses are one of the most important elements of the logistics system. The necessity of specially equipped places for holding stocks exists at all stages of material flow, starting from the source of raw materials to the final consumer.

The efficiency of the logistics system depends not only on the improvement of industrial and transport facilities but also warehousing. Warehousing plays a critical role in logistics systems, providing the desired customer-service levels in combination with other logistics activities. A wide variety of operations and tasks are performed in warehousing (Hannan Sadjady, 2011). It contributes to:

- preservation of products, materials and raw materials quality;
- improving the organization of production and transportation processes;
- improving the usage of the company's territory;
- reduction in vehicles downtime and transportation costs;
- lowering of unproductive loading/unloading and warehousing operations quantity.

The goal of this project was to explore the forest industry, in particular the pulp and paper industry. Also, to analyze the current work of the company and to propose possible improvements to increase the quality of the organization’s operations.

1.2. Research methods

I have spent nine months working for the Company Kymen Cargo before I start to write this thesis work. During this time, I took part in the regular work of the organization and received some observations that I included in this research. I also conducted a survey among employees in order to find out the necessary information.

I was provided with general reports and data of the company. The theory information was taken from books, articles, and Web publications. The thesis also includes my own experience, knowledge and ideas. Research methods in this thesis work are qualitative – information was collected and analyzed; own assumptions were made as a result.

1.3. Wood industry in general

The importance of wood for humanity cannot be underestimated. It is one of the oldest material on the planet, which was used in all areas of human life - from fuel and source of heat to manufacturing of paper and household items and building dwellings. Despite the development of technologies and large amount of diverse materials in the modern world, wood remains one of the most popular options. Wood is widespread in many areas due to availability, good external characteristics, low weight and excellent strength parameters. Also, important advantages of this raw material are environmental friendliness, good technical characteristics, ease of use and practicality.

Based on the availability of this wood in the nature of northern regions and the necessity for final products, it can be concluded that the forest industry originated many years ago. This industry has rather complicated structure. Conditionally, all branches of the forest complex can be divided into three main groups (Finnish Forest Association, 2016):

- Timber industry - harvesting and providing wood materials with appropriate conditions for further storage;
- Woodworking industry - processing of raw materials;
- Pulp and paper industry - mainly chemical processing of wood for manufacturing pulp, cardboard and paper.

Pulp and paper enterprises produce a wide range of products. First of all, these are various types of paper and paperboard, stationery, sanitary and

household items. Also, products manufactured by this industry are used in many others, such as chemical, food, textile, automobile, etc.

2. Current overview of forest industry in Finland

2.1. Forest resources

Among the world leaders who carry out successful work with wood, Finland stands out in particular. Such strong positions of the forest industry in the country associated with geographical features. According to the statistics provided by the Food and Agriculture Organization of the United Nations (2017), about 75% of the territory is occupied by forests, so the total area of resources is almost 23 million hectares. The country has only 0.5% of world timber reserves, but the share of Finland in the production of timber products in the world is 5%, and in exports - 10%.

The species composition of the Finnish forests is not diverse, it is dominated by coniferous trees - pine (50% of total fund), spruce (30% of total fund). But this is the result of targeted forest-growing focused mainly on the production of needed types. Of the broadleaved trees, birch is predominant, representing 16 percent of the timber resources.

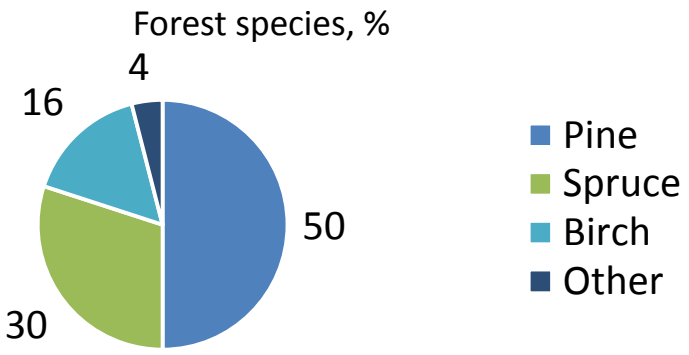

Figure 1. Forest spices in Finland

These types of trees are ones of the most popular for the pulp and paper industry and actively used for production.

2.2. Paper and paperboard production in Finland

Paper and cardboard form the technological peak of wood processing. The scale and structure of their production characterize the level of country's timber industry development. Some types of paper and paperboard produce in limited number of countries that are carefully monitoring the non-proliferation of their existing technologies. There are no strong differences between paper and cardboard, usually, cardboard means thicker and heavier material.

The production of paper and cardboard in the world has increased more than 3 times in half a century. Despite the fact that the total area of forest coverage in the world is steadily decreasing, the demand for forestry complex products is steadily growing.

Table 1. Leader countries in the production of paper and cardboard (millions tons)

Country	1970	Country	1990	Country	2017
USA	45,8	USA	71,96	China	108,5
Japan	12,9	Japan	28,1	USA	72,1
Canada	11,2	Canada	16,5	Japan	26,2
USSR	6,7	China	13,99	Germany	22,9
Germany	5,9	Germany	12,2	India	14,9
UK	4,9	USSR	10,7	Republic of Korea	11,6
Sweden	4,4	Finland	8,97	Indonesia	10,5
Finland	4,3	Sweden	8,4	Brazil	10,3
France	4,1	France	7,1	Finland	10,28
Italy	3,5	Italy	5,7	Sweden	10,26
World total	**125,6**		**239,3**		**410,3**
Share of top 10 countries in world production, %					
	82		**76**		**67**

The world's pulp and paper industry has changed at both country and regional levels. Nowadays China is the world leader (more than 20% of world production). Due to increase of timber production and growing demand on this materials in China, the production of paper and paperboard has increased many times over. Significant increase in paper production can be marked in the Republic of Korea, Indonesia and other countries of the Asian region. Therefore the share of Asia in the global market has increased many times, and the share of former leader regions - North America and Europe - is gradually but noticeably decreasing.

Although, Finnish forests make up only half of the percent of the world's forest resources, Finland occupies on of the leading position in top 10. According to the statistics provided by Food and Agriculture Organization of the United Nations, Finnish paper industry consistently produces around 10 million tons of paper and paperboard and same amount of pulp annually.

2.3. Finnish manufacturers

The pulp and paper industry is one of the largest sectors in Finland with total income from exports of EUR 9,08 billion (Luke Natural Resources Institute Finland, 2017). The following major factories are operating in Finland - concerns Stora Enso, UPM-Kymmene, Metsä Group. They account for more than 98% of the production and export of products of the entire forest industry in Finland.

Table 2. Financial results of leading Finnish forest industry companies

	UPM - Kymmene			Stora Enso			Metsä Group		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Sales, EUR million	10138	9812	10010	10040	9802	10045	5016	4658	5040
Operating result, EUR million	916	1143	1292	915	884	1004	537	439	566

According to data provided by Finnish Forest Industries (2017), manufacturers distributed throughout the whole country. As it can be seen on the map below there are:

- 17 paper mills;
- 14 paperboard mills;
- 19 pulp mills;
- 10 new or pending forest related projects.

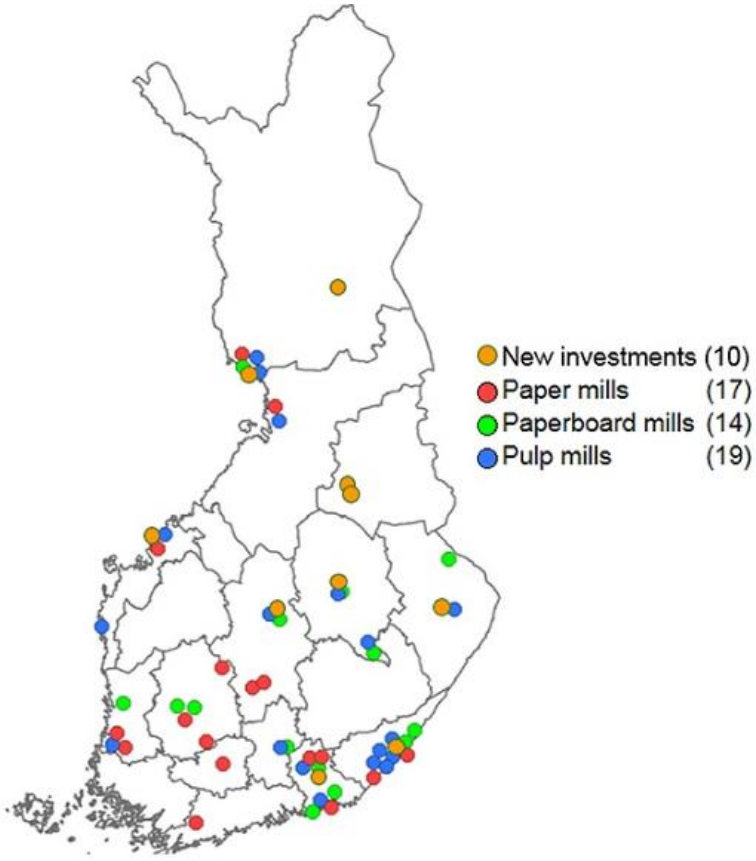

Figure 2. Paper-, paperboard- and pulp mills in Finland

2.4. Export statistics

According the data provided by Natural Resources Institute of Finland (2017), forest industry products accounted for one-fifth of total goods exports. In 2017,

the value of exported manufactured products of this industry totaled nearly EUR 12 billion. It takes 12% share of the total exported products from Finland.

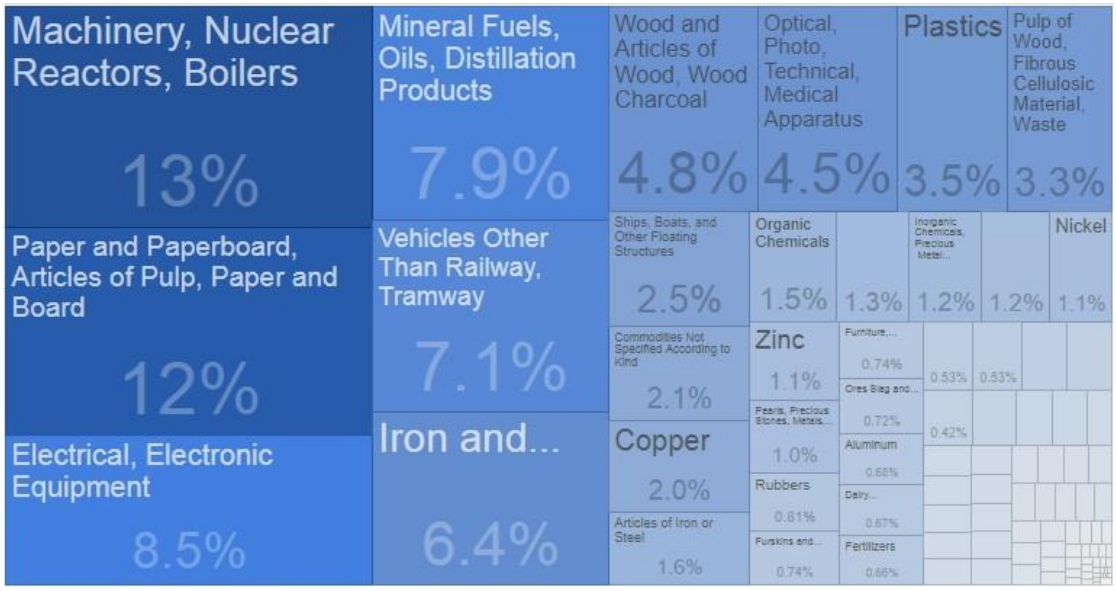

Figure 3. Finland exports by category

The exports value of the pulp and paper industries products was EUR 9.08 billion. In real terms, the value of exports decreased by 2% from the previous year. Exports in the wood-product industries totaled EUR 2.90 billion, showing an increase of 6% from the previous year in real terms (Foreign trade in roundwood and forest industry products by country, 2017).

Pellervo Economic Research's (PTT) predicts good prospects for the forest industry this year and next. Metsä Group's Äänekoski pulp/bio products mill has reached full capacity, therefore pulp exports grew significantly. Export of paper was long decreasing, but according to the forecast, it has signs of improvement; paperboard exports are steadily growing (PaperAge, 2018).

Regarding exports of paper and paperboard, USA and European countries are the most important trading partners of Finland. From Europe - United Kingdom, Germany and Russia imported the greatest amount of paper last year. According to International Trade Centre (2018), the 10 countries listed below imported 62.8% of that total.

1. Germany: $1.5 billion
2. United Kingdom: $912.6 million
3. United States: $674.1 million
4. Russia: $631.2 million
5. Belgium: $605.4 million
6. Poland: $438.6 million
7. Spain: $372.8 million
8. Sweden: $331.4 million
9. Italy: $238.8 million
10. Turkey: $232.8 million

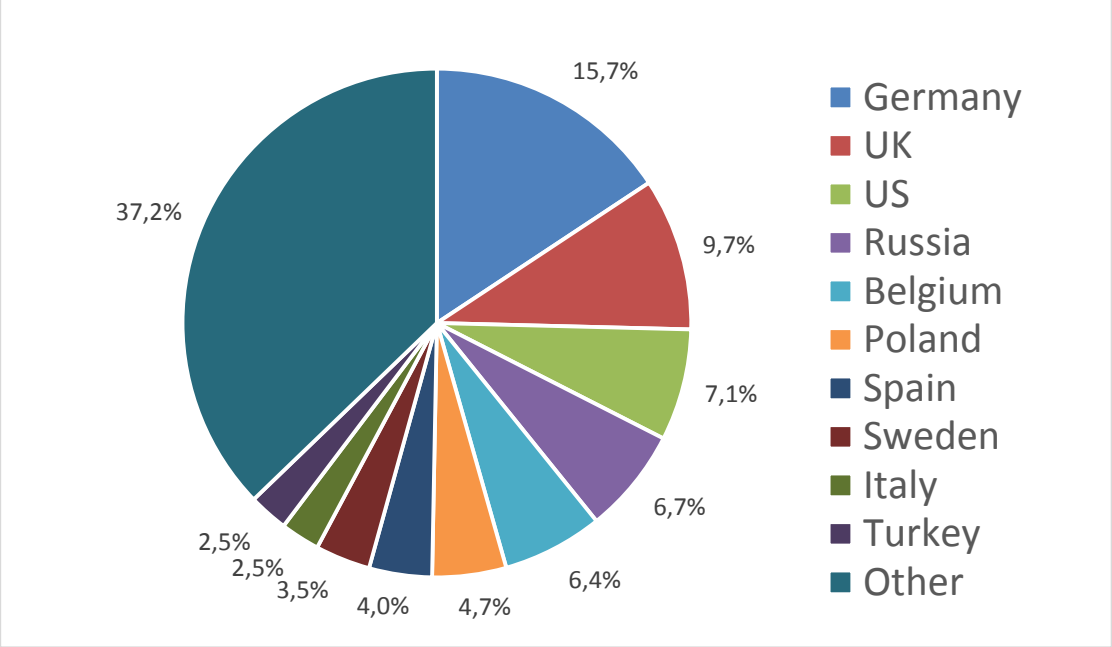

Figure 4. Paper exporters from Finland

2.5. Trade relationships with Russia

Over the years, partnership between Finland and Russia has been developing very actively. Over the two centuries, relations between Russia and Finland have undergone a series of dramatic turns and have gone from mutual mistrust and armed conflicts to cooperation and partnership.

After the collapse of the USSR, bilateral economic relationships are mainly based on the Intergovernmental Agreement on trade and economic cooperation from January 20, 1992. Moreover, about 90 intergovernmental documents were concluded. The parties actively cooperate in various areas, such as environmental issues, trade and economic sphere, cultural interaction or science. Along with Germany and Sweden, Russia is one of the most important trading partners of Finland.

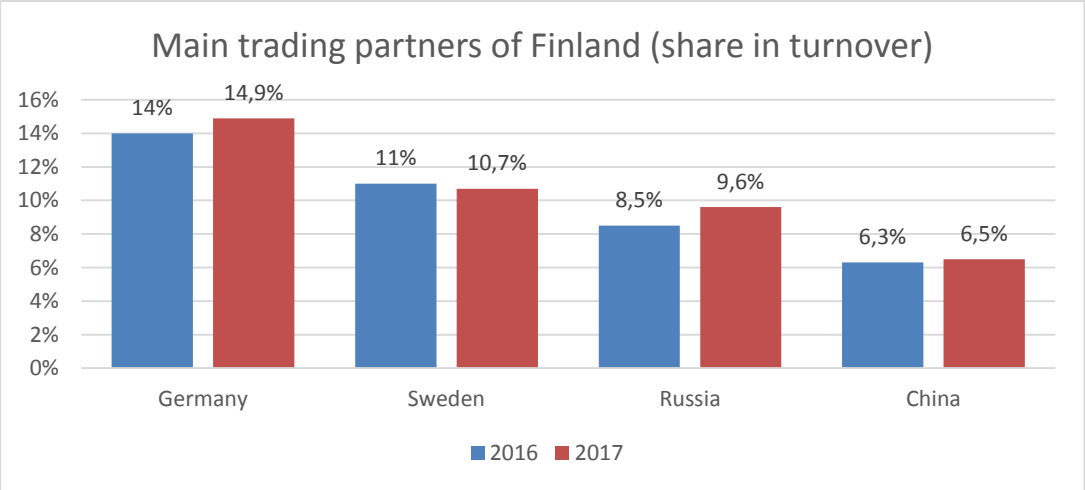

Figure 5. Main trading partners of Finland

Finland is a long-term partner of Russia in the forest sector. These countries have established strong relationships in field of forestry - timber trade, equipment for logging, scientific and technical cooperation.

3. Warehouse operations

Nowadays, a modern large warehouse is a complicated technical structure consisting of numerous interrelated elements, which has a certain structure and performs a number of functions for the transformation of material flows, as well as storage, processing and distribution of goods among consumers.

Warehouses are one of the main elements of the logistics system and play an important role in goods transferring from the manufacturer to the consumer. The final output largely depends on the proper organization of the warehouse

and its working processes, therefore special attention should be paid to the design of the warehouse and its functional features.

3.1. Warehouse characteristic

It is necessary to clarify some definitions. A *product* is determined as the type of good, for example, a beverage bottle of a specific brand. Particular bottles are called *items*, and a combination of several items from several products requested by a customer is called a *customer order*.

For evaluation and characterization, the warehouse can be viewed from three different perspectives – resources, processes and organization. Products entering the warehouse subsequently go through several stages called *processes*. All facilities, equipment and personnel necessary for the warehouse's operations refer to *resources*. Lastly, the *organization* includes all planning and control operations used to start the system.

There are a number of core resources that need to be described. Firstly, a *storage unit* - in (or on) which products can be stored. Pallets, cardboard or plastic boxes are examples of storage units. Combination of multiple subsystems that store different types of products called *storage system*. They can be very diverse - from simple shelves to highly automated systems with automated conveyors and cranes. Retrieval of items from storage system and their further movement can be performed manually or with the help of *picking equipment*. An example of mostly used pick-up equipment is a forklift truck. *Material handling equipment* is needed for preparation of cargo for loading and shipping, for example, sorter systems and palletizers. Moreover, for proper warehouse operation, additional equipment is needed. *Auxiliary orderpickers*, for example, barcode scanners, support the collection of orders. There also may be a computer system to provide computer control of the processes called *warehouse management system*. Finally, one of the most important resources is personnel, since warehouse performance largely depends on their productivity. (Warehouse design and control: Framework and literature review, 1999)

The flow of goods through the warehouse can be divided into several separate stages or processes.

- The *receiving* process is the first process that an incoming item encounters. Products arrive in warehouse by external or, in the case of production warehouse, internal transport. At this phase, arrived products are inspected and can be transformed, for example, repacked into other storage modules. After, they wait for transportation to the next process.
- The process of *storage* includes placement of goods in warehouse, their direct storage and ensuring proper conditions for this, monitoring the availability and condition of stock. The method of placement is selected depending on equipment, tasks, destination of goods, protection from damage, fast finding of necessary item etc. Basic principle of optimal storage is the efficient use of warehouse area volume.
- The *orderpicking* process refers to relocation of goods from their storage locations and can be performed manually or (partially) automatically. Subsequently, items can be transferred for sorting process, which means a grouping of goods intended for the same customer.
- At the *shipping* stage, orders are collected, checked, packed if needed and eventually loaded in trucks, trains or any other carrier.

3.2. Warehouse organization

In this section, basic principles of warehouse design will be considered. Whether it is a small warehouse serviced by manual labor or a large automated distribution center, the following three principles remain unchanged: design criteria, cargo handling technology and storage areas planning.

The warehouse design criteria are related to the physical characteristics of warehouse and cargo flows. Design process is determined by three factors: number of floors in warehouse, usage of its height and characteristics of the cargo traffic. Ideal warehouse has only one floor; it helps to avoid elevators, use of which takes time and energy. Lifts are often the “bottlenecks” next to which accumulates a queue of forklifts.

With any size of warehouse, it is necessary to strive for maximizing the filling area of each floor. Mostly, the height of storage facilities is approximately 6–9 meters, although modern automated equipment allows the use of premises with a height up to 30 meters. By using racks or other similar systems, it is possible to productively exploit the entire volume of warehouse, up to the roof. The maximum height of warehouses is limited by structural features of forklift trucks, as well as fire safety requirements, due to the fire protection systems capabilities. In addition, the warehouse layout should ensure uninterrupted movement of goods, regardless of how much time they spend in the warehouse. In general, this means that cargo must come from one side of warehouse, be stored in the middle and be shipped from the other side. This method minimizes the possibility of congestion and mess.

The second principle relates to effective organization of cargo handling. Main requirements are the continuity of freight traffic and achievement of savings due to reasonable cargo traffic.

Continuity of freight traffic means that it is better when one loader or loading facility moves cargo to its destination place than when several people or pieces of equipment serve certain sections of the route. Transferring cargo from hand to hand or reloading from one loader to another not only leads to loss of time, but also increases the risk of cargo damage. So, in general, in warehouse operations, longer and less frequent routes are preferable. Saving due to reasonable movements means that for every operation you need to move as much cargo as possible - not by one package at a time, but by pallets or boxes. That might cause additional difficulties such as simultaneous

movement of different products or components of several different orders, but nevertheless, it can help to reduce costs.

According to the third principle, when designing a warehouse, it is necessary to take into account the physical characteristics of goods to be stored - the volume, weight and storage conditions.

The main factor determining the choice of planning decision is the volume (size) of the cargo. Large cargo shipments or transit cargo better be stored near the shortest routes of loading and unloading, near the main aisles and on the lower shelves of the racks. This helps to reduce the distance of goods movement. Shipments of small volumes, conversely, can be placed away from the main aisles and on the upper shelves of the racks. Similarly, when planning the storage space, cargo characteristics such as weight and storage conditions should be taken into account. For example, heavier loads should be placed as low as possible to minimize the risk of damage during lifting. On the other hand, storage of small items requires racks with small cells. Therefore, the layout of warehouse should reflect characteristics of all types of stored products.

3.3. Warehouse efficiency

Companies are constantly striving to find ways to improve warehouse operations, developing maximum efficiency with minimum costs. To maximize productivity and quality of customer service can be used various methods. Despite the fact that the most advanced methods vary depending on the industry and supplied goods, there are examples of suggestions which are applicable to most companies.

- Improving the organization and maintenance of job places. This direction includes actions that cover rational organization, workplace facilities, proper care of equipment, full workload and ensuring an uninterrupted process at each stage.

- Training and staff development. Activities related to professional development of warehouse workers, contribute to implementation of more complex operations in a larger volume with less labor and time. This includes not only ensuring appropriate qualification of stuff, but also improving the overall atmosphere and team building.
- Rational planning. It is important to properly distribute the warehouse territory, logistically correctly zone the areas; it leads to lower costs and optimization of product processing. Also, it is important to effectively plan the distribution of warehouse equipment, which has a positive impact on capacity indicators and, accordingly, leads to the reduction of warehouse logistics costs.

3.4. Optimization of warehouse operations

According to the information given by Kisov K., Portnov A. in their journal article, problems on the way of improving the efficiency of warehouse operations can be divided into four groups:

- organizational (distribution of functions, areas of responsibility of personnel and departments);
- technological (sequence and methodology of operations);
- informational (information systems of accounting and data processing, communication tools);
- technical (availability and condition technical resources).

Choosing the area for efforts application to optimize warehouse technologies, first of all, it is needed to pay attention to the development in the field of improving organization of processes and technology of work performance.

The absence of necessity for significant development and implementation costs and the ability to quickly implement and obtain practical results make organizational decisions the "optimization engine".

Work on the optimization of warehouse processes, generally, is carried out in four stages:

- Logistics expertise;
- Redesign of warehouse working technology;
- Improving organizational and management decisions;
- Implementation.

The purpose of the first stage is to discover key problems, solution of which will give the most tangible result with minimum spending of time, resources and materials. Firstly, it is needed to analyze what is the main warehouse "bottlenecks" and weak spots. Typical problems of the basic warehouse processes are given in the table below.

Table 3. List of typical problems of warehouse processes.

Process	***Problem***
Receiving	Uneven supplying, lack of information on expected arrivals.
	Difficulties in identification of incoming goods (incorrect labels, technical errors, etc.).
	The lack of special zones for temporary storage of problem items.
Storage	Irrational placement of goods in warehouse. This type of decisions are not regulated and made by loaders.
	Internal movements are not recorded in the information system, no mechanism for controlling relocations.
	No optimization of the placement of goods in the warehouse (compaction, consolidation).
Order picking and shipping	Picker routes when assembling the order are not optimal. Storage of various goods in one place, which entails errors in the selection.
Inventory	Belated write-off of goods (shipped back to manufacturer, damaged by employees, etc.) - time is spent on searching for the necessary item.

It is also necessary to analyze the areas related to warehouse operations - purchases, sales, information support. This will allow identifying problems in cooperation between warehouse and related units.

The goal of the second stage is to develop effective solutions aimed at reducing operating costs and improving the quality of work. The main objectives of this phase are listed below.

- Calculation of standard inventory for the main groups of goods, taking into account statistics, development forecast and level of demand.
- Determination of required design plan and number of storage units based on information about traffic and dimensional characteristics of the cargo being processed.
- Warehouse zoning; determination of necessity in specialized areas - quarantine, waste, etc. Development of goods flow distribution model by warehouse areas.
- Development of efficient goods placement method in storage locations and picking routes; movement of goods within the warehouse.

Redesign of warehouse operations allows for a short period of time to significantly reduce the cost of maintaining stocks, to increase the efficiency of storage space usage and to increase the throughput of the warehouse.

The purpose of the third stage is the optimal distribution of functions, powers and areas of responsibility among the warehouse personnel. Tasks of the stage:

- Designing administrative processes with a view for improving the efficiency of interaction with related units (procurement, sales, transport, etc.), customers and suppliers.
- Development of warehouse structure, distribution of functions, powers and responsibilities.

- Development of a system of key indicators, such as for example, monitoring the efficiency of warehouse and personnel motivation systems.

As a result, it is worth noting an increase in staff productivity, ensuring transparency of warehouse processes and decrease in cost of handling one unit of cargo.

The goal of the fourth stage is the practical implementation of solutions aimed at optimizing of warehouse technologies, obtaining the maximum effect from changes. Tasks of the stage:

- Fast solution of organizational and technological problems arising in the course of implementation.
- Testing the implemented information system or changes to the existing one (if necessary).
- Adjustment of the developed solutions in case of identifying the features that were not previously taken into account.

In conclusion, it is worth noting that an integrated approach to solving problems of reducing logistics costs and improving the processing of goods allow achieving significant positive results.

4. Process

The following description of the processes, decisions, actions and documents will be based on the experience of the previous work of the author as a warehouse manager. The company Kymen Cargo was engaged in loading and unloading paper rolls and pallets. They were delivered by road and rail from Finnish manufacturers, mainly Stora Enso and Metsä Board, to 2 warehouses with total area of 19000 m^2. Author's task was to unload, store, get needed information about customers and orders, collect them and load into trucks or wagons, which later were sent mainly to Russia, Ukraine and Belarus. The company worked in connection with another company - Steveco

Logistics. Its services cover all communication with customers and suppliers, customs clearance, freight forwarding.

4.1. Safety regulations

First of all, it is necessary to briefly mention about safety rules on working warehouse. Since it is warehouse where forklifts moving, manager outfit has to fully comply with safety regulations - he must have a helmet, reflective elements on clothes and special work shoes. He always has to be careful with moving forklifts and gave them priority in traffic, do not be at a dangerous distance from maneuvering vehicles or inside the truck/wagon when unloading (loading). It is also necessary to know the fire safety regulations and the rules of first aid. Everyone knows where the emergency exits and fire extinguishers are. In case of fire, each worker must inform others and call 112.

4.2. Receiving of product from Finnish manufacturers

Goods are received in two ways - truck and train delivery. Delivery by wagons is carried out under control of stevedore's person and VR Transport worker. They coordinate the arrival schedule in order all parties work in a proper way. Since there are two railway tracks in the territory, the main task of the warehouse manager is to correctly direct the wagon for unloading. The same with delivery by road. Every day a few trucks from Finnish manufacturers come to the territory of the company. The main task is to check the bill of lading, correctly determine the type of goods and send the driver to the desired warehouse.

After arrival, it is necessary to transfer this information to the forklift driver so that he is able to unload the cargo in the shortest possible time.

The territory of warehouses is marked in a special way for the convenience of determination of location of the goods. After unloading, forklift driver transfer information about the unloading place and the warehouse manager enters this data into special electronic program.

All rolls are labeled in a special way at the factory. In addition to the paper specifications, the label contains the order and roll number. There is also a barcode on it, which makes scanning into the program easier. This information is useful for further loading.

4.3. Storage rules

Before placing at warehouse, according to technology, it is necessary to make an inspection of the incoming goods in order to detect damage of the packaging. If something is detected, rolls should be repaired with thick paper or scotch tape and set aside until further proceedings.

Dents and deep cuts can spoil a large amount of paper and lead to financial losses. Therefore, special attention should be paid to the condition of floor, since any sharp protrusions and surface irregularities (rubbish, stones, wood chips, etc.) can seriously damage the surface of rolls.

Another important aspect is correct temperature and humidity at warehouse, since the violation of this conditions can immediately lead to damage to the product.

Protection of paper and cardboard rolls from external mechanical impacts is poor and they easily can be damaged. All operations associated with movement of rolls must be mechanized and be carried out strictly according to technological standards.

Paper rolls should be stored one on top of the other, overpressure on the lower rolls, which can cause deformation and damage, should be avoided.

Figure 6. Kymen Cargo warehouse with paper rolls

4.4. Order processing

Orders received from customers are processed in Steveco and later transferred to the warehouse managers via e-mail. Basically they come few days before the arrival of the customer's truck for loading. The letter contains all the necessary information - name of the customer, license plate number of truck that will arrive for loading, amount of rolls and required order number. Also there is a unique number assigned to a specific order. This number is transferred to a special warehouse program in order to print all information about the location of these rolls and the amount of stock balance.

The task of the manager is to analyze the possibility of loading this order - whether all rolls can fit into the truck, whether the weight on axles is right, etc.

After printing the order on paper, warehouse manager need to go to location of necessary rolls with a special barcode scanner. All needed barcodes

scanned in order to enter information into the program about roll characteristics (order number, weight and so on) and monitor stock.

Figure 7. Example of barcode scanner

At this stage, warehouse manager checks the correctness of rolls places and their condition. After that, if rolls are far from each other at warehouse, the paper with the order is transferred to forklift driver so that he can collect the rolls into one place for quick loading in the future.

At the end of each working day, warehouse manager received license plate numbers of trucks that are planned for next day. After that it was necessary to check the availability of all necessary documents.

4.5. Loading process

Several times a day it was necessary to manually check the arrival of trucks to the warehouse territory. Warehouse manager matches the car number with the load list and send the truck to the required warehouse and gate for loading.

After that, information about the arrival of the truck is transferred to forklift driver, who calculate needed loading sequence and weight distribution and

starts the loading. At this stage, there may be some disagreement between the truck and forklift drivers, which must be resolved by the warehouse manager. This is complicated by the fact that the customer's workers mainly speak in Russian, and warehouse worker in Finnish.

If the loading went right and the driver is satisfied, he is sent to the Steveco office to process the necessary documents for transportation of cargo and its export.

5. Research during work process

For a better understanding the workflow of the company and identifying possible weaknesses, interviews were held with various employees. The conversation started with some general questions to initiate the communication. After that questions which are given below were asked. In the end, the employee was given the opportunity to independently express an opinion on the working process and note possible weaknesses.

Questions for forklift drivers:

- What items do you handle in the warehouse?
- Which item represents the biggest volume?
- Describe how warehouse location decisions are made?
- What factors are considered when unloading?
- How do you communicate with a truck driver?
- What improvements can you offer to increase the efficiency of working processes?

Questions for warehouses managers:

- What processes do you handle in the warehouse?
- What is the most time consuming process?
- Describe how warehouse process decisions are made?
- How do you communicate with a truck and forklift drivers?

- How do you process incoming orders?
- What are the benefits of the current structure?
- Are there any issues with current structure?
- What improvements can you offer to increase the efficiency of working processes?

Questions for Steveco's stevedores:

- How do you get data from the supplier?
- How do you get orders from the customer?
- How can be changed the process of transferring this information to the warehouse?
- How can you change time of receiving information about incoming and outgoing orders?
- What improvements can you offer to increase the efficiency of working processes?

6. Noticed weaknesses and possible solutions

6.1. Call-up system

The first most obvious improvement is the installation of a call-up display in the trucks' parking area. Currently, warehouse managers have to walk independently to the parking lot, check the presence of trucks, and then come back to send them to the right ramp for loading. Since before appearing on warehouse territory, they mark themselves in the Steveco office, author suggests the following sequencing of actions. Steveco workers send information about the arrival of truck to warehouse manager, who, after checking the availability of the loading, enters the information into the display system. On the screen in front of the drivers appears the plate number of his truck and the number of the ramp where he needs to drive. This method saves warehouse staff time and speeds up the workflow.

Figure 8. Example of led display

Below there are the advantages of this system:

- Efficient call-up system to manage and control transportation vehicles;
- Permanent display for a 24-hours operation, 7 days a week;
- Good reading conditions even at long distances (up to 120 meters);
- Additional features possible (such as signal tone).

6.2. Stones

Another problem that was discovered during the work in the company - small stones at warehouse.

The company's operates at two warehouses, which are located at a distance of about 100 meters from each other. During the working day, forklifts move from one warehouse to another many times. In the winter season, the street area is sprinkled with special stones to ensure safety. These stones on the wheels of the loader are often transferred to the floor of the warehouse. After that, they may fall under the rolls, causing damage. This action is a reason of dissatisfaction of the customer and, as a result, complaints and penalties.

The author sees the solution of this problem in two ways. The first is the replacement of stones with a special chemical that can ensure safety and eliminate the possibility of stones entering the warehouse. The second is to distribute forklifts between warehouses and prohibit them to move from one to another.

6.3. Order in advance

Another possible improvement is to change the way of working with the customer. In particular, how frequent customers place their orders. It is necessary to conduct a survey among clients in order to find out whether they are able to plan orders, for example, for the week ahead. With the help of this, warehouse workers will be able to prepare the necessary rolls in advance, and forklift driver are able to collect them in one place.

7. Conclusion

The main objective of the thesis was to study the pulp and paper industry, analyze the way of company's work and to propose possible improvement for the future. Completed research and development of solutions are considered as the initial stage of solving the problem of optimization.

Table 4. Conclusion

	Problem	Cause	Solution
Call-up system	Irrational use of labor and time when sending on loading and unloading operations.	The lack of a system in general.	LED call-up display installation.
Stones	Unnecessary objects at warehouses causing problems and penalties.	Wrong choice of road surface treatment method. Unnecessary movement of forklifts between warehouses.	Changing the way of treatment and/or prohibition of outdoor movement

Orders receiving	Irrational use of labor and time when receiving orders.	Lack of agreement with the customer.	Changing the way of working with customers. Receiving orders in advance.

In my opinion, the initial goals were achieved. The thesis presents possible solutions for warehouses optimization, and the company can use it to improve its warehouses.

On the other hand, the research contains only basic improvements and there is still a lot of work to be done. Perhaps, these improvements may not significantly change the way of organizations work. But these changes will surely positively affect on work of the company's employees. This can reduce the irrational use of their labor and increase their attentiveness when working with other tasks.

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