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DESIGN OF BOTTLENECK OPTIMIZATION IN SELECTED LOGISTICS COMPANY

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Abstract:

In every major company logistics should be at the forefront in the proper functioning of the company. The logistics company represents the place of organization, planning, management and realization of the flow of goods, production and distribution according to the order of the end customer in order to meet all market requirements at minimal cost. Accompanying these conditions is the fact that there is always room for streamlining these processes. The article describes the functioning of logistics activities in the company from the receipt of goods to its final distribution. The essence is an analysis of optimization issues in a selected company abroad, which should help make the company as a whole. Thorough analysis processes were identified four bottlenecks caused mainly by human factor, and on this basis proposed solutions, which should contribute to better functioning of the company processes and optimize logistics operations.

Key words:

Storage, sorting, bottleneck

INTRODUCTION

The selected company deals with the distribution of branded apparel, shoes and fashion accessories. It supplies stores and warehouses around the world but primarily focuses on the export of goods to Europe. In this case, distribution is a complex, branched process of supplying large quantities of goods from various suppliers to a large number of customers. Streamlining processes, simply and easy transfer of goods from receipt to expenditure is a priority for the company. Also processing and sending orders without complications and delays. The more complex the structure is, the more demanding the process of efficient operation and planning, as well as the effort to streamline the processes and the optimization process itself. Every day the company has to deal with various problems related to machine failures, scanners and especially human factor failure. To maintain the effective functioning of the company, it is necessary to ensure the fluent functioning of all processes. The article is therefore focused on the analysis of operations in the selected company. It focuses on logistics processes and optimization of the basic processes of the company, which are the essence of business optimization [1].

1 METHODOLOGY

The receipt of goods begins with the delivery of the lorry to a predetermined place of unloading. The receipt worker checks the accompanying documents, the quantity, condition of the goods, based on which the receipt card will be issued. If errors are found in the paper documentation, the process of determining the cause of the error is detected and then the delay of other processes. The inspection also involves a random inspection of the goods. If the worker found deficiencies during the inspection, they must be recorded on the relevant document. By means of handling means, the cargo is unloaded to a predetermined place in the warehouse or intermediate storage. The receipt of goods is managed by the main warehouse worker. Several workers with different tasks participate in the receipt of goods, from unpacking, splitting, sorting to deciding where a single package should be directed. The content of the goods determines the direction of the package. Decisions often result in errors and wrong classification of specific goods [2, 3].

1.1. Goods receipt and storage goods receipt and storage

The acceptance of the goods is followed by storage. Goods can be placed using handling equipment, as follows:

- Fixedly, if the goods have a predetermined place in the warehouse;
- Movable, if goods are randomly stored in free space in the warehouse.

Storage handling equipment is selected based on several factors. It depends on the type, the quantity of the goods and also on the storage facility where the received goods will be placed. The goods can be also laid loose in the warehouse, or (if the situation so requires) goes directly to the picking process.

The most important step in the company is solved during the storage in the warehouse. Each box of goods has its specific number, location of storage, and the number corresponding to the goods and season. If in this important step, the boxes are marked with an incorrect number, the error will not be detected until the final distribution steps. The entire tagging cycle must take place again [3].

1.2. Sorting

Sorting in the logistics centre is divided into three parts:

- Unloading and division of goods;
- Collection of goods;
- Issue of goods.

Unloading and division of goods

Work on the entry point of the logistics centre begins with the arrival of a truck to one of the two types of ramps. These ramps differ from each other in the way of unloading imported goods. The first type consists of an automatic conveyor belt on which the goods are unloaded. Goods, respectively boxes are stored in the semi-trailer and transported without pallets for faster work and better handling during unloading. The speed of the conveyor belt is determined so that workers working in the order splitting section are able to transfer goods from one conveyor belt to the other. In the second type of unloading, the boxes are stored on pallets, since their unloading is carried out by a pallet truck with subsequent delivery to a predetermined unloading point [4]. The introduction of the second type of unloading was mainly due to the acceleration of work in this department, since if the unloading consisted exclusively of manual unloading; the quantity of processed (unloaded) trucks would be

significantly lower. The goods, whether from one or the other type of ramp continue to part of the division of the goods. The role of the workers in this section is to correctly sort the orders because several types of orders can occur in the semitrailer truck. Orders (boxes) must be placed on the conveyor belts in the correct order. This will prevent chaos in their palletisation. If there are a many boxes in one order, two or more conveyor belts are used side by side. Before palletizing, all boxes are labelled by the sticker (Type1) with different barcodes. This will record the entire order into the system, which also allows their control (the number of goods imported must be equal to the number of scanned boxes in the order). After scanning, there is a part of placing the goods on pallets in three different ways:

1.SIZE - storing goods in this way means that cardboard boxes of only one type of clothing size (S, M, L, XL, 2XL, 3XL) can be placed on the pallet, and at the same time the entire pallet is labelled with another type of sticker (Type2). However, re-marking with a different type of sticker serves for better handling when it is stored by a forklift truck because it is considerably larger than the initial scan sticker, which means that the forklift operator is able to scan it from the seating position. At the same time, thanks to this sticker, the worker can find the desired pallet faster, because before placing it on the shelf, the exact place of storage is entered into the system, which is what this sticker allows.

2.X - If the boxes are stored in this way, it is possible to use the process of mixing several kinds. It is possible to mix three or more sizes (depending on the size and number of boxes in the order). The entire pallet is also labelled with the same type of sticker (Type2) as in the previous example and stored in the same space.

3.BATCH - the third method of storage differs from the previous two in not labelling pallets with another type of sticker, since the pallets deposited in this way do not proceed to the storage location, but are used immediately in the picking department where they are unpacked by the staff of the department. This is mainly because some export orders do not consist of the number of boxes of a given size, but of the number of pieces of a given size.



Fig.1 Conveyor belt

1.3. Storage

Storage is the organization of material at a predetermined location. It can be defined as the part of the company's system that ensures the storage of products between the place of origin and the place of consumption. It provides information on the status, conditions, and distribution of stored products - stocks to management. Storage plays an important role as an entry point of consolidation for receiving all supplies from individual business suppliers [5, 6].

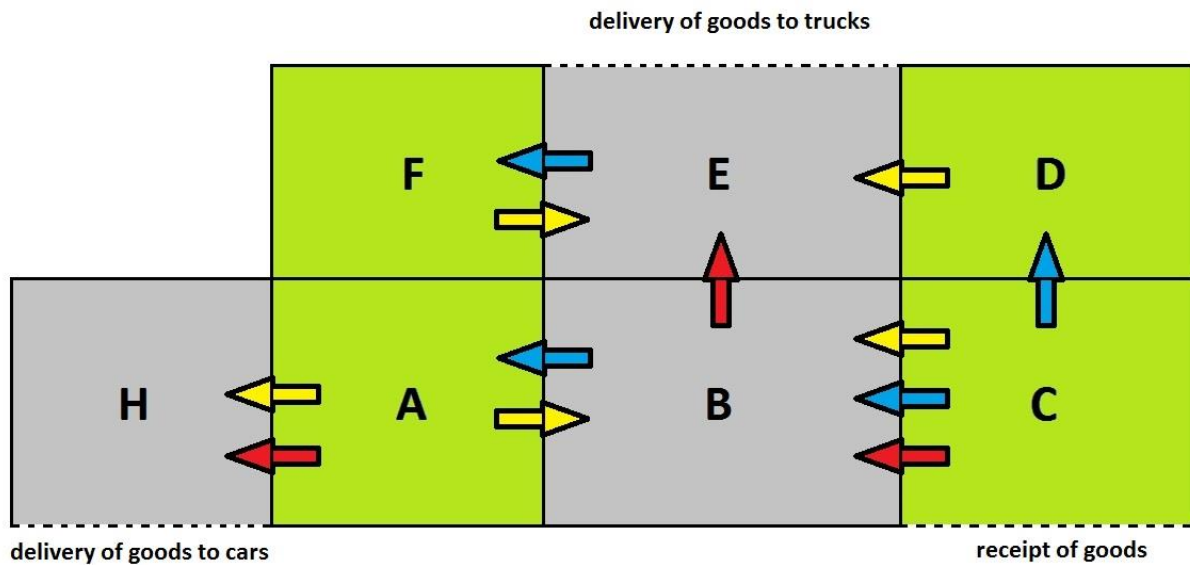


Fig. 2 Movements in the storage

Storages (stock) are divided according to several criteria. The company has a large warehouse space spread over several halls. Three of the seven halls have single-storey warehouses with multi-level racks that reach 12 meters. There are two types of boxes with goods. We divide them into boxes that are sent directly for distribution and boxes that go to intermediate storage. In the intermediate storage, they are later divided into several compartments according to the type of clothing contained in the box. Especially work with accessories, especially shoes. Even some types of clothing, such as winter jacket, are separated.

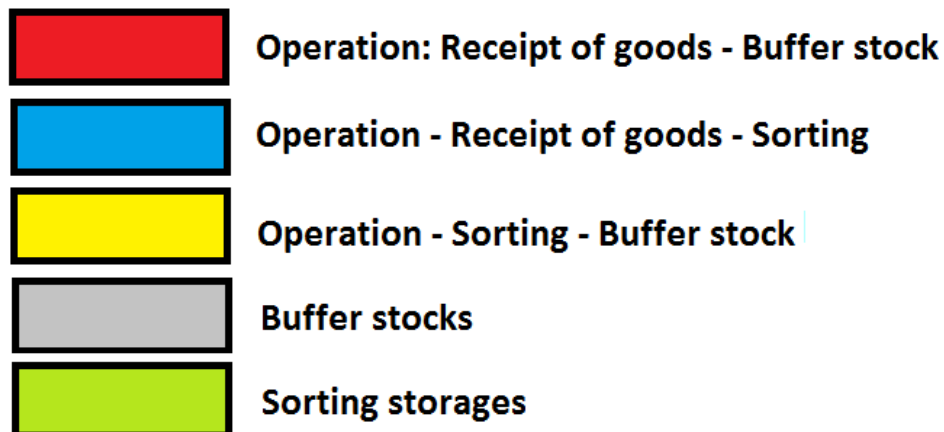


Fig. 3 Characteristics of operations in the storages

Upon receipt, the goods are divided into individual halls according to priority and operation. The total complex consists of seven halls. Hall C is used to receive and divide goods. Halls B, E, and H are one-storey with high shelves. Hall B is also an intermediate store for Halls E and H, from which the goods are picked and delivered for transport to smaller warehouses, companies, branches. Halls A, C, D, and F are multi-storey and serve for collection, division, sorting and packaging. Goods are moved from these halls to intermediate

storage B for storage or to halls E and H directly for removal. Hall C is essential and a priority in the distribution of goods. Goods are divided into halls either by the operation to be carried out or by the type of goods contained in each box. Each of the halls (A, C, D, F) has the same functions and tasks but works with different goods. The exception is hall C, which also has a ground floor reserved for the distribution of goods to other halls.

The movement of materials between warehouses is shown in Figure 1. The low-lift trucks and forklift are only allowed to move between or in the hall. In the storey halls, boxes are manipulated by a handling unit, which serves for the collection and subsequent sorting of goods. These goods continue to individual packing centres and then back to intermediate storage. The company carries out countless operations and manipulation of large quantities of goods.

1.4. Picking and competition

Picking and preparation of goods is based on customer requirements. Nowadays the instructions come not only as written order forms, but also as electronic messages. The order can also be sent by e-mail. The data is processed in a storage system that can recognize instructions sent to customers for storage [1].

1.5. Distribution of goods

Distribution policy can be defined as the process of all strategic decisions that must be made in relation to the product or performance path from the manufacturer to the final consumer or processor [7].

The physical distribution is composed of the movement of goods and materials for storage and order processing, and also solves tasks that define a separate distribution operation daily. The basis of this level ensures the execution of tasks, which have been defined for a successful distribution process. Physical distribution management is carried out at three levels, namely strategic, tactical and operational [5,7].

At a strategic level, decisions are made about the composition of the distribution process, distribution warehouse allocations, shipping methods and receiving the orders. At the tactical level, decisions are made on the use of resources, the construction of warehouses, equipment, and handling equipment required for the process. It is about effective using resources that are available [3, 5].

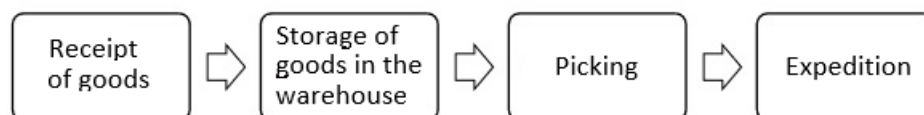


Fig. 4 Logistics activities in the storage

At the operational level, it is a solution to everyday tasks necessary for successful operation. For example, assign orders to the correct day, picking the required amount in the required quality, import at the right time.

The distribution of goods in the company takes place in several cycles.

- The first cycle is the direct distribution of pre-packaged goods pallets directly to the truck;

- The second cycle is the indirect distribution (one part is distributed to the truck, the other part either remains in stock or is shipped to another truck);
 - The third cycle is simply distributing fewer cartons to cars or vans.
- The distribution is terminated by the release of the goods to the transport vehicle and handing over all necessary documents [8].

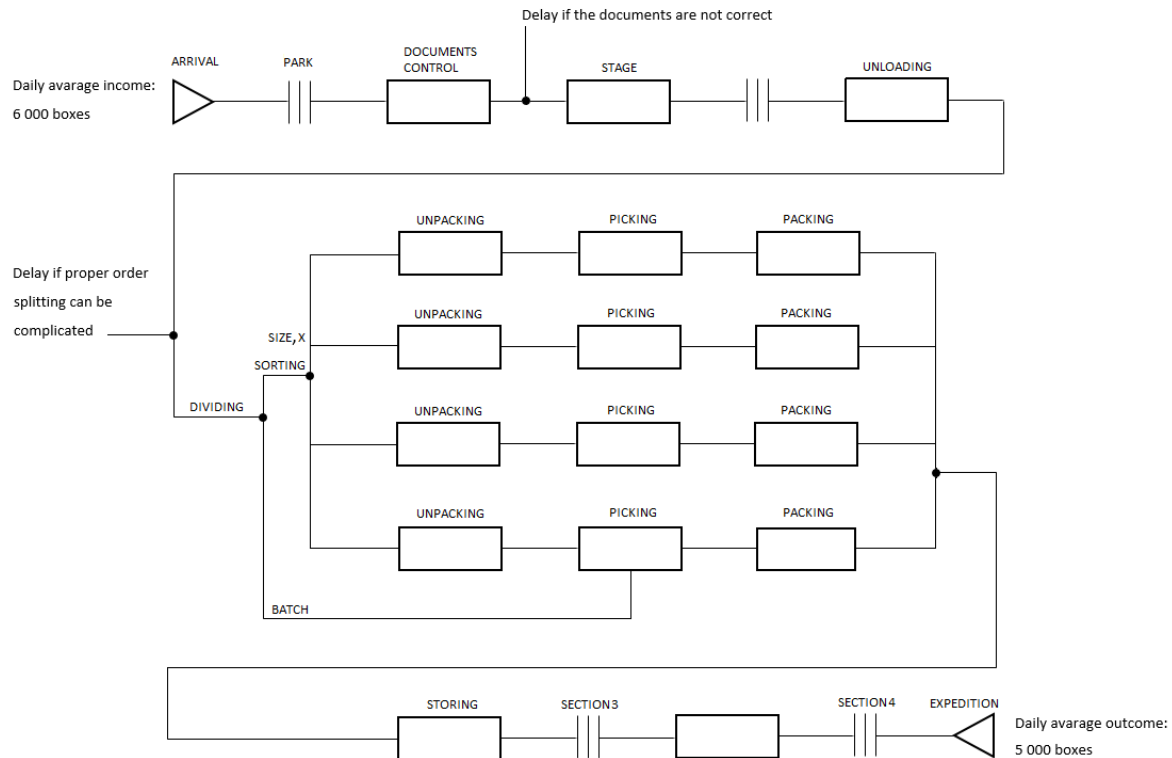


Fig. 5 The logistics operation scheme

2. RESULTS

The company employs several hundred employees obtained mainly from recruitment agencies. As these employees are often unskilled, they become the narrow place of the entire logistics process in the company.

1. Labelling and location of cardboard boxes of goods

As mentioned in the section describing the storage of goods - each of the cardboard boxes of goods is marked with its own number, order and stored at a predetermined location. However, there are often mark-up or localization errors. These errors are not only contributed by the human factor, but also by the unintelligible ordering of the boxes and inaccurate information about the item.

2. Completion of orders

In storeyed halls, employees collect goods based on the order in two ways:

- a) Manual;
- b) Manually using the scanner.

During manual collection of goods, respectively completion of the order, there is a high rate of error caused by a failed human factor. For collecting goods using a scanner, the error rate is zero, because each piece of the order is scanned and the system does not allow the collection of other goods or goods respectively different numbers.

3. Packing the order

Another narrow place in the company is packaging. When packing, an error occurs with there is a manual mistake in classifying the goods. As in several cases, there is a human factor error. Although employees use a computer and SAP program, the final step is up to the employee who can be mistaken the specific number of pieces in the box or the total number of boxes.

4. Moving the employees

Depending on the volume of work, each hall has a specific number of employees to have at the workplace on a given day. If these numbers are not met (again human error - illness, absence) workers must be amendments from other departments. This disrupts the fluency not only in the workplace where there were no employees, but also in other departments that are forced to move workers from department to department during a given day. This disperses employees and reduces their working time due to moving from workplace to workplace. Employees also complain about running departments because they are accustomed to certain work ethics. Heads of the Unit have different rules, one has strict criteria and the other is more lenient and friendlier [9, 10].

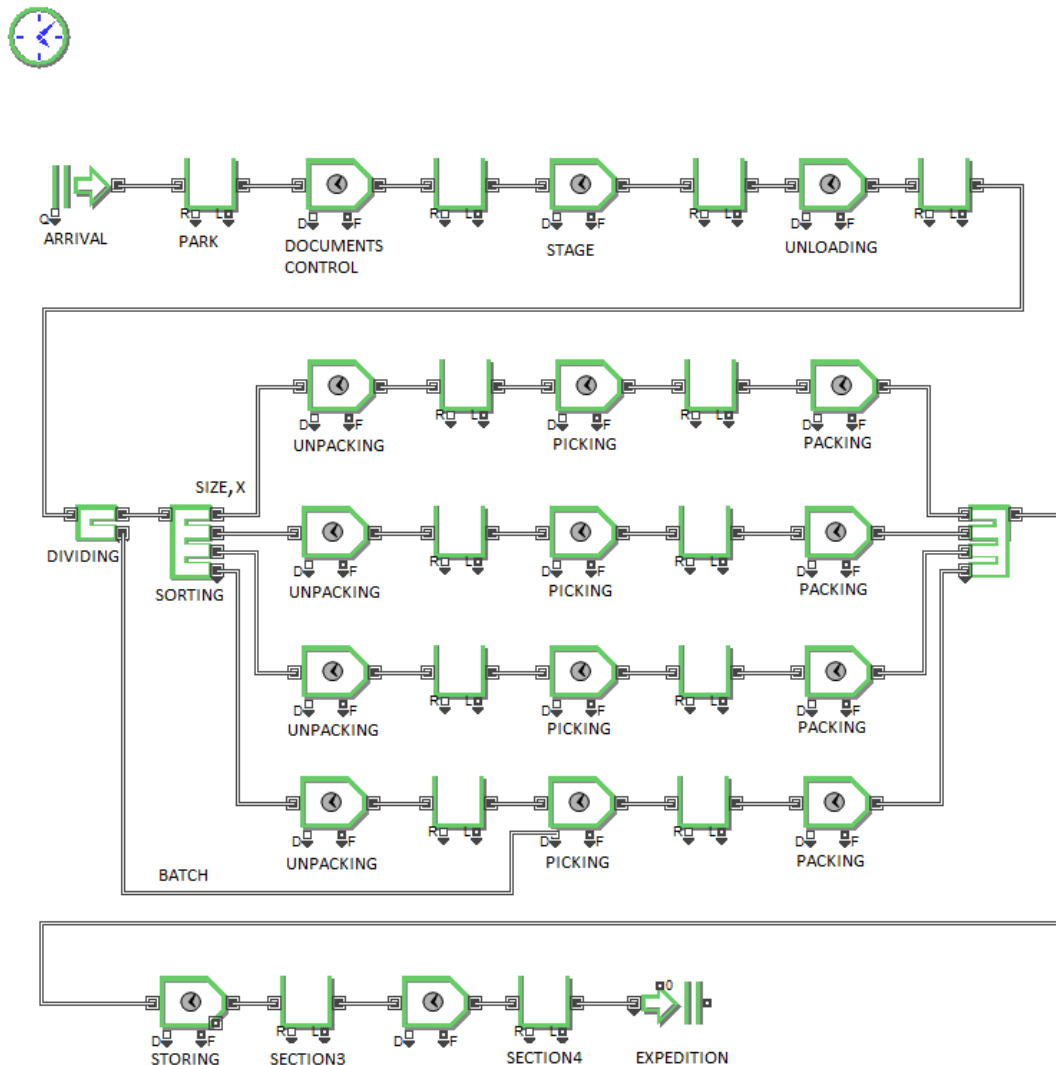


Fig. 6 The model operation in ExtendSim

3. DISCUSSION

One of the most serious problems facing the company is its own employees. The company recruits unskilled workers in different parts of Europe through recruitment agencies for lower wages. These workers need more time to learn and acquire knowledge of the entire logistics operation, or at least the specific operation with which the employee works. The time that a company invests in getting new employees to work is not enough for employees to find out all the negatives and problems they face in operations [2].

Employees work in different halls, but the same operations are primarily performed in all halls. If an employee is transferred from one hall to another, for example because of the lower number of workers, there are other problems. Since each hall has its own leader, each leader has different rules, different disciplines and different conditions. It is necessary to unit requirements and demands on employees. The more these criteria differ, the more mistakes will be made if employees are transferred from one hall to another. Communication between heads of departments and the unification of criteria and conditions for employees is needed [11].

In a company, many things depend on the human factor. Up to more than 85% of errors in the company are caused by a failed human factor. The company would need to modernize operations and eliminate human error by introducing modern technologies.

Proposal to modernize individual departments:

- Automation activities in process;
- Computerization of activities;
- Increase the number of scanners;
- Purchase of new and modern handling equipment.

4 CONCLUSIONS

Based on the processes carried out in the company, the ExtendSim program created a model from the arrival of the truck, i.e. the receipt of goods to the final loading and shipping. The model simulates the entire material flow. Through this model and the actual analysis of processes carried out in the company, several shortcomings have been identified that affect the continuity of operations. The bottleneck is the following: labelling and location of cardboard boxes of goods, completion of orders, packing the order, moving the employees. The bottleneck that were analysed, even though they were found in different logistics sections, stem from one source - the human factor. It would therefore be appropriate to consider retraining, respectively, training new employees in more detail or the introduction of a new labeling and location system for goods boxes would help to avoid delays. This process would avoid errors by introducing automation. It would also be appropriate to set out conditions or requirements for newly recruited employees, which would in some way restrict the entry of employees not suited to the job. It is also necessary to set aside a certain amount of money for the modernization and computerization of processes in the form of the purchase of multiple scanners and other technological equipment, which would largely avoid marking errors or order picking itself.

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