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## LOGISTICS OF DAIRY PRODUCTS: THE CASE OF DELHAIZE SERBIA

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**Abstract:** *Planning, management, realization and control of logistics chains of perishable goods, in which milk and milk products are included, represent exceptionally complex tasks. Characteristics of these goods set specific demands for every grummet of the chain, but efficient realization requires certain knowledge, skills, technology and continuous conditions control, primarily of temperature. In order to understand complexity of dairy logistics chains better, in this paper all processes and activities which occur during the supply of the stores of Delhaize Serbia are analyzed.*

**Keywords:** *Dairy products, Logistics, Cold Chain, Distribution center, Retail.*

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### 1. INTRODUCTION

Dairy products are part of perishable goods and are only some of the goods which require certain temperature. Perishable goods can be divided into two types: living products (fruits, vegetables, seafood, etc.) and non-living products (meat, dairy products, frozen products, etc.). Controlling and monitoring the temperature are crucial in order to prevent goods from spoilage (Donselaar et al., 2006; Joshi et al., 2011). Today, perishable products are especially important for the retailers in order to increase their profitability, and quality of the products is the reason why customers choose one retailer over the other (Thron et al., 2007; Joshi et al., 2011). First of all, when talking about cold supply chains, besides product, which is the subject of the certain chain, is temperature. The temperature is the main parameter when talking about cold chains. It is very important to monitor the temperature throughout the whole chain because this parameter determines shelf life for cooled and frozen goods (Bigaj & Koliński, 2017). There are several ways of monitoring the temperature throughout the whole chain. In this paper only two of them will be mentioned. One of them is RFID technology, which uses RFID tags, which are placed together with the product which is being transported. Information about the temperature can be extracted at any point, which helps determining any temperature fluctuations. Another advantage that this technology provides is reducing costs of unloading goods which is not for human consumption anymore due to temperature fluctuations. Another technology which is used in order to monitor the temperature is based on Time-Temperature Indicators (TTI) usage. These indicators, which are attached to the product, are relatively new solution and are not expensive. In case some mechanical, chemical, enzymatic or microbiological reaction occurs, the indicator's label will change the color (Bruzzzone et al., 2005; Olivia & Revetria, 2008). Because of everything previously mentioned, management of the cold supply chain is very important task which requires not only certain individual skills, but also cooperation and information sharing between entities in supply chain. In order to understand better the complexity and problems

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which occur in cold supply chains which are managed by Delhaize Serbia, in the following part of this paper one centralized supply chain of dairy products made in Serbia is analyzed.

## 2. DELHAIZE SERBIA

Ahold Delhaize is one of the biggest retail Group in the world. In Serbia, Ahold Delhaize is doing business through Delhaize Serbia company. Delhaize Serbia has more than 11,900 associates who serve more than 1, 2 million customers in 404 stores. In Serbia they are known for brands Maxi, Tempo and Shop&Go.

There are three types of retail stores, three formats, which differ significantly as flow generators. Tempo format consists of hypermarkets with average size of 4,200 m<sup>2</sup> and average size assortment of 21,500 products. These hypermarkets, mainly located in the suburbs, are open 24 hours a day and the prices of the products are low. There are altogether 12 Tempo hypermarkets through Serbia. Maxi format represents 210 traditional family supermarkets located all over Serbia. Supermarket's average size is 531 m<sup>2</sup>, and the average assortment consists of 6600 products. Product prices are a bit higher than in the Tempo hypermarkets. Shop & Go format stores are the type of corner shop, with the average size of 120 m<sup>2</sup> and an assortment of approximately 2,500 products. In total there are 161 stores in this format. Stores of this format are intended for customers who want a quick and easy purchase, and in line with that, prices are higher.

The construction of a distribution center in Nova Pazova, 2015, created the opportunity to build a centralized supply system (85% of all deliveries), which made traceability of information, processes and activities along the entire supply chain. According to some specific characteristics, a small part of articles belongs to decentralized supply system.

Delhaize Serbia divided their articles into five basic groups: Dry food - food products that do not require specific temperature conditions (ambient mode); Non-food - non-food products; Perishable food - the products that have a short shelf life and require specific temperature control; Frozen food - products that require deep freeze and Fresh food - products that require certain temperature conditions, for example meat, fruit and vegetables.

The centralization of supply varies according to product groups. Dry food group has the centralization of 76%. Products of The Coca-Cola Company, the Knjaz Milos company, as products of low value and high volume, and therefore the high cost of transportation, are exceptions and their supplies are still done directly from a supplier. In addition, due to packaging which requires reverse flows, supply of beer is made in a decentralized way. In the non-food category, centralization has reached 59%. Seemingly, a small percentage is determined by the specificity of the type of goods. In fact, this category is characterized by a very large assortment, which varies widely depending on the size and the type of retail store. Percentage of centralized supply of products from the Perishable food is 83%, i.e. eggs and bakery products are delivered directly from suppliers. Frozen food group is centralized by 44%. Fresh food category is almost completely centralized (98%), and only fresh fish is delivered directly from suppliers to special shops with the division for fish. Such a considerable degree of centralization is the result of Delhaize Serbia tendency that the quality of the product apart that company from the competition and to be recognized by this category of foods, which is of great importance to their consumers. Due to the specific characteristics, an analysis of supply of company retail stores of dairy product is performed below. Dairy products belong to the group of perishable food that require temperature from 0°C to 8 °C during transport.

### **3. SUPPLYING STORES WITH DAIRY PRODUCTS**

Supplying stores with dairy products are 100% centralized for the main suppliers. Four main suppliers (“Imlek”, “Meggle”, “Silbo” and “Somboled”) are delivering goods to the distribution center (DC) in Nova Pazova, where the goods are stored, picked according to demand and delivered to the stores. In order to increase assortment and fulfillment of the customer’s demands, smaller, local suppliers are supplying local stores, i.e. up-country stores, directly.

Milk buyers are at the beginning of the logistics chain (which buys milk from smaller producers in region) or bigger, registered milk producers. Next one are the factories that are engaged in the production of dairy products and which are delivering goods to the DC of Delhaize Serbia or perform direct deliveries to up-country stores. At the end of the chain are stores that are in direct contact with customers.

Business ties between the participants, are realized by e-mail or through a procurement specialist who is filling in and forwarding orders to the suppliers. In addition to this, the company has implemented the SAP (Enterprise Resource Planning application software), which is primarily intended for internal communication within the company itself.

Reverse flows which occur in this chain are the flows of loading and handling units, expired or damaged goods. EURO and Roll pallets are the ones that are used in dairy products chain. Goods that have expired or have been damaged, are returned to the DC. It is arranged with the suppliers that there is no goods returning, which means that all of the returned goods need to be sorted in the DC and then handed over to specialized companies for processing, disposal or destruction. Reducing this kind of reverse flows can be achieved with the specially organized sales stickers which are labeled on items, and represents the percentage of price reduction.

### **4. ANALYSIS OF THE PROCESSES AND ACTIVITIES IN DAIRY PRODUCTS CHAIN**

The whole process starts with negotiations between Category Management of Delhaize Serbia and producers. When choosing producer to work with, his reputation, reliability and quality are very important. After selection of the potential suppliers, contracts are being signed, assortment, product specification, indicative quantities, prices, sales and expiry date at the moment of delivery are being defined. The policy of the company is that goods can be accepted only if 10-30% of the expiry date has not passed in the moment of delivery, depending on the type of goods. After successful negotiations, information about arranged items are being sent to the logistics sector, department of planning, forecasting and procurement which are ordering items according to the market demand.

Ordering goods from the supplier is done through application which automatically sends filled order using e-mail that is already in the system. Assortment and quantities depend on store demand, the current state of the stock, goods that are already on their way to the stores, defined delivery schedule, etc. Also the company has a 450 items assortment of this kind of goods, approximately 5-10 items per suppliers that supply local (up-country) stores and over 100 items per main suppliers. Delivery deadline from manufacturer to the DC for this type of goods is 24h.

Goods delivery from suppliers to the DC is done by trucks while products are placed on EURO pallets. During delivery there are 32-33 pallets of milk and dairy products. Delivery dynamic for the main suppliers is daily – every working day, from Monday to Saturday. On a daily basis average size of delivery to the DC is 450 pallets of dairy products.

Quantitative and qualitative controls are done when receiving the goods. Quantitative control is done by counting received packaging. Qualitative control is performed by technologist who is measuring and controlling the temperature of the cargo box of the vehicle, documentation and expiry date listed on the product. During delivery of milk and dairy products, only temperature of the cargo box of the vehicle is being checked. Based on this temperature (up to 8<sup>o</sup> C) it is

determined whether goods can be accepted or not. The percentage of declined goods due to inadequate temperature is negligible.

Upon completion of the receipt of the goods, it is being stored. For storing dairy products in the DC a 460 m<sup>2</sup> area is provided. Goods are stored in selective racks at higher levels, where it is lowered to the picking area if necessary. Lowering the goods from the storage zone to the picking zone is done on the principle of FEFO.

Stores are ordering goods by requisition for the next day on daily basis. Daily number of orders is equal to the number of the stores that are owned by the company, and is now around 404. After processing all of the requisitions, a picking order is formed, whose number is equal to the number of the orders placed by the stores. When picking, S-shape strategy is used. All picked goods are then placed on roll pallet and are ready for loading and distribution.

After receipt goods are stored and then picked according to the stores orders. Picking technology is picked by store, which means that picker visits every rack and is picking goods according to the order of only one store. This procedure is done for every order/store. In order to form a functional pallet package intended for the stores, when picking goods, layout is designed in way that picker is firstly encountering goods with greater mass and volume, and then goods with lower mass and volume. Picking is done only at the level of units of packaging, not the product unit. Pallets with picked goods are then transferred to dispatch front, where pallets are being wrapped, marked and prepared for the shipment. One of the latest solutions which company implemented in delivery of the goods, in order to reduce unloading time, is the usage of the roll pallets. These kinds of pallets do not require the usage of the pallet cart (jack) or forklift while unloading. Because of this, the unloading is much faster and easier. Another advantage of this type of pallet is also the possibility of forming multiple levels on the pallet, which enables the delivery of the wider range of products. During the formation of the above-mentioned pallet, milk and dairy products of larger mass are placed at the lower level, since it's heavy goods, and which are mainly packed in a cardboard box containing about 12 packs of one item.

For distribution to retail exclusively road transport is used. Data on processed orders, available vehicles and store locations are entered in the application for vehicle routing (ORTEC). Output from the application is the route of transport means, which transport means operate on which route, the order of visiting facilities, and the method of loading the transport devices. During the operation of means of transport, consumption of fuel, routes cost, vehicle restraint upon receipt of goods in the shops, the temperature in the cargo area of the vehicle and so on, are controlled. There are electronic locks on vehicles that help to prevent "disappearance" of the goods on the road. The advantage of these locks is that only the manager can open load space of the vehicle with the appropriate key.

After preparation of the documentation, the means of transport are loading for distribution. During the distribution, the temperature is constantly monitored by sensors located in the vehicle and by the software that is responsible for collecting data on temperature. In this way it is possible to read the temperature at any point along the entire chain.

Delivery of goods to retail stores is done in three waves. Stores are graded according to their priority delivery and this determines which store will belong to which wave. This priority can be changed in consultation with the store. The first wave is related to delivery of goods to the first top 50 shops. In these stores, the ordering of goods is done in the morning until 10 am, and delivery time is 8-12 hours. The second wave consist of stores that make requisition goods to 10 am, and the delivery time is 24 hours. The third wave consists of stores that requisitions goods to 18h and delivery time is 24 hours. Applying the wave distribution of goods is achieved by optimization of the use of resources. Thus, significant savings are achieved in terms of reducing the required number of staff, transport and handling means, handling areas, the means of transport etc. Every workday at 10 am a cross section of previous orders is done, checking how

many goods are available in stock, and everything is able to go to the store. If there are not enough goods available in stock, some shops get a whole other partial order. When it comes to meat, fruits and vegetables, redistribution is done and in these cases, all stores receive a reduced amount of ordered goods. Everything described above can be represented by a flow chart of the process, Figure 1.

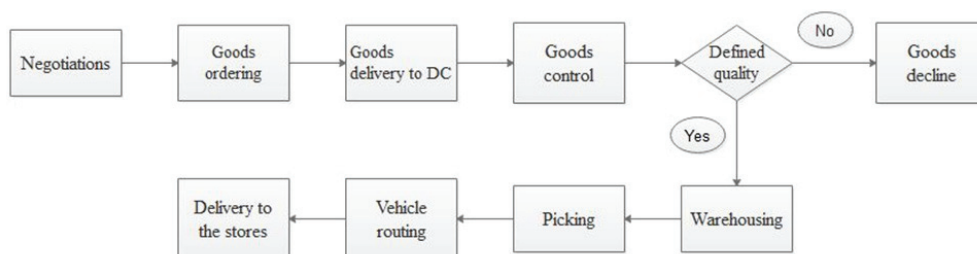


Figure 1. Process flow chart

## 5. CONCLUSION

By analyzing processes and activities of the logistics chain of dairy products, several points have been identified, which may be subject to optimization in order to achieve better and more precise realization. Using the system for performance control and monitoring, company Delhaize Serbia is monitoring operations of the system, detects critical spots along the chain and fixes the problem when it occurs. Some of the problems which occur and possible solutions for fixing them are given below.

At the strategic level, centralization problem, which company is gradually solving for all groups of goods from its assortment and which is mainly solved for the analyzed goods, stands out. At the lower operational level, the problem of large product packaging units stands out and in smaller shops, with smaller inventory turnover, initiates bigger supplies in stores, which was not in conformity with the strategy of centralization which, among other things, allows you to reduce storage and increase the retail space in stores. This problem is solved by negotiating with the supplier, concerning the reduction of packaging units. In process of goods preparation for delivery, there is a pallet compiling problem, i.e. problem of adequate stacking of the picked goods. The real challenge is to put together different kinds of products with sensitive packaging on the EURO pallet, and at the same time consider the possibility of manipulation, stacking into truck and dismantling at the delivery points. One way to overcome these problems is the use of roll pallets in goods delivery.

Goods distribution and delivery in the city represent the special group of problems. The ability to access, distance between the store and parked vehicle, possibility of goods loading/unloading realization represent significant problems, primarily in central urban areas and especially for perishable goods. On the other hand, planning and regulation of logistics activities is reduced due to the implementation of city ordinances that define the time of delivery, dimensions or capacity of the vehicles which are used in delivery. Since the public administration defines these regulations without analyzing conditions and influence, it only limits the implementation of logistics activities instead of making them more sustainable and efficient. This group of problems could be the subject of the next research.

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