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Description of the reverse logistics of a unit of mineral water filling the city of Recife / PE: a case study

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Abstract

This article was designed to study the reverse logistics operation of a unit of mineral water filling the city of Recife-PE. The company has a source in Aldeia and a distribution center in Imbiribeira. The study was aimed at highlighting the return of bottles of mineral water of 20 liters with a view to reusing them in the process of filling of mineral water. The physical distribution of the bottles of mineral water is made by 8 zone delivery in the city. The study describes all the reverse process, and outline key issues and limitations of the practice of reverse logistics of bottles due to lack of adequate infrastructure for the practice of returning the bottles.

Keywords: reverse logistics; mineral water bottle of 20 liters; filling.

1. INTRODUCTION

Logistics is an activity where firms are always looking for a process of change, due to changes in various economic sectors and value chains. Due to the changes, companies often seek to introduce new activities and techniques related to logistics in order to improve their way of understanding the supply chain and adopting new business models that allow the competitive advantage of organizations. (CHOPRA & MEINDL, 2002; DORNIER *et al*, 2000).

The reverse logistics can be characterized as an area of logistics that performs all the reverse process of distribution. This activity is still poorly explored, despite having a key role as it aims to reduce costs by reusing materials and products that can be recycled, but also to better provide logistic services in order to meet the needs of customers and consumers. (LACERDA, 2003; LEITE, 2003).

It may be noted that the beverage companies apply some principles of reverse logistics for a long time, compared to other business sectors. However, the application of these principles is still incipient when compared to large companies seeking to reduce manufacturing costs and reuse of materials in view of their reuse in the production process of the company and / or sale it to other units that have the aim of reusing materials.

The company searched performs reverse logistics of containers of twenty liters (bottles of water) a view to restock the mineral water.

The company carries out basic activities related to reverse logistics. However, there is a need to improve their logistics operations, and the reverse relating to operations (return of the vessel in order to carry out the replenishment of mineral water).

This study is very important since it is an activity little explored mainly by large organizations. These companies buying and selling of products such as cardboard, glass,

plastic, metal etc. in order to achieve the reuse of these materials is much larger than in smaller organizations (with the exception of recycling cooperatives).

It's clear, therefore, that the study relating to transactions related to reverse logistics is very necessary and current, as it enables the achievement of competitive advantage for organizations and reducing costs throughout the logistics process.

2. COMPANIE SURVEYED

In order to preserve the integrity of the studied company chose not to submit the name of the same or the group it belongs. Therefore, will be used fictional name for both.

The company filling "Natura Água Mineral Ltda." is part of the "Nordeste Água Mineral S.A". This, in turn, is genuine and works in the Brazilian market for five decades and was comprised of sixteen companies that operate in various areas and segments, thus generating broad social benefits in various states of Brazil.

Built in the 60th, the company "Natura Água Mineral Ltda." is the largest bottling mineral water in Brazil, having 21 sources in 15 states. The company leads the market, ensuring supply to all regions of Brazil, thereby generating more than 2,000 direct jobs. Through its innovative feature and its industrial potential, the company expanded study the performance of their products also acting in the sale of soft drinks, juices and energy.

The product line of "Natura Água Mineral Ltda." is very broad involving the following products, among others: cup 200 ml; pet 330 ml; pet 300 ml with gas; pet 500 ml with gas; pet 500 ml; pet 1.5 liters; pet 5 liters; pet 10 liters; and bottles of 20 liters (the latter is composed of polycarbonate bottle).

The development of this work is only for the description of the reverse logistics of bottles of mineral water 20 liters, which are reused to perform the new filling, while a few exceptions as described in further discussion of the article.

3. PROPOSED METHODOLOGY

The company studied was a unit of mineral water filling the city of Recife-PE, which has a plant and a distribution center for products.

The research method chosen, we chose to study the case because of its analysis and implementation should be restricted to operational activities of only one plant, despite influencing the entire logistics chain of this product. (YIN, 1994).

The method used for data collection was the questionnaire and in loco observation, thus necessitating the presence of the researcher in the place where performed the reverse process of product (LAKATOS & MARCONI, 1991).

The research is characterized as being descriptive. In the descriptive study, the researcher seeks to discover, classify and interpret the reality of the facts, no interest to modify them. It is characterized also by being a field research, literature and documents, since it involved the need to study in various research sources (VERGARA, 1997).

This work aims to study the reverse process of post-consumer, in the case of containers of 20 liters of mineral water, in the following way: description of the operation of reverse bottle of 20 liters of mineral water.

4. LITERATURE REVIEW

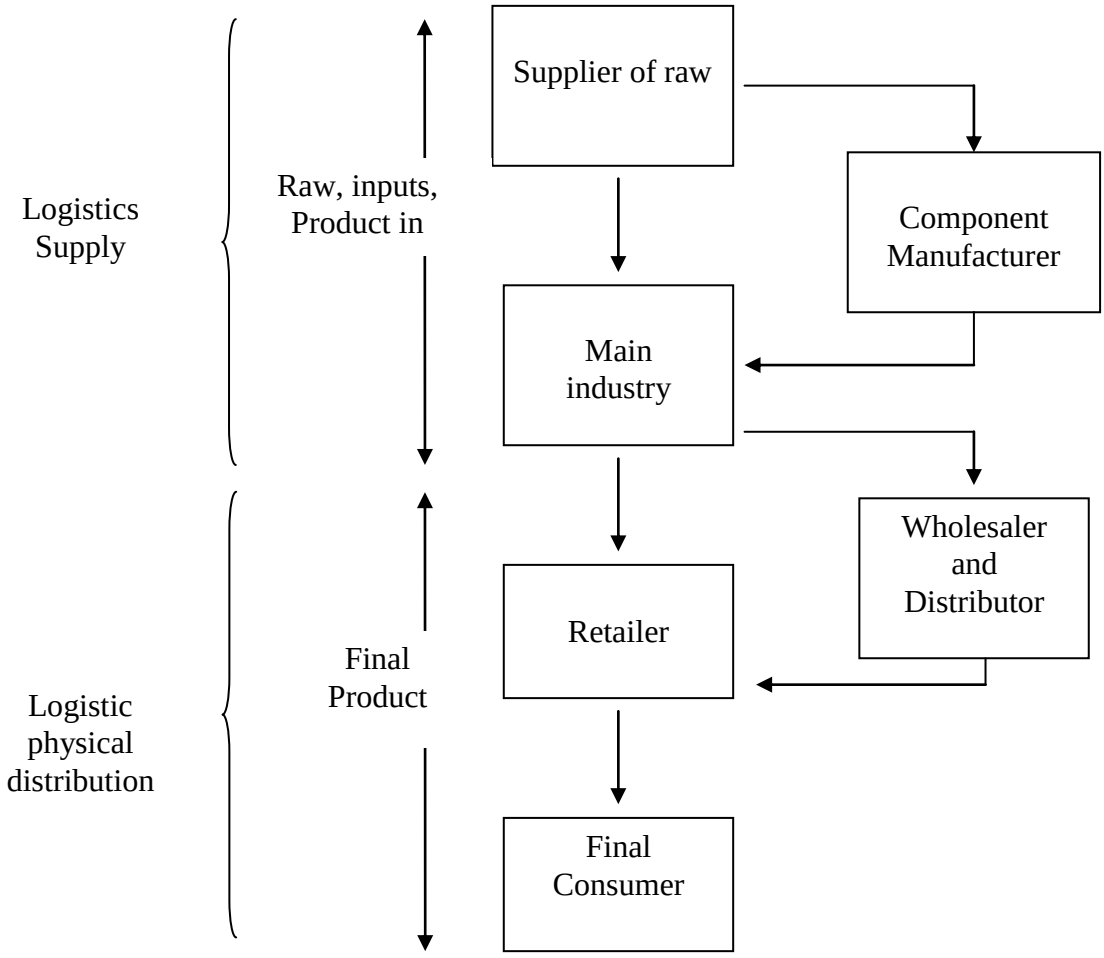
4.1. Logistics and supply chain

Logistics is the process of planning, implementing and controlling the flow efficient and cost effective raw materials, inputs, product in process, final product and

information from point of origin to point of consumption in order to meet the demands customers. (BALLOU, 2001; CHRISTOPHER, 2002; NOVAIS, 2001).

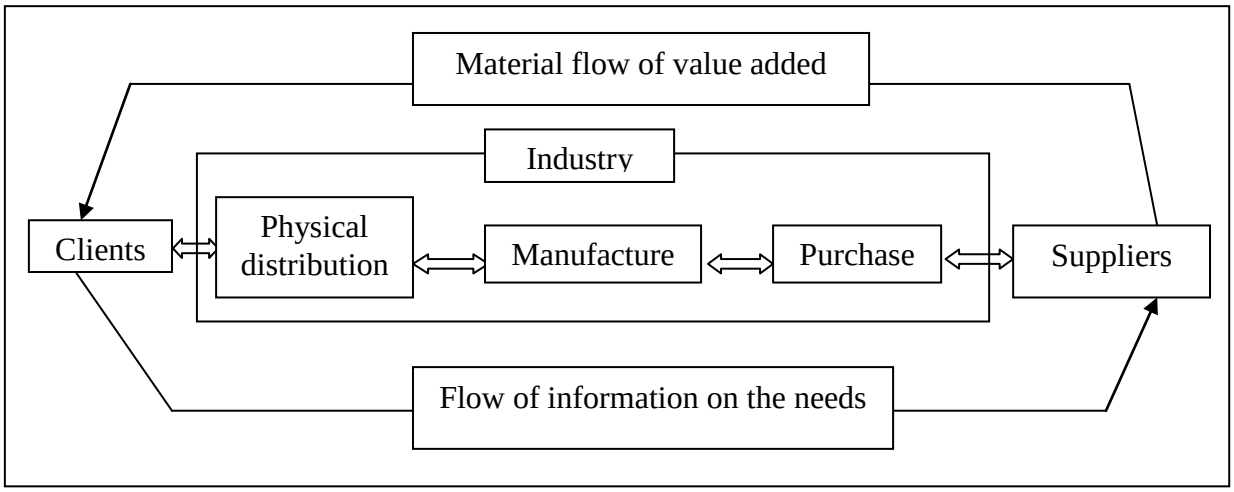
The supply chain starts with the suppliers of raw materials that supply inputs to manufacturers of components or major industry. After the manufacturing of products, they can be distributed to retailers and / or wholesalers and distributors to meet the small retailers who are responsible for supplying the final consumer.

Therefore, it is noticed that the chain can be represented by a group or conglomerate of companies in different industry sectors (suppliers, carriers, industry, distributors, intermediaries, customers and consumers) that aims to allow better flow of materials, goods, money and information in order to improve productivity and efficiency of all logistics activities, as well as enable the reduction of operating costs.



Picture 01: Typical Supply Chain

Source: Adapted NOVAIS (2001)



Picture 02: Integration of supply chain

Source: Adapted BOWERSOX & CLOSS (1996)

Logistics comes to be seen as its strategic importance and relevance to the successful operation of industrial, commercial and / or services within the supply chain organization. "Logistics was subsequently used as a differentiating factor, of strategic nature, in search of more slices of the market." (NOVAIS 2001, p. 48).

4.2. Physical distribution and Distribution channel

Physical distribution is the process that involves the sending of finished products industry to the end consumer. The objective of physical distribution is to provide a good level of service that aims to establish an excellent relationship across the distribution network seeking to achieve distribute products according to the time set to the right place at low cost. (BALLOU, 2001; NOVAIS, 2001; BERTAGLIA, 2003).

> Distributing is a function of dynamic and diverse, ranging from product to product, from company to company. Thus, the distribution must be extremely flexible to meet the various demands and restrictions imposed on him, whether physical or legal (BERTAGLIA 2003, p. 170).

Physical distribution doesn't necessarily end when the products reach the customer more for supporting the lifecycle of the product and the handling of return. The main objective of physical distribution is to perform the procedures with quality, speed, reliability and lower total cost, meeting the needs of customers. (BOWERSOX & CLOSS, 1996; FLEURY *et al*, 2000).

"Physical distribution is the operational processes and controls that allow you to transfer the goods from point of manufacture to the point where the goods are finally delivered to the consumer." (NOVAES 2001, p. 107).

The main objective of physical distribution is to help in generating revenue, providing an excellent level of customer service making the total cost of the product is lower (BOWERSOX & CLOSS, 1996).

Physical distribution involves meeting the expectations of customers at the lowest possible cost. These efforts extend to inter-organizational, throughout the supply chain, to reach the final consumer." (FLEURY *et al* 2000, p. 77).

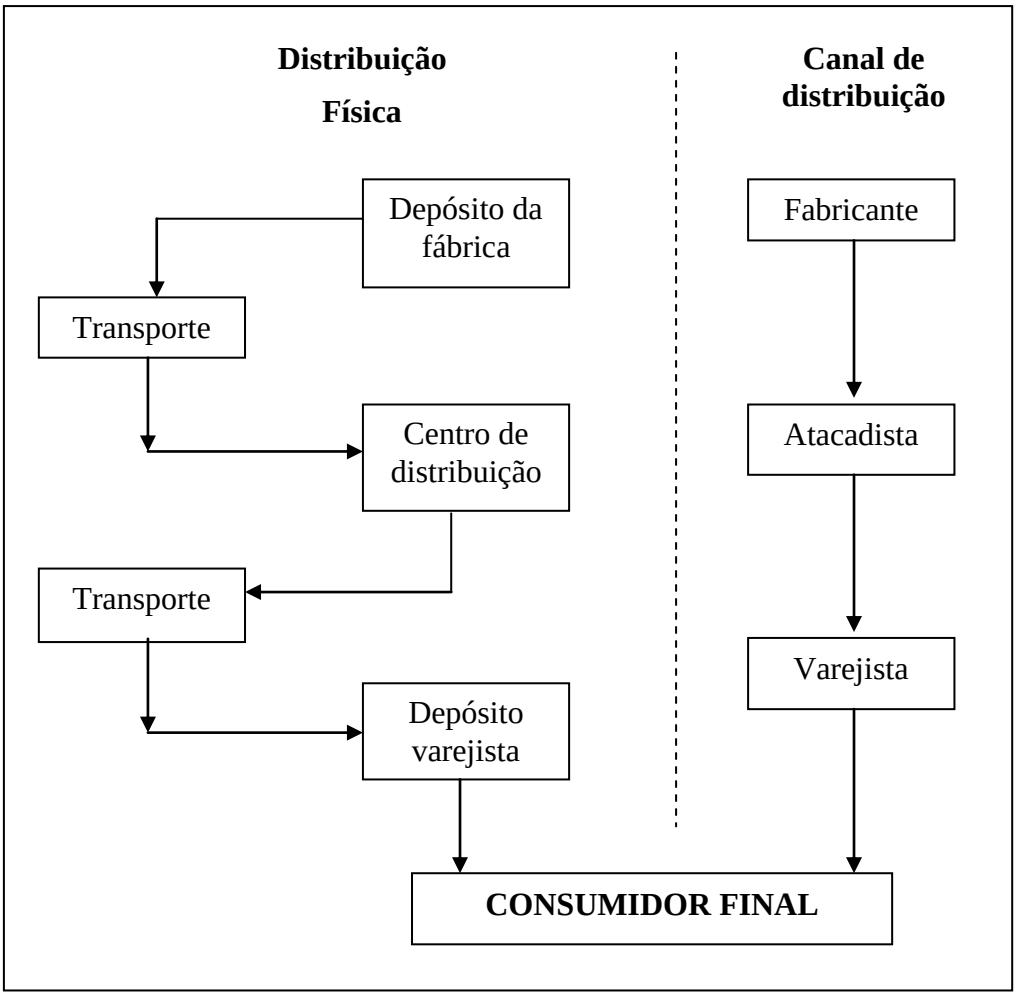


Figura 03: Paralelismo entre canais de distribuição e distribuição física

Fonte: Adaptado NOVAIS (2001, p.109)

> Distribution "one to one" in which the vehicle is fully loaded in the warehouse of the factory or on a CD retailer (full complement) and transports the cargo to another point of destination may be another CD, a shop or any other installation.
>
> Distribution "one to many", or shared in that the vehicle is loaded in the CD retailer with goods to various stores or customers, and performing a predetermined delivery route. (NOVAIS 2001, p. 149).

The concept of distribution channel is meant to provide products or services to the subsequent elements of the supply chain in order to meet the needs of inputs, raw materials, parts, accessories, product in process, final product or any other components needed for the survival of the chain of supply. Therefore, the distribution channel to meet the needs of customers throughout the chain (BALLOU, 2001; NOVAIS, 2001; BOWERSOX & CLOSS, 1996).

4.3. Reverse Logistics

The reverse logistics is characterized as the return of goods after-sales and post-consumer production cycle through distribution channels reverses (LEITE, 2003).

The reverse process is advantageous when it adds value to logistics operations, becoming a competitive advantage for organizations that are part of the supply chain organization (LACERDA, 2003).

Due to the high possibility of obtaining competitive advantage, organizations seek to fit the new reality is that current compliance with the laws never before seen by

the companies. One example is the case for the appropriateness of companies with environmental legislation, correct disposal of unserviceable materials and products, the correct way to perform the recycling of hazardous materials and obsolete etc. (LEITE, 2002; LEITE, 2003; LACERDA, 2003).

The reverse logistics is the process of reverse movement of the product, the destination point (clients) to the point of origin (plant or recycling facility or collection point) in order to contribute to the implementation of systems recovery and recycling of solid materials (BALLOU, 2001).

A reverse logistics efficiency depends on several factors (ARIMA & BATTAGLIA, 2003):

→ the possibility of easy view of financial gains with investments in reverse channel through the financial recovery of materials previously considered "lost" or resale to secondary markets;

→ the establishment of a centralized return center, with the concentration of technical and operational resources using, for example, consolidation of freight or return collections, to improve contact and level of service to the customer;

→ the good performance of the system information, it should be available (almost) immediately to all participants of the reverse;

→ the adoption of efficient technologies could streamline the process of collecting and transmitting data without errors;

→ the constant training of human resources directly linked to the activities of reverse logistics; and

→ the good administration of financial resources, trying to incorporate the assets involved and over time reduce them.

4.3.1. Obtaining competitive advantage through the reverse logistics

"The management of the supply chain can be defined as the management of the whole chain of supply of raw materials, manufacturing, assembly and distribution to final consumer." (Slack *et al* 1997, p. 317). Thus, reverse logistics is inserted into the logistics activity which in turn lies within the supply chain (SCM) organization. Thus, reverse logistics is one of the participants in the logistics process (LEITE, 2003).

"The source of competitive advantage is found primarily in the organization's ability to differentiate themselves from their competitors in the eyes of the customer and, secondly, by its ability to operate at low cost (most gain) (CHRISTOPHER 2002, p. 03).

The search for reverse logistics as a competitive advantage is increasingly conducted through the activities of recycling and reuse of products and packaging. Thus, there're three main reasons for taking advantage of the organization: i) environmental issues (new legislation), ii) increased competition and iii) cost reduction by adopting the reverse logistics (LACERDA, 2003).

In Brazil, the potential for the activity of reverse logistics industries recyclable material is staggering: for example, between 1994 and 2000 the production of PET bottles has increased more than 300% over the same period the annual recycling spent 290 thousand to 1.5 million, the latter representing only 26% of the total marketed (REVISTA TECNOLOGÍSTICA, 2002).

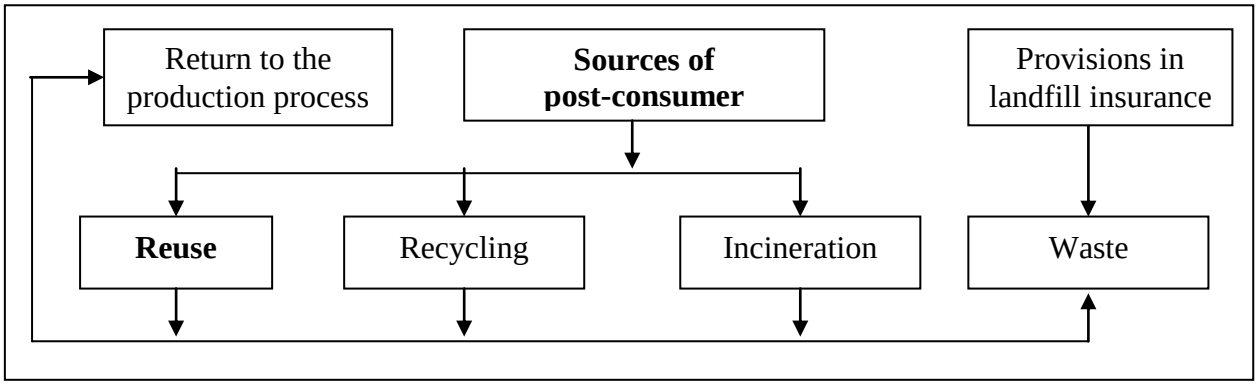
4.3.2. The reverse logistics post-consumer

The reverse logistics of post-consumer, the product after the end of its life cycle can go straight to landfills or incinerators or even go back to the production cycle through the channels of dismantling, recycling or reuse. In the process of dismantling and

removing the parts that have conditions of use or re-manufacturing, the rest is used in the process of recycling or sent to landfills. In the process of recycling the products returned to the industries to be recycled and reused again become the productive process (LEITE, 2003).

There are three possible applications for products of post-consumer before heading to the production process or landfills (LEITE, 2003), which are:

» the reuse of products that adds value and reuse of post- consumer by increasing its useful life;



Picture 04: Asset recovery post-consumer (emphasis added)

Source: Adapted LEITE (2003, p. 42)

» recycling of materials, which add values like economic, ecological and logistical assets to post-consumer, causing the material to return to the production cycle to replace new raw materials; and

» incineration, which adds value to the economic and post-consumer for its transformation into electric energy.

The recycling of post-consumer is basically the selection and removal of materials of interest that are present in the product. But for this to happen there must be technical

and economic feasibility, which in many cases is the greater difficulty of recycling organizations (LACERDA, 2003; LEITE, 2003).

The reverse logistics of post-consumer demand for a greater reuse and upgrading of the product (or its components) at the end of life, so that they pass through the reverse channel reuse, dismantling, recycling to its final disposition (LEITE, 2002).

In Brazil, 55% of all plastic produced is directed to the production of packaging, which have reduced lifetime, making it a product with high potential for disposal, which is of great concern to society. In Brazil there're 5160 companies working in the processing of plastics, more than 700 companies that recycle about 29% of the material that is produced.

According to the applications of plastics in Brazil, about 40 to 50% of plastics are used for production of packaging and disposables, which have a low lifetime, and the remainder is used for products with life cycles longer. The sources of materials post-consumer of this sector are the garbage collectors, the selective collection and scrap (LEITE, 2003).

5. CASE STUDY

One unit of mineral water bottling company "Natura Água Mineral Ltda" is located in the city of Recife-PE, and has a Distribution Center (DC) located at Aldeia, neighborhood of Recife.

Before to the activity of the physical distribution of 20 liter bottles of mineral water and subsequent return of the containers, will be realize the importance of explaining the process of industrialization of mineral water unit studied.

5.1. Filling process of mineral water "Natura Água Mineral Ltda", unit Recife-PE.

The process of industrialization or filling of mineral water company studied is composed of the following phases, which are: i) funding through pump extraction, ii) container, iii) filtering; iv) gasification; v) potting; vi) labeling; and vii) storage. Below has the simplified description of the stage of the process.

The first phase of the case concerns the funding through the pump for the extraction of mineral water source that supplies the unit of the company. The water is done through specific pipes and contaminate water (non-toxic PVC pipes or other material approved by the DNPM - National Department of Mineral Production). Therefore, the placement of specific tubes should be no contamination of water which must be extracted with maximum possible purity.

Shells are used to make the storage of water only to capture a view to carrying out any adjustment in the same pH. The period of water storage in reservoirs is specific to three days to not interfere with the quality of water.

The next stage is the filtration operation is retention of solid particles through filter material that does not change the chemical composition and physical-chemical properties of water. This stage is the removal of unstable elements of water.

The fourth stage of the gasification process is that it's the addition of carbon dioxide during the process of potting. This process isn't conducive to clean water, or water must be pure and natural regardless of the gasification process.

The fifth stage is the filling which is an operation in order to make bottling water in containers and specific, such as: glass 200 ml; pet 330 ml pet with gas; pet 300 ml; pet 500 ml with gas; pet 500 ml; pet 1.5 liters; pet 5 liters pet; pet 10 liters; and bottles of 20 liters.

That doesn't mean that the plant filling all these containers. The process of filling the water containers will depend on the production process (installed capacity of

machinery, equipment suitable for filling the vessel, number of production lines, plant layout etc.) and demand of the consumer market.

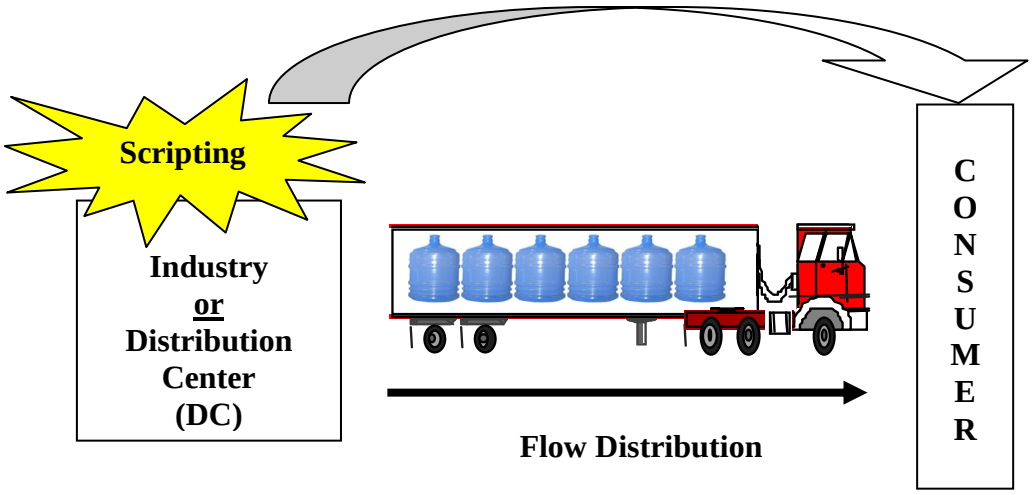
The process of filling the tanks of 20 liters, from the reverse logistics process, must meet several requirements, namely: i) meet the perfect conditions of cleanliness and hygiene; ii) the container is reused should clean and in good condition for the new filling iii) shall not contain any crack or fissure vi) must have gone through a screening process to check any foreign element or odor that may compromise v) must have gone through the process of washing and disinfection; and vi) the package must ensure the integrity of the water, without changing their physical characteristics, physical-chemical, microbiological and sensory.

The labeling stage is the insertion of a label in the body of the product, causing it to be clearly identified. Another purpose of the label is the suitability of the product quality standards, information from the composition of the product, branding, content, capacity (ml, liter, kg etc.), among others.

Storage is the permanence of the product in the company's facilities (warehouse or distribution center) until the product is required by the customer through a purchase order, so the purpose of storage is to stay with the product until the customer to complete the purchase same.

5.2. Description of the physical distribution of bottled mineral water of 20 liters

The main objective of physical distribution is to the right products to the true places at the correct time and with the level of service desired for the lowest possible cost. (NOVAIS, 2001; BALLOU, 2001; CHOPRA & MEINDL, 2002; FLEURY *et al*, 2000; BOWERSOX & CLOSS, 1996).



Picture 04: Simplified diagram of the flow of the physical distribution

Fonte: Prepared by the authors

Physical distribution used by the company is "one to many", because the product is transported from the production plant (or DC) to the customer according to the desired amount for the same. This distribution aims to be efficient from the moment it is used for a routing system in order to draw a roadmap of pre-determined delivery causing the product to reach customers faster.

The physical distribution "for a very" is characterized by being sprayed, or sent to various clients, the desired amount through midsize car segment that to diversify the types of products traded. Another characteristic of this type of distribution is the downtime, frequency of customer visits, quantity to be delivered, share product delivery, the distance between the DC and the pocket of supplies, time to complete the script and return the deposit (or DC) among others.

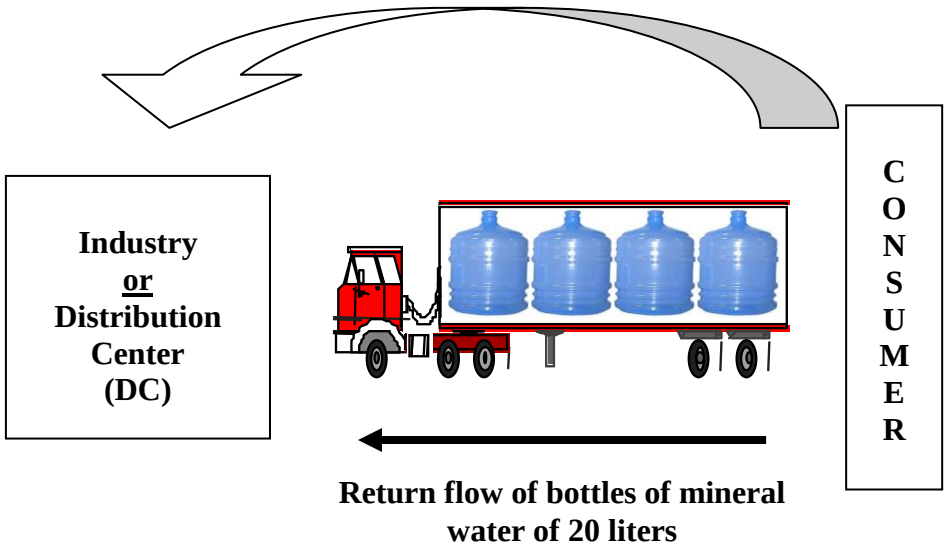
5.2. Description of the reverse logistics of bottled mineral water of 20 liters.

The reverse logistics of 20 liter bottles of mineral water is considered a usual practice of logistics because it is a container to be reused several times before the lifetime of it.

Giving back the containers is performed at the same time that the physical distribution of the product is held, or when the supply of cylinders of 20 liters of mineral water is the collection of empty bottles of the product.

This strategy of returning the product becomes cheaper and efficient because of the frequent replenishment of bottles of mineral water of 20 liters at the point of marketing the product (supermarkets, gas stations, disk water, wholesalers who sell bottled water for retailers or consumers end etc.).

Thus, the cost of reverse logistics of bottles of 20 liters of mineral water is considered cheap and easy to be operated by other companies in the same sector of activity.



Picture 05: Simplified diagram of the return flow of bottles of 20 liters of mineral water

Source: Prepared by the authors

In view of the proposed study it appears that the reverse logistics of post-consumer containers of 20 liters of mineral water reuse is considered (the bottles being reused again by re-packaging of mineral water, provided that it is able to reuse).

The ability to reuse the bottles is when: i) the product is in good working condition; ii) good condition; iii) there is no type of malfunction; iv) the product does not present any type of odor that makes unusable; v) when the cylinders have less than 3 years of use; vi) can be your internal and external cleaning; among others.

6. CONCLUSION

It is clear, therefore, that the subject matter of this paper is quite relevant in view of the achievements of discussions about the importance of implementing reverse logistics and its main characteristics. The same search always take into consideration the type and characteristics of the product to be returned from the point of consumption to the point where it will be reused or reissued in the production process of the organization.

The reverse logistics is considered essential for determination the company's strategic position within the SCM (Supply Chain Management) to be considered good practice logistics that must be disseminated and practiced by organizations that seek to differentiate and add value to your product.

The reverse logistics of 20 liter bottles of mineral water is widely used by units of the property in question, considering the reuse of the vessel until it completes its useful life, and low cost of return, since the time of the physical distribution of the product is a collection of empty bottles and thus their reuse in the production process of the organization.

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