

Reverse Logistics Applied in Waste of Fried Food in Restaurants in the Center of a City in the Forest Zone of Minas Gerais State

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Abstract - the objective of this study was to identify whether there are in the current context the existence of reverse logistics in residues of fried food in restaurants in the center of a city in the region in the Forest Zone of Minas Gerais State. The methodology applied to research was the use of the research literature review and the case study with the use of a structured questionnaire with the question of qualitative and quantitative approach in order to generate graphs with the answers obtained. The research results showed that the application of reverse logistics in the local restaurants has functioned satisfactorily and with it generated greater production, sustainability and profitability.

Keywords: Reverse Logistics, Restaurants, sustainability.

I. INTRODUCTION

The concept of logistics is, according to the Council of Logistics Management [1], "the process of planning, implementation and control of efficient and effective flow of goods, services and related information from the point of origin to the final consumer, with the purpose to meet the requirements of customers."

From this definition of logistics and its membership by industry brought several incremental transformations that have been promoted on commercial activities. To the extent that the competitiveness between companies increased, the importance of conquering a logistics of excellence was essential and considered a competitive differential and even strategic, seeking to reduce the time between purchases of inputs, production of goods and its delivery to the final destination. Therefore, not only was more

interesting to organize only its own logistics, but be interested by its suppliers and customers.

However, the objective of this work was to evaluate the reverse logistics center applied in waste of fried food in restaurants in the center of a city in the region of Zona da Mata of Minas Gerais.

In practical terms, reverse logistics has as main objective to reduce the environmental pollution and waste of raw materials, as well as the reuse and recycling of products. For example, organizations such as supermarkets, shops and industrial discard considerable volumes of material that can be recycled such as paper, cardboard, *pallets* of wood, plastic, among other industrial residues with great potential for reuse or recycling.

II. LITERATURE REVIEW

According to Leite [2], the concept of reverse logistics is in agreement with all operations related to the reuse of materials and products. Its principle is related to the destination postoperative use of products and materials. These activities resemble, for example, in products with a manufacturing defect. And then reverse logistics, responsible for all logistics activities to collect, dismantle and processing products, using the result of the postoperative use of products and/or materials, thus reducing the impacts on the environment.

By the way, reverse logistics is an amplitude of logistics is used in a generic way, in its broadest sense, all operations related to the reuse of materials and products, encompassing all the logistical activities to collect, dismantle and *processing* products and/or materials and parts used in order to ensure a sustainable recovery [2].

A. The Concept of Waste

The definition and conceptualization of expressions of residue and trash have been used differently according to the location in which it is applied. According Yoshitake [3] garbage is all and any material discarded by human activity, domestic, social and industrial, which already has more usefulness and is therefore discarded by its owner. Now, to Amorim [4] garbage is all that is discarded and which is not perceived and which has no immediate usefulness.

By the way, Brazil had already need to regulate and standardise the disposal of waste and for this came to have a regulatory framework in the area of solid waste. The law created is used to distinguish between residues (which can be reused or recycled) and reject (it is not possible to reuse). Currently, this law serves to regulate any type of waste [5].

B. Definition of Waste of Fried Food and Damage Caused to the Environment

Oils and fats are types of materials that don't mix in water, which may be of animal, plant and microbial even formed in its greater part of condensation products between "glycerol" and "fatty acids" called triglycerides. The difference between Oil in liquid form, and fat, in solid state, lies in the proportion of saturated acyl groups and introducing the present in triglycerides, in oils unsaturated chains are carbonic, making the liquids at ambient temperature of 20° C, while in chains carbonic fats are saturated, leaving the solids at the same ambient temperature. Therefore, the edible oils and fats consist mainly of triglycerides [6].

According to data from the United States Department of Agriculture (USDA, the acronym in English), in 2016 the volume of vegetable oils came close of 186.9 million tonnes, among them the origin of palm, soy, canola, sunflower and others.

According to Fonseca [7], on the basis of years 90, one of the major problems encountered by the Community is the large formation of urban garbage. Such a situation is directly related with the disorderly growth of the population, and as a result of increased food production and processing of raw materials, transforming them into final consumer products, thus contributing to increasing growth of cluttered and without planning of waste, bringing unexpected consequences and for the environment and also decreasing the well-being before the collective interaction.

When the oil is disposed of down the drain of the kitchen sink, among other things can cause bad smell, dramatically increases the difficulties to treat sewage. This oil is led by the sewage system until the rivers and even to the sea. This fact is explained by the oil is lighter than water and is on the surface, making a heterogeneous mix. Thus, hinders the entry of light and blocks the oxygenation of the water. With this hinders the process of the base of the aquatic food chain, causing an environmental imbalance and compromising the fauna [8].

There are several ways to reuse of waste of fried food as a way of minimizing environmental impacts and generate new sources of income. With this can be manufactured products from various segments of the industry, as is the case of the use in the production of soap and detergent, oil paints, mass of putty, ecological roof, biodiesel production, among others.

III. MATERIALS AND METHODS

For the development of this article were surveyed academic websites, magazines, books, current legislation and sites related to the topic, thus creating a bibliographic research. For Martins [9] a bibliographic research aims to collect data for the reader to understand a little more about the topic, i.e., the literature review where starts the job and also seeks to studies and similar publications to the topic researched, in order to obtain new results to the problem addressed.

So all the figures presented are property of the authors of this study.

On the type of approach, the study in focus it is classified as quantitative and qualitative. A qualitative research, in accordance with Gerhardt and Silveira [10] does not take into account numerical values, dealing with aspects of the object of study aims to describe and explain.

With respect to the objective of the study and how it was done, falls as exploratory, since the information was collected by means of questions from a questionnaire developed and validated by [11]. The semi-structured questionnaire was applied to managers of restaurants in the center of a city in the. The limitation in the central area of the city is given by the fact of being the neighborhood of the city with the largest number of restaurants as evidenced by the table in the Annex. For the application of the questions were made requests in the establishments classified as operating, according to data collected in the municipality of Cataguases in the sector of Sanitary Surveillance. A total of 21 (twenty-one)

restaurants in the city center, these only 1 (one) has not responded.

Finally, the questionnaire mentioned, composed of 12 closed questions was applied to the managers of establishments during the months of august and september 2018. The responses were tabulated with the aid of Excel 2010 software and the graphs generated were of great importance for identifying the current picture the existence of reverse logistics in residues of fried food in restaurants in the center of a city in the region of Zona da Mata of Minas Gerais.

IV. RESULTS AND DISCUSSION

The following results were extracted from the answers obtained by applying the questionnaire in the city center studied. Thus considered only restaurants that contain at least one employee and with this criterion were removed the restaurants of neighborhoods, because the vast majority were family farms.

In Figure 1, Chart 1 shows the number of employees working in the establishments. Notes that 60% of restaurants have from 6 to 10 employees, other 25% have from 1 to 5, 10% of 11 to 15 and still a share of 5% account with an amount between 16 and 20.

According to Ballou [12], the reverse logistics also involves all operations related to planning and control of production, material handling, packaging, storage and dispatch, physical distribution, transportation and communication systems that performed synchronized mode, can do with that companies add value to the services offered to customers and also allowing a competitive differential in the face of competition by its employees.

Gráfico 1 – Quantos funcionários possui o estabelecimento? é mais utilizados em seu estabelecimento?

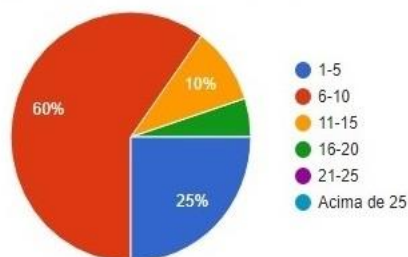


Fig. 1 - Number of employees

Figure 2 quantifies the type of vegetable oil used in restaurants and, based on the chart 2 below all establishments make use of soybean oil due to its lower cost on the market.

Gráfico 2 – Que tipo de óleo vegetal



Figure 2 - Type of oil used

In Figure 3 demonstrated in chart 3, the majority, about 75% said that they use the soybean oil because of its lower purchase price, while the remaining 25% for issues related to the habit.

Gráfico 3 – Por quê?

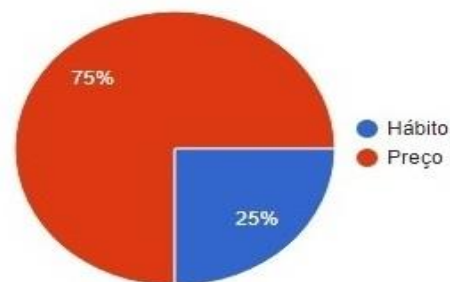


Figure 3 - What are the reasons for the use of soya oil.

In Chart 4, represented by the Graph 4 shows the average consumption of soya oil used on a monthly basis, being that the half responded that they spend more than 40 liters per month. A slice of 20% said that uses more than 160 liters per month. It is perceived that increasingly the restaurants give more value to prepare dishes of lower calorific values, i.e., without immersion in fat and also investing in healthier foods, especially in salads.

There restaurants who responded use from 1 to 10 liters per month and 6 to 10 liters per

month, i.e., practically do not use fat, are the cases of healthy food restaurants called fit.

Gráfico 4 – Qual o seu consumo médio mensal?

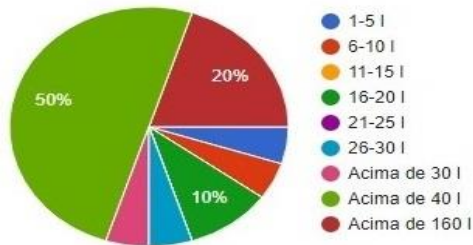


Figure 4 - average monthly consumption

In Figure 5, as evidenced by chart 5, about 50% said that monitor for a period of use, 20% by viscosity, 15% color and other 15% by the presence of particles. In this questioning the answers were varied and had a manager who used more than one criterion, however, was to mark the answer that was more predominant.

Gráfico 5 – Como é percebido o momento da troca?



Figure 5 - Time of changing oil

In Figure 6 below, represented by the graph 6, 60% stated that change every 2 days the oil and only 5% have stressed that used by 2 weeks the same oil. The biggest restaurants use industrial cookers that together with the oil is mixed water and salt and therefore its use extends if those 20% who claimed to change every week.

Gráfico 6 – Qual a periodicidade de troca?



Figure 6 - Perception of changing oil.

As shown in figure 7, Graph 7, after frying food, 45% of respondents said to store the material in the same location where the process and 15% did not stores by changing the daily product.

Gráfico 7 - Como armazena o material de um dia para o outro?

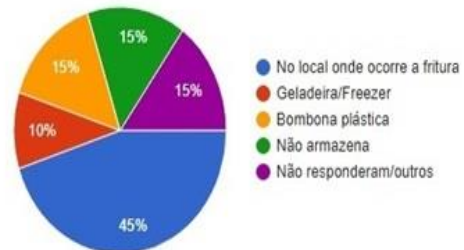


Figure 7 - Storage of material

As seen in the graph , the graph 8 through 8 below in relation to the disposal of waste, 80% of respondents said that the material is stored at the collection for later recollection by companies specialising in the recycling of this material. Adding to this, 10% of the disposal of material is sold and only 10% is being badly disposed, where understands that 5% discards in the sink and other 5% drop in other places.

Gráfico 8 – Como é feito o descarte deste material em seu estabelecimento?

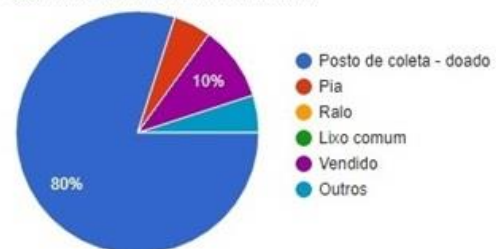


Figure 8: Disposal of material

According to Leite [2] where reports about the different forms of processing and marketing of products or its constituent materials, since their collection to their reintegration to the productive cycle as secondary raw materials. Therefore, the life cycle of a product loses its initial function due the reuse of the product and its raw material.

Thus in figure 9, represented by the graph 9, the city counts with a large company of recycling of residual oil to fry for manufacture of biodiesel that allocates to the majority of establishments containers for storage of material for subsequent collection, having as an incentive for this exchange for cleaning materials, such as detergents, brooms, mops, among others. The managers of restaurants, a total of almost 90% said that they know what is the best way to discard the material in question and other 90% stressed that know the impacts caused by the inappropriate disposal of this material.

Gráfico 9 – Você sabe como seria a melhor forma para descartar esse material?

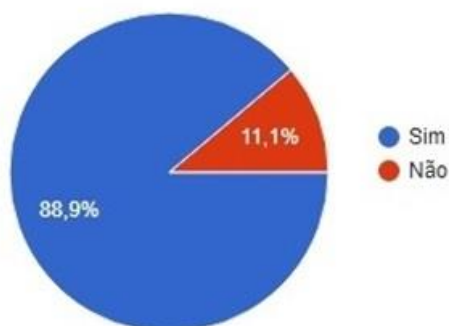


Figure 9 - Perception of disposal of materials

During the visits, the leaders were very receptive and claimed to know about the relevance of the theme, and only one establishment among the 21 located in the center of the city did not respond to questions as shows figure 10.

Gráfico 10 – Você conhece os impactos associados ao descarte inadequado do óleo vegetal residual?

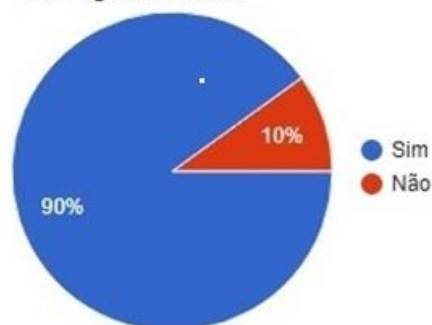


Figure 10 - Knowledge of impacts of vegetable oil

Figure 11, represented by the graph 11, realizes that the manager has knowledge of other purposes that can be given to the oil after use, and 90% said that they know yes. In addition to the collection of the company that transforms into biodiesel, the other way most often cited was the manufacture of soap in bar. Had also said that they donated for manufacture of detergent, glycerin and ration for animals.

Gráfico 11 – Você sabe que outras finalidades podem ser dadas a este resíduo após seu consumo?

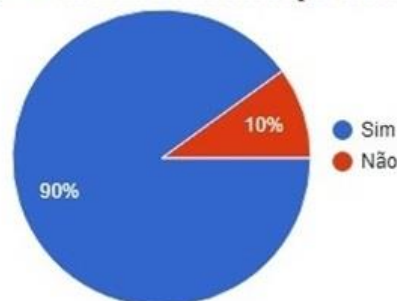


Figure 11 - Perception of the purposes of oil residue

The last question, represented by Figure 12 and Figure 12 shows that 70% of managers donate or have an interest in donating the material. The other 30%, one half sells and the other half are replaced by other types of objects.

Gráfico 12 – Você se interessaria em descartar o óleo:

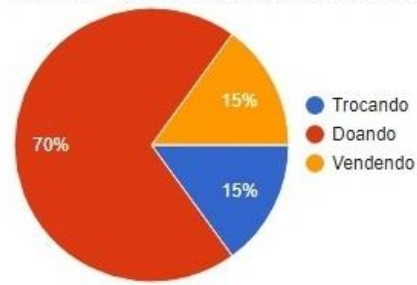


Figure 12 - Interest in oil disposal

V. CONCLUSION

You can see the results of the research that a large part of the restaurants in the town has knowledge of environmental impacts produced by improper disposal of soybean oil.

Still on your discard, managers demonstrated knowledge about the damage caused by the waste when disposed of improperly and during visits *in loco* demonstrated interest in improving the system for disposal of residual oil for deep frying in their establishments.

It was found that 80% of the oil is disposed of appropriately by restaurants and collected by companies specialising in recycling of this material being this number quite animator is taken into consideration that only 10% is discarding in sinks or other forms.

In this way, it was identified in the current context that there is existence of reverse logistics in residues of fried food in restaurants of the town center where the study took place.

REFERENCES

- [1] CLM - COUNCIL OF LOGISTICS MANAGEMENT (1995). World Class Logistics: *The Challenge of Managing Continuous Change*. Pennsylvania: Council Of Logistics Management. 423 p.
- [2] Milk, Paulo Roberto. Reverse Logistics: Environment and competitiveness. 2a. ed. São Paulo: Prentice Hall, 2009.
- [3] Yoshitake, M. *Theory of managerial control*. São Paulo: Ibradem, 2004.
- [4] Amorim, A.P. et al (2018). Municipal dump: an approach to environmental problems in the city of Rio Grande - RS. Available in: <http://www.seer.furg.br/ojs/index.php/ambeduc/artic/e/viewFile/888/920>
- [5] Ministry OF THE ENVIRONMENT (CINIR). Solid waste management in Brazil (2010). Available at: <http://www.sinir.gov.br/>
- [6] Moretto, Eliane. *Technology of vegetable oils and fats in the food industry*. Varela, 1998.
- [7] Fonseca, Introduction to the study of solid waste and urban cleansing: the Union. 1999.122p;
- [8] Fogaça, Jennifer Rocha Vargas.(2018) used cooking oil and the environment; Brazil School. Available at

<https://brasilecola.uol.com.br/quimica/oleo-cozinha-usado-meio-ambiente.htm>.

- [9] Martins, Heloisa Helena T. de Souza. *Qualitative research methodology*. Education and Research, v. 30, 2004.
- [10] Gerhardt, Tatiana Engel; Silveira, Denise Tolfo. *Research Methods*. Porto Alegre: Editora da UFRGS, 2009.
- [11] Thode-Filho, Sergio; Mattos, Ubirajara Aluizio; Silva, Elmo Rodrigues. *Management of post-consumption waste: evaluation of the process of consumption and disposal of waste vegetable oil in commercial establishments in the city of Duque de Caxias, Rio de Janeiro state*. The National Congress of excellence in management, 2010.
- [12] Ballou, R. H. - "*Business Logistics: transport, administration of materials and physical distribution*", Atlas, São Paulo, (1993).