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Feasibility of Frying Oil After Treatment by a Biofuel Company in Manaus- Amazonas

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Abstract

Waste generation has increased in many sectors given the demand and population growth. Reverse logistics comes to contribute to the return of these wastes to the production chain. In this context, frying oil is one of the most processed waste and transformed into new products, such as: biofuel, boiler fuel, soap manufacturing, concrete formwork release agent etc. Oil is one of the wastes whose recycling only happens by law, because it has low added value, unlike plastic, aluminum and copper, whose values are higher. The average oil consumption in Brazil reaches 3 billion liters per year, but only 2.5% of this total is recycled, the others are discarded in the wild. The aim of this study is to analyze Reverse Logistics at different points, seeking to describe the chain steps, from the final consumer, through the PEV and ending in the companies that will reuse the frying oil already treated. In Manaus, the logistics of frying oil is done by cooperatives and private companies, being MASSEG, the largest company in the segment. This research has an explanatory character, approaching a case study, which made it possible to observe the financial and environmental feasibility of reverse logistics for the collection of frying oil, carried out at Condomínio Shopping Manauara Center, in the city of Manaus, AM. To reverse this scenario, many companies are investing in the reverse logistics process. Procedures such as leaving drums empty so that they are filled with waste oil, separation of solid waste and water from oil, are already part of the routine of tenants that also contribute to non contamination of water bodies. The collection, transportation, filtering, decantation and commercialization of the product already treated, for fuel purposes, is performed by the company itself. Finally, the company uses part of the treated oil to manufacture biodiesel, applied to the consumption of its own fleet, with no commercialization of the generated biodiesel. Thus there is a reduction in the use and costs with usual fuels (fossils), seeking to add the culture of sustainability.

Keyword: Reverse Logistics, Biodiesel, Waste.

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Abstract

Waste generation has increased in many sectors given the demand and population growth. Reverse logistics comes to contribute to the return of these wastes to the production chain. In this context, frying oil is one of the most processed waste and transformed into new products, such as: biofuel, boiler fuel, soap manufacturing, concrete formwork release agent etc. Oil is one of the wastes whose recycling only happens by law, because it has low added value, unlike plastic, aluminum and copper, whose values are higher. The average oil consumption in Brazil reaches 3 billion liters per year, but only 2.5% of this total is recycled, the others are discarded in the wild. The aim of this study is to analyze Reverse Logistics at different points, seeking to describe the chain steps, from the final consumer, through the PEV and ending in the companies that will reuse the frying oil already treated. In Manaus, the logistics of frying oil is done by cooperatives and private companies, being MASSEG, the largest company in the segment. This research has an explanatory character, approaching a case study, which made it possible to observe the financial and environmental feasibility of reverse logistics for the collection of frying oil, carried out at Condomínio Shopping Manauara Center, in the city of Manaus, AM. To reverse this scenario, many companies are investing in the reverse logistics process. Procedures such as leaving drums empty so that they are filled with waste oil, separation of solid waste and water from oil, are already part of the routine of tenants that

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Keywords: *Reverse Logistics, Biodiesel, Waste*.

1. Introduction

The population increase has contributed to accelerate the problems related to the generation of industrial, commercial, agropastoral and domestic waste. Environmental impact control measures are constantly studied in order to minimize the incorrect disposal made by the population, especially with the use of reverse logistics.

Observed in the Environmental Management Program (PGA) [1], the waste from frying oil used, coming from industry, commerce and residences, has a polluting potential, if disposed of incorrectly. Thus, recycling promotes environmental and socioeconomic balance.

This waste is of great environmental impact in itself, as one liter of waste oil is capable of contaminating up to 25,000 liters of water. This occurs because the oil creates a surface film, preventing oxygen exchange and ends up killing the waste. living beings in that water body. In addition, waterproof the soil and contribute to the occurrence of floods.

According to [2], the environment, besides being impacted by the burning of fossil fuels, can also be affected in other ways, such as the incorrect disposal of solid waste, being the frying oil one of them, thrown in the soil and streams. 'water, contaminating groundwater.

In Brazil, several recycling projects have been created to reduce this potential problem, among them, the reuse of this frying oil residue. Unfortunately, even though it is one of the champions of reverse logistics, millions of gallons of oil of vegetable or animal origin are improperly dumped into the sink drains. As a result, there is an imbalance in microbial life, clogged sewage pipes, foul smells and increased operation of water and sewage treatment plants, which are forced to use more chemicals in water treatment [3].

According to Law 12.305 / 2010 [4], the responsibility and attributions are shared in the destination of the waste generated forming a chain with the following actors: manufacturers, importers, distributors, traders and consumers, responsible for the correct destination of this waste.

Currently, companies have a social and environmental responsibility, and assume the generation of waste produced until the end of their useful life cycle. Together with the individual, they must share the management responsibilities of waste generated, even as consumers become more demanding, forcing companies to adapt to current reverse logistics processes.

According to [5], reverse logistics arises through the motivation of social and environmental issues and sustainability principles, advocated by the environmental impacts caused by mismanagement in the disposal of waste, after being consumed. As a result, companies develop strategies for collecting, disposing and reusing this post-consumer waste, positively impacting the economy and environment, making

production more environmentally friendly and sustainable.

The Organic Law of the Municipality of Manaus [6] provides for measures for the reuse of vegetable oil and its residues, in order to minimize environmental impacts, from inadequate dumping on the environment, regulating the collection of vegetable oil and its residues, to mitigate these impacts. There are companies that work with meals in general, and that handles cooking vegetable oils, directly obliged to implement in its functional structure, the collection program of this material to be used for the production of biodiesel, mold release agent, soap and others. [7]

According to Art. 3 [6], vegetable oil used in food preparation is collected by private companies, NGOs and collectors' cooperatives.

Paragraphs 3 and 4 of Art. 3 [6], cited above, determine that companies from the Manaus Industrial Pole (PIM), which provide meals to their employees or have outsourced industrial kitchens, must collect this oily waste in a period of time. by the competent environmental agency, and present certification of the destination of this waste.

In order to control this collected waste, it is necessary that the generation companies, collection / transport and disposal, submit the Waste Transport Manifest (MTR), because only then, the control can be effective. This control through the MTR is generated in 4 (four) ways: 1st way-Generator, 2nd way-Carrier, 3rd way-Treatment Station and 4th way-Environmental Agency, closing the cycle of the correct destination of the collected waste. Subsequently, according to Article 5 [6], companies that do not forward these manifestos to the competent environmental agency, will lose the right to certification of collection.

Many establishments do not comply with the legislation, mainly due to lack of supervision. In addition, the population and commercial establishments pour thousands of liters of waste oil daily into the sewers, causing major problems in the different areas.

To prevent this waste from reaching the sewage system and watercourses, the problem must be tackled at its source. The population, in general, should store in drums, plastic bottles or other container, other than glass, used frying oil, and so hiring cooperatives and recycling companies to collect this stored oil.

For reverse logistics to occur, operating costs must be reduced. It is essential that this chain of stakeholders be more organized, avoiding unnecessary displacements, and also that the waste oil frying generator is aware of the various forms of reuse for this type of waste, such as soap, paint, animal feed, biodiesel etc. With all these possibilities of reuse, the discard in the middle is avoided [7], returning as raw material.

According to PNRS [4], the responsibility lies not only with the end consumer, but also with everyone involved in the process until the final proper disposal. Logistics planning should be observed, while the efficiency in this process of reusing used frying oil [7].

As suggested by [8], for the smooth operation of a reverse logistics network, the frying oil collection used, must occur from the implementation of the Voluntary Delivery Points (ENP). This facility serves to minimize the reverse flow problems that may arise in the generation of collected oil stock by checking the quality of the product received, the costs of the activity and its transportation. The most important item in the reverse logistics process is the volume of oil collected, even more than quality and price [9]. But the success of this whole operation is only achieved through Environmental Education. The ENP is only an item of this reverse logistics if the used frying oil generator facilitates the ENP for waste disposal. The process of delivery should always be attractive, because the waste has low added value and cannot at any

time cause disinterest in the final consumer, with the risk of compromising the entire structure.

Given the above, the objective of this study is to analyze the Reverse Logistics at different points, trying to describe the steps in the chain from the consumer, through the ENP and ending in companies that will reuse the cooking oil already treated.

2. Material and Method

2.1 Kind of study

The methodology used in this work is based on the descriptive survey on the use of edible oil used as raw material for various products in local industries and their collection logistics.

The type of research approach is explanatory. According to [10], descriptive research aims to describe facts and / or phenomena of a given reality and explanatory research is concerned with identifying the factors that determine or contribute to the occurrence of facts and / or phenomena of a given reality. .

2.2 Study area

The study area is located in the city of Manaus, but it is inferred over the entire area covered by the Company, including the metropolitan region, which includes the municipalities of Iranduba, Manacapuru, Rio Preto da Eva and Presidente Figueiredo (Figure 1).

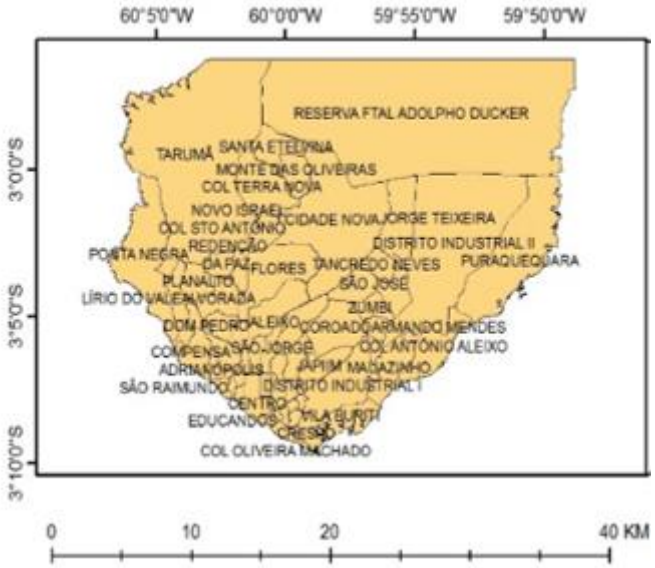


Figure 1 - Satellite image - City of Manaus and Municipality of Iranduba, AM.
Source: Thiago Fernandes (2019)

There are two actors in this case study, the first actor is represented by Condominium Shopping Manauara Center, used in the analysis as a generator, thus becoming the verification area of the information collection point, shown in Figure 2, through a satellite image.

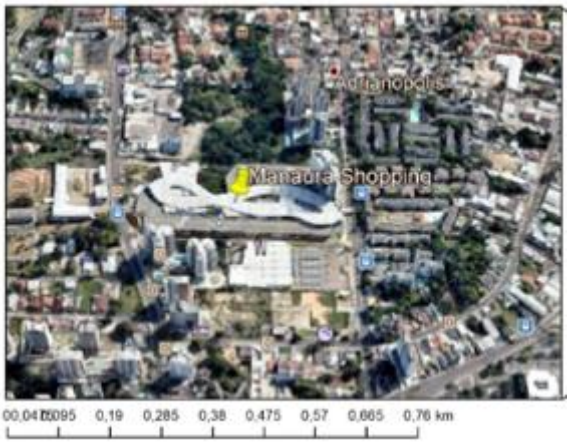


Figure 2 - Location Manauara Shopping Center - (3º06'16.0 ”S 60º00'36.5” W).
Source: Thiago Fernandes (2019)

The second actor represents the waste treatment company in Manaus, Company MASSEG Transport e Assessorial Ltda. She has the responsibility to collect the waste, transport it, take it to the Oil Treatment Station (Figure 3), then dispose of it. treated oil for companies using this product.

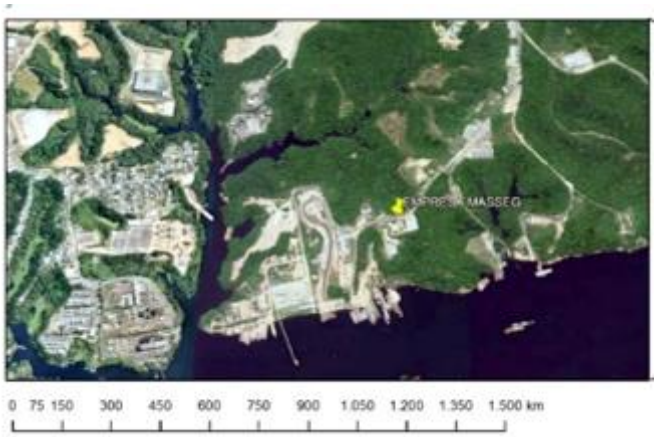


Figure 3 - MASSEG Company Location.
Source: Thiago Fernandes (2019)

2.3 Data collect

Actor 1 was selected for the study as a generator of frying oil waste, due to the large amount generated daily by their cafeterias and restaurants, having as a requirement to allocate it to a certified company, which carries out the entire waste management process (the generated oil), being the responsibility of the actor 2. The equipment used is: 20 or 50 liter drums, suction hoses and vacuum truck, which will store the used oil in your tank. The collected oil often presents other undesirable aggregate residues, such as: frying residue (flour, bone, skin, etc.) and water, which will be separated in the filtering and decanting process at the treatment plant.

After segregation of all residues contained in the oil, such as water and other solid residues, will be able to be marketed, with companies that will use this product for various purposes, such as: boiler burning, soap

manufacturing, release agent and biodiesel [11].

3. Results and Discussion

The average consumption of cooking oil in Brazil is around 3 billion liters per year, with only 2.5 percent being recycled in any way by the market. Unfortunately, the rest is discarded unevenly in the environment by industry, commerce and the general population, causing major damage to nature [12].

One of the actions that contribute to the irregular disposal of oil waste in nature is the lack of "environmental education" and the lack of knowledge that this waste can be transformed into a product, returning to the production chain.

To better understand the reverse logistics process of frying oil in the city of Manaus, collection follow-up was done at Condominium Manauara Shopping Center. The company has contracts with several retailers (cafeterias and restaurants), where waste oil is collected.

As [13], for the preparation of various foods, the frying confers characteristics, pleasant, with great acceptance by the consumer when the oil is still new. However, when its acidity increases due to constant frying, its darkening occurs. This feature is a warning to avoid its consumption. It can cause various types of manifestations harmful to health, such as obesity, hypertension, diabetes and cancer.

So that the collection procedure occurs in a way that does not cause major inconvenience to the commercial establishment, especially to customers. This service is performed after the mall closes. 20 liter drums are left to let shopkeepers fill them with used oil. The drum has a screw-on lid, a fixed sieve to prevent solid waste from being placed along with the oil, and a sticker with the collection company contact phone. On average the collection is done twice a week.

In Shopping Manauara Center Condominium alone, the collection takes place in approximately 10 snack bars, a total of 400 liters of oil per week and 1,600 liters per month. The collected oil itself will cover the collection logistics when it returns to the production chain. Shopkeepers store the oil in drums, and when the capacity of the container is close to the limit, request its collection.

At the time of collection, when the full drum is replaced by an empty one, the certificate of destination is given, containing the volume, date of collection, and place of destination. The shopkeeper pays nothing for this service. After being asked to remove the full containers, the company supplies the shopkeeper with empty and clean drums for the next collection cycle.

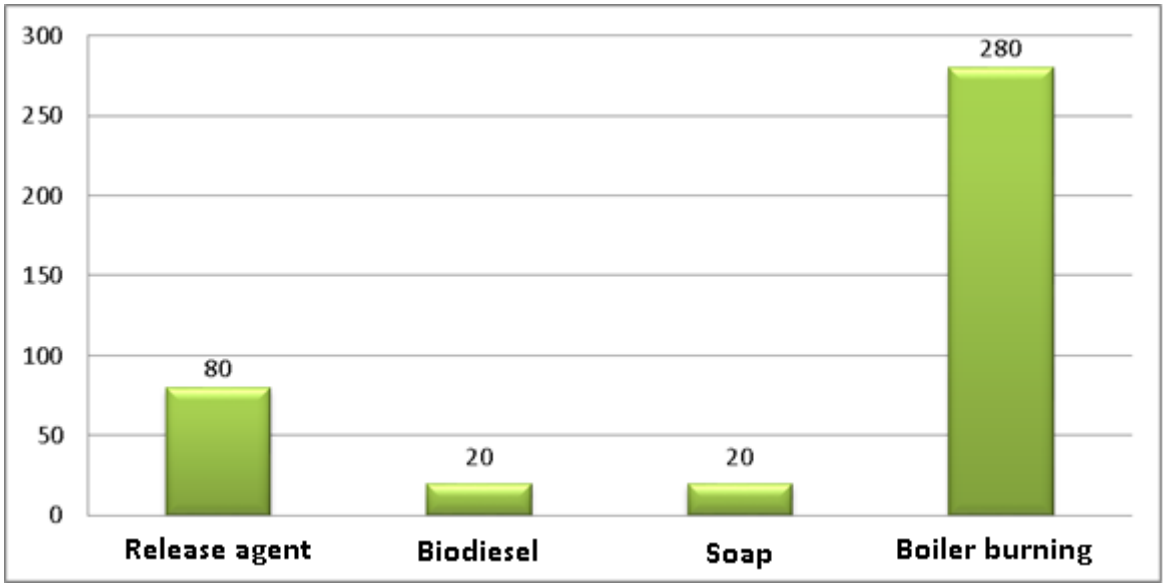
Outside the mall, a 3,000-liter vacuum tanker truck sucks up the oil contained in the drums. From that moment on, the drums are empty for the destination company, where they will be washed to clean the next replacement.

The waste collected from companies, restaurants and snack bars, arriving at the treatment site, will be filtered again to remove solid waste that may still be contained in the oil. From this stage onwards, it will proceed to decantation drums, where the separation of water from oil will occur, as it is harmful to the product. To speed up the process, the settling tanks are heated. When the oil is free of all water and solid waste, it is ready to be marketed as a product [14].

The companies that use frying oil as a product are: factories that have boilers, and replace diesel as fuel with purified oil; construction companies that use as release agents for concrete forms and soap factories.

For weekly collection of 400 liters of used frying oil after discarding the removal of water and solid waste, it is possible to generate approximately 280 liters of boiler burning oil, 80 liters of concrete mold release oil, 20 liters of oil for biodiesel manufacturing and another 20 liters for soap making (Figure 4).

Figure 4 - Products generated after purification of 400 liters treated residual oil.



Source: Own authorship, 2019.

In processing part of the purified oil into biofuel, the most used form in the capital of Amazonas, through its biodiesel plant, has a monthly production of less than 10,000 liters, being the consumption made by the company's truck fleet, with no commercialization of this fuel by part of the treatment company, only for the use of its fleet.

According to paragraph 2 of article 1 [15], prior approval by the ANP is not required for experimental or specific use that covers the caput, if monthly consumption of fuel to be tested is less than 10,000 liters.

4. Conclusion

The results obtained in the feasibility study of the frying oil used for the production of biodiesel, concrete mold release agent, soap or boiler burning, by countless other companies in the Metropolitan Region of Amazonas, showed the importance of reverse logistics. An economic and social instrument that enables the collection and the return of solid waste, in our case the used frying oil, to the industrial sector, returning to the production cycle.

Reverse logistics, besides preserving the environment, enables the reuse of this waste, turning it into a product, which will generate jobs and benefits to society and nature in general.

Finally, the results of this study demonstrated the importance of the correct disposal of oil residues. From a dangerous environmental liability, turned into a product of extreme utility for various segments of industry and construction. Since the greatest legacy provided by reverse logistics is the reduction of the polluting load on the environment.

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