

ANALYSIS OF THE CURRENT STATE OF TREATMENT OF WASTE EDIBLE OIL ON THE TERRITORY OF THE CITY OF UZICE AND THE IMPORTANCE OF RECYCLING

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Abstract: Waste edible oil is created by performing catering and tourism activities, in industry, trade and as a by-product in the edible oil industry. Spillage of waste edible oils into the sewage, negatively affects the state of the environment and directly endangers the flora and fauna of rivers. The importance of waste oil recycling is the production of biodiesel fuel. The production of biodiesel from waste oils and fats, in addition to being an alternative to existing raw materials for sustainable biodiesel production, is also a way to solve the problem of disposing of huge amounts of waste material with significant energy value. The paper analyzes the current state of treatment of waste edible oil, which is created by food preparation, based on surveys of economic entities in the territory of the City of Uzice.

Key words: waste oil, biodiesel, recycling

Introduction

Given the limited reserves of fossil fuels, which are estimated to last another 50-90 years, as well as the negative impact of these fuels on the environment and global climate change, intensive research and development of fuel production technologies began, especially before the end of the 20th century from different types of biomass, as the only source of renewable energy, which can be converted into liquid fuels. Given that the largest share in the total consumption of fossil fuels in the transport sector is related to diesel fuels, the need and importance of finding alternative diesel fuels, which would be obtained from renewable raw materials and in accordance with the principles of sustainable development, is especially emphasized. populations without compromising the needs of future generations. Biodiesel is a renewable fuel, which by its properties is a good biodegradable alternative to fossil diesel. Unlike diesel, this biofuel contains negligible amounts of corrosive and toxic compounds, such as sulfur compounds and aromatics. However, for now, biodiesel is primarily produced from edible oils of cultivated plants, which affects its high price and non-competitiveness in the market in relation to fossil diesel. Therefore, cheap lipid feedstocks, such as waste oils and animal fats, have significant potential in biodiesel production. The production of biodiesel from waste (used) oils and fats, in addition to being an alternative to existing raw materials for sustainable biodiesel production, is also a way to solve the problem of disposing of huge amounts of waste material with significant energy value. However, a common problem with cheap lipid feedstocks, such as waste oils, is the increased content of free fatty acids (SMAs), which negatively affect the efficiency of conventional biodiesel production processes.

1. Renewable energy sources and sustainable development

Sustainability of production and consumption is one of the key principles of sustainable development. Sustainable consumption is the use of services and products that meet the basic needs and requirements for a better quality of life, while minimizing the consumption of natural resources, emissions and emissions of toxic substances, so as not to endanger the environment.

The issue of energy security and stability is a key issue of the entire world economic, economic and social system. The EU's ultimate goal is a 20% increase in the use of renewable energy sources and a 20% reduction in greenhouse gas emissions.

Electricity sources are divided into: conventional and renewable. Conventional sources include large, expensive thermal power plants and nuclear power plants that are dangerous pollutants, along with large hydropower plants, which are not direct pollutants, but are also expensive and large, so they are also considered conventional sources.

Renewables do not depend on coal and oil reserves, are clean and non-consumable, and usually involve small-scale plants.

Advantages of renewable energy sources:

- o They are available in large quantities
- o Will be available in the future
- o They are free
- o They do not create pollution of air, water, soil
- o Devices of all sizes can be used
- o Central and decentralized production is possible
- o It is possible to monitor the growth of needs more easily
- o Enable sustainable development

Problems with renewable energy sources

- o In principle, they are of low intensity for conversion into useful forms of energy
- o Equipment for their use is expensive
- o They are available occasionally and with varying intensity
- o Most of them are far from populated areas
- o Cannot be used to drive cars, buses...

1. Bio - diesel

Biofuels are a comparatively clean alternative to oil as a fuel source and can be particularly useful for traffic. They have the potential to provide fuel that emits small amounts of carbon compared to conventional fossil fuels.

Biogas is a gas that arises from the decomposition of biological (organic) waste, regardless of whether the decomposition takes place at a landfill, a closed anaerobic digestion plant or a wastewater treatment plant. Bioethanol (C₂H₅OH) produced by biological fermentation of hydrocarbons obtained from plant material, in terms of fuel use, is important as an additive or substitute for gasoline.

Biodiesel is a fuel produced from agricultural crops as a renewable source, and which can completely replace fossil fuel in engines with a diesel internal combustion process. Biodiesel is obtained by technological process from vegetable oils of agricultural crops such as rapeseed, sunflower, palm and the like, as well as from waste oils and fats by the process of transesterification in the presence of catalysts. In internal combustion diesel engines, biodiesel can be used as a pure fuel or in a mixture with diesel obtained by refining crude oil. Depending on the share of bio fuel in the mixture, biodiesels are called

B100 (pure 100% biodiesel), B5 (5% biodiesel and 95% fossil diesel), B20 (20% biodiesel and 80% fossil diesel), etc. The plant for processing crude or waste vegetable oil produces the desired products, biodiesel and glycerol water or glycerol. Possible waste from the production process.

Biodiesel, an alternative fuel derived from renewable sources, is the commercial name for methyl ester (ME). Biodiesel is a standard liquid non-mineral fuel, it is completely biodegradable, non-toxic and reduces harmful gases that create a greenhouse effect.

Today, two types of fuel, alcohol and biodiesel, are widely used. Both fuels can be used alone or with the addition of conventional fuels.

Disadvantages of bio fuel:

- The impact of biofuel production and use on the environment in a broader sense, including the impact on local ecosystems, needs to be carefully considered
- Forest plantations for biofuel require huge amounts of water or the use of hazardous additives in fertilizers and pesticides
- Biofuels must, with caution, be accepted as an alternative fuel source as they are one of the few alternatives to conventional oil use.

2. Biodiesel production

Biodiesel or methyl ester is a chemical compound obtained by the so-called, by transesterification, ie chemical reaction of higher unsaturated fatty acids and alcohol in the presence of a catalyst. Biodiesel can be produced from:

- o all types of fats and oils of vegetable and animal origin such as (rapeseed, sunflower, corn),
- o from waste oil from restaurants and households from all types of higher fatty acids.

As a by-product of this chemical reaction (transesterification), trihydroxyl alcohol, glycerol, is formed, which is also a significant raw material that is widely used in industry.

The choice of basic raw material for biodiesel production depends on the specific conditions and circumstances in specific countries (climate, representation of certain agricultural crops, economic development of the country). In Europe, rapeseed oil (82.8%) and sunflower oil (12.5%) are mostly used for biodiesel production. Rapeseed oil methyl ester is usually referred to by the acronyms MERU or MER, and sunflower oil methyl ester by the acronym MESU.

Biodiesel is the first, and so far the only, alternative fuel that has passed a complete evaluation of exhaust emissions and potential health risks according to the program prescribed by the US Environmental Protection Agency (EPA).

These tests have shown that biodiesel-powered diesel engines have significantly lower smoke and particulate emissions. Emission reductions average about 40%. Lower smoke and particulate emissions are also achieved when using a mixture of conventional diesel fuel and MER. Similar results are obtained with regard to the reduction of carbon monoxide (reduction of about 40%) and hydrocarbons (reduction of about 65%). Nitric oxide emissions from diesel engines running on biodiesel are higher by about 10% on average.

It is important to point out that the emission of polycyclic aromatic hydrocarbons (PAH - Polycyclic Aromatic Hydrocarbons), highly carcinogenic fractions of particulate emissions, is lower by about 80%. As for the emission of carbon dioxide, which contributes to the greenhouse effect, the combustion of biodiesel in engines does not increase the emission of this gas compared to the emission that would occur in the natural life cycle of oilseed rape. This means that biodiesel is neutral in terms of its contribution to the greenhouse effect.

The thermal power of biodiesel is about 10% lower than the thermal power of conventional diesel fuel, which results in a reduction in engine power. However, thanks to the higher viscosity of biodiesel, the efficiency of the injection system is higher, with unchanged injection parameters.

Using biodiesel does not damage the engine. On the contrary, the good lubricating properties of this fuel contribute to lower wear of the elements of the piston-cylinder group, as well as the elements of the injection system. In recent years, there has been an insistence on reducing the sulfur and aroma content in diesel fuel, which significantly worsens the lubricating properties of the fuel. Mixing conventional diesel fuels and MER, even in a small percentage, significantly improves the lubricating properties of the fuel. In this way, the lack of lubricity of non-sulfur fuels can be fully compensated, while improving the quality of exhaust emissions.

The use of renewable energy sources in the European Union has been topical for a long time. European Directive 2003/30 / EC stipulates that by 2010 the share of biofuels in the transport industry will be 5.75%, and this quota was met in 2010 only by Germany and Denmark.

In the Republic of Serbia, sunflower oilseeds, soybeans and oilseed rape, and waste edible oils can be used as raw materials for biodiesel production. The total area under oilseeds is estimated at 668,800 ha, of which the cultivation of oilseeds for biodiesel could be done at 350,000 ha.

FIRST GENERATION BIODIESEL Biodiesel means alkyl (methyl) esters of higher fatty acids obtained from triglycerides (triacylglycerols) of edible, inedible or waste vegetable oils, animal fats or algae by the process of transesterification with alcohol (usually methanol) in the presence of catalysts or bases.): triacylglycerol + alcohol (methanol) → alkyl (methyl) esters of higher fatty acids (BIODIESEL) + glycerol.

SECOND GENERATION BIODIESEL The main difference between 1st generation biodiesel and next generation biodiesel (in the literature one can also find the term "sustainable" biodiesel is in their raw materials: while for the production of 1st generation biodiesel edible oils of cultivated plants are used, raw materials for biodiesel production the following generations are inedible lipid raw materials (inedible vegetable oils, waste oils and fats, algae oil) In terms of composition, and thus the properties of the fuel itself, there is no significant difference between biodiesels obtained from edible and inedible raw materials: methyl) esters of higher fatty acids, obtained by transesterification of triglycerides present in the composition of starting oils, characteristic of the plants themselves and their growing conditions. The quality of biodiesel, regardless of the raw material used, must comply with existing standards.

3. Analysis of the current state of collection and disposal of waste edible oil on the territory of the City of Uzice

Biodiesel production in Serbia is an opportunity for the development of agricultural rural areas, where about 45 percent of the population lives. On the other hand, it would be good for encouraging small and

medium enterprises, small oil mills and biodiesel companies, because 85% of the land in Serbia is privately owned.

Current production capacities in Serbia (annual production).

“Viktoria Oil”, Sid 75,000 t (100,000 t)

“Bioplanta”, Bačka Topola 4,000t (20,000t)

“Fam”, Kruševac 25,000 t

"BioenergoOil", Sombor 1,400t

The oil industry of Serbia hinted at the possibility of building a factory, ie a plant for the production of biodiesel with a capacity of 50,000 tons per year. The theoretical potential of biodiesel in Serbia is about 200,000 tons per year and was determined based on the analysis of arable land for growing crops from which biodiesel can be produced, while the real potential is much lower and depends on many different factors.

According to some analyzes, there are about 350,000 hectares of agricultural land in Serbia intended for crops from which biodiesel could be made. The potential in Serbia lies in more than 100,000 tons of edible used oil, of which one tenth can be used as a raw material for biodiesel. About 14,000 hectares of agricultural land are needed to produce 10,000 tons of biodiesel. For example, if 200,000 hectares were planted with oilseed rape, with an average yield of 2.3 tons per hectare, in the next ten years, about 150,000 tons of biodiesel could be obtained.

Oilseeds are currently grown in Serbia on an area of 337,900 ha, of which 93% or 314.2 thousand hectares in Vojvodina, while the share of oilseeds in agricultural production in central Serbia is about 1%.

The paper analyzes the current state of collection and disposal of waste edible oil, which is created by food preparation, based on surveys of economic entities in the City of Uzice.

A survey of 45 business entities (restaurants, hotels, fast food) was conducted on the territory of the city of Uzice. The aim of the survey is to preserve and protect the environment, record the amount of waste oil in the city of Uzice and consider the possibility of recycling edible waste oil in the Regional Center for Waste Management JKP Duboko.

Figure 1. Survey on the quantities and manner of disposal of waste edible oil

<p>In order to preserve the environment, we implement:</p> <p>SURVEY</p> <p>on the quantities and manner of disposal of waste edible oil</p>
<p>Name of business entity: _____</p> <p>Activity of the economic entity: _____</p> <p>Business entity address: _____</p> <p>Date of the survey: _____</p>
<p>Questions:</p> <p>1. Quantities of waste edible oil generated on a monthly basis:</p>

2. How do you dispose of waste edible oil after use?

3. Do you hand over the waste oil to an authorized operator and to whom?

4. Are you interested in collecting waste oil?

YESNO

5. Are you interested in JKP "Duboko" taking over and disposing of waste edible oil free of charge?

YESNO

6. If you would collect waste edible oil for JKP "Duboko", what equipment do you need?

Warning: _____

Conclusion

Waste oils are those that come from food preparation and those that occur as a by-product in the edible oil industry. The production of biodiesel from waste oils and fats, in addition to being an alternative to existing raw materials for sustainable biodiesel production, is also a way to solve the problem of disposing of huge amounts of waste material with significant energy value, especially if household waste oils are taken into account. , which usually end up improperly delayed with regard to the unregulated collection of these waste oils, negatively affecting the state of the environment. About 40-50% of the edible oil used for food preparation is consumed in restaurants and industry, and the rest in households, of which 50% is absorbed into food and the rest is waste. If oil for biodiesel production were collected exclusively from restaurants, given the more certain possibility of introducing systematic collection of this waste, the potential amount of such raw material is 20-25% of the total amount of oil used for food preparation.

Any restaurant that prepares more than 20 meals a day must separate the waste edible oil and hand it over to the operators. Although it is a legal provision, many catering facilities do not respect the adopted rules, so that the oil often ends up in the sewer. We have received permits from the Ministry of Environmental Protection and the city Secretariat for Environmental Protection to collect and transport these waste edible oils, ie we have permits for the entire cycle of waste treatment. That is why we need the support of the city inspection, which would control the facilities.

According to the survey conducted on the territory of the city of Uzice, the amount of 710 l of waste edible oil was recorded in 19 business entities. 10 respondents agree to cooperate with JKP Duboko, and that is the amount of 250 l, while 9 of them (restaurants that have larger quantities) do not want cooperation because they already hand it over to an authorized operator, or put it in containers - 460 l.

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