

THE METHOD OF BIOFUEL MIXTURES PRODUCTION AND THE DETERMINATION OF THE PRODUCTION PLACE IN LOGISTIC CHAIN OF THE CONSUMPTION

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Summary. In this article is represented the method of biofuel mixtures production with using chemically pure hydrocarbon components. The method of choice of possible biofuel production place in logistic chain is also represented in it.

Key words: biofuel, component, consumption, motor car transport, production place.

INTRODUCTION

The problem of alternative environmentally pure motor-car fuel production is very important in all the world and the developed countries pay great attention to the solving of this problem.

Nowadays the motor car transport is the mass source of an environmental pollution in most of countries, its part of pollution is from 50% up to 60% in total amount of harmful dumps, and in big cities this amount rises more than 80% - 90% [1].

Nowadays there is no industrial production of biofuel in Ukraine, there is only its handicraft production. The building of specialized plants for producing Ukrainian biofuel is planned by the government. According to the Cabinet of Ministers order from 28.12. №576-r «About the affirming of the conception of governmental program of the biofuel production development until the year 2020» the production of more than 520 thousand tonnes of biofuel every year has been planned in Ukraine since the year 2010.

The main aim of that document is «increasing of Ukrainian eco-power safety level and decreasing of national economy depending on the import of oil-products, providing the biofuel to agrarian sector of economy and transport », but the ways of its production and economically profitable field of its production are not marked.

RESEARCH OBJECT

The analysis of the biofuel using, as an alternative fuel for combustion engines, and the determination of efficiency in its using is considered in [1]. This question becomes more actual because of prompt rise in prices for power resources.

The problem of affordable fuel is acute throughout the world. Its cost is determined not only by the expenses on raw materials, but also by the expenses on its transportation to the place of consumption. The raw material potential, production and using of fuel, mainly alternative environmentally clean motor-car fuel, should take place as close as possible to each other.

Along with the introduction of secondary petroleum refining processes (alkylation, isomerization, etc.) in order to improve the quality of motor fuels, considerable attention is paid to the development of various additives and supplements, giving the motor fuels such properties, including environmental, which in principle can be achieved by technological processes of production fuels.

At the same time such factors, as the necessity of oil resources economy and the improvement of operating, and especially ecological properties of fuels, stipulate the searches of new effective methods of production and using the substitutes of oil fuels for cars.

The research purpose is a choice of method for the production of the motor-car fuel mixtures and the analysis of a possible place of biofuel production in the logistic chain of consumption.

The formulation of the task is to develop a new method of ecologically clean motor-car fuel mixtures production with using chemically clean compound hydrocarbon components and to determine the economically effective place of biofuel production in logistic chain.

RESULTS OF EXPERIMENTAL RESEARCH

The logical continuation of trends in production of complex fuels is getting the fuel of plant origin (biofuel) with necessary physical and chemical properties for combustion in an engine by selection and genetic changes of the raw material. Since the use of methanol for producing biofuel complicates measures for accident prevention and environmental protection, and its use causes raised wear of engine details, then the alternative is to use more expensive alcohol as ethanol for production biofuels [8].

The production includes processes, beginning from rape seeds processing and finishing by storing the products. The main processes during production PEE are the following: pressing, filtration, etherification, cleaning, distillation, conditioning (optionally), quality analysis of the made products. Pressing is a process of making oil from the rape seeds. It includes such sub processes: seeds purification, calibration, frying. Filtration is a process of deleting or separation of different types of admixtures from oil, which got in it during pressing. This process is of great value, because of inseparated admixture the fuel will be with unsatisfactory physical and chemical properties in the eventual result. Etherification - is a thermal process of glycerin

deleting as a result of addition ethanol and catalyst to rape oil. Purification - is a process of deleting catalyst and possible admixtures. Quality analysis of made product is a final process. It includes verification and possibility of biofuel using [2].

Basic and responsible part of biofuel production process is etherification, for which it is important to provide the necessary amount of ethane and catalyst, as well as to provide the necessary temperature at which it passes, providing the excretion of glycerin.

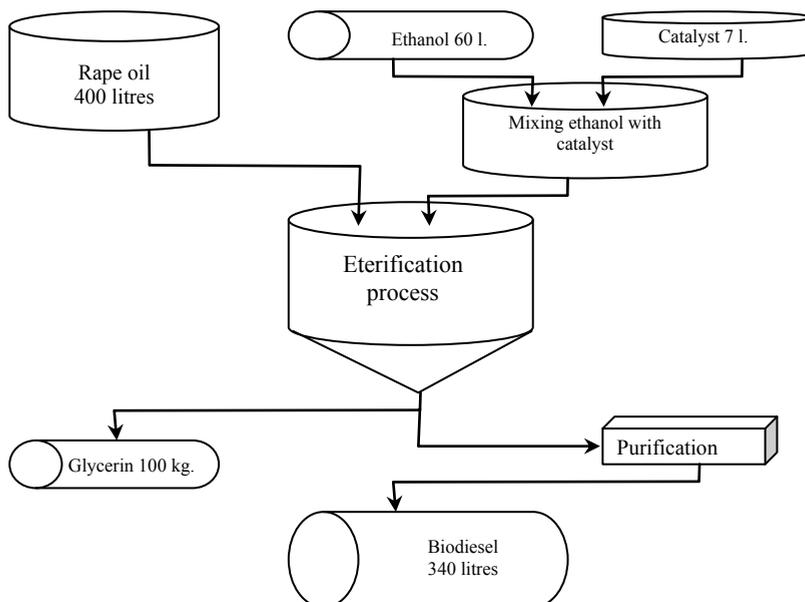


Fig.1. Elements of biodiesel production

The features of biodiesel production consist of the following task. The biofuel is made of rape oil by the schema shown on the Fig. 2.

At the estimation of basic indexes of biodiesel it is set, that the mixture of biodiesel steams with air, unlike a diesel fuel, does not create explosive mixtures. It is set that the warmth of biofuel combustion (34,3-41,7 MJ/t) is less, than diesel, and temperature of inflammation of such essential oil in 1,5 time higher than diesel fuel. Application of this type of fuel [3] practically does not provide the changing of power and torque of engine. However, there is about 5-7% of fuel expenses increase that is compensated by biofuel power reducing. The mechanical and thermal loading of engine remains almost at the same level, and the temperature of exhaust gases goes down on 3-10%.

Basic oil raw material for making biodiesel is traditionally technical rape. Although there are other kinds of agricultural products, suitable for its production, for example sunflower. Expedience of growing rape or other agricultural products as raw

material for making biofuel for engines is stipulated by the level of expenses on its production.

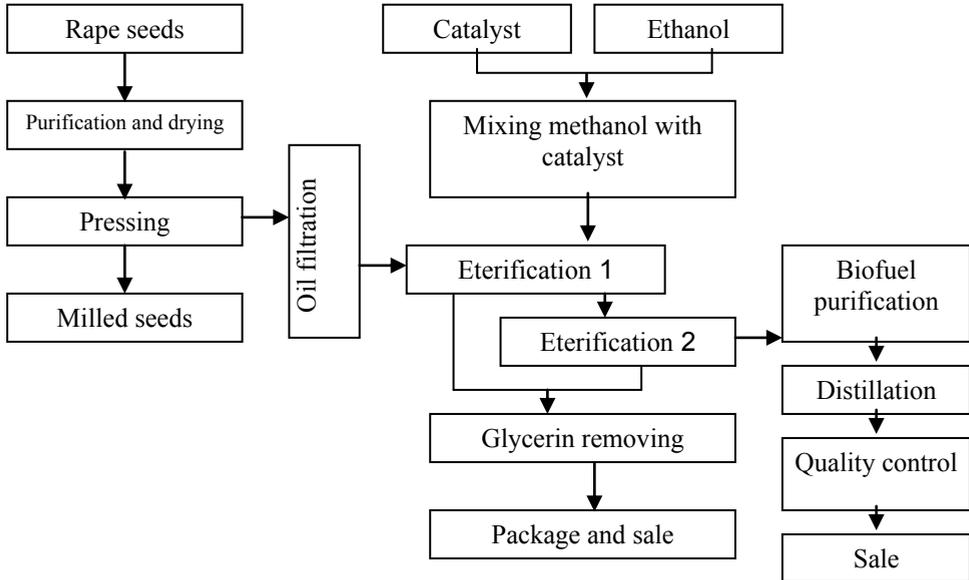


Fig.2. Full schema of biofuel production

Providing the economic efficiency of using biodiesel in Ukraine requires the complex account of all direct expenses and facilities from realization by-products during its production.

While building the plant for biofuel production in the logistic chain of consumption the building place should be chosen so, that expenses on realization of future transportations were minimum. The potential value of expenses in logistic chain “raw-transportation-production-transportation-consumption” is defined as «vial». This value takes into account the distance of the served sources (flows), and transport meaningfulness and it can be expressed in such a way:

$$\min \sum_{i=1}^n g_i \cdot l_i = V, \quad (1)$$

where: g_i - is a transport meaningfulness (for example, amount of the transported freight) of i -th source; l_i - is distance from this source to the economic-geographical centre of production.

To find the coordinates of economic-geographical centre, which serves objects (suppliers of raw material and users) with the least transport expenses, designate the sources (flows) $P_1, P_2 \dots P_n$ with known coordinates, accordingly, X_1 and $Y_1; X_2$ and $Y_2 \dots X_n$ and Y_n with known transport meaningfulness $g_1, g_2 \dots g_n$, and also unknown centre P , located between the known points $P_1, P_2 \dots P_n$ with hypothetical coordinates X and Y .

The coordinates of general economic-geographical centre let's define as:

$$X = \frac{\sum_{i=1}^n g_{pi} \cdot X_{pi} + \sum_{j=1}^m g_{cj} \cdot X_{cj}}{\sum_{i=1}^n g_{pi} + \sum_{j=1}^m g_{cj}}, \quad Y = \frac{\sum_{i=1}^n g_{pi} \cdot Y_{pi} + \sum_{j=1}^m g_{cj} \cdot Y_{cj}}{\sum_{i=1}^n g_{pi} + \sum_{j=1}^m g_{cj}}, \quad (2)$$

where: X_{pi} and Y_{pi} ; $i = 1 \dots n$; and X_{cj} and Y_{cj} ; $j = 1 \dots m$ - coordinates of conveyance and collection points, $g_{pi} \dots g_{pn}$; $g_{cj} \dots g_{cm}$ - transport meaningfulness of conveyance and collection points.

In this case collection points are agricultural enterprises, growing rape, sunflower and other oil plants. The conveyance points are consumers of biofuel, for example, filling stations or transport enterprises.

At the same time, in spite of certain advantages and seeming simplicity, for industrial production of biofuel in Ukraine it is necessary to solve great number of problems. Among them are: creation of areas for growing rape and sunflower, improving the structure of agricultural lands, creating new technologies, providing the assured markets of sale, creation state standards in the field of production and using the alternative types of energy.

CONCLUSIONS

In connection with diminishing of oil supplies it is actual to use alternative types of complex fuels for combustion engines, using of which all owes to save rare mineral fuel and substantially to reduce the content of harmful substances in exhaust gases. For attaining the value of physical and chemical properties of biofuel, which could respond to the set standards of fuels and which would allow using biofuel in combustion engines without the re-equipment of their fuel-pumping systems– it is possible, by the choice of optimum correlation of component parts and modes of biofuel production processes.

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СПОСОБ ПОЛУЧЕНИЯ БИОТОПЛИВНЫХ СМЕСЕЙ И ОПРЕДЕЛЕНИЕ МЕСТА ПОИЗВОДСТВА В ЛОГИСТИЧЕСКОЙ ЦЕПОЧКЕ ПОТРЕБЛЕНИЯ

Григорий Нечаев, Максим Лучко, Максим Слободянюк

Аннотация. Представлен способ получения биотопливных смесей с использованием химически чистых углеводородных компонентов. Представлена методика выбора возможного места производства биотоплива в логистической цепочке

Ключевые слова: биотопливо, компонент, автотранспорт, производство, логистическая цепочка