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NEEDS, OPPORTUNITIES AND CHALLENGES OF BIOFUEL PRODUCTION ON THE ENTERPRISES OF UKRAINE

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Забарна Е.М., Черепанова Н.А., Потреби, можливості і проблеми виробництва біопалива на підприємствах України

У статті визначено потребу у виробництві біопалива, обумовлена імпортною залежністю України від нафтопродуктів. Проаналізовано численні проблеми стримують переключення дизельних двигунів на «екологічне» паливо і показані можливості його виробництва на підприємствах України. Представлені оцінка такого виробництва, вигод для власників дизелів. Дана оцінка нововведення з точки зору охорони навколишнього середовища.

Ключові слова: біопаливо, потреба, проблеми виробництва та споживання, рапс, масло

Забарная Э.Н., Черепанова Н.А., Потребности, возможности и проблемы производства биотоплива на предприятиях Украины

В статье определена потребность в производстве биотоплива, обусловленная импортной зависимостью Украины от нефтепродуктов. Проанализированы многочисленные проблемы сдерживающие перевод дизельных двигателей на «экологическое» топливо и показаны возможности его производства на предприятиях Украины. Представлены оценка такого производства, выгоды для владельцев дизелей. Дана оценка новшества с точки зрения охраны окружающей среды.

Ключевые слова: биотопливо, потребность, проблемы производства и потребления, рапс, масло

Zabarba E.N., Cherepanova N.A., Needs, opportunities and challenges of biofuel production on the enterprises of Ukraine

In this article is defined the need in manufacturing of biofuel due to dependence of Ukraine on petroleum products. Analyzing a lot of problems which constrain the transfer of diesel engines on “ecological” fuel and showing opportunities of manufacturing this fuel on Ukrainian enterprises. Presentation of evaluation of this manufacturing, profit of diesel owners. Evaluation of innovation taking in consideration environmental protection.

Keywords: biofuel, demand, problems of manufacturing and consuming, colza, oil

Constant and increasing scarcity of petroleum products in Ukraine encourages to search the alternative sources of fuel and energy resources. As you know, one of the alternative sources of diesel fuel is biofuels, derived from vegetable rape oil, soy-bean and sunflower.

Deficit and the rising price of oil is concerned not only Ukraine, but all of Europe. World-famous companies in Europe "Shell" and "British Petroleum" experience different types of biofuels more than 25 years and planning to increase its share in its production volumes of up to 30 – 40% in coming years [1].

Various aspects of deficit reduction and oil biodiesel production devoted to the works: Ablava A.R., Bezuglova N.I., Vinarova A.Y., Vishnevsky P.S., Voskoboynik Y.P., V.A. Gavrilova, G.M. Geletukha, Gordienko L.I., Dubovskoy A.G., Dubrovin V.O., Kaletnik G.M., Kapustin V.M., Karpov S.A., Kirilenko I.G., N.G. Konkova, Kravets B.M., Kushnir I.V., Kuts T.V., Melnychuk M.D., Mitchenkov O.O., Shpak A.P., O.M. Špichak etc. The main content of these works of scientists devoted to prospects and biofuel technology. Opportunities and challenges of biofuel production is extremely insufficient attention has been paid. Therefore, it should be recognized that what determines the relevance of the theme of this article.

Analysis of recent research and publications

First fuel tested at the end of the XIX century in compression Rudolf Diesel engines were vegetable oils. Until the end of the 50s of the twentieth century, with varying success attempted a partial or complete substitution of diesel oil. In 1990, Germany has developed a technology for using rape oil for fuel for diesel engines, as when burned practically not allocated carcinogens. In 1991 Olmule (Austria) was built the world's first plant for the production of environmentally clean fuel [1].

Currently, biofuels produced from rape and sunflower – in Europe, soy – in the U.S., canola (rape) – in Canada, Indonesia – from palm oil, the Philippines – from coconuts, mustard, jatropha, sorghum – in India, lard and fish oil – in Vietnam, from castor oil – in Brazil [2]. Promising raw material are also considered oleaginous algae, giant elephant grass, chicken and frying fat, vegetables and fruit cake, cutting cheese, etc.

In the world production of vegetable oil. palm oil belongs to the championship, its output is 31%, soy – 29%, rapeseed – 14%, sunflower – 9%, other – 17% [3]. The greatest potential for increasing the production of palm oil has Indonesia, Malaysia, Southeast Asia, rapeseed (canola) – Canada, Southeast Asia, sunflower – Argentina, Russia, Ukraine. Since these countries have the greatest potential for the production of raw materials for

biodiesel, we can assume that in these countries there is also a great opportunity to manufacture biofuels.

One of the best sources of biodiesel worldwide recognized rape. The decision scientists recommend humanity as an energy alternative canola is also influenced by the fact that it is very crop yields. Hectare of rapeseed yields up to 700-1000kg of oil compared to 400 kg – 500 kg and soybean – sunflower. (Table 1)

Table 1. Average yield of major oilseeds in the world, with 1 hectare per year.

Culture productivity	oil palm	Rape	Sunflower	corn	soybean
kg of oil per 1 hectare per year	3200	740	541	2330	427
biofuel yield 1 hectare, l.	4700	1800	865	3500	750
Cost of biofuel, \$ / l	0,37	0,58	0,81	0,92	0,53

Manufacturing process of rapeseed fuel looks like this: first oil was purified, and then it was added methanol and the catalyst (alkali). The result is a mixture which is allowed to settle. Light upper and product fractions are rapeseed methyl ester, or biodiesel.

Technical and economic characteristics of rape, despite the fierce resistance of gasoline producers are gaining more and more countries. For instance, state biodiesel program already adopted in the United States, France, Australia, Brazil and some other countries. And the European Union has a law according to which the share of biofuels in fossil fuel must be at least 2.75%. In the world of rape wedge over the last few years has increased by 2 times and today is already 22-24 million hectares. Two-thirds of its crops are concentrated in China, India, Canada. Rapidly reviving rape production on the European continent: the crops have already reached 4 million hectares, and the average yield – 24-26 c / ha [2].

Ukraine is not far behind the world's progress, where in 2011 the sown area of rape amounted to 1 million hectares and has raised 1.8 million tons of rapeseed. If fate that in 1990 were collected 130 tonnes of rape, the crop of 2011 increased compared with 1990, 13.8 times [4].

Rape is grown without fertilizers, unpretentious, does not drain, and enriches the soil, "cures" it from rot. This is the best precursor for winter. According to the observations of agronomists yield wheat grown after rape increased by 15-20%, and the gluten content – 2-3% [5].

The best conditions for growing winter rape are Lviv, Ivano-Frankivsk, Ternopil, Khmelnytsky, Vinnitsa, Kiev, Rivne and Volyn region; spring – Kirovohrad, Kyiv, Cherkasy, Odesa, Kherson, Poltava, Chernihiv, Sumy, Kharkiv regions and Crimea.

In the EU countries biodiesel provide substantial state support. So in Germany, biofuels are not subject to mineral and environmental taxes, is a system of subsidies for rapeseed cultivation. In France, the tax credit is 0.35 euro / liter of biodiesel. In Spain, motorists using biofuels, intracity allowed free parking. In Europe as a whole 1 liter of biodiesel 0.10-0.15 euros cheaper than diesel [4]. Note that the cost of biodiesel depends on several factors: the yield of rapeseed, efficiency and straw meal, the cost of chemical ingredients (methanol and alkali), glycerin refining depth of water, process quality biofuel.

The purpose of this article is to identify the needs, opportunities and challenges of biofuel production in Ukraine.

The main material

It should be noted that the production of rapeseed is interesting not only to biofuel producers, but also to farmers, as the first matures rape of oilseeds, has a 100% liquidity and creates favorable market prices. Additionally, rapeseed improves and enriches the structure and condition of the soil. Therefore, public agriculture authorities should support those manufacturers who choose to work with rape, due to the use of economic incentives for high-quality seed material domestic and foreign selection, soft loans for the purchase of special cleaning equipment, plant protection products and fertilizers. Should be established the crop insurance.

Rape processors should be placed on an equal conditions with rape exporters by imposing a tax on exports of rapeseed. When Ukraine's accession to the World Trade Organization (WTO) in 2008, has not been ascertained customs duties (restrictions) on the export of rape, so this rule WTO Ukraine can not revise unilaterally. However, state tax system is in the hands of the Parliament of Ukraine and the Government and can be changed, as this country needs, that is, the export of rapeseed can be a tax. It is

clear that the processing of rapeseed in Ukraine allows you to keep in Ukraine and salary income, and rapeseed exports deprives us of these revenues.

According to the "Development Program of biodiesel production for the period up to 2010" [6]. Ukraine should produce and consume currently more than 520 tonnes of biodiesel, which requires the provision of gross yield of rapeseed about 1,7-1,8 million tons. When rapeseed yields an average of 20 t/ha must sow 0.85-0.9 million hectares of arable land, which is about 3% of the total area (33.8 million hectares) of arable land in Ukraine. Replacement parts diesel fuel, which currently consumes the economy of Ukraine (about 6 million tons per year), the ratio of 30% biodiesel and 70% petroleum diesel, require annually produce more than 2 million tons biofuels.

Thus, the annual demand for biodiesel is currently 2 million tons. Existing capacity for biodiesel production does not exceed 0.5 million tons, ie facilities for the production of biofuels is not enough.

We analyze the raw material for biofuel production in Ukraine. Judging by the State Statistics Committee of Ukraine, in 2011, the country harvested

8.67 million tons sunflower seeds from which produced 3.18 million tons oils (Table 2). It is known that food and technical objectives in Ukraine consumes about 500 tonnes oil per year. Thus, the quantity of 2.68 million tonnes ($3.18 - 0.5 = 2.68$ million tons) can direct the manufacture of biofuels. 4.2 million liters biofuels can be obtained from this amount of oil.

In addition, in 2011, Ukraine has been collected 1,437 million tons rapeseed, from which can be obtained as 0.48 million liters biofuels. From 2,264 million tons soybean collected in Ukraine in 2011 could be obtained 0,755 million liters biofuels. The total value of biofuels, which can be obtained from the Ukrainian raw materials, will be: $4.2+0.48+0.755=5.435$ million liters. Biodiesel excess (more than 3.4 million liters) can be profitably sold to foreign buyers.

Today, unfortunately, about 90% of rapeseed and soy is not processed in Ukraine, and as a raw material for biodiesel goes to Europe and Turkey.

Table 2. The volume of production of vegetable oils in Ukraine, thousand tons

c	1990	1995	2000	2001	2002	2003	2004	2005	2006	2010	2011
soy					16	18	44	46	63	20,2	21,6
rape			19	23	13	6	24	49	64	32,4	33,7
sunflower	1070	686	973	935	980	1203	1289	1353	1650	2990	3177

In the EU biofuel market is formed with the direct participation of the European Parliament. Thus, the Directive of the European Parliament and of the Council of 8 June 2003 on the use of biological energy sources provides to bring the share of biofuels in 2020 to 20% of the total consumption of petroleum products. Since 2009, each Member State is required to produce and consume biodiesel [4].

In this connection, there is provided various kinds of stimulation of the production and use of biofuel. For example, in Germany, producers and distributors of biodiesel do not levy environmental tax, and taxes payable when buying raw materials production (but high taxes on oil refineries thence pay in full). Here the fact of using rape for industrial purposes is no longer surprising. Price for rape collected from public fields, 5-10 cents lower than at grocery rape.

Most manufacturers produce in Germany officially approved models of cars and trucks with biovehicle in connection with the growth of its popularity among consumers. More than 2.5 million registered vehicles using biofuels. In Germany, together with Austria to refuel vehicles created more than 1,700 filling stations which sell 2.1 million tons of biofuel per year, the price of which is equal to 0.75 euros per liter, as opposed to 0.90 euros per liter [7].

France produces about 600 tons biofuel per year and ranks second in the EU after Germany for the production of biofuels. Biofuels used in France 63% of cars and trucks. Petrol in France is in surplus and diesel fuel is scarce. The solution is biofuels. Proportion of rapeseed oil in admixture with fuel oil is already 30%.

Swedish manufacturer rape Svensk Raps set ratio of 2-3% of the total number of biofuel f. Average performance in the year of the need for production is 70 tons up to 100 tonnes biofuels.

In the Czech Republic, for example, setting minimum standards for levels of dietary supplements in the fuel, the production of which is subject to a preferential tax (EUR 90 per 1000 liters against EUR 306 per 1000 liters at full tax rate); considered preferential fuel containing at least 31% of esters of vegetable origin. The country has 22 processing plant rapeseed for biofuels [7].

"Evrokrestyane" for each hectare of land sown rapeseed receive from the state subsidy of EUR 0,350. As a result of these preferences the same biodiesel at the pump the same in Germany stands at 15% cheaper than diesel oil [3].

The production of biofuels has developed worldwide rapidly. For example, Australia has a

project on the use of new fuel in May 2003. Domestic producers and importers of biofuels will be provided a subsidy of 38.14 cents / liter.

In the U.S., a mixture of 20% biofuel with 80% fuel oil (fuel B-20) has been widely used in the 15 states that have received legal permission to use it. In North Dakota and Minnesota all diesel fuel must contain 2% biofuels. In Washington State Office of public transport now uses biofuel B-20, and in the near future plans to use fuel B-40 [4].

Many countries produce biofuels and actively used. First steps in this direction makes and Ukraine. In accordance with the Law of Ukraine "On alternative types of liquid and gaseous fuels" from January 14, 2000 № 1391-XIV, the Presidential Decree "On measures to promote the production of fuels from renewable raw materials" from September 26, 2003, "Concept of development programs biodiesel production for the period up to 2010", approved by the Cabinet of Ministers of Ukraine dated 28 December 2005 № 576, in December 2006, the Cabinet of Ministers adopted the "Program of development of biodiesel production until 2010", which provides for the construction of at least 20 companies with a total capacity of at least 623 tonnes per year [8].

The program is implemented in commissioning Saratsky district of Odessa region small business biodiesel capacity of 7 tons in January 2007. A year after the start of the enterprise, which is the raw material for rapeseed biodiesel production increased to 15 tonnes per year. Completed construction of a biodiesel fuel for farms in the Kherson region. Capacity of this enterprise, processing rapeseed, soybean, sunflower, about 10 tons fuel per year. Built plant for the production of biodiesel capacity of 50 tons per day in the Dnipropetrovsk region. Biodiesel plant capacity of 58 thousand tons per year built now, "Linares" in Zhytomyr region. Three plants for biodiesel production capacity of 20 thousand tons per year operates in Vinnitsa region.

The temp of "greening" cars, tractors, marine diesel engines and diesel locomotives constrained set of unsolved problems: impaired production of high quality biofuels, how, where and who will undertake renovations engine fuel systems, how much it will cost, what are the incentives to move to the new fuel, which benefit from the use of biofuels will have owners of cars, tractors and other transport modes; affect innovation as on environmental protection, how many need arable land for the cultivation of raw materials for the production of biofuels, what should be the power for its production today and in the future who will invest new direction economy. Long-term budget deficit leaves no hope for state funding of the case.

For the promotion of biofuel production and protect their interests 30 Ukrainian producers of bioenergy feedstock, biofuels and processing equipment have formed an association "UkrBioEnerg". Association suggests contribute to the creation of the legislative and regulatory framework for the development of the biofuels

market, investment in this sector, the implementation of the commissioning of facilities for the production of biofuels. The Association considers biofuels promising direction of development of the economy of the country and will actively promote the establishment of new businesses and expansion of existing facilities.

Serious constraint to the production of biofuels is the lack of equipment suitable for the production of biofuels such that would meet European standards. Manufacturers of this equipment in Russia and Ukraine are units. In Ukraine equipment for the production of biofuels, satisfying European standards, manufactures SPE "Trend" in Kiev and "Biodiesel-Dnepr" in Dnepropetrovsk. The main volume of these companies purchase equipment: Germany, Spain, Estonia and other countries. Ukrainian investors have begun to show interest in this equipment for the last 2-3 years.

High-performance and efficient complete equipment for biodiesel production company has already delivered "Desmet Ballestra" in Russia for 55 plants. Another potential Russian partner for Ukraine could be the company "D1", supplying modular plants for the production of biodiesel, which guarantees assistance in the sale of goods.

Optimistic forecasts of experts are convinced that 1 liter of biodiesel would cost in Ukraine, about 6.5 UAH, in contrast to the current price of diesel is 10.5 c. 1 liter.

The advantages of biofuels based on rapeseed oil are renewable resources, limit emissions of carbon dioxide and sulfur, cetane number greater than that of petroleum-based fuels and therefore reduce engine noise. An important difference from the oil biodiesel is its biodegradability. When released into water or soil biodiesel undergoes almost complete biodegradation less than a month.

Transportation and storage conditions of biodiesel are the same as for diesel fuel. Biodiesel has a higher flash point than the conventional diesel engine, which means less risk of explosion.

Existing service stations without any modifications apply to work with biodiesel. Thus, the existing fleet of vehicles and infrastructure can be quickly converted to use fuel with the addition of biodiesel.

We should objectively say about the shortcomings of biofuels. It is worse in terms of quality, increases fuel consumption by about 10%, it is necessary to alter the engine nozzle; accelerated metal corrosion and aging of rubber, engine output is reduced by about 7% biofuels require heating at low temperatures increases coking nozzles, pistons, piston rings, require more frequent replacement of oil in the crankcase.

Conclusions

Imminent exhaustion of oil reserves in the world, Ukraine's dependence on imported oil by about 80% encourages conduct the search for alternative energy resources. One of these resources is a biological fuels derived from renewable plants: rapeseed, soybean, sunflower and other oilseeds.

For biofuel production in Ukraine adopted the basic regulations and the first steps in the implementation – established enterprises, and the first ton of new fuel, but there is still no state support in the development of new areas of the economy, there are no regulations that encourage the production and consumption of biofuels.

Providing vehicles country the necessary volume of biofuels constrained disadvantages for its production capacities. Lack of market in Ukraine agricultural land is a serious obstacle for investors influx of investment in the expansion of production of

biological materials (rapeseed, soybean, sunflower and other crops). In addition, Ukraine is underdeveloped agro-technology of cultivation, breeding, seed production of biological raw materials compared to the U.S. and Europe.

The best raw material for biodiesel is rapeseed.

Lack of facilities for the production of biofuels due to shortage of equipment manufacturers and the global level, the lack of scientific research and development work to create technologies and methodological support biofuel production and use, and also low level of demand for the new fuel.

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