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*Conducted analysis technology IZ-production Rusty lnыh oils.*
***Rastytelnoe oil, TECHNOLOGY, grain products.***

*The analysis of technologies is conducted from the production of vegetable butters.*
***Vegetable butter, technology, grain, products.***

UDC 620.95

## FUEL AND ENVIRONMENTAL INDICATORS OF USE biodiesel

***VV Chub, applicant***

*The results of the analysis of regulatory characteristics and environmental performance of diesel engine D-65N tractors PMZ-6 AKL using diesel fuel, biodiesel based on methyl esters of fatty acids of rapeseed oil and biodiesel use heat to vporskom fuel into the engine cylinder.*
***Environmental indicators diesel engine, diesel fuel, diesel biofuel heating fuel.***

**Problem.** Increased energy needs and the depletion of mineral fuels, encourage the search for alternatives and the increasing use of motor fuels derived from biological materials. Ukraine belongs can meet their needs from domestic oil production by 10-12% and natural gas by a third, which poses a threat to energy security.



Analysis of sales canola and wheat to buy 1 ton of diesel fuel with the profits from the sale shows that in 2000 had to grow up and realize 27.5 tons of rape or 14 tons of wheat in 2003, 4.9 tons of rape or 9 tons of wheat in 2005 - 13.8 tons of rape or 204 tons of wheat in 2011, 14.1 tons of rape or 54 tons of wheat [1], since the introduction of agricultural production technologies using renewable fuel produced from domestic raw materials is one of the areas providing not only food security, but also can greatly affect the autonomy of its own energy and can create a

competitive environment in the oil market, implemented in the agricultural sector.

**Analysis of recent research.** Compared to biodiesel fuel, which is derived from petroleum, has several advantages: does not contain sulfur; In the event of a ground for 7 days decomposed by almost 95%, while fuel oil only 16% during the same period [2].

In the research Zvonova VA Kozlov AV, AS Terenchenko [3] observed reduction of CO by 41% and 3%, SnNm 86% and 75% and increase the concentration of NOx by 21% and 10% using biodiesel from soybean and sunflower oils in vyhrekamernomu (Predkamernomu) 2h diesel engine 8.5 / 11. The authors observed an increase in specific fuel consumption by 7.2% compared with diesel fuel at a lower 13% NCV sunflower biofuels. VG Semenov [4] for diesel engines vortex chamber and direct injection marks reduction of CO respectively 12 and 10%, SnNm 35 and 10% solids by 36 and 24% carbon black and 50 to 52% and a slight increase in NOx emissions.

In studies of the diesel engine on rapeseed oil methyl ester, performed I.V.Parsadanovym [5] The decrease in 8-11% opacity and mass emissions of parts by 42%, increase fuel economy up to 10%, while the concentration of CO and NOx changed slightly.

Voytov VA Karnaukh MV Datsenko MS [6] noted that in comparison with the work of the engine MD-14 diesel fuel, the use of biodiesel is a significant reduction in emissions CO (30-40%)And observed as an increase or reduction of NOx, depending on the speed and engine load. Reported effective reduction of engine power by 12% while increasing the specific fuel consumption by 17%.

Popov DV, Linnik II[7] in the study of the engine D-243 for rapeseed methyl ester noted a significant increase in the hourly and specific fuel consumption, as well as the concentration of nitrogen oxides NOx in the exhaust gases.

Thus, analysis of the literature shows that today the impact of biodiesel on operational and environmental performance needs further study, including for tractor diesel engines, which are largely used on field work.

**The purpose of research.**Identify environmental and operating performance of the engine D-65N at work on diesel fuel oil, biodiesel and biodiesel, and efficiency of biodiesel heating vporskom to the engine cylinders to a temperature of 115 to 120 ° C.

**Results.** One of the main disadvantages of biodiesel obtained by esterification of vegetable oils, is the difference between physical and chemical properties compared with diesel fuel, in particular this applies to higher viscosity and lower NCV biodiesel. Higher viscosity leads to deterioration spraying fuel (fuel cut increases the dispersion length flare

vporsku and decreases its opening angle), which leads to poor mixing and consequently decreases the completeness of combustion and increase the intensity of fouling on the details cylinder-piston engine [8]. The lower heating value of fuel leads to poor technical performance indicators, such as increasing the hourly and specific fuel consumption [9, 10].

According to conventional theory of combustion [11, 12, 13], in diesel fuel consumed by the flow of complex processes kinetic and diffusion combustion. Spraying fuel as pulse jet inhomogeneous in terms of diesel, is a complex process that is characterized by non- stationarity, complex dynamics of torch fuel and its individual drops unequal structure of the torch along the length and cross section, the presence of fuel droplets of different diameters, which are different in the cylinder periods of time, temperature and concentration considerable heterogeneity in the area of the fuel plume [14].

When vporsku more fuel density and viscosity decreases spray angle is increased diameter drops and spray distance distribution flare, resulting in deterioration of mixing in the cylinder and, consequently, increases the delay spontaneous combustion (which for the optimization of combustion should be reduced), reduces the time and completeness of combustion in the cylinder, deteriorating economic and environmental performance of the engine.

In the application of heating fuel, a decrease in viscosity of fuel injected, consequently upgrade is vporsku (fuel spray angle increases, decreases dalnobiynist flare, reduced diameter spray droplets [15, 16], which leads to improved dispersion and completeness of combustion .

To investigate the influence of temperature heat biodiesel operational and environmental performance of diesel engine D-65N, we completed the modernization of the power of the engine according to patent [17]. Heating temperature of diesel fuel was maintained within from 115 to 120 ° C, according to prior studies [18, 19].

Studies to determine the environmental and operational performance indicators using engine D-65N tractors PMZ-6 AKL and obkatochno brake stand-CI-5543-HOSNYTY. As a result of experimental tests obtained regulatory characteristics of the engine using diesel fuelbiodiesel without heating and heating with biodiesel and obtained values of carbon monoxide (CO), hydrocarbon compounds (SnNm) and nitrogen oxides (NOx) in the corresponding modes of regulatory characteristics that were recorded with gas analyzer 325 FA 02-01.

The obtained values of the hourly fuel consumption (Fig. 1), the value of hourly CO (Fig. 2), SnNm (Fig. 3) and NOx (Fig. 4), made it possible to evaluate the work on diesel fuel examined and assess the effect of temperature on heating the process of combustion of diesel fuel.

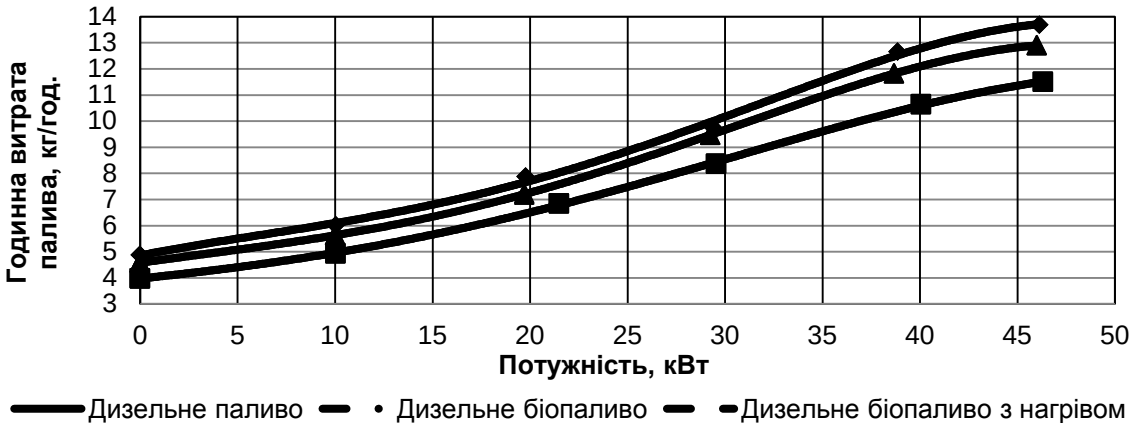


Fig. 1. Change the hourly fuel consumption of the engine load.

Analysis of the performance characteristics show that biodiesel on engine develops almost the same power as in conventional fuels, but has worse fuel consumption figures (Fig. 1). When working on a diesel engine developed capacity 46.31 kW at crankshaft rotation 1771 rev / min. hour and fuel consumption of 11.5 kg / h. (248 g / kWh.) Corresponding specifications TU 23.1.120-78. For biodiesel without heating capacity was 46.13 kW at 1764 r / min. and fuel consumption of 13.68 kg / h. (297 g / kWh.) On biodiesel with heating capacity was 45.99 kW at 1759 r / min. and fuel consumption of 12.9 kg / h. (280 g / kWh.), Which was by 19.75% and 12.9% more than the cost of fuel when running on diesel fuel. Increased costs biodiesel without heating associated with lower heat capacity and incomplete combustion of fuel. The use of biodiesel heating before vporskom a cylinder cut improves mixing and consequently improves the completeness of combustion and decreases overrun biodiesel from 3 to 10% depending on the load of the engine, compared with diesel fuel without heating. The use of heating fuel before vporskom allows you to bring the difference in fuel consumption to the difference calorific value of diesel fuel and oil-based biodiesel.

In diesel engines CO formed in local areas with a rich mixture, which dookyslyayetsya in carbon dioxide (CO2) in the enlargement process, because the cylinder is always abundant oxygen.

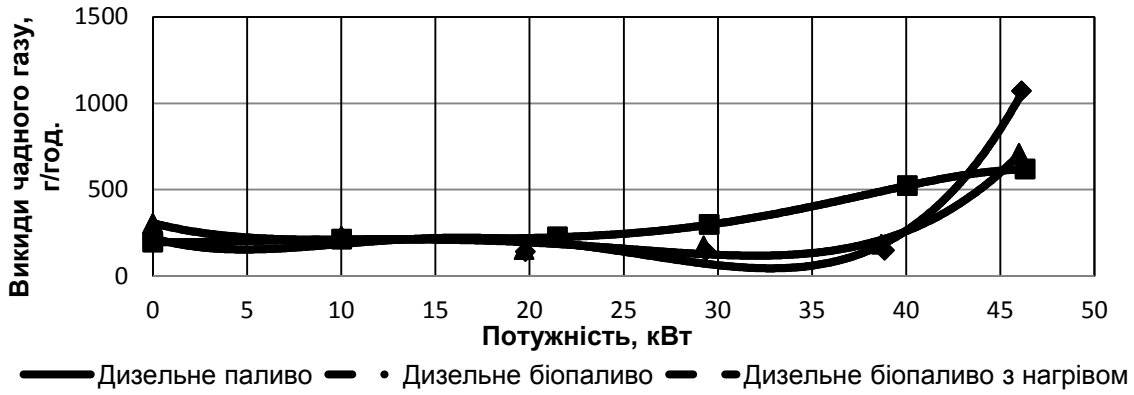


Fig. 2. Change specific emissions of carbon monoxide from engine load.

The analysis of carbon monoxide (Fig. 2) shows that when booting from idling to 20 kW number of hourly emissions of carbon dioxide, by weight, almost the same and is an average of about 200 g / h. With increasing engine load from 20 to 40 kW diesel fuel, an increase in the number of hourly emissions almost doubled, while at work on biodiesel is a slight decrease in the value of emissions and is at 39 kW - 147.5 g / h . At the maximum load of the engine is a sharp increase in hourly emissions of CO to the value of 1070 g / h. when running on biodiesel without heating and 709 g / h. when running on biodiesel with heating, in excess of 81.3% and 15.6% diesel fuel emission factors.

Reduction of specific emissions of CO using biodiesel compared to diesel fuel almost the entire load range due to the presence in the structure of the molecule biofuel free oxygen enhances the oxidation.

Hydrocarbon compounds This decomposition products of partial and incomplete oxidation of the fuel.

Analysis of performance changes specific emissions of hydrocarbon compounds from fuel (Fig. 3) shows that the nature of the change hourly emissions from idling to 40 kW, almost the same and did not differ significantly. It should be noted that the values of specific emissions for biodiesel SnNm unheated slightly lower than diesel fuel and idle when running on biodiesel with heating emissions of hydrocarbons, by weight, 50% higher than values for diesel. At maximum load should be noted a sharp increase in hydrocarbon emissions for biodiesel unheated that 2 times the value of the mass emissions when running on diesel fuel.

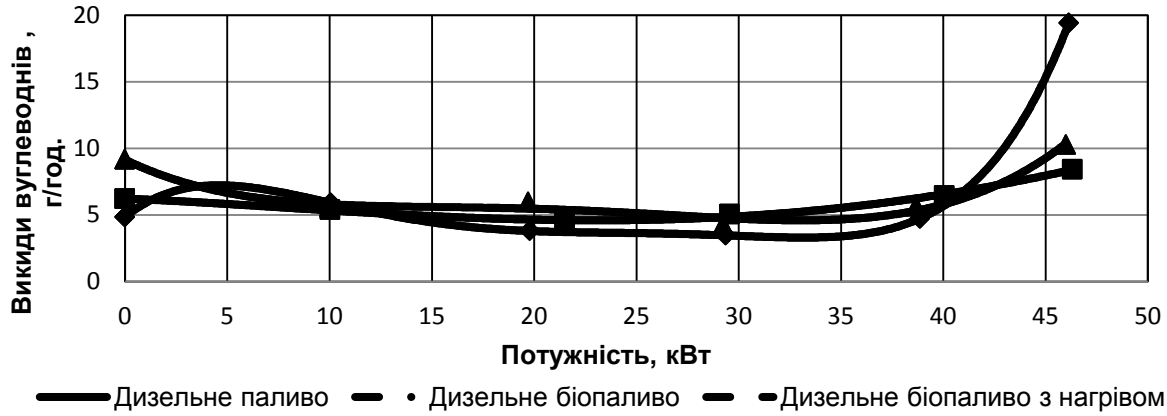


Fig. 3. Change hourly emissions of hydrocarbon compounds of engine load.

The dramatic growth of the mass emissions of harmful compounds and CO SnNm diesel engine at maximum power when running on biodiesel without heating compared with the values for diesel fuel due to the lack of quality cutting and mixing (drop of fuel when sawing larger than diesel fuel, because of the high viscosity) that backdrop maximum cyclic fuel supply leads to an increase in the number of zones with insufficient oxygen around the fuel droplets where biofuel molecules with larger molecular chain do not have time to go and complete destruction as a result of oxidation and deterioration completeness of combustion and increased emissions of carbon monoxide and hydrocarbons.

Analysis of the relationship shown in Fig. 2 and 3 also showed that the values of CO and SnNm for biodiesel production using heat almost the entire load range slightly higher than biodiesel without heating. SnNm in this mode for diesel fuel without heating by 50% and 90% respectively exceeded biodiesel with heating.

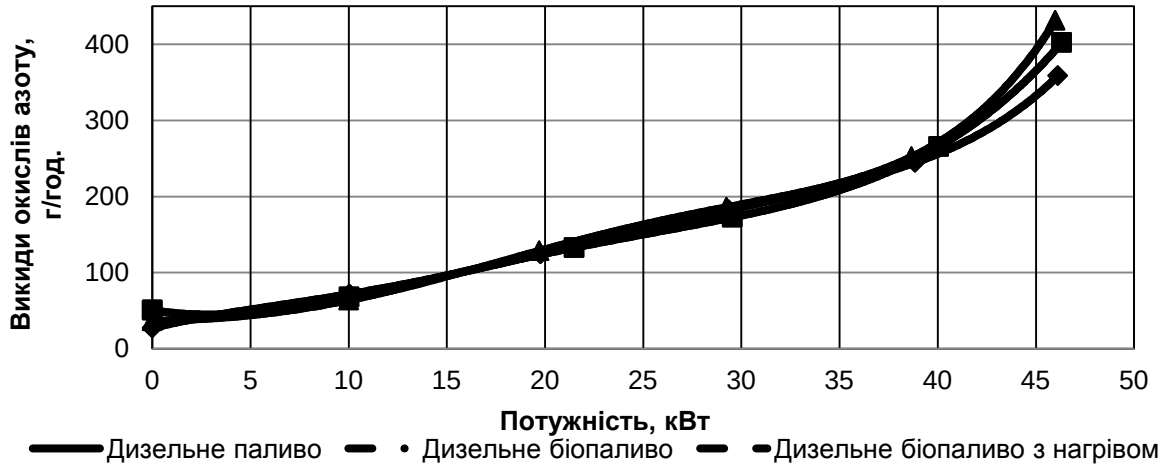


Fig. 4. Change hourly emissions of nitrogen oxides from motor load.

The formation of nitrogen oxides during combustion occurs at a temperature greater than plus 2200ºS. Temperature heterogeneity in the combustion chamber of a diesel engine caused by the heterogeneity of the structure of the fuel mixture in the cylinder. When it burned, in some areas of the combustion chamber temperature can reach values greater than plus 2200ºS, although the gas temperature in the cylinder rarely reaches values plus 1900ºS.

Analysis of the experimental dependences (Fig. 4) showed that the specific values of emissions of nitrogen oxides almost identical changes with changing load and slightly different for the studied fuels. The maximum capacity of specific NOx emissions for biodiesel with heating exceeded by 6.7% and 20.4% emission values for diesel and biofuels without heating respectively.

More important specific emissions of nitrogen oxides, for biodiesel heating associated with an increase in temperature of local areas of combustion by increasing fullness of its combustion, which in turn intensifies the formation of NOx.

## Conclusions

When using biodiesel from vegetable oil is an increase in the cost of biodiesel compared to petroleum but hourly emissions of carbon monoxide are reduced, especially when engine load greater than 20 kW. Emissions of hydrocarbon compounds and nitrogen oxides have a similar pattern of change and not significantly different for subjects fuels. The key difference from general changes emission observed at the maximum load of the engine, because of adverse conditions for mixing and combustion, but this mode is not typical, given the workload diesel engines of tractors in the performance of manufacturing operations in agricultural production.

The use of biodiesel heating before vporskom into the engine cylinder to temperatures from 115 to 120 ° C, reduces fuel consumption, while not significant increase in emissions, confirming improve dispersion, mixing and complete combustion of fuel in the application of heat.

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*Results Pryvedenы analysis rehulyatornыh performance indicators and ecologically diesel engine work D-65N UMZ-6 AKL If you use diesel fuel, diesel byotoplyva based on metylovыh эfyrov zhyrnыh acid rapeseed oil, and the heating of application of diesel fuel injection before byotoplyva cylinder in the engine.*

***Environmental indicators, Diesel engines, diesel fuel, diesel byotoplyvo, the heating fuel.***

*The results of analysis of regulatory characterization and environmental performance of diesel engine D-65N of tractor PMZ-6 AKL on diesel fuel, biodiesel on basis of fatty acid methyl esters of rapeseed oil, diesel and heating applications biofuil before the fuel injection into engine cylinder are given.*

***Environmental indicators petrol, diesel, biodiesel, heating fuel.***

UDC 621,438

## SIMULATION OF FLOW IN CHANNELS form variables spray dryers DEVICES

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***National University of Life and Environmental Sciences of Ukraine***

*The method of geometrical shape of the flow channels, providing a slow transition between intermediate channel sections, which helps reduce the unevenness of the velocity field in the channel and reduce aerodynamic losses spray dryers devices.*

***FORanal, flow, modeling, drying installations, spray devices***

**Problem.** Effectiveness spray drying, the quality of the product depends largely on the work of spray devices. The process of spraying directly affects the droplet size, distribution of size, speed and trajectory of the drops of the product in the drying chamber. The average droplet size and distribution of the size of a function type



used spray atomization conditions and product characteristics (viscosity, density, surface tension).

Sprayers dryers must work efficiently and reliably in harsh environments, which is essential in achieving economic production of high quality product. In today's spray drying plant widely used as a spray device pneumatic and mechanical injector channels with different sizes and geometric shapes. When the gas flow (liquid) through them lost energy caused mainly loose phenomena and uneven velocity field.

Boundary layer plays a major role in the dynamic and thermodynamic interaction viscous medium with the surface washed his