

## DEVELOPMENT OF GAS-DIESEL PROJECT FOR NEW MODERN TRACTORS

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**Abstract:** *The article discusses the development of a NEW HOLLAND gas tank tractor diesel engine project. The research objective is to substantiate the optimum operating conditions of a gas tank fitted tractor based on existing experience. The method for comparing diesel performance indicators is provided at work on the diesel and gas-diesel cycles. Converting equipment to gaseous fuel significantly reduces emissions of toxic substances into the environment (more than 30 percent) and saves money with lower performance losses (less than 5 percent). The value of the research carried out is that research into systems of central and dispersed supply of gaseous fuel and the application of compressed natural gas in diesel engines makes it possible to get an unbiased understanding of the system being put into service for further development. The reduction of greenhouse gas emissions, which includes carbon dioxide CO<sub>2</sub>, as well as the requirements for limiting the emission of toxic substances CO, CH, NO<sub>x</sub> in the exhaust gases of modern internal combustion engines of modern and advanced transport. Emissions and ratios of hydrogen atoms to carbon in fuel have been proved. Measures are proposed to reduce the process of harmful emissions by vehicles into the atmosphere, e.g. NEW HOLLAND engines, methods and means are listed to increase the potential share of compressed natural gas in blended fuels.*

**Keywords:** *project, gas-cylinder tractor diesel, reduction of greenhouse gas emissions, fuel type, ratio of hydrogen atoms to carbon in fuel, reduction of harmful emissions from vehicles.*

Compressed natural gas (CNG) - natural gas (methane (CH<sub>4</sub>)), compressed at a compressor station to a pressure of 200-250 bar (196-245 kg/cm<sup>2</sup>) ... CNG is used as a gas-engine fuel instead of oil products, as it has a number of advantages, the main of which are high environmental friendliness and low cost.

The price of CNG is 2.4 times lower than the price of diesel fuel (DF). Therefore, when re-equipping agricultural tractors and vehicles to work on the gas-diesel cycle, the cost of fuel in the cost of agricultural products is reduced, this currently reaches 50%.

The rated power of converted gas-diesel must be given at the level of the basic diesel engine when converting agricultural machinery to operate on the gas-diesel cycle; at the same time maintaining the nominal torque reserve coefficient is also significant.

Up to now, the gas-diesel engine working cycle has been researched and the directions for its development in economic and environmental metrics have been substantiated, making it possible to upgrade the combustion chambers and diesel fuel supply equipment in the first place.

Ensuring the required characteristic of auto tractor gas-diesel and, consequently, the nominal torque reserve factor, depends on the joint operation of the Gas-Air Mixture Supply System (GAMSS) and engine shaft speed regulator. In view of the lack of research on the functioning of LNGVS design of its components was impossible and LNGVS auto-tractor gas-diesel was created by the method of experimental development. This method requires large material costs; in addition, it does not always provide the required nominal coefficient of reserve torque.

In the present work research on maintenance of the necessary characteristic of auto tractor gas-diesel is conducted for the purpose of successful re-equipping of agricultural machinery for work on the gas-diesel cycle.

The conversion of tractors to operate on the gas-diesel cycle is connected to the installation of a group of relatively large mass gas cylinders. In this regard, the effect of the weight of gaseous cylinders on the agricultural output of agricultural tractors on the soil in this work.

Vehicles with gas-diesel fuel supply system with internal mixing are currently commonly used around the world.

The purpose of this work is to develop methods to improve the efficiency and economic safety of two fuel and one fuel gas piston internal combustion engines with electronic microprocessor control work cycle by converting diesel engines to compressed natural gas.

**The object of research** is a NEW HOLLAND tractor.

**The subject of the research** is conversion of ICE on liquefied natural gas (LNG) used as an alternative fuel to diesel.

**Methods of research.** Theoretical research methods are based on traffic theories and operational properties of transport vehicles, regression analysis, analysis and synthesis of technical systems, internal combustion engine theory and numerical calculation methods. Expert studies are carried out on special bench installations with the use of standard and private methods, with the help of specialized control and measuring equipment in accordance with regulatory documents to conduct experimental studies of traction and speed properties of tractors. Processing of experimental data results was carried out by methods of mathematical statistics with the use of PC.

Reliability and validity of the theoretical provisions of the work is confirmed by their implementation in constructions, converted ICE cars, experimental studies and the results of laboratory and road tests.

The scientific novelty of the work done is as follows:

1. The problems of gas-diesel processes development are analyzed.

2. The main theoretical aspects of gas-diesel process development with internal blending on the basis of liquefied petroleum gas are determined.

3. The methods and means of increasing the viscosity share of liquefied gas in the mixture fuel are developed.

The practical value of the work lies in justifying the advantages of using gas fuel, especially LNG (methane), as compared to diesel fuel, for internal combustion of cars. Scientific and technical principles of methane application in engines with self-ignition have been implemented when converting the system to spark ignition to reduce toxicity and improve fuel efficiency. The developed recommendations can be used in design developments at the enterprises of automotive industry and at creation of new competitive technological systems and machines.

The technical development of society leads to an increase in the number of vehicles to move people and goods. As the world fleet of vehicles grows, the amount of harmful emissions into the atmosphere increases. To curb this increase, many countries are introducing exhaust emission standards for vehicle engines, and the technical and economic level of development depends on the limits of the emission standards that a country takes. The most developed countries have stricter exhaust emission standards. In addition to CO, CN, NO<sub>x</sub> emission standards, there are emission standards CO<sub>2</sub> which directly depend on the type of fuel used and its consumption. Thus, for new passenger cars weighing no more than 1250 kg: from 2005 Below 170 g/km, from 2008 Below 140 g/km, and from 2012. Below 120 g/km, from 2008 below 140 g/km, and from 2012.

#### *Description and function of the tractor*

NEW HOLLAND T 7060 - tractor. Designed for quality mechanization of labor-intensive and complex farm equipment and supports a large number of attachments. In agriculture it is used for harrowing, plowing and cultivation, cultivation and irrigation of land. The tractor is actively involved in preparations for planting horticultural and agrarian crops. Also, the tractor can be used in municipal services, as well as for commercial structures, businessmen and entrepreneurs, i.e. in small and medium businesses and the Ministry of Emergency Situations.

*Specifications NEW HOLLAND T 7060. Fuel tank capacity - 439 l;*

*Capacity of the tank in the hydraulic system - 100 l;*

*Capacity of the tank with motor oil - 15 liters;*

*Type forever - three-point suspension of categories II and III;*

*Load capacity of the three-point implement - 7.2 tons;*

*Generator voltage - 12 c;*

*Generator current strength - 150 A;*

*Transmission - multistage, with 18 fronts and 6 rear gears;*

*Volume of wheelbase - 2884 mm;*

*The size of mines - 18, 4 R 42;*

*Engine type - diesel, six-cylinder, turbocharged and intercooled;*

Capacity of the engine - 156 kW;  
PTO capacity - 134 kW;  
Operating volume of the engine - 6.8 liters.

*Features of the device and operation*

NEW HOLLAND T 7060 is equipped with a six-cylinder diesel engine; it is equipped with auxiliary electronics for stable and trouble-free operation. The 6.7-litre power unit develops 215 h.p. at rated capacity, while the Turbo Boost function increases this to 242 hp. The maximum torque is 869 N/M.

*Therefore, the work has been implemented:*

The structural elements and designs of gas-diesel fuel supply systems are developed;

At the first stage of formation of technologies of supply of gas-diesel fuel (GDT) for diesel engines of agricultural machinery conversion into gas-diesels capable to work both on gas-diesel, and on diesel cycle is preferable.

The project of fuel supply system with regulation of initial fuel pressure in high pressure lines was developed:

A method of regulation of fuel supply to the diesel cylinder, which is that the system switches off fuel supply to the cylinders by changing the opening time of the drain valve.

Methods and means have been developed to increase the possible share of liquefied gas in the blended fuel;

Methods and means that implement them include regulation of blended fuel composition, addition of activating additives and additives to it, disconnection of cylinders and cycles at reduced loads in order to increase the share of substitution of diesel fuel with gas.

Gas-diesel fuel supply systems with combined blending have been developed;

It is expedient to convert the diesel engine into a gas-diesel with a combined mixture (external by GHG and internal by DT), which does not require costly design changes in the main engine parts and components. For this purpose, it is necessary to make constructive changes to the power supply system of the base diesel, providing the required supply of gas and ignition diesel fuel in the gas-diesel cycle.

Methods of control of structural elements and design of gas-diesel fuel supply systems are developed;

Gas supply and dosing is carried out with the help of gas-air mixture supply system (GASAS) interacting with speed regulator.

As a result, the costs of harmful emissions into the atmosphere by vehicles specifically by the NEW HOLLAND engine have been reduced.

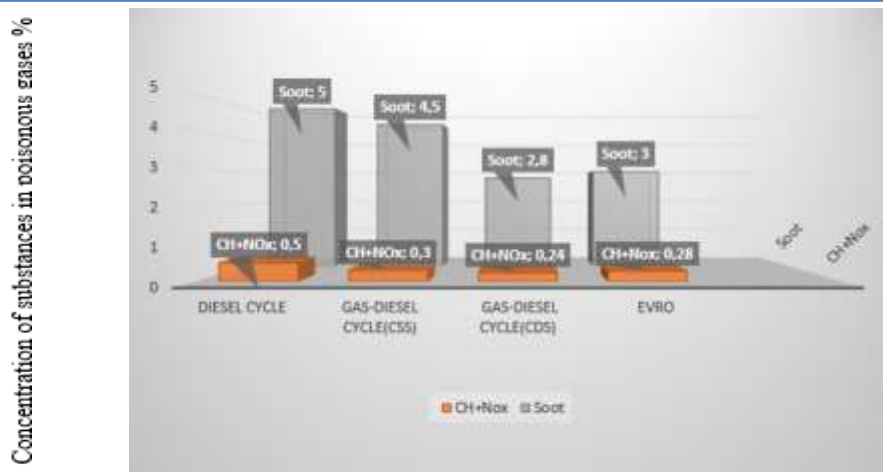


Fig-1. Graphic diagram of the results of the environmental study of the tractor NEW HOLLAND at operation on the diesel cycle, gas-diesel cycle with the central system of gaseous fuel supply (CS) and gas-diesel cycle with the distributed system of gaseous fuel supply (DS).

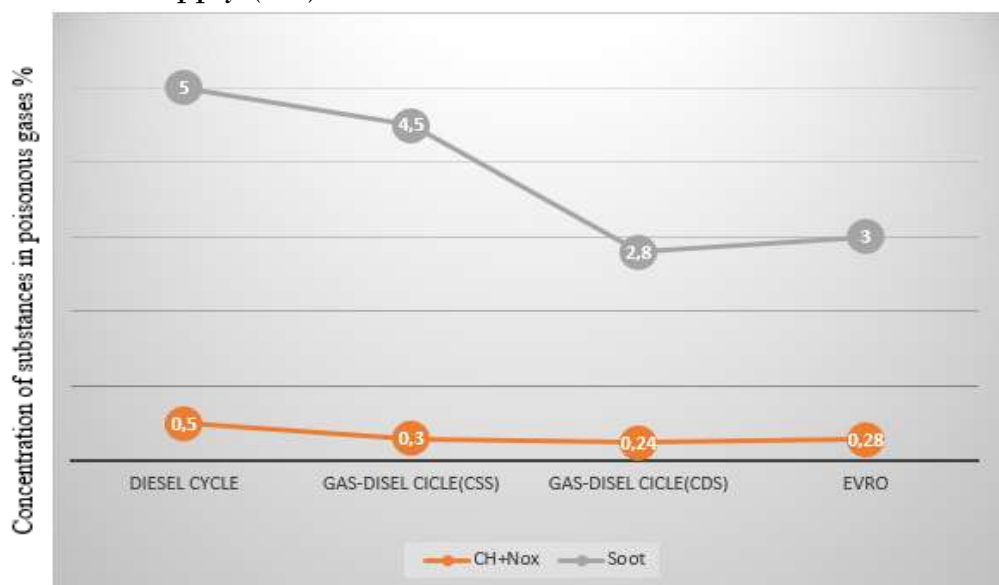


Fig-2. Schedule of the research results of NEW HOLLAND tractor at operation on the diesel cycle, gas-diesel cycle with the central system of gaseous fuel supply (CS) and gas-diesel cycle with the distributed system of gaseous fuel supply (DS).

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