Annotation

Management of the diesel engines' operations in conditions of low atmospheric density

Main objective of the study – this investigation is focused on the reduction of explosive emissions and numerical improvement of diesel performance in conditions of low atmospheric density by influencing the working process and its operations.

One of the main sources of explosive emissions into the atmosphere are diesel engines of transport equipment. The amount of the main toxic explosives of a diesel engine depends on the quality of fuel combustion, which is significantly affected by atmospheric parameters. Under conditions of low atmospheric density (higher temperature and/or lower barometric pressure), the quality of combustion deteriorates, explosive emissions (especially carbon monoxide and soot) increase, and diesel power decreases.

This study analyzes modern ideas about the formation of the main explosive emissions (carbon monoxide, soot, hydrocarbons, nitrogen oxide) in the technological and energy processes of fuel combustion. The most probable mechanisms for the formation of the main explosives at high temperature in the combustion chamber (CC) of a diesel engine form the basis of the developed mathematical model.

It is justifiable that by influencing the working process of a diesel engine through the use of oxygen-containing alcohol additives to diesel fuel, it is possible to reduce explosive emissions and improve the performance of the working process under conditions of low atmospheric density.

The mass fraction of O_2 in the alcohol molecule (up to 50% for CH_3OH) makes it possible to advance the quality of the combustion process of enriched mixtures in the combustion chamber of a diesel engine. Along with improving energy and environmental performance, this will expand the fuel and raw material base.

An experimental technique and a special setup have been created to study the influence of various factors on the process of thermochemical transformations of fuels under temperature conditions characteristic of the combustion process of fuel in a diesel engine.

Based on the results of the experimental studies of the TCP fuel, certain regularities and facts have been established for the selected types of fuels.

Bench tests of the 8ЧН12/12 diesel engine were carried out with atmospheric parameters characteristic of the real conditions of the highlands of 750 and 3340 meters above sea level.

Computational studies were carried out on a mathematical model, the data obtained give satisfactory convergence with the results of bench tests, which indicates the correctness of the chosen model and its suitability for calculating the working process and soot in the exhaust gasses (EG) of diesel engines.

Keywords: diesel engines, combustion chamber, carbon monoxide, hydrocarbon, nitrogen oxide.