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Abstract

In this dissertation has been presented how geometry of the combustion chamber in compression ignition engine with direct injection influence on the emission of the nitrogen oxides. The choice of the nitrogen oxides had been supported by its special harm to health, the environment and the difficulty in reducing at the level of the formation and elimination from exhaust gases.

The emission of the nitrogen oxides depends on many engines construction factors and fuel injection parameters. In this dissertation, plenty of attention, was put on the analysis of the describing these phenomena literature. It has permitted to eliminate its influence on conducted research beyond the geometry of combustion chamber. Testing was performed on five combustion chambers, which varied in diameter and depth of the chamber but chosen in this way to ensure the same compression ratio.

As a result of the research and simulations it has been confirmed that there is connection between the diameter of the combustion chamber and the level of nitrogen oxide emission.

Presented simulation of turbulence and its effects on the stream of fuel has allowed to prove the thesis which were based on the attached stream theory disintegration and other researchers study concerning on the effect of droplet size and droplet residence time in the combustion zone. Air turbulence and fuel injection in the cylinder and in the combustion chamber simulations were carried out in SolidWorks Flow Simulation. A mathematical movement model of fuel drops in swirling air was developed and its results cover with the simulations made in SolidWorks Flow Simulation.

All conclusion which are included in this dissertation, based on researches and simulations, confirm the thesis of work. The conclusion of this dissertation may provide a guidance in the design of toroidal combustion chambers.

Keywords: compression ignition engine, combustion chamber, toxicity, nitrogen oxides emission