

PHD THESIS SUMMARY  
"OPERATION OF THE DIESEL ENGINE WITH ELECTRONIC CONTROL"

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The doctoral thesis aims at one of the two internal combustion heat engines that are the most used in vehicles, including those equipped with national safety structures, but also the most controversial energy source on vehicles in the last period.

Chapter 1 is titled *Current stage and Diesel engine perspective*. It presents the evolution of this engine, the imposed pollution requirements, the main advantages and disadvantages. The main objectives of the doctoral thesis are presented.

Chapter 2 is entitled *Experimental tests*. This chapter presents the vehicle, engine, equipment and software used. The experimental research were conducted with a Ford Focus automotive fitted with a turbocharged Diesel engine. The results obtained are presented, the statistical analysis of the data is performed and the existence of functional dependencies is highlighted.

Chapter 3 is named *Mathematical models of engine operation*. The character of functional dependencies is determined using correlation analysis. Discrete and continuous mathematical models are deduced. It is presented the establishment of integer and fractional order of a mathematical models.

Chapter 4 is entitled *Control and stability of engine operation*. This chapter addresses the issue of stability of engine operation and the stability conditions for a fractional order system, as a generalization, the integer order system being a particular case. The main electronic control algorithms for operation of the Diesel engine are presented.

Chapter 5 is called the *Fuel injection control system*. The component elements are analyzed and the requirements imposed on the system are presented. It aims to control the fuel injection through the cycle fuel flow. Are established the static characteristic of the injector, the operating equation in dynamic regime and its response in time.

Chapter 6 is titled *Supercharger air pressure control system*. The main component parts are analyzed. It is targeted controlling the pressure of the air supply. It is established the static characteristic of the air pressure sensor, deduce the operating equation in dynamic regime and the response in time.

Chapter 7 is called the *System for controlling the quantity of recirculated gases*. The main constructive-functional benchmarks related to the EGR system and the problem of controlling the quantity of recirculated gas are analyzed. Is determined the static characteristic of the EGR valve, and are deduced the operating equation in dynamic regime and the response in time.

Chapter 8 is called *Control system for polluting substances*. In this part are presented the polluting substances accompanying the operation of a Diesel engine and their effects on human health. Were estimated the quantities of pollutants emitted by the Diesel engine used in the experiments, which confirm their classification in the Euro 4 pollution norms. The possibility of being included in the Euro 6 norms for the Diesel engine used for testing is highlighted, by equipping it with a catalytic reduction system, for which the related calculations are performed. The static characteristic of the nitrogen oxide sensor, the dynamic operating equation and its response over time are established.

Chapter 9 is entitled *Main contributions, thesis openings and dissemination of results*. The contributions made in the study of the operation of the Diesel engine are introduced. There are some openings offered by the doctoral thesis. The dissemination of the research results as well as the list of published works are presented.