

RESULTS OF PhD THESIS ABSTRACT  
"OPERATION OF GASOLINE INJECTION ENGINE"

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The PhD thesis aims to analyse the operation of a gasoline injection engine, based on experimental data, one of the most used energy sources on current vehicles, also used in national security structures.

Chapter 1 is entitled *Current study stage of the operation of gasoline injection engine*. A brief overview is realised for the main components contributing to the efficient engine operation. There are presented the main advantages of these electronically controlled engines. The main objectives of the PhD thesis are also highlighted.

Chapter 2 is entitled *Experimental Tests*. The Logan Laureate's vehicle engine and the used equipment for the tests are presented. It is specified the equipment and software with which the experimental research were carried out. There are exemplified on the graphs the main operating characteristic of the engine and the vehicle.

Chapter 3 is entitled *Time Analysis of Engine Operation*. A comparative analysis of some functional parameters of the engine is performed, which highlights its functional particularities. It presents the way of variation of the interest parameters and the trends of their evolution. First order statistical characteristics are presented.

Chapter 4 is entitled *Spectral analysis of engine operation*. There are presented the monospectral frequency analyses, the coherence analysis, the polispectral frequency analysis and the time-frequency analysis, with the particularities and limitations of each one. Spectral analysis of the data highlighted the nonlinear character of the motor operation and led to the establishment of high energy harmonic components from the experimental series.

Chapter 5 is entitled *Study of the dynamical, economical and energetic efficiency of the engine*. The dynamics, economics and energy efficiency are studied based on experimental data. There are presented some criteria for their appreciation, with the corresponding values. Two methods of the energy efficiency optimizing of the engine are presented. The optimal LQR control and the optimal PID control are also analysed.

Chapter 6 entitled *Analysis of the influence of functional factors on engine performance*. It aims at the character of the functional dependencies between parameters by supporting both simple and multiple correlation analysis. The dispersion analysis is presented, with examples based on the experimental data. The information analysis is also presented which highlights the factors that have the greatest influence on the functioning of the engine. There are presented with examples, the two types of sensitivity analysis, global and local, using the Sobol index.

Chapter 7 is entitled *Modelling and simulating the operation of a gasoline injection engine*. There are presented models and simulations with two advanced engineering programs (CAE). For this purpose, is presented the modelling and simulation process of the operation of the gasoline injection engine in the LMS AMESim programming language. Also, the operation of engine was modelled and simulated using Matlab - Simulink. Graphs were presented with some of the main functional parameters of the engine. The model used is the most complex of the ones presented, because it takes into account both the air flow from the intake manifold and the fuel injection and engine torque generation, all depending on several parameters.

Chapter 8 is entitled *Contributions, openings of the PhD thesis, dissemination of research results*. The contributions made in the study are presented. There are highlighted the openings offered by the PhD thesis. The dissemination of the research and the list of published works are presented.