Abstract of the Ph.D. Thesis

"POWERFUL DIESEL ENGINE FUNCTIONING STUDY"

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The main purpose of the Ph.D. thesis consists in elaborating and applying a theoretical and experimental study algorithm of powerful Diesel engine functioning in stationary and dynamic regime, using a professional engine testing stand.

In Chapter 1, there are highlighted some general aspects of the issues aimed in the Ph.D. subject. It is also presented a syntesis of the general present day panel regarding the theoretical and experimental Diesel engine functionig process. It is provided the main Ph.D. thesis objectives.

Chapter 2 is designated to the experimental research. There have been presented the objectives pursued along the experiencing steps, the engine technical features, engine stand, hardware items and the software used for colleting and storing the data. There have been presented the experimental results obtained in 30 sample tests in dynamic regine functioning of the Diesel engine.

Chapter 3 is intended to analysinng the stationary regime functioning. It is presented the way of experimental settling of the static characteristics, according to the standard in force. There are settled the regulator (governor) characteristics, external characteristic and engine loading characteristic. It is carried out the mathematical modelation of the static characteristics. It is highlighted the way of using the static characteristics in the dynamic study and a statistical analysis is performed afterwards.

Chapter 4 deals with the engine functioning analysis in the dynamic regime. It is performed the statistical analysis of the dynamic regimes, using the data obtained in the trials of the engine on the stand. It is drawn up the analysis in monospectral and bispectral frequency of the dynamic regimes, by using Fourier transform, the 3-rd cumulant and bi-spectrum cumulant. It is aimed the coherence analysis of the dynamic regimes. It is drawn up time-frequency analysis of the dynamic regimes, by applying Cohen class transforms and wavelet transform. It is drawn up the cyclical spectral analysis of the dynamic regimes.

Chapter 5 is designated to settle the mathematical models of Diesel engine functioning in dynamic regimes. It is highlighted the difficulty of settling the mathematical models because of highly non-linear dependencies between the functional parameters, which lead to the necessity of using artificial intelligence algorithms, too. There are settled full number, discreet and continued mathematical model orders by using identification algorithms of processes and systems based on experimental data, fuzzy lots, neural networks and neuro-fuzzy algorithms. There are deduced mathematical fractional order models by using fractals.

Chapter 6 deals with the issue of functional factors' influence over Diesel engine performances in dynamic regime. There are highlighted certain methodological aspects. It is applied the correlation analysis in order to find out the dependency between the variables. It is carried-out the sensitivity analysis to point out the sensitivity of the variables which define the performances linked to the variation of the functional factors. It is used the multi-variable dispersion analysis in order to find out how it is influenced the dispersion of the variables defining the engine performances. It is carried-out the informational analysis, namely, by using the information theory, respectively by entropy and mutual information concepts, in order to ascertain how the aimed factors influence the variables corresponding to the performances and which is the interdependency between two different factors.

Chapter 7 presents the main contribution brought in the theoretical and experimental study of the powerful Diesel engine functioning. There are also stressed some study directions the research results opened by the Ph.D. thesis and there is highlighted the dissemination of the research results, as well as the list of the related published works.