

REVIEW

By Prof. PhD Eng. Emil Marinov, RU "Angel Kanchev", Ruse

Dissertation for awarding the educational and scientific degree "Doctor"

On the topic: Study of the influence of the type of fuel on the working process of a diesel engine

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**Doctoral Program: Internal Combustion Engines,
Research Area 5.1.**

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According to the submitted documents for the announcement, participation and defense of the dissertation, it can be concluded that everything has been done in accordance with the normative documents of the law and those of the Technical University of Varna. So far, no signal for plagiarism has been received from the participant. A plagiarism check was also made in AI Plagiarism Checker, where no plagiarism was found either. This gives grounds for conducting this procedure.

1. Relevance of the developed problem

The presented dissertation is 135 pages long and contains 50 figures, 11 tables and 22 mathematical dependencies. The content is divided into Introduction, 4 chapters, Conclusions, references, contributions and a list of published materials on the dissertation.

The development of the scientific work is based on an extremely important problem at the current stage of the development of automobiles powered by diesel engines. Scientific research is mainly focused on the following areas: combustion chambers and combustion process control, increasing engine efficiency, economy and improving environmental performance, noise and toxicity of exhaust gases. The last problem is related to the use of fuels, the combustion of which produces gases with a lower content of toxic components. The use of biofuels composed of esters as an additive to diesel fuel is one of the ways to create alternative fuels and opportunities to reduce toxic gases in the atmosphere.

In this direction, in-depth and multifaceted studies of different types of biofuels and the possibilities for improving the basic characteristics of diesel engines are being carried out.

2. Analysis of the literature used and study of the state of the problem

The knowledge of foreign languages has allowed the PhD student to get acquainted with a large part of the research carried out in the field of biofuels both in Bulgaria and internationally. For this purpose, a total of 84 literary sources were used, of which 52 titles were in Cyrillic and 32 in Latin.

The analysis of these scientific publications allowed the PhD student to get acquainted with the achievements made in the field of research of the working process of diesel engines when working with biofuels.

The conclusions made at the end of the first chapter allow for the correct formulation of the purpose and objectives of the study.

3. Methodology of the study

Scientific research has been carried out in two directions: theoretical and experimental.

The theoretical part is related to determining the main thermodynamic processes occurring in the engine when working with biomixtures (biodiesel) and their influence on the performance of the diesel engine. A theoretical model was created and a software product DIESEL – RK was used, with the help of which a thermodynamic and thermal calculation of the working process in the diesel engine was made. This process was developed by Prof. Razeleitsev. Based on the results obtained, the graphical dependencies are constructed for different percentages of added biofuel.

The experimental part was carried out in the laboratory of internal combustion engines of the University of Ruse. For this purpose, special equipment and equipment are completed. The experiments were carried out with a diesel engine Fiat1.9.ITD. The main indicators of the engine were measured. The results obtained are given graphically and compared with the theoretical ones. Based on the overall results obtained, the main conclusions of the study are formulated.

In the course of scientific research, the methods of analysis, generalization, etc. were used.

4. Credibility of the study

The approach and model used to study the problem give grounds for the reliability of the results obtained. Part of the experimental research has been carried out in the Research Laboratory of Internal Combustion Engines at the University of Ruse "A. Kanchev", which is well equipped and guarantees the accuracy of scientific research.

5. Contributions of the dissertation

In general, I accept the contributions formulated in the dissertation, as well as the conclusions drawn. Doctoral research is devoted to the working process of diesel

engines with an electronic fuel injection system when adding biodiesel to pure diesel fuel at different concentrations. The contributions formulated stem from the conclusions drawn.

5 applied scientific and 2 applied contributions have been formulated.

The contributions are found in the creation of mathematical models, models for calculating the work process, a database for analyzing and improving experimental equipment.

The formulated scientific contributions are the result of theoretical and experimental research.

Here I should note that the 7 main conclusions made show the influence of biofuels on the power, economic and environmental performance of diesel engines.

6. Assessment of the degree of participation of the PhD student in the development of the dissertation and contributions.

The PhD student, under the guidance of her supervisors, has actively participated in the development of the scientific work, for which she has made a great personal contribution to the results obtained. This is confirmed by the scientific publications presented. Reporting them to prestigious scientific teams, as well as their printing, speaks of in-depth knowledge of both theoretical and experimental research, as well as in their analysis and formulation of conclusions based on graphic material.

I definitely believe that the PhD student independently and under the guidance of her supervisors has developed her dissertation, and the conclusions and contributions are the personal work of Eng. Georgieva, directed by her leaders.

7. Evaluation of the publications on the dissertation.

The publications related to the dissertation, five in number, were presented through highly qualified scientific forums. One of the publications is a standalone one, and four with one co-author. One of them is published in Latin, and 4 – in Bulgarian

A reference has been submitted in accordance with the requirements of the Regulations on the Minimum Requirements for the Acquisition of the Doctor's Degree. The report shows that the requirements are met. It is accompanied by a Declaration of Reliability of the specified data.

8. Using the results of the research in scientific and social practice

The results obtained in the dissertation have a great scientific and applied contribution. They support the achievement of major social and economic benefits of biofuels research in the operation of diesel engines.

9. Implementation of the research results

The results obtained can be used in further research, as well as in practice and

the learning process.

10. Abstract

The abstract consists of 42 pages and 40 figures. In general, it fully reflects the research carried out in the dissertation. The analyses made and the results obtained allow for the quantitative assessment of the studies performed.

The abstract is prepared in accordance with the regulatory requirements. A list of scientific publications on the dissertation is presented, five in number.

11. Notes and recommendations

In my preliminary review, I made some remarks that have been taken into account. Here I will make the following recommendations:

- To comment in more detail on the choice of supplements;
- The formulated contributions should be related to the conclusions and publications made;
- Comment in more detail on how the percentage of additive and the speed of rotation of the engine are selected;
- To clarify the concepts of biodiesel fuel – what exactly is added and on what basis it is produced;
- The main conclusions should be more specific.

Regardless of the recommendations made, I believe that the author has done a very good job with structuring, writing the texts and the overall design of the dissertation.

I rightly give a positive assessment of the developed dissertation, which meets the requirements of the Law on the Protection of Persons with Disabilities.

Conclusion

On the basis of the materials on the dissertation and the results obtained by the PhD student Mag. Eng. Velichka Rosenova Georgieva, I believe that all the requirements for awarding the scientific and educational degree "Doctor" have been met and I recommend to the esteemed jury to award the doctoral and scientific degree "Doctor" in the professional field 5.1. Mechanical Engineering, PhD Program Internal Combustion Engines.

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May, 2025

/Prof. Emil Marinov/