

O P I N I O N

**by prof. PhD. Eng. Asen Tsvetanov Asenov,
University of Ruse**

of a dissertation for the acquisition of an educational and scientific degree "**Doctor**"

**Topic: "STUDY OF THE WORKING PROCESS OF A DIESEL ENGINE OPERATING
WITH THE ADDITION OF ALCOHOL"**

Author: eng. Daniel Krasimirov Kostadinov

Scientific field: 5. Technical sciences

Professional field: 5.1 Mechanical Engineering

Doctoral program: "Internal Combustion Engines".

Supervisors: Assoc. Prof. PhD. Eng. Krasimir Bogdanov and Assoc. Prof. PhD. Eng. Radostin Dimitrov.

The opinion was prepared in accordance with Order No. 274/08/05.2025 of the Rector of the Technical University of Varna.

1. Relevance of the problem developed in the dissertation

In the 21st century, active attention is paid to the emissions emitted by internal combustion engines of cars. Despite the fact that environmental standards are constantly rising, cars with diesel engines are considered one of the most serious pollutants. In this regard, measures have been taken to reduce pollution from diesel cars, by including various additives to diesel fuel or by encouraging consumers to use electric or hybrid cars. At this stage, one of the most common cars, especially for the transport of goods and passengers, are those with diesel engines, due to the serious advantages of diesel fuel over other alternatives. In this regard, the presented dissertation examines the processes and benefits of a diesel engine running on diesel fuel and mixtures with n-butanol, which is a prerequisite for reducing harmful emissions into the environment.

Taking into account the above, I believe that the topic of the dissertation is relevant and has a connection with the policy of the Republic of Bulgaria at national level and that of the European Union.

2. Contributions of the dissertation

In the dissertation, scientific, applied and applied contributions are found. Scientific contributions are not found.

Scientific and applied contributions

6 scientific and applied contributions are presented. I accept only two of them. These are contributions 1 and 4, which enrich science with new models. These are:

- A modified mathematical model for calculating workflow parameters from recorded indicator diagrams, which takes into account the change in pressure in the engine cylinder through 0.1 degrees from the rotation of the crankshaft.
- A model for calculating the parameters of the working process of a diesel engine with a high degree of reliability has been developed.

Applied contributions

The rest of the contributions I consider to be applied, which complement the existing knowledge and have application in practice related to the use of n-butanol as an additive in diesel fuel.

15. Opinions, critical remarks and recommendations to dissertations

I have the following remarks about the work:

1. In chapter 1 on page 9 it is noted "heavy duty engine", I suppose it means "engine of a heavy truck". The terminology in Bulgarian should be specified.
2. In Chapter 2, formulas 1.3, 1.4 are not numbered well and some indicators are not written with correct indices on pages 11 and 12.
3. It is noteworthy that some of the conclusions can be refined, for example, the conclusions in Chapter 3 and Chapter 4.
4. In Chapter 4, it is not clear how many percent of n-butanol additive should be added to diesel fuel in order to obtain the best results.

CONCLUSION

The educational part of the preparation of the PhD student is confirmed by the research and the design of the dissertation and the abstract. The scientific part is confirmed by an appropriate study of the literature sources on the problem, with the appropriately chosen mathematical apparatus, the software used, the presented scientific-applied and applied contributions and the publications made, which shows an increase in the professional training of the PhD student and opportunities for future

independent and team research. The results of the work on the dissertation are presented in 4 reports of scientific conferences with international participation among the scientific community.

I accept that the submitted materials comply with the Academic Staff Development Act, the Regulations for its implementation and the Procedural Rules of the Technical University of Varna. Therefore, I give a positive assessment of the work on the dissertation of Eng. **Daniel Krasimirov Kostadinov**, and propose that he be awarded the degree of Doctor in the field of higher education 5. Technical Sciences, professional field 5.1 Mechanical Engineering.

06.06.2025

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MEMBER OF THE JURY:.....

/Prof. PhD. Eng. Asen Asenov/