

REVIEW

by Assoc. Prof. PhD. Eng. Rosen Petrov Hristov, Technical University of Varna

on the dissertation work for obtaining the educational and scientific degree

"Doctor"

professional field 5.1 "Mechanical Engineering"

PhD Program: Internal Combustion Engines

Eng. Stoyan Nedelchev Stoyanov

Topic of the dissertation: "Characteristics of gas injectors for engines"

1. Relevance of the problem developed in the dissertation.

In Europe and in particular Bulgaria, the use of gas fuels in internal combustion engines in cars is very popular. The share of cars subsequently converted to work with gas fuels prevails over the original factory ones. Knowledge of the characteristics of gas injectors enables manufacturers of such equipment and service stations to use appropriate software settings to achieve better engine characteristics in terms of power, fuel consumption and environmental characteristics. I believe that in this regard the topic considered in the dissertation is significant and relevant.

2. Contributions

The aim of the dissertation to determine the actual flow characteristics of a gas injector and to investigate the main factors influencing the fuel delivery characteristics has been achieved. A qualitative analysis of the obtained results has been carried out and an answer to the set tasks has been given.

I am familiar with the doctoral student's work and fully acknowledge his personal contribution to the preparation of the scientific work. I have witnessed his growth from a person working in practice to a scientist capable of understanding the essence of the problem and conducting quality theoretical and experimental research.

The doctoral student demonstrates high-level knowledge of the topic, has used 117 literary sources, and has 4 publications, one of which is independent.

Scientific and applied contributions:

- A hydrodynamic model of a gas injector has been created, showing the nonlinear influence of the nozzle diameter on the throughput, with larger diameters observing a redistribution of pressure drops between the valve area and the nozzle orifice;

- The values of the leakage coefficient for different diameters of the throttling hole have been determined, and a tendency to decrease with increasing diameter has been established due to the changing ratio between the structural resistance and the hole;

- Time-section dependencies have been derived for different durations of the control pulse;

- The influence of various factors such as injector temperature, different coil resistance value, differential pressure and throttle orifice diameter was investigated;

- The influence of oscillatory processes on the pressure values in the fuel leakage zone has been determined and it has been established that with longer duration of the control pulse and engine crankshaft rotation frequencies, the injector opens under conditions of undamped pressure fluctuations.

Applied contributions:

- A specialized stand has been designed and built for studying the flow characteristics and dynamics of gas injectors, accompanied by operating methodologies and safety instructions;

- The developed methodology and the test bench are applicable for calibration and optimization of fuel supply systems in alternative fuel engines;

- The results obtained have potential for environmental applications through more precise control of the cycle fuel portion and reduction of toxic emissions;

- The stand and the developed methodologies can be used for training and qualification of specialists in the field of gas injection systems.

3. Critical notes

I have no significant comments on the dissertation. I can only note that the formulation of the contributions should be shorter and more general, without explaining specific results.

4. Conclusion

Considering the presented comprehensive study by Eng. Stoyan Nedelchev Stoyanov, I believe that it meets the comply with the Academic Staff Development Act, the Regulations for its implementation and the Procedural Rules of the Technical University of Varna and I give a positive assessment. I propose to award him the educational and scientific degree "Doctor" in the professional field 5.1 "Mechanical Engineering", doctoral program "Internal Combustion Engines".

27.11.2025

Prepared by:
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