

## REVIEW

### **regarding competition for the academic position of a "Professor"**

Professional field 5.5. Transport, navigation and aviation, (Ecology of transport vehicles), announced for the needs of the Department of "Transport Engineering and Technologies", Faculty of Mechanical Engineering, Technical University of Varna, announced in State Gazette No. 56/19.07.2022 with candidate

**Assoc. Prof. Eng. Zdravko Dinchev Ivanov, PhD**

**Reviewer: Prof. eng. Velizara Ivanova Pencheva, PhD**, according to Order No.: 716 of 04.10.2022 of the Rector of the Technical University of Varna, and Protocol No. 1 of the meeting of the Scientific Jury of 28.10.2022

### **1. General information and biographical data**

The only candidate in the competition is Assoc. Prof. Zdravko Dinchev Ivanov, PhD, Eng., from the Department of "Transport Engineering and Technologies" in the Technical University of Varna.

Assoc. Prof. Zdravko Dinchev Ivanov, PhD, Eng., received his Master's degree, specialization "Internal Combustion Engines" in the same department in 1983. He has experience as a constructor in the field of design, testing and improvement of internal combustion engines. He had worked at the Diesel Engine Research Institute, Dobrich, section "Dynamic Strength, Vibration and Noise of Diesel Engines".

In 1988, Assoc. Prof. Zdravko Dinchev Ivanov, PhD, Eng., began teaching at the Technical University of Varna. He obtained his PhD degree in 2004 with a defended dissertation on the topic "Investigation of noise from the working process of automotive diesel engines" in the Specialized Scientific Council "Energy Technologies and Machines" at VAK. He acquired the academic position "Associated professor" from the same scientific council in 2006. In his many years of teaching activity, he teaches disciplines related to the optimization of the construction of transport vehicles, oscillatory processes in automotive technology, vibration phenomena and noise emission, environmental characteristics of motor vehicles, computer technologies in transport technology and systems for automated design.

Assoc. Prof. Zdravko Dinchev Ivanov, PhD, Eng., has significant experience in developing new specialties, new master's and PhD programs, new study documentation, development of courses for professional qualification, experience in accreditation of professional areas in the field of higher education 5. Technical sciences, Professional field 5.1 Mechanical engineering and Professional field 5.5 Transport, navigation and aviation. He is currently the Head of the Department "Transport Engineering and Technologies". Assoc. Prof. Ivanov is a member of the Faculty Council of the Faculty of Mechanical Engineering and the Academic Council of the Technical University of Varna and the chairman of the General Assembly of the Faculty of Mechanical Engineering.

### **2. General description of the submitted materials**

The general description and characteristics of the scientific-research and scientific-applied

activities is based on the deposited materials. The materials are presented according to the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria and the Regulation for the for the Implementation of the Law of the Technical University of Varna.

A total of 47 works were submitted for participation in the competition, of which: 42 scientific publications; 3 published university textbooks and 2 study aids.

From the total of 42 scientific publications:

- 17 scientific publications in scientific journals, referenced and indexed in world famous databases, Index SCOPUS;
- 25 scientific publications in non-refereed peer-reviewed journals or in edited collective volumes.

23 scientific papers are published in English, and 19 scientific papers – in Bulgarian.

According to the groups of indicators to meet the requirements of the Law of the Development of the Academic Staff in Republic of Bulgaria for holding the academic position "Professor", the presented materials are as follows:

In group of indicators **A**. The candidate has presented a PhD thesis on the topic "Investigation of the noise from the working process of automotive diesel engines" in the specialized scientific council "Energy Technologies and Machines" at VAK, 2004 and awarded the educational and scientific degree "Doctor", scientific specialty "Internal Combustion Engines" – 50 points.

In group of **indicators B**. The candidate has presented 10 publications in scientific journals, referenced and indexed in world famous databases (Scopus and/or Web of Science) with SJR and/or IF. Publications are equivalent to a monographic work and constitute a total of **120.67 points**.

In group of **indicators Г**. The candidate has presented 7 publications in scientific journals, referenced and indexed in world famous databases (Scopus and/or Web of Science) with SJR and/or IF (Group Г.7) published in the period after holding the academic position of Associate Professor (69.98 points). These publications do not replicate the publications presented in group B. The candidate has presented 25 publications in non-refereed peer-reviewed journals or in edited collective volumes (Group Г.8) published in the period after holding the academic position of Associate Professor (233.35 points). Total number of points in group of indicators Г – 303.33 points.

In group of **indicators Д**. The applicant has declared a sufficient number of citations to meet the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria and the Regulation and the regulations for its application. No citations were found where the cited and the citing publication have at least one author in common. In the group of indicators Д a total of 270 points are presented with a required minimum of 100 points. In the submitted documents for participation in the competition, only citations from the period of the last three years in scientific journals, referenced and indexed in world famous databases (Scopus and/or Web of Science) are indicated. Citations of the candidate's publications before this period in the documents are not declared.

In group of **indicators E**. The candidate was a supervisor of one PhD student, with the topic of the dissertation "Investigation of noise emissions from automotive diesel engines". He is also currently the supervisor of three PhD students in the process of developing their dissertations. The

topic of the doctoral candidate is related to the topic of the competition and explores the problems of environmental impact of noise from the working process of internal combustion engines. There are two participations in national scientific and educational projects. He co-authored and independently published university webbooks on disciplines that are part of the university's current curricula: "Internal combustion engines", "Torsional oscillations in automotive technique" and "Lifted transport technology". University manuals have been published: "Internal Combustion Engine Laboratory Exercise Guide" and "Automotive Torsional Vibration Course Design Guide". The management of 11 scientific research projects is added to the activities under this indicator.

In group of **indicators Ж**. The candidate is a long-time teacher at the Technical University of Varna. In the last three years, he has lectured students in the educational qualification degrees "Master", "Bachelor" and "Professional Bachelor". The annual workload is significant, with a total of 1,059 hours of lectures held in the last three years. According to the rules for occupying academic positions at the Technical University of Varna, **1059 points** are collected from this indicator.

The presented materials show that the minimum national requirements for the occupation of the academic position "Professor" in the field of higher education 5. Technical sciences are fulfilled according to the provisions of the Law on the development of the academic staff in the Republic of Bulgaria, the regulations for its application, as well as the additional requirements of the Regulations for the conditions and procedures for the occupation of academic positions at Technical University of Varna.

### **3. General characteristics of the research and applied activities of the candidate.**

The main results of the research activity can be grouped in the following thematic areas:

- analysis of noise and vibration characteristics of internal combustion engines and transport equipment;
- study of the factors affecting the development of the working process of internal combustion engines. Engine operation with fuel additives, use of modified fuels treated with nanoparticles and alternative fuels with improved environmental performance;
- study of fuel supply parameters for internal combustion engines, as the main factor determining the environmental characteristics of transport equipment in operating conditions;
- reducing carbon emissions by optimizing the design of internal combustion engines and studying the dynamic processes during vehicle movement.

The presented publications, equivalent to habilitation work, are thematically related to the general title "Research on the performance of engines with alternative fuels with improved environmental characteristics". They are dedicated to researching the variety of factors influencing the environmental sustainability of vehicles, factors determining the development of the working process of internal combustion engines, as well as the use of alternative technologies to improve environmental performance.

Scientific publications are reviewed and reported in a number of national and international forums. More than the half of the presented works for participation in the competition are in English. All of them are available to both the Bulgarian and the international scientific community.

The presented results of the research and scientific-applied activity correspond to the topic

of the announced competition in the field of higher education 5. Technical sciences, Professional field 5.5. Transport, engineering and aviation, study discipline "Ecology of transport vehicles".

#### **4. Assessment of the teaching activities of the candidate.**

The indicators presented for group Ж. in the reference show significant teaching experience. The candidate carries out his teaching activity by holding lectures at the Technical University of Varna, the colleges within the structure of the Technical University of Varna, as well as at the Engineering - Pedagogical Faculty of Sliven at the Technical University of Sofia. He is the supervisor of a total of 71 graduate students and has reviewed 85 diploma theses in the Bachelor's and Master's programs. He is the chairman of the examination committees for the state examination and diploma defenses of students from the "Transportation Engineering and Technologies", "Automotive Engineering" and "Repair and Operation of Transport Technology" majors of the Technical University of Varna. He is the scientific supervisor of a total of 4 doctoral students. Of them, one defended, two with upcoming defense and one in the process of training.

Assoc. Prof. Zdravko Ivanov has participated in the scientific juries for holding the educational and scientific degree "Doctor", the scientific degree "Doctor of Sciences", for "Chief Assistant professor" and in nine juries for occupying the academic position "Assistant Professor". He was the chairman of one jury for the acquisition of the Doctorate and of two juries for the academic position of "Associate Professor".

Assoc. Prof. Zdravko Ivanov has been a long-time organizer and chairman of the organizing committee of the annual International Scientific and Technical Conference "Transport, Ecology - Sustainable Development", which has more than 25 editions and is an authoritative international forum in the field of transport.

The general teaching activity of the candidate definitely exceeds the minimum requirements of the regulations of the Technical University - Varna for holding the academic position "Professor".

#### **5. Main scientific-applied and applied contributions.**

After a detailed acquaintance with the scientific works, as well as with the submitted author reference for scientific, scientific-applied and applied contributions, I can summarize the contributions as follows:

##### ***Scientific contributions.***

- a new methodology was created for the study of the environmental and noise characteristics of the engines when operating in transient modes, [Г.7-1];
- the boundary conditions determining the degree of exhaust gas recirculation are defined, [Г.8-24];
- determining in operational conditions the phases for the start and end of fuel injection and the degree of nervousness of injection by analyzing the vibration pulses of vibration acceleration, [Г.8-8], [Г.8-15], [Г.8-21];
- a methodology was created for the pre-processing of data arrays from processes registered with analog-to-digital converters, [Г.8-2], [Г.8-3], [Г.8-4], [Г.8-5], [Г.8-21];
- a method was created for determining and analyzing the natural frequencies of the dynamic models of discrete oscillating systems, [Г.8-17], [Г.8-18].

### **Scientific and applied contributions.**

- creating and verifying a new approach, [B.4-4], [Г.7-2];
- improvement of methodologies, [B.4-2], [B.4-3], [Г.7-3], [Г.8-1], [Г.8-15], [Г.8-21];
- model development, [B.4-6], [Г.8-9], [Г.8-13], [Г.8-16], [Г.8-20], [Г.8-25];
- algorithm development, [Г.8-14], [Г.8-15];
- determination of diagnostic parameters, [Г.8-6], [Г.8-7].

### **Applied Contributions.**

Applied contributions in the field of:

- determining the noise characteristics of engines, [Г.8-12], [Г.8-19];
- experimental determination of the noise emission factor, [Г.8-22], of the torsional susceptibility of crankshafts. [Г.8-23], of torsional and strain measuring of longitudinal vibrations of crankshafts, [Г.8-10], [Г.8-11].

All the mentioned contributions are distinguished by relevance and are related to the theme of the competition - noise reduction from the working process of automotive diesel engines, improvement of the environmental characteristics of ICE, experimental and mathematical determination of kinematic and dynamic parameters of transient modes of operation of ICE.

### **6. Significance of the contributions to the science and practice**

The main scientific and scientific-applied contributions of Assoc. Prof. Zdravko Ivanov, PhD, Eng., are in the field of environmental characteristics of transport equipment, research on the factors influencing environmental indicators, analysis of the working processes of internal combustion engines, influence of fuel supply, alternative fuels and fuel additives, composition of harmful components in engine exhaust gases. In-depth research has been carried out regarding the emitted noise from vehicles, analysis of the noise characteristics of engines. The results of these studies have been published in authoritative specialized publications, and a significant part of them are in English. The results of Assoc. Prof. Zdravko Ivanov, PhD, Eng. research have aroused serious interest from specialists abroad and in Bulgaria. The list of citations is sufficient to cover the minimum national requirements for holding the academic position "Professor".

I refer to the noted contributions as follows:

- Development of new approaches, methodologies and models;
- Enrichment of existing knowledge;
- Applied contributions relate to a specific solution to a narrowly formulated task from a given scientific field with immediate practical applicability.

The contributions correspond to the theme of the competition, the citations show that they have gained notoriety and characterize them as significant for science and practice.

In the specific works, modern approaches and devices corresponding to the development of science are used. In general, the obtained results have a contribution to enrich the science, practice and training of engineering personnel in the field of transport technology.

In general, the contributions relate to the expansion of scientific knowledge, the establishment of dependencies, conclusions and recommendations in the field of internal combustion engines and their environmental performance.

I consider the contributions to be the result of the applicant's personal efforts. The scientific papers were developed in a team, but in half of them (21 papers) Assoc. Prof. Zdravko Ivanov was the first author.

The data indicated in the presented materials show that the quantitative indicators have been fulfilled and the candidate meets all the requirements for awarding the academic position "Professor" according to the Law for the Development of the Academic Staff in the Republic of Bulgaria and the Regulation for the for the Implementation of the Law of the Technical University of Varna.

### **7. Critical remarks and recommendations**

In some of the presented scientific works, the considered problems have a dissertable nature. They can represent a good basis and, together with the research done, be continued and developed as a dissertation work.

Most of the experimental studies were carried out with the help of specialized stands and methods, created and developed specifically for the purposes of the specific study. This has allowed the authors to perform registration and analysis of extremely fast processes, such as the rate of heat release, the movement of elements during fueling, study of the dynamic parameters of the vehicle, transient sequential processes, etc. These stands and methodologies should be popularized to a greater extent so that they can also be used for other specialized research in the field of transport engineering and technology.

### **8. Personal impressions and opinion of the reviewer**

I know Assoc. Prof. Zdravko Ivanov from our many years of joint work. I have attended his appearances at scientific forums, where he shows erudition and correctness. His colleagues respect his scientific achievements. The developments presented by him are very well received by the national and international scientific community. Taking into account his many years of teaching experience, his authorship and co-authorship of textbooks and teaching aids, and his participation in scientific projects, I believe that Assoc. Prof. Zdravko Ivanov is a well-established lecturer in the higher education. He is extremely conscientious and precise. His high level of language training is impressive, he is fluent in written and spoken Russian, German and English.

### **9. CONCLUSION**

From the presented materials, it can be seen that Assoc. Prof. Zdravko Ivanov has achieved the necessary scientific, scientifically applied and applied results for the requirements of the competition. Assoc. Prof. Zdravko Ivanov successfully develops theoretical and applied problems independently and in a team. The scientific and scientific-applied contributions have a theoretical character in the study of the environmental sustainability of vehicles, the development of the working process of internal combustion engines, the emitted noise from vehicles, a consequence of the noise characteristics of the engines. His teaching activities are characterized by the development of courses at a high level, corresponding to the modern development of automotive technology. The presented scientific works meet the requirements of the normative documents and fully cover the criteria laid down in them.

The examined and evaluated documents, the analysis of the research work, the teaching

activity, as well as the contributions in the peer-reviewed journals characterize the candidate as a well-established researcher and university teacher.

Based on the above, I believe that Assoc.Prof. Dr. Eng. Zdravko Dinchev Ivanov meets the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and Regulation for acquiring scientific degrees and holding academic and teaching positions at Technical University of Varna and I find it reasonable to propose to award Assoc. Prof. Dr. Eng. Zdravko Dinchev Ivanov the academic position of "Professor" in scientific field 5. Technical sciences, professional field 5.5. Transport, navigation and aviation", study discipline "Ecology of transport vehicles" at Technical University of Varna.

14.11.2022

Заличена информация  
по Регламент (ЕС)  
2016/679

Reviewer: ..

/ Prof. eng. Velizara Pencheva, PhD /