

OPINION

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on the materials presented for the competition
for the occupation of the academic position "Associate Professor" in
Area of Higher Education - 5. Technical Sciences,
Professional Field - 5.1. Mechanical Engineering,
Scientific specialty - Industrial Heat Engineering

In the competition for Associate Professor, announced in the State Gazette, issue. 58/23.07.2019 and on the website of Technical University of Gabrovo, for the requirement of the Power Engineering Department at the Faculty of Mechanical Engineering, a single candidate is Senior Lecturer Valentin Metodiev Petkov PhD - Technical University of Gabrovo.

1. An overview of the content and the results of the presented works

Out of the scientific papers on the PhD thesis, the candidate Senior Lecturer Valentin M. Petkov participates in the competition with a total of 29 works. In terms of scientific subjects, all 29 scientific works are in the field of energy efficiency (heat transfer enhancement in heat exchangers; solar collectors efficiency) and, therefore, without exception, they are in the field of the competition. The candidate has submitted an additional list of seven scientific reports which are outside the field of Industrial Heat Engineering. The scientific papers in the field of the competition are distributed as follows:

- one monograph in English, which I appreciate as a thorough and comprehensive study. The monograph is aimed at energy efficiency evaluation of apparatus using non-circular ducts and laminar fully developed flows;

- three scientific articles in international journals with Impact Factor (IF) – 2 articles in the Journal of Enhanced Heat Transfer (IF: 0.605) and 1 article in the International Journal of Thermal Sciences (IF: 3,488);

- eleven scientific papers in the International Review of Chemical Engineering - an online journal, published by University of Chemical Technology and Metallurgy – Sofia and indexed by Google Scholar;

- seven scientific articles in the Journal of the Technical University of Gabrovo, which is monitored by Web of Science;

- one scientific article in Thermal Engineering – journal which is published by Technical University - Varna;

- three scientific articles at the UNITECH International Scientific Conference organized by the Technical University of Gabrovo;

- three study aids, 1 of which is a handbook for laboratory work co-authored with Prof. V. Zimparov, 1 collection of problems in thermodynamics and 1 reference book containing thermodynamic tables.

Senior Lecturer Valentin M. Petkov, PhD is a sole author of 6 scientific works. The summary results of the applicant's activity show that Valentin M. Petkov significantly exceeds the minimum national indicators of „Г”, „Д” and „Е” groups for occupation of the academic position Associate Professor, and the minimum requirements of the Technical University of Gabrovo.

2. General characteristics of the candidate's activities

2.1. Educational activity (work with students and doctoral students)

Senior Lecturer Valentin M. Petkov PhD is a lecturer in four courses at bachelor degree and five courses at master degree. The following documents have been presented: Certificate

of English language proficiency; Certificate of complete design ability in the field of heating, ventilation, air-conditioning, refrigeration, heat and gas supply. The candidate was the scientific supervisor of 42 graduates, 17 of them in the master's degree. He has a leading role in the research team working in the field of energy efficiency, which traditionally involves a significant number of PhD students and students. The above confirms the convincing pedagogical, linguistic and professional expertise of Senior Lecturer Valentin M. Petkov in the field of competition.

2.2. Scientific and scientific-applied activity

The citation reference includes a total of 28 citations, 10 of which are in the journals with IF, 15 in foreign journals, one in proceeding of a conference abroad, one in a PhD thesis in Spain and one in a Bulgarian edition. Indisputable evidence for the level of scientific work is the citation in journals with high IF (International Communications in Heat and Mass Transfer (IF: 4,224); Energy Conversion and Management (IF: 7,181); Int. Journal of Heat and Mass Transfer (IF: 4,346)); Int. Journal of Mechanical Science (IF: 4,134)). According to Scopus, the candidate has an h-index of 3. Over the years, Senior Lecturer Valentin M. Petkov has participated in 14 university research projects, as he was scientific advisor in the last 4 projects. The candidate has a decisive contribution to the development of the laboratory base at the established Research Laboratory "Heat Transfer Intensification". The latter provides a technical opportunity for the development of research in the Department of Power Engineering and related doctoral theses.

2.3. Implementation activity

No documents have been presented regarding the implementation of the research.

3. Contributions and their significance for the science and practice

I suggest the following classification and formulation of the major contributions in the scientific works:

3.1. Scientific contributions

I do not find any contributions in this category.

3.2. Scientific-applied contributions

A. Creating new classifications, methods, constructions, technologies, etc.

- *Optimization of single-phase, fully developed duct flows based on minimizing the entropy generated [4(I)];*
- *Determined energy characteristics of ducts with a tree structure through the constructive theory application [2.2.10, 2.2.11];*
- *Extensive criteria for evaluating the energy performance of single-phase, fully developed laminar flows in ducts with different cross section geometries [4(II), 4(III), 2.1.2, 2.2.7, 4(IV), 4(V), 2.2.4, 2.2.5];*
- *Thermo-hydrodynamic characteristics of transient flow in smooth tubes [2.2.8, 2.2.9];*
- *Thermo-hydrodynamic characteristics of single-phase flow using combined intensification [2.1.1, 3.1.6, 3.1.7, 3.2.1];*
- *Critical analysis of criteria used to evaluate the effect of using different techniques to intensify single-phase heat transfer [2.1.3, 3.1.6, 3.1.8];*
- *Developed criteria for preliminary assessment of the effect of applying techniques for intensification of heat transfer in a single-phase flow [3.2.2].*

B. Receiving and proving new facts

- *For fixed cross-sectional ducts, it has been theoretically established that, in a case with laminar flow, circular cross-section tubes generate minimal entropy at a minimum optimal area, and in a case with turbulent flow tubes with an ellipsoidal section can generate*

minimal entropy [4(I)];

- *It has been theoretically proved that at a constant wall temperature, in some cases, a rectangular, ellipsoidal, trapezoidal or hexagonal cross-section of the tubes in a tube sheaf can compete with the standard circular shape [4(II), 4(III), 2.1.2, 2.2.7];*

- *It has been theoretically proven that with constant wall heat flux density, only in some cases the trapezoidal and hexagonal configuration of the tube sheaf can compete with the circular [2.2.4, 2.2.5, 4(IV), 4(V)];*

- *Experimentally obtained coefficients of hydraulic resistance and heat transfer in the transient mode of single-phase flow in a smooth tube [2.2.8, 2.2.9];*

- *Experimentally obtained coefficients of hydraulic resistance and heat transfer in combined intensification of single-phase flow in a circular tube [2.1.1, 3.1.7, 3.2.1].*

3.3. Applied contributions

- *The effect of using heat exchange intensification techniques to increase the efficiency of solar collectors has been experimentally evaluated [3.1.3, 3.1.4, 3.1.5];*

- *An experimental apparatus for studying the intensification of heat transfer in pipes and ducts for single-phase, laminar, transient and turbulent flow has been created [3.2.3].*

4. Assessment of the candidate's personal contribution

I am convinced that Senior Lecturer Valentin M. Petkov PhD has a major contribution both to the results in the scientific works and to the modernization of the research base in the Department of Power Engineering.

5. Critical notes and recommendations

The vector analysis is a research "tool", and in this sense the formulation of the first scientific contribution must be revised.

6. Personal impressions

I have a direct impressions about the work of Senior Lecturer Valentin M. Petkov for 30 years. On this basis, I think that he is an established scientist and researcher in the field of energy efficiency.

7. Conclusion:

Given the above, I propose Senior Lecturer Valentin M. Petkov PhD to take up the academic position of "Associate Professor" in Area of Higher Education - 5. Technical Sciences, Professional Field - 5.1. Mechanical Engineering and Scientific specialty - Industrial Heat Engineering.

25.10.2019

Jury Member: /signature/
/Prof. Galya V. Duncheva DCs/