

OPINION

authored by Prof. Ilia Slavov Zhelezarov, Ph.D.

concerning materials submitted for participation in competition for awarding the academic position of “Associate Professor” in higher education area (5) Technical sciences, professional field - 5.1. Machine Engineering, scientific major “Structural mechanics, resistance of materials”

Vladimir Petrov Dunchev, Ph.D. – Chief assistant professor in Department “Applied mechanics”, Faculty of Mechanical and Precision Engineering is a candidate for participation in the competition for awarding the position of “Associate professor” announced in the State Gazette, issue 68 from 31.07.2020, and on the website of Technical University of Gabrovo (TUG) for the needs of department “Applied mechanics” which is a constituent unit of the Faculty of Mechanical and Precision Engineering of TUG.

1. Overview of content and results in the submitted works

The scientific and applied research activity of Chief assistant professor Vladimir Petrov Dunchev, Ph.D. is focused in the sphere of enhancing and predicting the fatigue strength and fatigue life of metal components through static surface plastic deformation in correlation with Surface Integrity, optimizations and new optimization procedures of static processes of surface plastic deformation, comparative analysis between diamond burnishing and deep rolling, effect of ion nitriding on fatigue performance of steel, experimental study on the roughness of low-carbon steel, medium-carbon steel and tool steel after diamond burnishing, finite element simulations of static mechanical surface treatment processes, temperature dependent constitutive models of surface layers' behavior of construction materials subjected to diamond burnishing, experimental study of the obtained roughness in pieces of aluminum alloy subjected to surface plastic deformation with toroidal roller, study of the effect of sliding velocity on Surface Integrity in diamond burnishing.

For his participation in the competition the candidate Chief assistant professor Vladimir Petrov Dunchev, Ph.D. has submitted one habilitation thesis – 10 related publications in international journals with scientific reviewing and with Impact Factor, indexed in the world renowned data bases of Web of Science in the thematic area of “Enhancement of fatigue strength of metal construction materials through static surface plastic deformation”, abstract of his doctoral thesis submitted for awarding of educational and scientific degree of Ph.D., entitled “Information and calculation system for bidding and optimal design of metal structures of bridge cranes”, 1 scientific publication with impact factor published in an edition which is referenced and indexed in world renowned data bases of scientific information, 10 scientific publications in non-referenced journals with scientific reviewing or in edited volumes of collections, 3 scientific papers presented at national conferences and 2 study guides. Some of the publications submitted for participation in the competition present the results obtained from implemented projects and scientific contracts. The list of 15 citations of the above publications in prestigious scientific editions attests to the quality of the scientific and applied research activity of the candidate.

2. General description of candidate's activity

2.1. Teaching and pedagogical activity

Chief assistant professor Vladimir Dunchev, Ph.D. began his teaching career in 2015 as an assistant professor in the Department of Mechanical Engineering at the Technical College of Lovech, which is a constituent part of the Technical University of Gabrovo. In 2016 he was appointed as assistant professor in Department “Applied Mechanics” which is a constituent unit of the Faculty of Mechanical and Precision Engineering of TUG and in 2017 he was appointed as Chief assistant professor in the same department where he currently reads lectures in 4 subjects and conducts seminars in 7 subjects on resistance of materials, theoretical, technical and applied mechanics, all of which are in the thematic area of the announced competition for awarding the academic position of “Associate professor”. The teaching and pedagogical activity of the candidate meets the requirements for acquiring the academic position of “Associate professor” at the Technical University of Gabrovo.

2.2. Scientific and applied research activity

The candidate Chief assistant professor Vladimir Dunchev, Ph.D. is currently a researcher in the team of the Center of Competence “Smart mechatronic, energy- and energy saving systems and technologies”, laboratory “Smart systems for studying structure and properties of materials”. He participated in the project “Supporting the growth of scientific personnel in engineering and information technology” under Operational program “Human resources development” and quite a few other research projects funded by the grant for the inherent research activity of TU- Gabrovo: “Mechanical and mathematical modeling of creep and relaxation of residual stresses around plastically deformed holes in high-strength aluminum alloys at room temperature”, “Enhancement of fatigue life of components made of high strength aluminum alloys subjected to cyclic bending”, “Study of the effect of cyclic strengthening of surface and subsurface layers of medium carbon steels on fatigue strength” “Method and tool for crack resistance enhancement of small fastening holes in high strength aluminum alloys” and “Impact of the degree of surface plastic deformation on the fatigue strength of metal components treated by sliding friction”.

2.3. Implementation activity

The results of the teaching, pedagogical, scientific and applied research activity of Chief assistant professor Vladimir Dunchev, Ph.D. have been implemented in the learning process and practical classes with his students. The candidate in this competition has taken active part in renovation and modification of test equipment and laboratory installation in the field of resistance of materials.

3. Contributions. Significance of contributions for science and practice

The candidate proposes two contributions: the first one is related to the proof of the hypothesis that in materials which are strengthened under the impact of cyclic deformation to maximize the fatigue limit (three and four point rotary bending) it is necessary for the surface layer to reach stabilized cycle and in the second it is proved that different combinations of controlling basic and additional parameters lead to different static burnishing processes (smoothing, mixed and deep) featuring different Surface Integrity which corresponds to different fatigue life and fatigue limit, which in turn allows for the fatigue behavior to be controlled and predicted through control of Surface Integrity. The applied research contributions related to obtaining and proving new facts are 7 in number, those concerning obtaining confirmatory facts - also 7, development of new classifications, methods, approaches, algorithms, constructions, models and the like – 18. The

contributions of applied nature are 8 in total. The scientific, applied research and application contributions come as a result of the overall activity of Chief assistant professor Vladimir Dunchev, Ph.D. and are of great significance for science and practice especially the ones related to surface plastic deformation in correlation with Surface Integrity, optimizations and new optimization procedures of static processes of surface plastic deformation, comparative analysis between diamond burnishing and deep rolling, finite element simulations of static mechanical surface treatment processes, temperature dependent constitutive models of surface layers' behavior of construction materials subjected to diamond burnishing, study of the effect of sliding velocity on Surface Integrity in diamond burnishing.

The quantitative indicators of the criteria for awarding the academic position of "Associate Professor" have been complied with and correspond to the stipulations of the Act for Academic Staff Development in Republic of Bulgaria, and the Rule for Acquisition of Academic Titles and Positions of TU-Gabrovo.

4. Evaluation of candidate's personal contribution

The results of the scientific, applied research and application activity of the candidate published in prestigious scientific editions and presented at international and national scientific forums make me to believe that the contributions are the individual work of Chief assistant professor Vladimir Dunchev, Ph.D.

5. Critical remarks and recommendations

I have no particular remarks or objections concerning the materials submitted by Chief assistant professor Vladimir Dunchev, Ph.D. and my assessment of them is entirely positive. Part of the large number of applied research and application contributions can be further systematised and categorized.

6. Personal impressions

I know particularly well the work of Chief assistant professor Vladimir Dunchev, Ph.D. as a young researcher in the team of Center of Competence "Smart mechatronic, eco-and energy saving systems and technologies", as well as his activity in laboratory "Smart systems for investigation of structure and property of materials". In partnership with other universities, he is working in a new and priority area for the University related to X-ray diffractometry and X-ray analysis.

7. Conclusion:

Drawing upon the content of the materials submitted for participation in this competition, the topicality and significance of accomplished scientific and applied research contributions, I propose to the esteemed jury that Chief assistant professor Vladimir Petrov Dunchev, Ph.D. be awarded the position of "Associate professor" in the higher education area of 5. Technical sciences, professional field of 5.1 Machine engineering and scientific major "Structural mechanics, resistance of materials".

Gabrovo
15.12. 2020

Member of jury: /signature/

/Professor Ilia Zhelezarov, Ph.D./