

REVIEW

on the materials submitted for participation in a competition for „Professor“ in the field of higher education 5. Engineering sciences, Professional field 5.13. General engineering, scientific specialty "Applied mechanics", in the discipline "Mechanics"

In the competition for professor, published in the State Gazette, issue 101 of December 27, 2019 and on the site of the University of Forestry with the code WWI-P-1119-28 for the needs of the Department of Mathematics and Physics at the Faculty of Forest Industry, as a candidate participates Associate Professor Georgi Yordanov Vukov, PhD, Faculty of Forest Industry, Department of Mathematics and Physics, University of Forestry, Sofia.

Reviewer: Professor Georgi Asenov Tasev, DSc. Professor in a professional field 5.13 General engineering, from University of Forestry – Sofia, pensioner from 10.02.2014

1. Brief biographical data for the candidate

Assoc. Prof. Dr. Eng. Georgi Yordanov Vukov was born on 29.01.1960. In 1985 he graduated from TU-Sofia with a qualification of engineer. Then he specialized in Applied Mathematics and acquired a qualification of engineer-mathematician at the Institute of Applied Mathematics at TU-Sofia.

He defended his Doctoral degree in 1997 and since 1999 is an assistant at the University of Forestry. He was successively an assistant, chief assistant and an associate professor (in 2002). Assoc. prof. Vukov has over 20 years of teaching experience at the University of Forestry.

2. Conformity of the submitted documents and materials of the applicant according to the Rules of the Development of academic staff at the University of Forestry

All the submitted documents for participation in the competition for achieving the academic degree PROFESSOR are in consent with the requirements of the LDASRB, the Regulations for its application and the Regulations for the Development of the Academic Staff at the University of Forestry.

The topic of the presented publications is in the scientific specialty "Applied mechanics". It covers theoretical and application problems in the following scientific and practical fields: mechanics, strength of materials, diagnostics of machines and equipment.

The scientific papers submitted for review are in accordance with the requirements and the high standards of the academic publications at the University of Forestry. The author's analyzes, evaluations and ideas, personal scientific contributions can be convincingly and without any doubt identified in them.

3. Assessment of the candidate's educational and pedagogical activities (work with students and PhD students)

The pedagogical activity of the candidate is characterized by a certain focus on the field of mechanics, strength of materials and diagnostics of the technical condition of machinery and equipment in the forest industry.

He developed educational programs in four disciplines, 6 university textbooks, as he is a sole author of 4 of them and 2 are co-authored by one colleague. He also developed 1

educational manual for practical classes in Mechanics. All the textbooks and the manual are reviewed by reputable scientists in the professional field.

Assoc. Prof. Georgi Vukov was a scientific advisor to a PhD student who successfully defended the Doctoral degree.

His university textbooks and co-authored textbooks are very well structured; the individual topics are developed at a very high level and almost all are supported by appropriate classical examples and examples from his scientific and research work, which adds additional importance to the textbooks.

The candidate has excellent knowledge in the application of modern research methods and equipment for research and education. The teaching and pedagogical activity of assoc. prof. Dr. G. Vukov is evaluated excellent.

4. Evaluation of the candidate's scientific, applied-scientific and publicational activities.

General description of the materials presented

The candidate Assoc. Prof. Dr. Georgi Vukov participates in the competition for the academic position "Professor" with 1 monograph, 6 university textbooks, 1 educational manual for practical exercises and 74 publications, published in prestigious editions in Bulgaria and abroad.

4.1. Participation in scientific, applied-scientific and educational projects

Assoc. Prof. G. Vukov has participated in 10 projects, directing two of them as a scientific coordinator and in 8 as a participant with significant contribution.

4.2. Characteristics of published scientific results

The publications can be classified as follows: in foreign reviewed editions – 9 (SCOPUS, Web of Science) + 7 (Other databases); in Bulgarian reviewed – 16 (Other databases); in non-reviewed – 17; in proceedings of scientific forums – 25, of which 11 in national and 14 in international issues.

The language of the publication of candidate's scientific production is as follows: in Bulgarian – 26 items and in English – 48 ones.

In terms of co-authorship, the distribution is as follows: 13 – single-authorship, 29 – with one co-author, 15 – with two co-authors, 8 – with three co-authors and 9 – with four co-authors; by his place in the collective scientific papers the candidate is first author of 29 publications, second author of 28 and third author of 4 publications.

Assoc. prof. Dr. G. Vukov has not submitted separation protocols for participation in the collective publications, that's why I reckon all the co-author's participation equal. The objective analysis of the scientific and applied-scientific contributions indicates that they result from the personal and independent work of assoc. prof. Dr. G. Vukov. In all publications, his individual character is evident; he is precise in quotations and references, so there is no room for discussions on the originality of his scientific achievements.

It is noteworthy that even in scientific publications with co-authors, his style, creative features and scientific contributions are evident. The broad scope of scientific interests of assoc. prof. Dr. G. Vukov should be added; his scientific interests are indicative of his ambitions as a scientist and a professional. I can summarize my conclusions by expressing my opinion that both the level of the candidate's achievements and the independence of what he has achieved as a scientist cannot be questioned in any way.

4.3. Reflection of the scientific publications of the candidate in the scientific works of the scientists

The total number of citations of the works of assoc. prof. Dr. G. Vukov is 63 pcs. Of them – in issues with impact factor – 13; in reviewed periodicals (SCOPUS, Web of Science) – 4; in reviewed in other periodicals and databases – 8; citations in non-reviewed periodicals and conference proceedings – 38. There are also 19 citations in dissertations, one habilitation work and non-ISBN editions.

I am convinced that in future more citations and references of the candidate's work will be published. Due to the common practice, the first citations appear about 3-4 years after the publication of a paper.

4.4. Basic scientific, applied-scientific and applied contributions

The contributions of the scientific production are based on the validity of the examination processes, which have scientific, applied-scientific, applied and methodological nature and can be classified into the following groups:

1. Proving with new means of significant new sides of already existing scientific problems and theories.

The contributions in this group refer to the scientific problems related to the development of a methodology for vibration diagnostics and monitoring of machinery and technical equipment in the forest industry. The developed dynamic research models are:

- Dynamic models have been developed and grounded to investigate the torsional vibrations of the drive mechanism of a horizontal veneer machine [G8-55], the parametric torsional vibrations of the drive mechanism of a horizontal veneer machine [G8-5] and the determination of its amplitude-frequency characteristics [G8-44];

- The relations for determination of the variable inertial forces of the tool slide on horizontal veneer machines [G8-2] have been theoretically established as also the ~~the~~ separate periods during the operation of the tool slide with precisely defined characteristics and duration [G8-3];

- A new author's approach is proposed to output by deductive way the second part of the generalized Hooke's law, as well as the relations of the deformations in different directions [G8-64].

2. Development of new methodologies, criteria for research and obtaining original results

Scientific and applied-scientific contributions to this area relate to the development of new scientific methodologies and criteria for justification and making of scientific based decisions. They include:

- A concept for development of multi-channel systems for monitoring, diagnostics and protection of equipment in woodworking and furniture production was proposed [8-48];

- Rules were output and potentials have been proposed to increase the efficiency of circular machines [8-42];

- Criteria for assessing the technical condition and determining the instantaneous working capacity of a class of veneer machines by examination of the torsional vibrations [G8-9] were analyzed and formulated;

- Criteria for supporting the systems of control, monitoring and diagnostics of the operation of wind generators [G8-52, G8-53] were proven and justified;
- A methodology for determining the channel length of the screw press' matrix [G8-56] was developed;
- Criteria for assessing the technical condition and determining the instantaneous working capacity of the machines were formulated on the base of the study of the torsional vibrations and measures were proposed to improve the methods of controlling their technical state [G8-9];
- Indications for identification of certain types of defects in the drive mechanism of the veneer machines [G8-51] were identified;
- Contemporary tendencies in the development of technical systems for monitoring, control and diagnostics of equipment in woodworking and furniture production are analyzed and justified; the advantages and difficulties of implementing and using of higher level systems were analyzed [8-49].

3. Obtaining and proving new dependencies and positions in theory and practice

The contributions in this group are as follows:

- The theoretical rules and a strategy for determining the additional dynamic moment on the drive shaft of the cutting mechanism of the veneer machines [G8-4] have been output and the rules for the study of the dynamics and torsional vibrations in the drive mechanism of the veneer machine from the malfunctions in the gear wheel profile [G8-46] were postulated;
- Diagrams of the parametric torsional vibrations of the cutting mechanism of the veneer machine [G8-5] and its amplitude-frequency characteristics [G8-44] were proposed;
- The maximum error in the form of details processed with a four-sided longitudinal-milling machine with no band base-formation and with distributed submission diagram [G8-60] was proven;
- Graphical rules were output and proposed to determine the influence of certain factors (cutting speed, feed speed, and thickness of the cutting layer) on the vibration intensity of the milling machine, by measuring the average square value of the vibration speed on the main shaft's bearings [D7-9];
- The equations describing the torsional vibrations of a wind turbine by Lagrange method were output; in them the contact forces between the gears were modeled in the form of linear springs located in the plain of action of the contact line [G7-5, G8-61, G8-62];
- The natural frequencies and mode shapes of wind turbine drive train [G7-5, G8-31] were proven, as also the vibration of a wind turbine at constant wind and constant rotational frequency of the rotor in the time and frequency domain [G7-6], the vibrations of wind turbine in variable wind with turbulence in the time domain [G8-61] and in the frequency domain [G8-28, G8-62] and torsional vibration of the wind turbine in which the contact forces between the gears are time dependent and are represented in Fourier series [G7-6, G8-28];
- Rules were output and analyzed, and possibilities for increasing the efficiency of circular machines were justified and proposed [8-42].

4. Obtaining and proving new facts

The main contributions to this field are:

- Dynamic models have been developed to investigate: the free and forced torsional vibrations of the cutting mechanisms of the machines when propelled with the two most commonly used belt drives – wedge and multi-wedge ones [G8-6], [G8-13];

- The influence of the wear and the change of the elastic and damping parameters of the belt drives on the torsional vibrations of the cutting mechanism [G8-10] was proven;

- The influence of wear and change of the parameters of the elements of the cutting mechanism (elastic and damping parameters of the belt drive; the variable torsional moment of the electromotor; the variable torsional moment of the cutting instrument) on the accuracy and quality of production [G7-1] was established;

- The knowledge of forced spatial vibrations of the milling machine and its spindle (12 degrees of freedom) from the unbalance of the cutting instrument [G8-20] and the free undamped and the free damped spatial vibrations of the milling machine, its spindle and the rotor of the propelling electric motor (models have 18 degrees of freedom each) [G8-18, G8-19] was amplified.

5. Contributions for implementation

This group of contributions consists of:

- The torsional vibrations of the gearbox in the presence of the most common defects in its components - cracked tooth and pitting [G8-7] were identified, as also were the torsional vibration of a wind turbine, where external forces are the wind forces applied to the rotor blades (the Blade Element Moment Theory method was applied) and the forces from the asynchronous generator (the Kovacs methodology was applied) [G7-6, G8-61] were identified;

- The concept of the natural frequencies and mode shapes [G8-24], results of numerical study of the free damped [G8-25] and the forced spatial vibrations of an axial fan [G7-7] have been further developed;

- Graphical analytic rules for determining the speed of transportation of bulk materials with screw mechanisms [G8-63] were output;

- Static deformation modules of five tree species were experimentally output and substantiated [G8-65].

6. Methodical contributions

The contributions in this group are:

- An application program written in Matlab has been developed and the results of a numerical study of the torsional vibration of the driving mechanism [G8-55] were presented.

- A methodology for determining the channel length of the screw press matrix [G8-56] was developed and substantiated.

- Measures are proposed to improve the methods of vibration acoustic diagnostics of equipment in woodworking and furniture production [G8-40] and of wind generators [G8-52], as well as to optimize the operation of wind generators and to increase their reliability [G8-53].

5. Evaluation of the candidate's personal contribution

The objective analysis of the scientific and applied-scientific contributions indicates that they result from the personal and independent work of assoc. prof. Dr. G. Vukov. In all publications, his individual character is evident; he is precise in citations quotations and references, so there is no room for discussions on the originality of his scientific

achievements. It is noteworthy that even in scientific co-authorship publications his style, creative features and scientific contributions are evident.

6. Clarity, accuracy, coherence and justification of the presentation

The presented scientific works and textbooks are presented clearly, accurately and in strict logical sequence. The obtained results are substantiated in a reasoned and clear manner, which allows to evaluate their importance and necessity for the theory and practice of the applied mechanics.

7. Level of formulation of the postulations, the research, the analyses and the results of the research (general literacy; style of presentation; quality of the illustrations)

The formation of the research results, the analyses and the illustrations are executed of a very high level. Candidate's language and style are scientific, with proper use of accepted scientific terminology.

8. Do the materials and concepts used in the published scientific literature and other sources (including Internet) have references to the scientific papers presented in the competition?

The candidate correctly refers to statements from foreign scientific works and I have not identified any elements of plagiarism or incorrect reference.

9. Critical notes

The "review" genre requires critical remarks, and it is clear that any scientist can be criticized for being at a certain stage in his or her development; neither of us could claim geniality and exclusiveness. But in such a review, when the overall evaluation is positive, the role of reviewer is first and foremost to share with the candidate his perusal of the candidate's works and to stand by the reviewer's point of view on what he would do if the issues over which the candidate is working were in the sphere of reviewer's scientific research.

In these notes there are no disagreements with the science he does, so the following is nothing more than an attempt to a different occasion, an invitation to discuss the possibility of rediscovery and other systematic fields of analysis and synthesis of other approaches in the subject area of the candidate's scientific research.

I will allow myself some methodological suggestions to assoc. prof. Dr. G. Vukov, since his appointment to the academic position of Professor will increase his work as a scientific adviser to PhD students and young scientists. Therefore, I propose the following advice regarding:

a / Postulating the problem, the purpose and structure of the scientific works

- ◆ The clarity and accuracy of the postulated problem has not been achieved everywhere, the topicality relevance is not justified, the structure is not logical [51,47159];
- ◆ Not always is the structure of scientific works arranged in a best way.

In the scientific works [62,65] there is a structural element "Introduction". It is good this element to be replaced with a PREAMBLE, where the problem and its relevance to be formulated and also the object, the subject and the purpose of the study to be postulated. An "Introduction" is ~~id~~ more relevant to books, textbooks, manuals, etc.

b / Accuracy and clarity of formulation the conclusions

- ◆ Basically the scientific works end with complete, clear and very well formulated conclusions, but there are also not clear conclusions [61,62,55,60]. It is not clear where the conclusions come from. The conclusions are formed with non-verbal sentences. In some of

the works the conclusions follow the scheme “ascertainment/accomplished; conducted; done”; what is new in the study is not visible. Furthermore, some papers end with a Conclusion, when it is better to end with concrete inferences.

◆ It is inadmissible to refer to literary sources, figures and tables in the conclusions and inferences of scientific works.

c / Formulation of titles of scientific works

◆ Scientific papers with titles of the type:

“On some topics of strength of materials– deformations in different directions and Hooke's generalized law”. Mechanics of Machines, Book. 3 (75), Varna and

“Determination of static modules of longitudinal (E) and angular deformation (G) of some tree species”. Collection of Scientific Papers – International Scientific Conference “50 Years of University of Forestry”. Sofia, 2003

Ambiguity of the type “some” are inappropriate for a title of scientific works. [41; 42].

◆ Scientific papers titled:

“Determination of the zones of change of the critical angular velocities of circular machines for longitudinal cutting”. Collection of Scientific Papers – International Scientific Conference “50 Years of University of Forestry”. Sofia, 2003 and “Determination of the errors during the formation of workpieces, processed by four-sided longitudinal-milling machines”. Collection of Scientific Papers – International Scientific Conference “50 Years of University of Forestry”. Sofia, 2003 “Determination” is inappropriate for scientific work where research and analyzed scientific contributions are available.

◆ Scientific papers with topics titled:

“Application of modern diagnostic methods for increasing the efficiency, economy and reliability of the equipment in woodworking and furniture production.” Management and sustainable development, book 1, ann. 10, V19, University of Forestry and “Application of monitoring and diagnostics systems for increasing the efficiency, economy and reliability of the equipment in woodworking and furniture production”. Management and sustainable development, book 1, ann. 10

The terms "efficiency", "economy" and "reliability ~~liability~~ " are not supported by relevant indicators and characteristics in the reports.

d / Formatting the figure captions

◆ The figure captions must be sufficiently informative in order the reader by seeing the figure and the caption to be able to understand what the author wants to say and not to look for an explanation in the text [52; 59]: Wind generator efficiency; Wind speed approach; Management systems; Wind generator.


◆ Figures without captions [47].

10. Personal impression

I know assoc. prof. Dr. G. Vukov as a scientist and a teacher. In each of his roles, he impresses with serious self-righteousness and demand for what he does; he demonstrates principles, consistency and integrity. The monograph submitted for the competition is a serious scientific work, impressing with depth of analysis and contributions to the theory and practice for determining the technical condition of machinery and equipment.

Conclusion

The professional values, scientific knowledge, the potential as a scientist and the qualities of the candidate's teaching experience allow me to assert that assoc. prof. Georgi Yordanov Vukov is a worthy candidate for the academic position of professor and undoubtedly meets all scientific, normative, professional and ethical criteria, also meets all the requirements of the LDASRB, the Regulations for its application and the Regulations for the Development of the Academic Staff at the University of Forestry Rules. In this respect he is appropriate for the academic position PROFESSOR in the field of the higher education 5. Technical Sciences, Professional area 5.13. General Engineering, scientific specialty "Applied Mechanics" in the discipline "Mechanics" for the needs of the University of Forestry.

Signature of the reviewer: 

/ Georgi Tassev

The review was passed *9.04.2020*