



O P I N I O N

from **prof. Dr. Vassil Jivkov Jivkov**
University of Forestry – Sofia,
Faculty of Forest Industry,
Department of Interior and Furniture design

On the materials submitted for participation in a competition for „Professor“, in the field of higher education 5 Technical Sciences, professional field 5.13 General engineering, scientific specialty „Applied Mechanics“, university course „Mechanics“

In the competition for academic position Professor, published in the State Gazette, issue DV 101/27.12.2019 and on the website 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 participate Assoc. Prof. Georgi Yordanov Vukov Ph.D., Faculty of Forest Industry, Department of Mathematics and Physics.

1. Brief biographical information

Associate Professor Engineer Georgi Yordanov Vukov, PhD was born on January 29, 1960. He has completed his higher education in 1985 as a Mechanical engineer in the field of Industrial Thermal Engineering at the VMEI "V. I. Lenin" (now Technical University), Sofia. He has specialized in 1986 and 1987 at the Institute of Applied Mathematics at the Technical University - Sofia and obtained the qualification of "engineer-mathematician". From 1985 to 1988 he worked as a production engineer at the Technical University - Sofia and participated in the design and development of equipment for the teaching process. Between 1988 and 1991 he has been a full-time doctoral student at the Department of Mechanics at the Technical University. He defended his dissertation on "Dynamic loads on the ball bearings of machines with cardan gears" in 1997 and was awarded the educational and scientific degree "doctor" in the scientific specialty "Dynamics, strength and reliability of machines, devices, apparatus and systems". From 1992 to 1998 he was a lecturer at the PFFC "Princess Evdokia". In 1999, after a successful competition, he was appointed Assistant Professor of Mechanics at the University of Technology, since 2000 he has been Chief Assistant, and in 2002 he was elected Assistant Professor.

Assoc. Prof. Georgi Vukov is a long-time member of the Faculty Board of the Faculty of Forest Industry.

2. Conformity of the submitted documents and materials of the applicant with the requirements following the Rules for DAS in the LTU.

The submitted documents and materials of the candidate Assoc. Prof. Eng. Georgi Yordanov Vukov PhD are in full compliance with the requirements required by the Rules for DAS in the LTU.

3. Assessment of the candidate's teaching activity (work with students and doctoral students)

Assoc. Prof. Georgi Vukov is the leading the following courses:

- **"Mechanics"** - speciality "Engineering Design (Interior and Furniture Design)", Bachelor's Degree, with 30 hours of lectures and 30 hours of seminars (2009 - 2019);
- **"Theoretical Mechanics"** - speciality "Wood and Furniture Technology" (TDM), Bachelor's Degree Program, full-time (30 hours lectures and 30 hours seminars) and part-time (16 hours lectures and 14 hours seminars)
- **"Strength of Materials"** - speciality "Wood and Furniture Technology" (TDM), Bachelor's Degree Program, full-time (30 hours lectures and 30 hours seminars) and part-time (16 hours lectures and 14 hours seminars)

From 2009 to 2017, Assoc. Prof. Vukov gave lectures and seminars in the university course "Metal Science" for the speciality TDM, Bachelor's Degree, full-time and part-time education, and from 2012 to 2014 he gave lectures and seminars in "Technical diagnostics" for the Master's Degree Program, full-time.

Assoc. Prof. Vukov has developed curricula for the courses he has taken at Bachelor's Degree Program and for the Master's Degree course for the period 2012 - 2014. For the last 10 years he has exceeded the academic load stipulated under the LTU Rules of Procedure.

Assoc. Prof. Vukov was a research advisor of Eng. Georgi Kovachev, successfully defended in 2015 a PhD thesis on "Dynamics of the cutting mechanism of a woodworking router with a lower spindle position", with a supervisor Assoc. Prof. Vasil Vlasev.

4. Assessment of the applicant's scientific, applied and publication activities

4.1 General description of the materials presented

The candidate Assoc. Prof. Georgi Vukov presents in the competition the following materials, corresponding to a group of indicators from the Minimum Required for Occupation of Academic Position "Professor", in the field of higher education 5 Technical Sciences, professional field 5.13 General engineering, scientific speciality "Applied Mechanics":

- **B3 - Habilitation work - monograph** - 1 issue, single-authored, 130 pages.

- **G - Publications** - 74 issues,

The publications are as follow:

- G7 - Scientific publications in journals that have been peer-reviewed and indexed in world-renowned databases of scientific information (Web of Science and SCOPUS) - 9 issues;
- G8 - Scientific publications in journals and proceedings, referenced and indexed outside the Web of Science and SCOPUS databases - 65 issues.
- **E18 - Participation in national scientific or educational projects** - 8 projects
- **E20 - Management of national scientific or educational projects** - 2 projects
- **E23 - University textbooks** - 6 issues., four single-authored and in two with co-author
- **E24 - Tutorials** - 1 issue, single-authored

4.2 Participation in scientific, applied and educational projects

- **E18 - Participation in national scientific or educational projects**

Of the eighth projects presented in this group of Indicators, three were funded by the LTU [E18-1, E18-2, E20-1], six by the BAS [E18-3 ÷ E18-8] and one by the Training and Experimental Forest Range of University of Forestry [E20-2].

- **E20 - Management of national scientific or educational projects**

One, funded by University of Forestry [E20-1] and one by Training and Experimental Forest Range "Yundola" [[E20-2].

4.3 Publication characteristics of scientific results

The candidate Assoc. Prof. Georgi Vukov presents habilitation work - monograph "Vibrodiagnosis and monitoring of technical equipment in the forest industry", which is in the field of specifics, characteristics, methodology and practice of conducting vibrodiagnosis and monitoring of technical equipment in the forest industry. The author systematizes a series of his original views and results in this direction. They are represented by a large number of specific developments aimed at the practical implementation of vibration diagnostics and monitoring in this type of equipment. Original, theoretically and practically proven methodologies and strategies are proposed for modelling and investigating typical malfunctions of this equipment. The monograph meets the requirements of the ZRASRB and the Regulations for the development of the academic staff at the University of Forestry.

The six published textbooks and one tutorials by Assoc. Prof. Georgi Vukov cover the subjects he has taught completely and are evidence of his teaching qualities.

Of the presented 74 journal articles and proceeding papers in Bulgaria and abroad, published after the last habilitation, the majority were published in English (48) over those in Bulgarian (26), 13 of them are single-authored, with one co-author - 29, with two co-authors - 15, with three co-authors - 8 and with four co-authors - 9 pcs. In the co-authored publications, the candidate came first in 29 publications, second in 28 and third in 4.

According to the group of indicators "G" the candidate collects a total of 802.9 points, which exceeds 4 times the required minimum of 200 points according to the Rules for the development of the academic staff at the University of Forestry.

4.4 Reflection of candidate's scientific publications in literature (known citations)

The candidate, Assoc. Prof. Georgi Vukov, encloses a list of 63 known citations of his works. According to the type of citations, they are distributed as follows:

- **Citations in scientific journals with Impact factor** – 13 citations (D12-1÷D12-13);
- **Citations in referenced and indexed journals and editions** (SCOPUS, Web of Science) – 4 citations (D12-14÷D12-17);
- **Citations in referenced and indexed editions in other databases** – citations (D14-1÷D14-3; D14-7÷D14-10, D14-17);
- **Citations in unreferenced scientific journals and editions** – 38 citations.

The candidate collects a total of 262 points per group of indicators "D", which is more than 2.5 times higher than the required minimum of 100 points, which is a proof of his recognition as a scientist in Bulgaria and abroad.

4.4 Contributions to the candidate's work (scientific, scientific-applied and applied)

The presented information from the candidate Assoc. Prof. Georgi Vukov is structured thematically. The contributions are summarized in the following areas: vibration diagnostics and monitoring of technical equipment in the forestry industry; dynamics, strength and reliability of machines in the forestry industry; dynamics and vibrations of wind turbine and multi-body drive model; technical diagnostics.

The most important scientific, scientific-applied and applied contributions in the works proposed for review by Assoc. Prof. Vukov are:

4.4.1 Scientific contributions

1. New methodology for vibrodiagnosis and monitoring of technical equipment in the forest industry has been created [V-3].

2. A new, deductive way of deriving the second part of Hooke's generalized law is proposed, as well as of the dependencies for deformations in different directions [G8-64].

4.4.2 Scientific-applied contributions

1. Dynamic models have been developed to investigate the free torsional vibration of a woodworking shapers [G8-6] and the forced torsional vibrations of the cutting mechanism generated by the variable torsional moments of the drive motor and of the cutting tool by counting the number of tools actual cutting knives of the cutting tool [G8-13].
2. The influence of the wear and change of the parameters of the belt gear on the torsional vibrations of the cutting mechanism [G8-10], on the accuracy and quality of production [G7-1] and on the operation at idle and at the running stroke of the cutting mechanism [G8-34] have been established.
3. Free and non-damping spatial oscillations of a router machine and its spindle on models with 12 degrees of freedom [G8-8, G8-22] and models with 18 degrees of freedom [G8-18, G8-19] has been studied.
4. Forced spatial oscillations of the wood shaper and its spindle with 12 degrees of freedom from the unbalance of the cutting tool [G8-20] and with 18 degrees of freedom caused by the imbalance of the rotor of its motor [G7-3] have been investigated and established.
5. Graphical relationship has been created to determine the influence of certain factors (cutting speed, feed rate and thickness of the cut-out layer) on the vibration intensity of the milling machine, by measuring the mean square value of the vibration speed on the main shaft bearings [G7-9].
6. The maximum edge size error of workpiece on 4-sided through feed planner moulders with no base positioning and with a distributed feed pattern [G8-60].
7. Dynamic models have been developed for the study of the free damping, non-damping and forced twisting vibrations of the cutting mechanism in the circular machine [G7-2, G8-16, G8-54], of the impulse loads arising during cutting in the circular longitudinal cutting machine [G8-57] and analytical dependencies have been derived for the study of hazardous modes of operation associated with the occurrence of shock loads [G8-42].
8. Free circular saw oscillations were investigated using the finite element method with four nodal 3D finite elements [G8-14], and the model was supplemented and further developed to investigate these circular saw oscillations with compensating channels [G8-12] and with compensation and noise reduction channels [G8-11].
9. Dynamic models have been developed to investigate the oscillations of the drive mechanism of a horizontal veneer machine [G8-55], the parametric torsional vibrations of the drive mechanism of a veneer machine [G8-5] and to determine its amplitude-frequency characteristics [G8-44].
10. Dynamic models have been developed to study the dynamics and vibrations of wind turbine and vehicle units. Multi-body model of a wind generator with 10 bodies and 8 degrees of freedom [G8-31, G8-61, G8-62], with 10 bodies and 11 degrees of freedom [G7-5, G7-6, G8-28] and 11 bodies and 53 degrees of freedom [G8-27] has been studied.
11. The free non-damping [G8-24], free damping [G8-25] and forced spatial vibrations [G7-7] of an axial fan, considered to be a mechanical system consisting of three solids with 18 degrees of freedom, were studied.
12. Criteria have been formed for assessment of the technical condition and determination of the current performance of veneer machines by studying the torsional oscillations [G8-9].

13. Measures are proposed to improve the methods for vibroacoustic diagnostics of equipment in woodworking and furniture production [G8-40] and wind generators [G8-52], as well as to optimize the performance of wind generators and increase their reliability [G8-53].\
14. The load-bearing structure of the armchair for rest was modelled, taking into account the resulting load [G8-32].

4.4.3 Applied contributions

1. Theoretically different parameters and dependences of the cutting mechanism of woodworking routers have been established [G8-3, 4, 6, 10, 13, 18, 19, 21, 23, 30, 34, 43].
2. Experimentally different parameters and dependences of the cutting mechanism of woodworking routers have been established [G8-4, 8, 10, 30, 33, 34, 35, 36, 37, 38, 39, 43].
3. Theoretically different parameters and dependencies of the circular saw have been established [G8-2, 11, 12, 15, 17, 58, 59].
4. Different theoretically parameters and dependences of the cutting mechanism of veneer machines have been established [G8-2, 3, 4, 9, 44, 46, 51, 52].
5. The vibrations of a wind generator under various maintenance parameters and atmospheric conditions are theoretically established [G8-5, 6, 7, 28, 29, 31, 61, 62].
6. The static modulus of elasticity of five tree species were obtained experimentally [G8-65].

5. Assessment of the candidate's personal contribution

From the materials provided in this competition for professor, I believe that Assoc. Prof. Georgi Vukov participates with works, developed by him (13 single-authored publications) and 29 co-authored, where the candidate is in first place in 29 publications and second in 28. As no separation protocols are presented for the co-authored articles, I accept that the contributions and participation in them are equally distributed among the co-authors.

I consider that the contributions submitted by the candidate are his work. Achieved scientific, scientific-applied and applied contributions are significant for the scientific field in which competition was launched, namely in the areas of scientific speciality "Applied Mechanics" and will be useful for science and practice.

6. Critical notes and recommendations

Some critical remarks may be made to the research work and contributions included in the documentation of this competition, the most significant of which are the following:

1. The scientific contributions presented by the candidate are underestimated and downplayed and are rather concise at the expense of scientific-applied and applied ones, which are very circumstantial and unnecessarily separated.

2. The few scientific-applied (item 1.3.2) and applied (item 1.3.7) contributions that are outside the field of woodworking machines, wind generators and its multi-body drive module have accidentally fallen between them.

I believe that the remarks made on the works presented do not in any way diminish the candidate's achievements.

7. Personal impressions

I have personally known Assoc. Prof. Georgi Vukov since the late 1970s, and professionally since 1999, when he became a full professor at the University of Forestry. He is an erudite

specialist, a hardworking and respected teacher. He works in the field of applied mechanics, as his main direction is the study of various processes and behaviour in woodworking machines related to the dynamics, strength, reliability and maintenance. His additional research interests are focused on the dynamics and vibrations of wind turbine and its multi-body drive module.

His research shows that Prof. Vukov is familiar with different software products that allow him to use them in the educational process. He speaks English and Russian. His participation in 10 research projects is proof of his ability to work in a team and solve various tasks.

Proof of the excellent teaching activity and attitude towards it by Assoc. Prof. Vukov are the 6 textbooks and 1 tutorial he has published.

Assoc. Prof. Georgi Vukov is a highly respected colleague. Personally, I can say that he is extremely helpful and friendly. In his relationships, he has always shown respect for his colleagues.

8. Conclusion

The achieved scientific, pedagogical and applied results, as well as the presented Report on scientific and publication activity (Appendix 2) by Assoc. Prof. Georgi Vukov PhD clearly show that he fulfils and exceeds all criteria for occupying an academic position of "professor" in the scientific field 5 "Technical Sciences", professional field 5.13 "General Engineering". The total number of points on all indicators is 1555 with a minimum requirement according to the Regulations for the development of the academic staff at the University of Forestry for the academic position "professor" of 600 (Appendix 1.3).

In connection with the above, strongly recommend Assoc. Prof. Georgi Yordanov Vukov to be elected "Professor" in the university course "Mechanics" in the field of higher education 5 "Technical Sciences", professional field 5.13 "General Engineering", scientific speciality "Applied Mechanics".

01.05.2020 r.

Opinion prepared by: ...


/prof. Vassil Jivkov PhD/