

OPINION

on the materials submitted for participation in a competition for „Associate Professor“ in the field of **higher education 6. Agricultural Sciences and Veterinary Medicine, Professional Field 6.5 Forestry**, Scientific Specialty “**Machinery and Equipment for Forestry, Logging, Woodworking and Furniture Industry**”, in the discipline “**Woodworking Machines**”.

In the competition for **Associate Professor**, published in the State Gazette 102/08.12.2023 and on the site of the University of Forestry with the code WWIAsP-1123-116 for the needs of the Department of “**Woodworking machines**” at the Faculty of Forest Industry, as a candidate participate **Chief Assistant Professor Valentin Atanasov Atanasov PhD**, Faculty of Forest Industry, Department of “**Woodworking machines**”.

Prepared the opinion: Prof. Slavcho Asenov Sokolovski PhD, Professor in a Professional Field 6.5 Forestry, from University of Forestry / Retired

1. Brief biographical data for the candidate

Chief Assistant Professor Valentin Atanasov Atanasov PhD was born on 28.11.1981. He graduated in 2004 as a Bachelor of Science in “Woodworking and Furniture Production” and as a Master of Science in “Woodworking and Furniture Production” in 2009, specialty "Furniture Production" from University of Forestry – Sofia. In 2014, he defended his Ph.D thesis in Scientific specialty: "Machines and equipment for forestry, logging, and woodworking and furniture industry “on a subject ”Research of the operational indicators of mobile horizontal band saws" with scientific supervisor Prof. Dr. Zhivko Gochev. In 2017, he defended his master's thesis in the specialty "Computer Design and Technologies in Mechanical Engineering" at TU - Sofia.

From 2014 to 2016, he was an assistant at the "Woodworking Machines" department and ran training sessions to students from the faculty of "Forest Industry" in 4 academic disciplines. From 2016 until now he has been a Chief Assistant Professor and lectures in 6 academic disciplines in the same department, one of which is Woodworking Machinery. Since 2016, he has been a part-time lecturer at TU - Sofia, Department of "Mechanical Engineering, Technology and Metal Cutting Machines". He has carried on lectures and training sessions on different academic disciplines at the department. Since 2016 he has been an engineer-designer in the company "Subcom Management" - Alexandria, Virginia, United States.

He specialized under the ERASMUS program for teaching mobility in Poland (2023), Austria (2023) and Slovakia (2022). He has participated in international trainings to improve qualifications under the COST program in Belgium (2013), Italy (2014), France (2014), Scotland (2015) and Portugal (2018). He participated in international scientific conferences in Croatia (2018), Hungary (2018), Germany (2018), Bulgaria (2018), North Macedonia (2015), etc. He was a member of the organizing committee of the 9th International Scientific Conference "Innovations in Forestry Industry and Engineering Design", organized by the "Forest Industry" Faculty, University of Forestry. He participated in the preparation of materials for program accreditation of the scientific specialty: "Machines and equipment for forestry, logging, woodworking and furniture industry". He has participated in several training courses: language, working with SPSS, environmental protection, etc. He speaks English, Italian and Russian.

2. Correspondence of the submitted documents and materials of the applicant with the Rules for Development of academic staff at the University of Forestry

Submitted documents and materials by Chief Assistant Professor Valentin Atanasov Atanasov,

Bulgarian and English on electronic files, as well as a proof of the citations of his publications. A total of 24 different documents and works are presented. Submitted diplomas and annexes are notarized.

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

According to the official note presented by Chief Assistant Professor Valentin Atanasov, his educational and teaching activities for the academic year 2023/2024 in the Faculty of Forest Industry, are as follows:

Educational Qualification Degree "Bachelor"

- Lectures in the discipline "Woodworking machines" 90 classes of regular training and 44 classes of part-time training;
- Lectures in the discipline "Machines for furniture production and furnishing" 90 classes of regular training;
- Exercises in the discipline "Woodworking machines" 60 classes of regular training and 30 classes of part-time training;
- Exercises in the discipline "Machines for furniture production and furnishing" 135 classes of regular training;
- Exercises in the discipline "Computer simulation modeling" 45 classes of regular training;

Educational Qualification Degree "Master"

- Lectures in the discipline "Design and testing of woodworking machines" 18 classes of regular training;
- Exercises in the discipline "Design and testing of woodworking machines" 9 classes of regular training;

In the last 5 years, he has fulfilled the workload stipulated by the regulations of the University of Forestry, which is in the range of 365 to 550 classes.

In the submitted official note we could find information about the 6 curricula developed by the candidate and with his participation in disciplines taught by him, as well as 3 peer-reviewed curricula. The candidate has been a scientific supervisor of 40 students and an advisor of 2 diploma theses.

In the official note submitted by the candidate from the Department of "Mechanical Engineering and Metal Cutting Machines" of TU-Sofia, there is information about the classes held in the same department in the period 2019-2023, as follows: lectures - 70 classes and exercises – 36 classes.

4. Assessment of candidate's scientific, scientific-applied and publishing activities

General description of the presented work

Chief Assistant Professor Valentin Atanasov, Ph.D has participated in the competition (according to Annex 2) with:

- Dissertation thesis – Ph.D, 2014, (A1) ;
- Monograph individual, 160 p. 2023, (B3);
- Publications – 33(G7,G8);
- Projects - 9;
- Citations – 27 (D13, D14,D15).

4.1 Participation in scientific, scientific-applied and educational projects

Candidate has participated in the competition with 9 scientific projects, of which: 1 scientific research project financed by the University of Forestry; 7 scientific-applied projects financed by

on 5 of which he is the supervisor; 1 infrastructure project financed by the University of Forestry. For the past 6 years he has participated in the preparation of the Faculty of Forest Industry stands at the Expomebel and Technomebel exhibitions.

Points are not required for this group of indicators, therefore they are not reported.

4.2 Characterization of published scientific results

Chief Assistant Professor Valentin Atanasov has participated in the competition with a habilitation work - a monograph "Force-Kinematic parameters for timber milling and their impact on the design of machine working bodies", issued in 2023 by Avangard Prima Publishing House in Sofia. Its volume is 160 pages. It summarizes the results of the experimental studies conducted on the kinematic and force parameters of the milling and feeding mechanisms of wood cutting machines (cutters, jointers, planers and other longitudinal-cutting machines) and wood materials (beech, oak, white pine, meranti, plywood and MDF). Proposals for design changes of the aforementioned mechanisms have been made, to use blade shafts with removable plates in the cutting mechanisms and to use stepless frequency inverters in the feed mechanisms. Recommendations for optimal cutting and feeding speeds are made. It is recommended to use CAD/CAE when designing the cutting and feeding mechanisms of milling woodworking machines.

The monograph meets the requirements of the rules for Academic Staff Development in Republic of Bulgaria and the regulations for the Development of the Academic Staff in University of Forestry. The book will be useful for the theory and practice and will be used by students, Ph.D students and engineers.

From 33 presented scientific publications (articles) 12 are in scientific magazines and 21 in sets of international scientific forums. There are about five times more publications abroad - 27, compared to those in Bulgaria - 6. All 33 publications are in English and only the monograph is in Bulgarian. According to the number of co-authors, the publications are distributed as follows: individual 4, with one co-author 9, with two co-authors 9, with three and more co-authors 12. In the co-authored publications Chief Assistant Professor Valentin Atanasov stands first in 11 publications, second in 9 and third in 5.

Foregoing, together with the information completed by the applicant in Annex 2 of National Center for Information and Documentation about the conformity of his materials to the Minimum Scientific Requirements, shows that the scientific, scientific - applied and publication activity of the candidate is significant in both quantity and quality, namely:

- In the individual scientific monograph, a modern knowledge on the subject of the competition useful for students and specialists is provided. A characteristic feature of the data reflected in the publications is that it is obtained by applicant's research and research activity.

- Scientific results obtained by the applicant are promoted in 33 publications, including articles and reports published in scientific editions, referenced and indexed in world-renowned scientific database – 15 (G7) and articles and reports published in non-referenced journals with scientific review or published in edited collective proceedings - 18 (G8). Of these, 29 (i.e. 88 %) are published in foreign editions, of which 11 (i.e. 38 %) are in journals and proceedings, referenced and indexed in world -renowned scientific information databases (Web of Science and Scopus), of which 1 is in a journal with impact factor. Considering the group of indicators "G" Chief Assistant Professor Valentin Atanasov gathers a total of 278.82 points. The required minimum is 200 points, which is 40 % more.

4.3 Reflection of Candidate's Scientific Publications in Literature (known citations)

The candidate has presented 27 citations in referenced journals and proceedings of scientific

information or in monographs and proceedings (D13), 3 in monographs and collective proceedings reviewed by scientists (D14) and 11 in non-referenced journals reviewed by scientists (D15).

Considering the group of indicators "D" Chief Assist. Prof. Valentin Atanasov, PhD, gathers a total of 280 points. The required minimum of 50 points is exceeded 5,6 times.

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

In the present opinion only the monograph and 33 scientific publications are subject of assessment of applicant's contributions. Candidate's abstract is not included.

The reference presented by Chief Assistant Professor Valentin Atanasov is structured thematically in the following important directions: force-energy parameters of milling machines and their impact on the construction of their main working bodies, kinematics and kinematic design of milling machines and dynamics of milling machines.

More important scientific, scientific-applied and practical contributions of candidate's work are, as follows:

- *Scientific contributions*

- A methodology has been developed and applied to investigate the cutting forces and milling power of the four tree species used in Woodworking and Furniture Industry (beech, oak, white pine and meranti) and two wood-based materials (plywood and MDF), taking into account real working conditions in the production of milling machines.

- A methodology is systematized for the study and analysis of the impact of milling modes (operating speeds) on the quality of processing, with a critical analysis of the existing formulas in literature.

- *Scientific and applied contributions*

- The necessary forces and cutting power for different tree species and materials are experimentally determined, which reveal their influence on cutting and feeding speeds and the milling surface.

- A methodology is proposed for the power design of cutting and feeding mechanisms of milling and planer-milling machines. It has been found that the power usage of the idle electric motor is 30% of its nominal.

- The required power to drive the main parts of milling machines, taking into account the coefficients of mechanical gear performance is determined. With the specified cutting forces, a strength and deformation sizing of milling machines parts is made.

- It has been found that blade shafts with carbide plates, situated on a spatial helicoidal curve, allow higher feed speeds, which brings to greater productivity of milling machines.

- It has been found that the rear feed roller of planer machines with the pressure on the parts smoothens the micro-irregularities made during the milling. This allows to increase the speed of planer machines.

- Based on mechano-mathematical model and calculations, a methodology is systematized to determine the forced spatial vibrations of a conventional milling machine and its spindle, caused by the imbalance of the cutting tool and real cutting forces. This methodology also allows determination of free spatial vibrations.

- *Applied contributions*

- The most appropriate frequency of rotation of the spindles of milling machines is calculated - 6000 min^{-1} . It is recommended that planer machines could be able to realize different cutting speeds, depending on wood species.

- During processing of tropical tree species and high density species it is recommended to use milling machines with a lower rotation frequency with removable plates blades situated on a helicoidal curve.
- The roughness of the surfaces (Rz) has been found to rarely exceed 50 μm , even at 15 $\text{m}\cdot\text{min}^{-1}$ feed speeds. The range of feed rate variation from 5 $\text{m}\cdot\text{min}^{-1}$ to 20 $\text{m}\cdot\text{min}^{-1}$ for conventional milling machines and jointers and 25 $\text{m}\cdot\text{min}^{-1}$ for planers is determined.
- Calculation results of natural frequencies and their own forms of free spatial vibrations of woodworking milling machine and its spindle are presented. They allow to give recommendations for modifying the machine construction in order to avoid resonance modes, increase reliability and quality of the processed surfaces.
- It has been experimentally found that when milling wood-based materials - plywood and MDF, the area of milling and the feed rate have the greatest impact on the dynamic behavior of the machine (vibration velocity).
- The influence of the feed rate and the milling area on the precision of the milling machine, depending on the size of the mechanical vibrations of its spindle is determined . It has been found that when processing white pine, the optimum cutting speed should be in the range of 40 ÷ 45 $\text{m}\cdot\text{s}^{-1}$, the feed rate up to 5 $\text{m}\cdot\text{min}^{-1}$, and the thickness of the removed layer up to 8 mm.
- It has been determined that considering universal milling machines, higher vibration velocity values are obtained at upper spindle bearing and the greatest impact is due to the speed of cutting, less - the speed of feeding and the thickness of the milling.
- It has been found that when checking the clattering of the ribbon saw, which is the result of the gaps in the bearings of conveyor wheels, no force should be applied in the feeding direction.
- It has been found that circular machine for logs is approximately eight times more productive than a jointer used for the same purpose. The influence of feeding speed on the roughness of the surfaces and the precision of a circular machine for logs is experimentally determined.
- Influence of the number of V-belts and the diameters of the belt shims on the operation of the cutting mechanism of milling machine in idle and power motion is determined. It has been found that with the increase of the diameters of the belt shims, the number of belts as well as their section could be reduced. Pre-tensioning forces also decrease, which is favorable to the bearings.
- It has been established that when cutting wood logs at negative temperatures, it is necessary to use a non -freezing fluid mixed with water to clean the cutting tool of the band saw machines.
- Change in the sound pressure level of a woodworking sliding table circular saw machine depending on wood species (white pine and beech), thickness of the material, frequency of spindle rotation and overhang effect of the cutting tool has been investigated.
- Construction of belt sanding mechanism with a fixed belt support has been developed, which has a low cost and can be made in mechanical repair workshops or small workshops.

5. Assessment of the applicant's personal contribution

I accept that most of the achieved scientific results in the submitted documents and papers for the competition for "Associate Professor" by Chief Assistant Professor Valentin Atanasov, Ph.D are his own personal work and research. He has presented one individual monograph and 3 individual scientific articles, and those in co-authorship have a leading role (he is the first co-author in 11 publications). This gives me the ground to accept that the listed above contributions by the candidate are individual contributions or have been achieved with his active participation. The scientific, scientific-applied and applied contributions are significant for the scientific specialty in which the competition "Machinery and Equipment for Forestry, Logging, Woodworking and Furniture Industry" has been announced and will be useful science and practice.

6. Critical remarks

I do not have any significant remarks in evaluating the research work and very-well prepared documents and materials for the competition. By positively appreciating the entire scientific and teaching work of the applicant, I consider to make the following recommendations:

- The applicant has sufficient pedagogical and scientific experience and knowledge, which allows him to publish educational manuals on the lectured disciplines.
- I would recommend the candidate to improve his research work, which will increase his publications in impact factor journals.

7. Personal impressions

As his former university professor I know Chief Assist. Prof. Valentin Atanasov, from his student years, and he has left me excellent impressions. He is very good professional who has improved his qualification through a second master's degree. Foreign language proficiency allows him to be actively involved in international scientific conferences, specializations abroad and international training courses.

As a lecturer he is a very responsible, communicative and active colleague. He is a respectable and erudite scholar. In his work, the candidate aims to apply new modern methods of education. His participation in international scientific forums in more than four foreign countries proves his renown abroad.

8. Conclusion

Achieved scientific and pedagogical results of Chief Assistant Professor Valentin Atanasov, PhD, their importance for the the learning process and the practice as well as their citation in international scientific journals gives me the reason to conclude that all the requirements of the Rules for development of academic staff in Bulgaria and the Regulations for their application in the University of Forestry for the academic title "Associate Professor" are completely fulfilled. The total number of points of all the indicators gathered by the candidate is 708,82, which significantly exceeds the required minimum of 400 points. There is an over-fulfillment of 77,2 %

In connection with the above, I propose Chief Assistant Professor Valentin Atanasov, PhD, to be elected "Associate Professor" in the discipline "Woodworking Machines" in the Professional field 6.5 Forestry, Scientific specialty "Machines and Equipment for Forestry, Logging, Woodworking and Furniture Industry".

Prepared the opinion:

/Prof. Dr. STAVENOSUKTOVSKI/

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