



REVIEW

On the materials submitted for participation in a competition for „**Professor**“ in the field of higher education 6. Agricultural sciences and veterinary medicine, Professional field 6.5 Forestry, scientific specialty „Technology, mechanization and automation of the woodworking and furniture industry“ in the discipline „Wood cutting and cutting tools“

In the competition for professor, published in the State Gazette, issue 37/07.05.2019 and on the website of the University of Forestry with the code WWW - P - 0419 - 06 for the needs of the Department of „Woodworking machines“, at the Faculty of Forest Industry, as a candidate participate Assoc. Prof. Zhivko Bonev Gochev Ph.D., Faculty of Forestry, Department of „Woodworking machines“.

The review is prepared by: Prof. Dr. Bozhidar Georgiev Dinkov, Professor in Professional field 6.5 Forestry from the University of Forestry, retired

1. Brief biographical data of the candidate

Assoc. Prof. Dr. Zhivko Gochev was born on March 25, 1960, in Dimitrovgrad, where he completed his secondary education. He graduated successfully from the University of Forestry, Sofia, with a Master's Degree in Mechanical Wood Technology in 1985. He was assigned to work as an engineer-technologist at Bukelon M Furniture Factory in Haskovo, where he worked until March 1987. After a competitive examination, he was admitted to the full-time Ph.D. course at the Department of Mechanization and Automation of Woodworking and Furniture Industry, Faculty of Forestry (1987 to December 1990). From 1991 to December 1992, he worked as a research engineer at the Research Department of the University of Forestry, and from 1992 to December 1994 worked as a technological engineer at ZDM „Koynare“ Ltd., Koynare. He successfully defended his dissertation in 1996 on the topic: „Investigation of the process of laser cutting of furniture details from particle boards“. His teaching activity goes through all academic positions: assistant (1991-1995), chief assistant (1995-2004) and associate professor (2005 until now).

From 2007 to 2016 he is the Head of the Department of Woodworking Machines, from 2013 to 2016 he is the Deputy Dean of the Faculty of Forest industry, and from 2016 until now the Dean of the same Faculty.

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

The submitted documents and materials from the candidate in connection with the announced competition for the position of "Professor" in the Professional field 6.5 Forestry, scientific specialty "Technology, mechanization and automation of the woodworking and furniture industry" fully comply with the Rules of the Development of academic staff at the University of Forestry, namely:

- European CV;
- Notarized copies of: higher education diploma; diploma of Ph.D. degree; scientific title associate professor; official note for the academic position of Associate Professor;

medical certificate; criminal record certificate, self-assessment report on the fulfillment of the national minimum requirements of Article 2a (2), (3) and (4) for the academic position of „professor“; list of publications and other scientific results after taking up the academic position of associate professor; a reference of the contributions and scientific works after filling the academic position of associate professor; reference for known citations; documents and written materials, certifying other professional and creative activities and appearances within the meaning of Article 67 (2); references for: successfully graduate Ph.D. student, a leadership of graduate students, prepared curricula, scientific, teaching and expert activity; declaration under Article 313 of the Criminal Code for the accuracy of the information provided. All submitted documents are uploaded electronically.

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

Assoc. Prof. Zhivko Gochev has been working as a lecturer at the University of Forestry in Sofia for more than 25 years. During this time he was assigned to teach students in the following disciplines: lectures and exercises on „Wood Cutting“, Bachelor's Degree; lectures and exercises in „Business Evaluation of Machines and Equipment“, Bachelor's Degree; lectures on „Wood Cutting and Cutting Tools“, Bachelor's Degree; lectures on „CNC Machines, Tools and Technologies“, Master's Degree; lectures and exercises in the application of „Lasers application in woodworking and furniture industry“, Master's Degree. Assoc. Prof. Gochev is an organizer and lecturer of two courses at the Center for Continuing Education of the University of Forestry for employees of the US Embassy in the Republic of Bulgaria. He is the head of the successfully graduate Ph.D. student Valentin Atanasov in the scientific specialty „Technology, mechanization and automation of the woodworking and furniture industry“, as well as of 28 successfully graduate students. He participates in the development of curricula for the disciplines „Wood cutting and cutting tools“, „Lasers application in woodworking and furniture industry“, „CNC machines, tools and technologies“, „Production Practice“, etc.

Under the guidance of Assoc. Prof. Gochev and with his participation, a very good educational and material base was built for the quality education of students in the mentioned disciplines. He has published the necessary training literature: one monograph ("Preparing and maintaining of band saw blades for cutting of round wood"); a textbook (Wood Cutting and Cutting Tools); two study aids and one book. An On-Line training course was developed in the Blackboard system at the University of Forestry, according to the curriculum of the discipline „CNC Machines, Tools and Technologies“. The course includes 13 lectures. The aim of the course is to provide students with basic theoretical and practical knowledge and basic personal skills necessary for developing a career in the use of CNC machines.

For the needs of the educational process, samples and photo material have been prepared to show the sequence of the technological process, the preparation of the teeth and the modes for the effective cutting of soft and hardwood with a band saw blades with part-set, swage-set, hardened and stellite tipped teeth.

My overall assessment is that Assoc. Prof. Gochev conducts an active and high level pedagogical, educational and organizational activity, which is due to his authority among the teachers and the respect of the students. Proficiency in five foreign languages has contributed

to his great professional background. Of course, his specialization in Japan (1997), Sweden (1998) and Finland (2001) and his participation in many international conferences and seminars in Slovakia (2004, 2006, 2008, 2012, 2014, 2016, etc.), in Croatia (2007, 2009), in the Republic of Northern Macedonia (2013, 2015, 2017), in Serbia (2010), in Turkey (2016), in Romania (2017) and more. His participation in many international, national and University of Forestry funded projects has contributed to his successful development of teaching and research.

Assoc. Prof. Gochev's pedagogical training and his work as a lecturer are of a high standard and fully meet the requirements for occupying the academic position of „Professor“.

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

The candidate Assoc. Prof. Zhivko Bonev Gochev Ph.D. participated in the competition with:

- Monographs – 1 pc.;
- Textbooks – 1 pc.;
- Educational aids – 2 pc.;
- Books – 1 pc.;
- Publications – 95 pc.;
- Projects – 21 pc.

4.1 Participation in scientific, scientific-applied and educational projects

Assoc. Prof. Gochev participates in 15 research projects, of which 3 international, 7 national and 5 funded by the University of Forestry. He is the head of 7 of these projects. He also manages contracts with the Faculty of Forest Industry for methodological guidance and support for the activity of woodworking production bases in the Training and Experimental Forest Ranges of Yundola and Barzia.

4.2 Characterization of published scientific results

The publications can be classified as follows:

- **Publications in scientific journals - 49 issues:**

- in foreign references in Web of Science and SCOPUS – 4 pc.;
- in foreign references outside Web of Science and SCOPUS – 8 pc.;
- in Bulgarian references outside of Web of Science and SCOPUS – 10 pc.;
- in Bulgarian non-refereed – 19 pc.;
- in international non-refereed – 8 pcs.

- **Publications in proceedings of scientific forums - 46 issues:**

- international references in Web of Science and SCOPUS - 9 pc.;
- national non-refereed - 11 pc.;
- international non-refereed - 26 pc.

- **By significance**

- in foreign refereed journals in Web of Science and SCOPUS - 4 pc.;
- in international proceedings of scientific forums referenced in Web of Science and SCOPUS - 9 pc.;
- in foreign refereed journals outside the Web of Science and SCOPUS - 8 pc.;
- in Bulgarian refereed journals outside of Web of Science and SCOPUS - 10 pc.;
- in foreign non-refereed journals - 8 pc.;
- in Bulgarian non-refereed journals - 19 pc.;

- in international proceedings of scientific forums - 26 pc.;

- in national proceedings of scientific forums – 11 pc.

▪ **Place of publication:**

- papers in proceedings at national and international scientific fora - **46**: Bulgaria (11), Germany (1), Macedonia (10), Slovakia (16), Turkey (3), Croatia (4), Czech Republic (1);

- articles in foreign journals - 20: Acta Facultatis Xylologiae (4), Annals of Warsaw University of Life Sciences - SGGW (6), Chip and Chipless Woodworking Processes (3), Menadžment znanja (3), PRO LIGNO (2), Wood, Design & Technology (2);

- articles in national journals - **29**: Management and Sustainable Development (5), Engineering Sciences (1), Information technologies and control (1), Woodworking and furniture manufacturing (4), Innovations in Woodworking Industry and Engineering Design (18).

▪ **Publishing language:**

- in Bulgarian – 17 pc.;

- in English – 74 pc.;

- in Serbian – 3 pc.;

- in Macedonian language - 1 pc.

▪ **Number of co-authors:**

- self-contained - 16 pc.;

- with one co-author - 16 pc.;

- with two co-authors - 23 pc.;

- with three or more co-authors - 40 pc.

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

The total number of known citations of the scientific publications of Assoc. Prof. Zhivko Gochev from other authors is 60. According to the type of citations they are:

▪ in refereed and indexed editions in Web of Science and SCOPUS - 13 issues:

- including in Impact factor (IF) journals – 7 pc.;

- including in Impact Rank journals (SJR) - 3 pc.

▪ in refereed editions outside the bases of Web of Science and Scopus - 8 pc.

▪ in non-refereed editions – 31 pc.

▪ in educational aids, monographs, dissertations, etc. - 8 pc.

Total number of cited publications - 20.

The points of citations of the candidate according to the requirements of Article 2a, (2), (3) and (4) (shown in the table) are 195 points, with 100 points required for the academic position of „professor“. I think that the creative activity of Assoc. Prof. Gochev is well known in Bulgaria and abroad.

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

From presented publications and creative achievements are not accepted for reviewing those not related to the announced competition, namely: publications on temperature technologies and processes in the wood and furniture industries, those on the production and use of biomass from wood, and those on various decorative coatings built on wood materials. Textbooks and educational aids are also not reviewed, as they are peer-reviewed before being

printed. Non-peer-reviewed publications and other submissions will be taken into account in the overall evaluation of the candidate's creative achievements.

I express my sincere praise to Assoc. Prof. Gochev that he has succeeded in taking time for scientific activity in other directions, in order to gain a greater insight into the students' education and problems in the scientific activity in the faculty.

Materials on scientific, scientific-applied and applied contributions are considered in three directions: „Cutting of wood and wood-based materials“, „Cutting tools“ and „CNC machines, tools and technologies“. The proposed configuration will result in some matches or repetitions of the publications cited for some contributions.

In my opinion, it is difficult to use wood cutting processes without knowing which cutting tool to use. Therefore, I will present joint scientific, scientific-applied and applied contributions from the three directions.

▪ **Scientific contributions**

1. A detailed methodology has been developed to study the working capacity of a wide and narrow band saw blades with part-set, swage-set and stellite tipped teeth. The following indicators were investigated: feed rate, the input power of the cutting mechanism, power consumption, and productivity, efficiency, cutting power, tangential cutting force, specific cutting work and surface quality (№№ 7, 46, 47, 53, 64).

2. A methodology is developed and experimental studies are presented on the force-energy parameters of the process of longitudinally flat and profile milling of solid wood with a shaper machine with a lower spindle arrangement using different types of tools. The influence of the feed rate and the milling area on the power and cutting force and the specific power consumption have been determined (№№ 18, 26, 34, 48, 49, 61, 62, 73).

3. The specific energy of laser cutting of various coniferous and deciduous tree species has been determined experimentally and theoretically. Experimental studies show that the specific energy of laser cutting can be regarded as a constant for a particular tree species (№ 92).

4. An adequate mechano-mathematical model for the study of the torsional vibrations of the cutting mechanism of a circular saw machine has been developed. The resonant modes of operation are defined, as well as their influence on the accuracy and quality of the production (№№ 3, 20).

5. The fatigue strength of a circular shaft at time-varying bending and torsional stresses has been investigated, depending on the kinematics and dynamics of cutting and output of possible waveforms of $\sigma(t)$ and $\tau(t)$ (№ 68).

6. The influence of the wear and change of the parameters of the elements of the cutting mechanism of a woodworking shaper machine on the accuracy and quality of production is investigated on the basis of a developed mechano-mathematical model (№№ 15, 16).

7. With the help of a developed mechano-mathematical model, numerical solutions and graphs necessary for the analysis of free non-damping and free-damping spatial vibrations of a particular shaper machine and their influence on the milling process can be obtained (№№ 35, 89, 94, 100).

8. A mechano-mathematical model has been developed to investigate the torsional vibration of the cutting machine of the shaper machine and the vibrational behavior of the

mechanism when the belt gear is worn, resulting in a change in its damping properties (№№ 11, 52, 97).

9. A methodology was developed and experimental studies were conducted on electric arc welding of a wide band saw blades with a melting electrode in pure argon, mixed with argon and carbon dioxide, without and with preheating of the two ends of the band saw blade, analyzing the influence of welding mode on the quality of the weld (№№ 31, 101).

10. The performance indicators of abrasive tools (grinding productivity, relative grinding productivity, abrasion tool wear and durability, the roughness of sanded surfaces, the presence of micro-cracks and burns) with ceramic and organic bond in a sharpening of a narrow band saw blades have been investigated (№№ 1, 42).

11. The vibration behavior of the cutting mechanism of circular saw machines was investigated using a mechanical-mathematical model. A number of simulation studies are possible through the model. The purpose is to model and analyze the operation of the cutting mechanism of the machine with all the features of its design (№№ 21, 68, 69, 91).

12. A numerical study of the forced space vibrations of a shaper machine with lower spindle position caused by the unbalance of the cutting tool has been carried out. The calculations were made at three different angular velocity values of 66 s^{-1} , 100 s^{-1} and 133 s^{-1} and at three unbalance values of 0,010 kg.m, 0,015 kg.m and 0,020 kg.m. The obtained results confirm the applicability of the developed model for investigation of vibration behaviour of a woodworking shaper machine (№№ 16, 24, 25, 35, 52).

13. Adequate mechano-mathematical model for the study of free oscillations in a circular saw with TCT teeth is proposed. Based on the model, simulation studies were conducted to study the natural frequencies of the circular saw (№№ 84, 85).

14. The presence of compensating temperature and low noise slots in the circular saw body reflects on the natural frequencies and mode shapes of the circular saw. In this way, it is possible to identify resonant regimes and formulate sound recommendations for avoiding them (№№ 59, 60).

▪ **Scientific-applied contributions**

1. Studies have been carried out concerning the performance and durability of the wide and narrow band saw blades, which give an answer as to what to choose when preparing the teeth of these saws, depending on the economic, technological and technical requirements of the company (№№ 7, 46, 47, 53, 64).

2. The values of the specific laser cutting energy, considered as a constant for a particular tree species, can be used to develop a theoretical model describing the kinetics of cut formation (№ 92).

3. Mechano-mathematical model find out the possibility for the numerical study of the natural frequencies and mode shapes of free spatial vibrations for a specific type of machine and its cutting mechanism, as well as the natural frequencies necessary for the definition of resonant modes of operation (№№ 13, 20, 35, 89, 94, 100).

4. Determination of the power and energy parameters of the process of logs sawing and longitudinal milling of solid wood contribute to a more complete clarification of the technological process and the location of each necessary machine in it (№№ 26, 34, 48, 49, 64, 73).

5. The main factors that influence the welding process of band saw blades related to the welding mode parameters have been identified (the magnitude of the welding current and voltage, the type and composition of the protective gas and its consumption, the diameter and brand of the welding wire, the value of the output end of the wire, the welding speed and the feed rate of the welding wire); factors related to the welding material (the steel mark of the band saw blade, its hardness, microstructure and the method of preparation of the blade welding ends); factors related to the heat treatment mode of the band saw blade in the welding zone (temperature and time of heating when heat treatment, missing or pre-heating the band saw blade ends before welding, as well as its temperature and duration) (№№ 1, 37, 38, 101).

6. The influence of the degree of wear, change of the setting and the sharpening radius of the teeth in narrow and wide band saw blades, on the quality and accuracy of the sawn materials and the productivity of the process of log cutting was investigated (№№ 64, 101).

7. An analysis of worn out area of cemented carbide KCr08 cutting edge of milling tools after cutting of laminated wood of scotch pine with use of POW glue „Folkolit“ by moisture content of 9% was performed. In the worn out area it was found extensive corrosion mosaic, with characteristic dimensions much larger than dimension of a single tungsten carbide grain being main building element of the cutting edge material (№ 19).

8. The profile of a universal cutter head in a set with profile knives and limitors (feed limiter) and an aluminum body was investigated. For practical calculations, a simplified method is used, the basis of which is the replacement of the oblique milling with a cylindrical one. The specified values of the linear and angular parameters of the profile head are determined. On this basis, it is estimated what is the influence of the feed per tooth and the accuracy of the cutter teeth placement on the quality of the processed surfaces (№ 48).

9. Clarification of the technological process, technological possibilities and the place of CNC machines in it, their effective use and overcoming of critical moments and current problems (№№ 65, 77, 103).

10. A method for more accurate assessment of the complex impact of CNC wood router with boring centers on the major technological and economical factors important to any furniture manufacturer is proposed (№№ 8, 77, 103).

11. A methodological approach has been developed regarding the choice of CAD systems and CAM modules for graphical programming of CNC machines and the expediency of their application in practice and the learning process (№№ 56, 57, 65, 103).

12. The process of cutting using the "nesting" method of laminated particleboard was investigated and the depth value of the cutter tool in basic board track on the workbench was measured using a routing-boring center, model CNC PRATIX Z2 by SCM, to achieve precise cutting with minimal fillet radius of edge and minimum depth value on work table (№ 22).

▪ **Applied contributions**

1. Technological instructions have been developed for the effective use of wide and narrow band saw blades with part-set, swage-set and stellite tipped teeth for the needs of Fagus Ltd. - Pernik, Training and Experimental Forest Ranges of Yundola and Petrohan and all interested companies (№7, 46, 47, 53, 64). Specific directions in these instructions are:

- sawing of wood logs with narrow band saw blades is possible when the volume of the tooth gullet provides the necessary capacity of the cut chips and their easy removal when the teeth come out of the cut;

- the quality preparation of the band saw blade ensures good performance of the sawn materials with portable band sawmills: roughness $\bar{R}_m = 190 \mu m$; deviation in size and shape accuracy of 1,5 mm and 1,8 mm at feed rate $U = 12 \text{ m/min}$;

- when cutting wood logs at a temperature of $0 \text{ }^\circ\text{C}$ it is necessary to use non-freezing liquid (WW) mixed with water in a ratio of 2:1 to wash the band saw blade or to add a dishwashing detergent to the solution;

- at lower operating temperatures ($-15 \text{ }^\circ\text{C}$) the best option for lubricating the band saw blade is 50% diesel and 50% oil for gasoline chainsaws, evenly applied on both sides.

2. The optimal feed rates are determined in terms of the power-energy load of a vertical shaper machine, respectively, and its spatial vibrations and resonant modes (№№ 34, 73).

3. Social and economic effects resulting from improved working conditions and the quality of wood logs cutting; saving band saw blades; increasing process productivity at the expense of higher feed rates, and greater durability of the band saw blade in the work process (№№ 7, 46, 47, 53, 64).

4. Recommended welding modes for band saw blades have been developed for the needs of the Training and Experimental Forest Range of Yundola and for all interested companies. The best results are presented in the respective program mode of welding according to the MAG and MIG method (№№ 1, 37, 38).

5. Types of defects and causes of their occurrence in the process of welding and heat treatment the band saw blades have been identified and analyzed. The technique and technology of electric arc welding of a band saw blades in a protective gas environment with a melting electrode are described, as well as safety measures (№№ 1, 101).

6. Detailed studies have been carried out on the preparation of wide and narrow band saw blades before their operation, namely (№№ 1, 64):

- the relationship between the length of service in working days and the change in the width of the saw blade is determined. It was found that, after the 26th working day, the saw had reached the limit of sharpening;

- as a result of repeated sharpening, the hardness of the hardened teeth in narrow band saw blades were found to reach 52 HRC and the sharpening radius increased six times. Further operation of the saw is only possible at lower feed rates;

- - the use of a wide band saw blades provide higher productivity. The volume of the sawn timber is twice as large as the narrow band saw blades of portable sawmills, but at the expense of the quality of the surfaces obtained. When using them, the required productivity and quality of the materials must be individually tailored to the company's assortment program.

7. The basic errors and defects, which occur in the satellite depositing on the band saw teeth in the Training and Experimental Forest Ranges of Yundola are analyzed. Recommendations have been made on how to visually control the heat treatment temperature, the method of side grinding of the stellite tipped teeth and the sharpening modes (№№ 1, 66).

8. The linear and angular parameters of the teeth of new petrol chain saws were investigated and after a certain period of work, before sharpening and after sharpening by three different methods (№ 82).

5. Assessment of the applicant's personal candidate

I accept that most of the results achieved in the research activity, in the materials presented at the competition, are personal to the candidate. This is confirmed by the fact that 16 of the publications are self-contained, and in 17 of the collective papers he is in the first place.

The above data clearly show that the scientific, scientific-applied and applied contributions referred to in item 4 are the candidate's main personal work or have been achieved under his guidance and with his active participation.

6. Critical remarks


In the works of the candidate and his other creative achievements, with which he participates in the competition, I did not find any gaps of principle or discussion character, i.e. such as misconceptions, incorrect approaches, methods, incomplete analysis, or incorrect summaries of specific results obtained. On the contrary, all the materials of the competition are well-formed and arranged, in each of his publications there is an introduction, the main content of the work, a conclusion, cited literary sources cited in the text. However, the following can be pointed out as a critical note: an unnecessarily detailed and factual reference to contributions to scientific works that could have been presented in a more general way without missing any of them. I recommend on the candidate continue still work systematically, seriously and effectively way in the field of education and science and to transfer his extensive knowledge and experience in addition to the students and more Ph.D. students.

7. Personal impressions

The publications and creative achievements presented at the competition, as well as my personal impressions of many years of professional communication with him, give reason to conclude that Assoc. Prof. Gochev is a highly qualified specialist and scientist in the field of wood cutting and cutting tools. As a person, he is educated, sociable, ethical and collegial. He regularly participates with authority in scientific forums at home and abroad. In his work, he shows diligence, creativity and striving to apply modern methods and means for quality and effective education of students. He has proven that he can solve research problems on his own, and is a useful and active performer in collective development. Through his many years of work, he has succeeded in entering the scientific field in which the competition was announced and establishing himself as a good professional and lecturer.

8. Conclusion

The actuality and positive assessment of good teaching activity, active participation in research topics and research publications give grounds for assuming that the requirements under the Rules for the Development of Academic Staff at the University of Forestry are fulfilled. In connection with the above, I propose that Assoc. Prof. Dr. Zhivko Bonev Gochev to be elected as a „Professor“ in the discipline „Wood cutting and cutting tools“ in the Professional field 6.5 Forestry, scientific specialty „Technology, mechanization and automation of the woodworking and furniture industry“.

Review prepared by: 
/Prof. Dr. B. Dinkov/

Review delivered on: