



## 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. Panayot Angelov Panayotov**, Professor in Professional field 6.5 Forestry from the University of Forestry, retired

### 1. Brief biographical data of the candidate

Zhivko Bonev Gochev was born on 25.03.1960 in the town of Dimitrovgrad. He graduated from the Ivan Vazov Polytechnic High School in 1978. During the period 1980-1985, he was a full-time student at the Higher Institute of Forestry - Sofia, specialty in Mechanical Technology of Wood, specialization in Furniture Production. After successfully passing the state exams, he was awarded the title of „engineer“ in Mechanical Technology of Wood.

After graduation, he worked for two years (1985-1987) at the furniture factory „Nikola Terziev“ („Bukelon M“ Ltd.) in the town of Haskovo, as an engineer-technologist. During the period 1987-1990, he was a Ph.D. student in the Department of „Mechanization and Automation of Woodworking and Furniture Industry“ at the „Higher Institute of Forestry“ - Sofia. Since January 1991 he has been working at the Research Department of the „Higher Institute of Forestry“ as a research engineer at the Laser Technology Laboratory, to which he became the head in 1995. During the period 1991-1996 he leads the exercises in the discipline „Wood cutting“ as a part-time assistant at the Department of Woodworking in the Faculty of Forest Industry at the University of Forestry. From January 1992 to December 2004 he was a technologist in the department of woodworking machines at ZDM „Koynare“ Ltd. - Koynare. He defended his dissertation in 1996 and received his doctorate degree. In September 1996 he was appointed Chief Assistant in the Department of Woodworking Machines, after which he starts lecturing and lead exercises in two disciplines in the Bachelor's Degree in specialty „Woodworking and Furniture Manufacturing“ at the Faculty of Forest Industry: 1. „Wood cutting and cutting tools“ and 2. „Organization and planning of the wood and furniture industry“, as well as one discipline in the Bachelor's Degree in specialty Business Administration 3. „Business evaluation of machinery and equipment“.

In 2005 he was habilitated and received the scientific title of „Associate Professor“ (Certificate № 23036 of 06.06.2005, issued by the High Attestation Commission of the Council of Ministers - Republic of Bulgaria). As an associate professor, he was authorized to lecturing and lead exercises in two disciplines: 1. „Wood cutting and cutting tools“, (Bachelor's Degree Program, specialty „Woodworking and Furniture Manufacturing“, now „Technology of wood and furniture“; 2. „Lasers application in woodworking and furniture industry“, (Master's Degree Program, specialty „Technology of wood and furniture“, Woodworking Machine module) and „CNC Machines, Tools and Technologies“ (Master's Degree Program, specialty „Technology of wood and furniture“). From the academic year 2018/2019, he also leads the practical discipline „Production Practice“ for Bachelor's Degree

Program in specialty „Technology of wood and furniture“. In November 2007, he was elected Head of the Department of Woodworking Machines for two terms until 2016. In the period 2013-2016, he is the Deputy Dean for Education Affairs of the Faculty of Forest Industry, and since March 2016 he is the Dean of the Faculty of Forest Industry, as he is at the time of the competition for the academic position of „Professor“. Since 2016 he is a member of the Academic Council of the University of Forestry.

## **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.**

In the application by Assoc. Prof. Zhivko Bonev Gochev, entry № FGP-4407 from June 26, 2019 to the Rector of the University of Forestry - Sofia, a request for admission to the competition for the occupation of the academic position of „Professor“ in professional direction was stated 6.5 Forestry, scientific specialty „Technology, mechanization, and automation of the woodworking and furniture industry“, in the discipline „Wood cutting and cutting tools“ for the needs of the department „Woodworking machines“, announced in SG, issue 37/07.05.2019, procedure code WWW-P-0419-06.

To participate in the competition, paper and electronic documents attesting to the applicant's empathy in the competition have been enclosed, some of which are: **1.** European CV; **2.** Higher education diploma for qualification „Master of Engineering in Mechanical Technology of Wood“ - specialization „Furniture Manufacturing“, which shows that his average success from the study is very good 5.34 and assessment from the State Exam: Excellent 5,75; **3.** Diploma for an educational and scientific degree „Doctor“, issued by the Higher Attestation Commission (Protocol 14, No 8 of 26.06.1996); **4.** Certificate of scientific title „Associate Professor“, issued by the Higher Attestation Commission (Commission 14, Protocol № 4 of 23.03.2005) in the scientific specialty 02.13.02 „Technology, mechanization and automation of the wood and furniture industry (Cutting of wood )“; **5.** Official notice of academic position and internship in the specialty; **6.** Medical certificate; **7.** Criminal record certificate; **8.** Self-assessment report on the fulfillment of the national minimum requirements of Article 2a (2), (3) and (4) for the academic position of „Professor“; **8.1** Self-assessment report for the fulfillment of the minimum national requirements under Article 2a (2), (3) and (4) for the academic position of „Professor“ (Appendix 2 - Research and Publication); **8.2** Self-assessment report for the fulfillment of the minimum national requirements under Article 2a (2), (3) and (4) for Doctoral Degree (Appendix 2 - Research and Publication); **9.** List of publications and other scientific and applied results after taking up the academic position of associate professor; **10.** A reference to the contributions and scientific works after filling the academic position of associate professor; **11.** A reference for known citations; **12.** Documents and written materials certifying other professional and creative activities and appearances within the meaning of Art. 67 (2); **12.1** Official notice for academic workload; **12.2** Official notice for participation in research projects to the Scientific-research sector at the University of Forestry; **12.3-12.6** Thank you letters (ZMM OOD - Smolyan; DADEX Ltd. - Smolyan; Technical University - Zvolen, Slovakia; St. Cyril and Methodius University - Skopje, Northern Macedonia); **12.7** Official notice of Participation as a Researcher at InnovaWood - Dublin, Ireland; **12.8** Official notice on participation in the Board of Directors of the JICA-Alumni Association in Bulgaria; **12.9** Official notice for an expert at the Bulgarian Institute for Standardization - Technical Committee-52 „Safety of Machines and Equipment“; **12.10** Official notice for participation in the Center for Continuing Education - University of Forestry; **12.11** License for Assessment of Machines and Equipment; **13.** Reference for successfully graduate Ph.D. student led by the candidate for the position of „Professor“; **14.** Reference for leadership of successfully graduate students; **15.** Reference to the prepared curricula, guided by the applicant; **16.** Classification of the publications of the candidate for the academic position of „Professor“; **17.** A reference about the applicant's scientific, teaching

and expert activity; **18.** Declaration under Article 313 of the Criminal Code for the accuracy of the information provided; **19.-20.** Information card modeled in Bulgarian and English; **21.-22.** Abstracts of the publications in Bulgarian and English; **23.** List of prepared reviews; **24.** List of all publications of the applicant; **25.** Abstract of dissertation work for a Ph.D. degree; **26-30.** Orders for the composition of accreditation committees certifying the participation of Assoc. Prof. Zhivko Gochev in them. From these documents, it can be seen that Assoc. Prof. Zhivko Gochev actively participates as a contractor and leader in the accreditation committees of Faculty of Forest Industry, respectively of the University of Forestry-Sofia.

**In conclusion, it should be noted that the candidate for the occupation of the academic position "Professor" has submitted all the documents required under Article 60 (2), (3) and (4) of the Law on the Development of Academic Staff and the Regulations of the University of Forestry - Sofia for its implementation.**

**When analyzing and comparing the requirements of the normative documents (Law on the Development of Academic Staff; Rules for the application of Law on the Development of Academic Staff; Rules of the University of Forestry) and the minimum requirements for occupation of the academic position of „Professor“ it is established that the candidate meets them. The total number of candidate points is 1200 with a minimum national requirement for the academic position of „Professor“ - 550 (Annex 1.4).**

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

Assoc. Prof. Zhivko Bonev Gochev started working as a lecturer at the University of Forestry (then Higher Institute of Forestry) in 1990 as a part-time assistant in the Department of Mechanization and Automation of the Woodworking and Furniture Industry in the discipline of „Wood Cutting“. According to the enclosed reference (Entry № FGP 2830/13.05.2019), he has 22 (twenty-two) years of work experience at the University of Forestry. After the successful public defense of a doctoral dissertation entitled „Investigation of the process of laser cutting of furniture details from particle boards“, in 1996 he was awarded the Ph.D. During the 1996/1997 school year, he was involved in lecturing on the discipline “Organization and Planning of woodworking and furniture industry” at the Faculty of Business Management at the University of Forestry. During the 1998/1999 academic year, at the suggestion of the Department of Woodworking Machines at the Faculty of Forest Industry, he was selected by the Faculty Council as the Chief Assistant in the discipline of „Wood Cutting“. In 2005 he was habilitated by a competition announced by the University of Forestry and the Higher Attestation Commission of the Council of Ministers of the Republic of Bulgaria issued him a certificate for the scientific title of „Associate Professor“. Since January 2011, he has been authorized to give lectures on the discipline „CNC Machines, Tools and Technologies“ for the Master's Degree Program, specialty „Technology of wood and furniture“ of the Modules: Furniture manufacturing, Woodworking Machines and Equipment, Technology of wood materials and composites. Assoc. Prof. Gochev lectures and exercises in the discipline „Lasers application in woodworking and furniture industry“, specialty „Technology of wood and furniture“, Master's degree program from 2005 until now. He has participated 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“ and others.

His auditorium employment for the academic year 2018/2019 amounts to a total of 256 hours, of which 194 hours for the Bachelor's Degree and 64 hours for the Master's Degree. The planned extra-curricular employment of Assoc. Prof. Zhivko Gochev is 73 hours. In total, his teaching load amounts to 329 hours, which is significantly more than he gets as Dean - 216 hours. According to Art. 61 of the Rules of Procedure of the University of Forestry, Assoc. Prof. Zhivko Gochev, as Dean of the Faculty of Forest Industry, uses a

reduced rate of the Annual training employment by 40%. Therefore, Assoc. Prof. Zhivko Bonev Gochev works with the students very actively.

According to the attached reference (entry № 3043/20.05.2019), he trained and led to the defense as a scientific adviser 28 successfully graduate students, of whom in the Bachelor's Degree Program, specialty „Technology of wood and furniture“ - 21 students and at the Master's Degree Program, specialty „Technology of wood and furniture“ - 7 students. Assoc. Prof. Gochev is the chairman of the State Examination Committee for Master's Degree Program in specialty „Technology of wood and furniture“ at the Faculty of Forest Industry and he is a member of the State Examination Committee for Bachelor's Degree Program in specialty „Technology of wood and furniture“. On the basis of the purposeful learning activity and the demonstrated precision in the perception of the work of his previous lecturers (Prof. Petko Grigorov; Prof. Peter Obreshkov; Prof. Georgi Filipov, Assoc. Prof. Vladimir Burnekov) the candidate was able to compile and print two study aids, one textbook, and one monograph. They facilitate the process of teaching and accepting scientific knowledge and scientific facts. The „Wood cutting and cutting tools“ textbook is the applicant's own work. It consists of two parts: 1. „Cutting of wood and wood-based materials“ and 2. „Cutting tools“. The first section includes 30 themes and the second 27 themes. The textbook is written on 523 pages and is illustrated with 506 figures, pictures and 133 tables. The independent work of the candidate is the monograph „Preparation and maintenance of band saw blades for cutting of wood logs“, which is 200 pages and contains 120 figures, photos, and 26 tables. Chapter 8 „Vocational Education and Training“, pages 246-262 of the Woodworker and Furniture Industry Entrepreneur's Handbook, University of Forestry, Entrepreneurship Promotion Center, should be considered as a teaching aid. Teaching aid is the lecture course „CNC Machines, Tools and Technologies“, published on the BlackBoard system at LTU. The monograph, textbooks, and teaching aids are all written in accessible language and with very good spelling. All the literature sources used are cited in good faith.

***Plagiarism was not observed when writing the teaching aids, textbook, and monograph.***

Assoc. Prof. Zhivko Gochev, Ph.D., has prepared and led to the defense 1 (one) full-time Ph.D. student: Eng. Valentin Atanasov Atanasov with the theme of the dissertation „Investigation of the Performance Indicators of Portable sawmills“. He has successfully participated in a competition for the academic post of Chief Assistant Professor at the Department of Woodworking Machines at the Faculty of „Forest Industry“.

The pedagogical preparation, educational and organizational activities of Assoc. Prof. Gochev and his work as a lecturer are at a high level 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 Gochev participates in the competition for the occupation of the academic position of "Professor" 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**

01-104); member of the staff of 1 national research project (№ 105); participates in 3 international scientific and applied projects, in one of which is a leader (№№ 106-108); participates in 5 national-educational projects (№№ 109-113); he is the manager of 1

infrastructure project financed by the University of Forestry (№ 114); he is the leader of 1 project funded by the Research Fund to support international scientific forums (№ 115); he is the leader of 6 projects funded by the Training and Experimental Forest Ranges of the University of Forestry (№№ 116-121).

Assoc. Prof. Zhivko Bonev Gochev is a member of the Chamber of Independent Valuers in Bulgaria (Certificate of Valuation Reg. № 300100629 / 01.12.2010).

#### **4.2 Characterization of published scientific results**

The publications of the candidate Assoc. Prof. Gochev can be classified as follows::

- **Publications in scientific journals - 49 pieces:**
  - 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 pc.
- **Publications in proceedings of scientific forums – 46 pieces:**
  - 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 Xylogologiae (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 well-known citations of the scientific publications of Assoc. Prof. Gochev are 60, which according to the type of citations can be divided into:

- in refereed and indexed editions in Web of Science and SCOPUS – 13 pieces:
  - 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.

In my opinion, the scientific activity of Assoc. Prof. Zhivko Gochev is well known in Bulgaria and abroad. According to the self-assessment reference for meeting the minimum national requirements under Art. 2a, (2), (3) and (4) for the academic position of „Professor“ the required number of points from the citations are 100 and those of the candidate is 195.

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

Contributions of the candidate's works directly concern with clarifying theoretical and practical issues in two main directions of the discipline „Wood cutting and cutting tools“: 1. „Cutting of wood and wood composites“ and 2. „Cutting Tools“, as well as the related direction „CNC Machines, Tools and Technologies“. The main scientific, scientific-applied and applied contributions from the three directions are:

- **Scientific contributions**

1. A detailed methodology has been developed to investigate the operability of wide and narrow band saw blades with part-set, swage-set and stellite tipped teeth, including the quantitative and qualitative side of the process: 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, 102).

2. A methodology has been developed and experimental studies have been carried out on the power and energy parameters of the process of longitudinally flat and profile milling of solid wood on a woodworking shaper machine with a lower spindle arrangement using different types of cutter head tools (№№ 18, 26, 34, 48, 49, 61, 62, 73, 104).

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

4. The natural frequencies and mode shapes of the circular saw machine are investigated on the basis of an adequate mechano-mathematical model for the study of the torsional vibrations of the cutting mechanism of the circular saw machine. The resonant modes of operation of the machine are defined, as well as their influence on the accuracy and quality of production (№ 13, № 20).

5. The vibration behavior of the cutting mechanism of circular saw machines was investigated using a mechano-mathematical model. The model allows to study the ongoing dynamic processes, to conduct simulation studies, to search for and to analyze the causes of high-level vibrations and noise (№№ 20, 21, 68, 69, 91).

6. 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).

7. A mechano-mathematical model is developed and the free-damping spatial vibrations of a woodworking shaper and its spindle have studied. The model was used to investigate the torsional vibrations of the cutting mechanism of the shaper machine and the vibrational behavior of the mechanism during wear of the belt gear, resulting in a change in its elastic and damping properties (№№ 35, 52, 89, 94, 97, 104).

8. 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 analysis of the results shows that the imbalance of the cutting tool on the shaper machine produces intense spatial vibrations not only on the spindle but also on the whole machine (№№ 16, 24, 25, 35, 52, 104).

9. A methodology has been developed and experimental studies have been conducted on electric arc welding of a wide band saw blades with a melting electrode: in pure argon medium; mixed with argon and carbon dioxide; without and with preheating of the two ends of the band saw blade. The influence of the welding mode on the geometrical characteristics and the quality of the weld is analyzed and the parameters of the temperature field are determined (№№ 37, 38, № 101).

10. The performance of abrasive tools with ceramic and bakelite bond for sharpening in production conditions of circular saws with steel teeth and narrow band saw blades have been investigated (№№ 1, 41, 42).

11. Adequate mechano-mathematical model for the study of free oscillations in a circular saw with TCT teeth is proposed. A methodology was developed by which the results of simulation studies were obtained for circular saws with TCT teeth and compensation slots (compensators for temperature tensions), as well as those with low noise slots. In this way, it is possible to identify resonant regimes and formulate sound recommendations for avoiding them (№№ 59, 60, 84, 85).

- **Scientific-applied contributions**

1. Studies concerning wood logs cutting with wide and narrow band saw blades with part-set, swage-set and stellite tipped teeth have been carried out. They contribute to a more complete elucidation of problems affecting their performance and durability. On this basis, the answer is given to the choice of the manufacturers in the preparation of the teeth of the band saw blades, depending on the economic, technological and technical requirements, and the capabilities of the company (№№ 7, 46, 47, 53, 64, 102).

2. The developed mechano-mathematical model and its variations, incl. for various woodworking machines find out the possibility for the numerical study of the natural frequencies and the mode shapes of the 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, 104).

3. Determination of the power and energy parameters of the process of cutting of logs sawing and longitudinal milling of solid wood contribute to a more complete clarification of the technological process and the place of vertical band sawmills with a cartridge, portable sawmills and shaper machines in it, their effective use and overcoming of critical points and current problems (№№ 7, 26, 34, 49, 64, 73, 102, 104, 105).

4. 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).

5. 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 (№№ 4, 64, 101).

6. The worn-out area of the tungsten carbide edge with cementation of KCr08 on milling tools after cutting of laminated wood of scotch pine by a moisture content of 9% with use of POW glue „Folkolit“ was investigated. An extensive corrosion mosaic was discovered in the worn-out area, with characteristic sizes much larger than the size of a tungsten carbide grain, which is a major constituent of the cutting edge material (№ 19).

7. 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. Определени са приведените стойности на линейните и ъглови параметри на профилната фрезова глава. 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. The ensuing determination of the basic kinematic and dynamic magnitudes will be much more accurate than if the cutter head is regarded as cylindrical with a milling radius corresponding to the farthest point from the center of arbor hole diameter (№ 48).

8. 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. A system of indicators for machine selection was developed according to its kinematic features and technological capabilities, selection of cutting tools, cutting schemes and modes, quality and accuracy of the machined surfaces (№№ 8, 77, 103).

9. 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).

10. 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 (№ 22).

- **Applied contributions**

1. Technological regimes and instructions have been developed for the effective use of wide band saw blades with part-set, swage-set and stellite tipped teeth for the needs of, according to the specific production conditions, for the needs of the Training and Experimental Forest Ranges at the University of Forestry and all interested companies (№№ 7, 46, 47, 53, 64, 102, 105).

2. It was found that the qualitative preparation of the band saw blades ensure good performance of the lumber materials with portable sawmills: roughness  $\bar{R}_m = 190 \mu\text{m}$ ; deviation in size and shape accuracy of 1,5 mm and 1,8 mm at feed rate  $U = 12 \text{ m/min}$ . For partially frozen logs this can be achieved with hardened teeth with universal profile 10/30 having the necessary stability and stability when interacting with the different density of wood (№№ 47, 53).

3. It was found that when cutting wood logs at temperatures below 0 °C it is necessary to use a non-freezing liquid (Windshield Washer) mixed with water (2:1 ratio) to wash the band saw blade or add dishwashing detergent to the tank. At lower operating temperatures (below -15 °C), the best option for lubricating the band saw is 50% diesel and 50% oil for gasoline chainsaws, evenly applied on both sides (№№ 47, 53, 105).



4. For the needs of the educational process, specimens and photo material were prepared to show the sequence of the technological process of selection, preparation of the teeth and modes for effective cutting of soft and hard wood with band saw blades with part-set, swage-set, hardened and stellite tipped teeth (№№ 7, 46, 47, 53, 64, № 102, 105).

5. Social and economic effects resulting from improved working conditions and the quality of log cutting; saving band saw blades from expensive alloyed tool steels; increasing the productivity of the process at the expense of higher feed rates of the sawn material; more durability of the blade during operation and longer operation between two consecutive sharpenings. The results obtained are directly practice-oriented and find application in the learning process of the specialty „Technology of wood and furniture“ (№№ 7, 46, 47, 53, 64, № 102, 105).

6. Recommended welding modes for band saw blades according to the MAG method for the needs of the Training and Experimental Forest Range of Yundola and for all interested companies have been developed (№№ 1, 37, 38, 101).

7 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).

8. In the production conditions of Fagus Ltd. it was found that by further reducing the initial diameter of the ball-bearing guides for guiding the band saw blade, the width of the narrow band saw blades for cutting logs with hardened teeth of 38 mm can be operated within normal conditions up to a width of 31,5 mm or without a tooth height of 25,5 mm, corresponding to 45 working days. In accordance with Wood-Mizer's recommendations, the permissible deflection of this type of saw blade is 33 mm i.e. the allowable size after deduction of the height of the tooth is 27 mm, which corresponds to 26 working days (№№ 1, 4, 64).

9. 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. Further operation of the saw is only possible at lower feed rates (№№ 1, 4, 64).

10. 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 (№№ 1, 4, 64, 102).

11. 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, 4, 66, 102).

12. 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 also appropriate recommendations were made (№ 82).

13. A curriculum and on-line training course were developed in the BlackBoard system of the University of Forestry in the discipline „CNC Machines, Technologies and Tools“, included in the curriculum of the specialty „Technology of wood and furniture“, Master's Degree Program for module: „Woodworking Machines and Equipment“; „Furniture Manufacturing“ and „Technology of Wood Materials and Composites“ (№№ 3, 103).

## **5. Assessment of the applicant's personal candidate**

Assoc. Prof. Zhivko Gochev has 16 self-contained publications. In 17 of the collective papers he is in the first place. This gives me a reason to claim that he works very actively both individually and in a team. I am convinced that the contributions to the candidate's scientific work are his own work or achieved through his active participation. He is the indisputable authority in the field of wood cutting and cutting tools in Bulgaria.

## **6. Critical remarks**

The works and materials submitted by the candidate for participation in the competition are well-formed and properly structured. I have not found wrong statements, methods of work or analyzes. Some minor spelling mistakes and technical inaccuracies are noted which do not belittle from the results achieved by the candidate.

I think that the contributions reference submitted by the candidate should be not as detailed but to be more summarized.

In conclusion, I recommend Assoc. Prof. Gotchev to be still active in the educational, research work and to assist with his organizational experience the development of the Faculty of Forest Industry.


## **7. Personal impressions**

I know Assoc. Prof. Zhivko Gochev from our many years of working together in the Faculty of Forest Industry, our participation in national and international scientific forums. He is an initiative and creative personality. He has earned the trust of the College and is highly sought after for advice in the area in which he works.

## **8. Conclusion**

**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. P. Panayotov)

Review delivered on: