



## REVIEW

on dissertation for obtaining the educational and scientific degree "Doctor" in:  
**Field of higher education: 5. Technical Sciences,**  
**Professional Field: 5.13 General Engineering,**  
**Scientific Specialty: Technology, Mechanization and Automation in Woodworking**  
**and Furniture Industry**

### **Author of dissertation:**

MSc Eng. Rostislav Bozhidarov Bozhkov, Doctoral student (part-time) at the Department "Furniture Production" at the University of Forestry (UF), Sofia, Bulgaria.

### **Dissertation Topic:**

"Influence of Material Properties on the Softness of Upholstered Furniture"

### **Reviewer:**

Prof. Dr. Eng.-Designer Pavlina Minkova Vodenova, University of Forestry, Faculty of Forest Industry, Field of higher education: Technical Sciences, Professional Field: 5.13 General Engineering, Scientific Specialty: Ergonomics and Industrial Design, Appointed as a member of the scientific jury by Order No. RD-132/12.03.2025 of the Rector of the UF.

### **1. Brief introduction of the candidate.**

Eng. Rostislav Bozhkov was born in 1972 in Pernik. He graduated in 1997 from the University of Forestry, Faculty of Forest Industry, majoring in Mechanical Wood Technology. He was enrolled in a part-time doctoral program in the scientific specialty "Technology, Mechanization and Automation in Woodworking and Furniture Industry" on 15.01.2020 (Order № 3CP-505/20.12.2019), with a deadline of 15.01.2024. He was officially removed from the register with the right to defend on 16.01.2024 (Order № 3CD-37/02.02.2024).

His experience as a teacher, designer, and manager of a furniture studio has influenced his professional development.

### **2. Relevance of the problem.**

Upholstered furniture must meet diverse requirements, not only ergonomic and functional.

Research into the deformation characteristics of upholstery depending on the physical-mechanical and elastic properties, thickness, and number of materials used in the spring structure—as well as the use of fire-resistant materials—has clear scientific and practical relevance.

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### **3. Degree of knowledge of the state of the problem and creative interpretation of the literature review.**

The PhD candidate has cited 83 sources: 23 in Cyrillic, 52 in Latin, and 8 standards, with no internet sources.

The literature review covers 44 sources (3 standards), discussing trends in the production of upholstered furniture and the key parameters of upholstery structure. Three conclusions are drawn, highlighting the lack of modern, comprehensive studies on upholstery structures made from contemporary materials, and the absence of appropriate mathematical models for determining softness levels.

### **4. Aim, objectives, hypotheses and research methods. Relevance of the chosen research methodology to the stated aim and objectives of the dissertation.**

Based on the literature, the goal of the dissertation is defined as: "To study changes in softness indicators and deformation characteristics of upholstery depending on the physical-mechanical and elastic properties, thickness, and number of materials used in the spring part of the structure."

Five main tasks are set, and the research objects selected are appropriate. These include spring units (Bonnell and Pocket), conventional and fire-resistant polyurethane foams, plywood and solid wood bases, upholstery inserts, polyester wadding, lining materials, and upholstery fabrics.

A stand was used to measure initial softness, total deformation, and softness coefficient. Results are expressed through average values and analysed using QstatLab 6 and SPSS 20 software through three-factor experiments.

### **5. Visualization and presentation of the results.**

The dissertation contains 42 figures and graphs and 16 tables, clearly presenting methods, results, and interpretations.

### **6. Discussion of results and literature used.**

The candidate has fulfilled the tasks and achieved the dissertation's goal using experimental data.

Most references are post-2000 (54), though older sources from the 70s–90s are also used where appropriate.

The literature is specialized and relevant to the topic, reflecting developments both nationally and internationally.



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### **7. Contributions of the thesis.**

The candidate reports 3 scientific-applied and 1 practical contribution:

#### **Scientific-applied contributions:**

1. The values of the main indicators of softness of the upholstery structure have been established – initial softness, total deformation of the backrest, total deformation of the seat, softness coefficient of the backrest, and softness coefficient of the seat – for six different types of upholstery structures, whose springing components are built from "Pocket" spring units, conventional polyurethane foams (N 3030 and N 3540), fire-resistant polyurethane foams (CME 3025 and CME 3530), upholstery insert, and polyester wadding.
2. Based on the experimental results, graphical dependencies have been derived between the applied load and the deformation behavior of the studied upholstery structures.
3. The established values and the degree of influence of the studied materials on the softness indicators of the upholstery can be used as a basis for determining the optimal option when designing a specific type of upholstery structure, according to its functional purpose.

#### **Applied contributions**

1. The studied upholstery structures can be applied in individual, serial, and mass production of seats and backrests of modern upholstered furniture, compliant with BDS 8962-90 and BDS 7669-89.

### **8. Assessment of the extent of the dissertator's personal involvement in the contributions.**

After reviewing the dissertation, I confirm that the research and its contributions are the result of the candidate's personal efforts under scientific supervision.

### **9. Critical comments and questions.**

The dissertation shows the candidate's thorough investigation and structured methodology.

There are some unnecessary repetitions, which are advised to be avoided in future academic work.

### **10. Published articles and citations.**

There are 3 independent publications based on the dissertation. No citations were listed.

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The publications cover key aspects, especially deformation behaviour of materials.

Presented abstract reflects objectively the structure and content of the dissertation.

#### **11. Assessment of the publications on the dissertation: number, nature of the publications in which they are printed. Reflections in science - use and citation by other authors.**

The 3 publications appeared in proceedings of the XIX and XX International Scientific Congress "Machines. Technologies. Materials.", listed in the National Reference List of peer-reviewed Bulgarian journals.

According to national academic standards (Law on Academic Staff Development), Eng. Bozhkov has:

Indicator A (dissertation): **50 points**

Indicator G8 (peer-reviewed non-indexed journals): **60 points**

**Total: 110 points** (minimum required: 30 points for category G)

#### **CONCLUSION:**

Based on the different research methods learned and applied by the PhD student, the correctly derived experiments, the made generalizations and conclusions, I consider that the presented dissertation meets the requirements of the FRAADB and the Regulations of the University of Forestry for its application, which gives me the reason to evaluate it as **POSITIVE**.

I take the liberty of suggesting that the Honourable Scientific Jury also vote in the affirmative and award the candidate **Rostislav Bozhidarov Bozhkov** the educational and scientific degree "**Doctor**" in the scientific specialty **Technology, Mechanization and Automation in Woodworking and Furniture Industry**.

Date: 07.07.2025  
Sofia

REVIEWER:   
(Prof. Dr. Eng.-Designer Pavlina Vodenova)