REVIEW
of a dissertation
for the acquisition of the educational and scientific degree "Doctor" in

Higher Education Area – 5. Technical Sciences,
Professional Field – 5.1 Mechanical Engineering,
Doctoral Program – Cutting of Materials and Cutting Tools

Author: Georgi Veselinov Karlovski, M.Sc.
Title: Study of the Parameters of the Turning Process when Working with Quick-Change Tool Holders
Reviewer: Prof. Eng. Ivo Malakov, DSc

The dissertation submitted for review consists of 124 pages and includes an introduction, four chapters, conclusions, a list of references, a summary of the contributions, lists of publications and utility models related to the dissertation, a list of abbreviations used, and an appendix. In connection with the dissertation, one utility model and five publications have been submitted, one of which is indexed in the Scopus database. The work was developed at the Technical University of Gabrovo under the academic supervision of Prof. Eng. Irina Alexandrova, PhD.

1. Topic and Relevance of the Dissertation
The dissertation addresses a forward-looking and relevant area in the design of quick-change tool holders, which are widely used in modern machine building. The improvement of their design is the subject of ongoing research, and any innovation that enhances their characteristics is valuable to engineering practice. The proposed innovative holder design, the developed models, the approach, and the methodologies for studying this product enrich and advance the knowledge and capabilities for solving problems in the examined field. They lead to improved functionality and quality of the machined parts, increased efficiency of application, and create prerequisites for broad implementation in machine building.
All of this defines the scientific and practical relevance and importance of the research.

2. Review of the Cited Literature
The dissertation examines and cites 138 literature sources, including 58 internet addresses, 33 sources in Cyrillic, and 47 in Latin. Both the literature review and the research section of the work demonstrate a solid understanding of the current state of scientific research and practical

developments in the field, which are very well illustrated. The citations are accurate and are accompanied by an analysis and a creative interpretation of the literature.
The author has presented the essence, analyzed, and systematized the main solutions found in specialized literature related to the turning process when working with quick-change tool holders and has identified some unresolved problems. Based on the extensive bibliography and its in-depth analysis, as well as his solid professional qualification and experience, the doctoral candidate has correctly defined the aim and objectives of the dissertation.
I believe the candidate has a very good understanding of the current state of the field and possesses the necessary capacity to obtain new results.

3. Research Methodology

The chosen research methodology is appropriate for the stated aim and objectives of the dissertation. It is well justified, and its validity is evidenced by the results achieved. The solution of the dissertation's problems is based on the successful combination of classical methods and tools for design and experimental research with modern methods and applied software for computer modeling and optimization.
The work consists of four chapters. The first chapter is a literature review. Chapters two, three, and four present the doctoral candidate's developments and research findings.
In Chapter 2, based on an analysis of existing solutions, an innovative system for quick-change clamping of tools with an epicycloidal profile of the contact surface between the holder and the modular head. This system can be used for clamping tools with either a rotational or prismatic coupling part.
Chapter 3 is dedicated to an experimental study of the influence of the type of tool holder and the coolant fluid on the surface roughness of the machined parts and the tool life of the cutting tool. The experimental research confirms the effectiveness of the developed quick-change tool clamping system.
Chapter 4 presents the results of a multi-objective optimization of the turning process for alloy steel samples based on selected objective functions. Functional relationships were established to assess the influence of cutting speed and feed rate on the surface roughness and tool life.

4. Contributions of the Dissertation

I accept the contributions formulated by the author, which are of scientific-applied and applied nature. The main scientific-applied contributions are:

1. An innovative design of a quick-change tool holder has been developed, which reduces the dispersion in average surface roughness Ra, increases tool life, and decreases auxiliary time.
2. A statistical approach for the selection of tooling has been developed and validated.
3. Mathematical models have been constructed to describe the dependencies of the average surface roughness Ra and tool life on cutting speed and feed rate.

4. It has been proven that the use of the ECOCOOL MACH 40 coolant fluid leads to improved dispersion of controlled dimensions.

The dissertation also includes a number of applied contributions.

The scientific-applied and applied contributions can be categorized into the following groups: development of new classifications, methods, designs, models, methodologies, etc.; discovery and verification of new facts; and enrichment of existing knowledge with practical applications.

I assess the contributions as significant and valuable for both science and practice in a current and relevant area of modern machine building. The results are original and fully meet the requirements for a dissertation for the acquisition of the educational and scientific degree "Doctor".

5. Publications and Citations Related to the Dissertation

In connection with the dissertation, five publications have been developed — two of which are sole-authored, while the remaining three are co-authored with the academic supervisor, where the candidate is listed as the first author. All publications are in Bulgaria; two are in the journal *Automation of Discrete Production*, and the others are in the proceedings of a scientific conference with international participation.

A co-authorship contribution protocol has not been provided for the publications related to the dissertation, but it can be concluded that the author has made an equivalent contribution to the co-authored publications.

I have no information regarding citations or the practical application of the dissertation results so far, but I am confident that they will be recognized within the scientific community.

The submitted publications sufficiently and accurately reflect essential aspects of the dissertation content and contribute to the dissemination of the work conducted.

6. Authorship of the Obtained Results

I assess the results presented in the dissertation as the outcome of joint work between the candidate and his academic supervisor – Prof. Dr. Irina Alexandrova. The personal contribution of Georgi Karlovski is confirmed by the fact that, out of the five publications related to the dissertation, two are sole-authored, and in the remaining three, he is the first author.

7. Evaluation of the Compliance of the Abstract with the Requirements for Its Development

The abstract has been prepared in accordance with the requirements of the Regulations for Admission and Training of Doctoral Students at the Technical University of Gabrovo and fully reflects the essence and the main contributions of the dissertation.

8. Opinions, Recommendations, and Remarks on the Dissertation

The doctoral candidate's solid knowledge of the literature, the use of appropriate research methods, the development of an innovative design for a quick-change tool holder, the proposed models and their analysis, the experiments conducted under production conditions, and the rich empirical material obtained, along with its processing, presentation, and analysis, all attest to the candidate's strong professional qualifications. These elements give the dissertation the characteristics of a methodologically sound, credible, and scientifically well-founded theoretical-experimental study with clear practical relevance and significance.

A strong testament to the candidate's inventive activity and work in the field of intellectual property protection is the submitted list, which includes 1 utility model (co-authored) related to the dissertation topic, 2 national patents, and 4 utility models (co-authored) in other areas of mechanical engineering.

I have no fundamental remarks that would challenge the candidate's main scientific-applied and applied contributions. I previously prepared a review for the internal defence of the dissertation, which included comments and recommendations, many of which were taken into account in the final version.

The relevance of the topic and the results achieved provide a solid basis for recommending that the candidate seek opportunities to summarize the findings in an appropriate format and publish them in indexed and peer-reviewed journals included in SCOPUS and Web of Science.

9. Conclusion

Based on my review of the dissertation and the accompanying materials, the fulfillment of the educational objectives of the doctoral program, as well as the relevance and significance of the achieved original scientific-applied and applied contributions, I confidently give a POSITIVE evaluation of the dissertation.

All requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, its implementing regulations, as well as the specific requirements of the Regulations for Acquiring Academic Degrees at the Technical University of Gabrovo, in terms of scope, volume, and quality of the dissertation, have been met.

On these grounds, I propose that Georgi Veselinov Karlovski MSc be awarded the educational and scientific degree "Doctor" in Professional Field 5.1 Mechanical Engineering, Doctoral Program "Cutting of Materials and Cutting Tools".

31.07.2025

Reviewer:

/Prof. Eng. I. Malakov, DSc/