REVIEW

on dissertation work
for the acquisition of the educational and scientific degree "Doctor" in
field of higher education – 5. Technical Sciences
professional direction – 5.1. Mechanical Engineering
doctoral program – „Cutting of materials and cutting tools"

Author: Eng. Georgi Veselinov Karlovski, MSc
Topic: „Study of the parameters of the turning process when working with quick-change tool holders"

Reviewer: Professor Jordan Maximov, DSc, PhD

1. Relevance and novelty in the dissertation work

The basis of this work is a new design of a quick-change tool holder, which is used in the assembly of a CNC turning center. Experimental studies show the advantage of this holder over a standard one. The advantage is expressed in minimizing the auxiliary time and less dispersion of the values of the average roughness Ra. In other words, surface integrity is simultaneously improved and productivity is increased. In addition, the tests were conducted in experimental conditions. Therefore, I believe that the relevance and novelty of the dissertation work are beyond doubt.

2. Cited literature

The literature used contains a total of 149 sources, of which 33 are in Cyrillic, distributed as follows: 1) in Cyrillic: textbooks – 22, books – 6, conference reports – 4, articles – 1; 2) in Latin: books – 13, articles – 40, conference reports abroad – 5, websites – 58.
There are cited articles in high-level journals of Elsevier Springer and Taylor and Francis, such as International Journal of Machine Tools and Manufacture, Journal of Materials Processing Technology, International Journal of Advanced Manufacturing Technology, Materials and Manufacturing Processes. However, the articles are only cited, there is no specific analysis of those of them that are directly related to the problem posed in the dissertation.

3. Research method

Given the specificity of the problem being treated, the main research method is the field experiment.

4. Brief description of the material on which the contributions are formulated

Chapter 1 outlines the macro-area in which the dissertation is positioned: trends in the development of CNC machine tools, technological equipment of CNC lathes,

characteristics of the turning process. Relevant conclusions are drawn and on this basis the goal of the dissertation and the tasks, the solution of which will achieve the goal, are defined.
Chapter 2 presents a new design of a quick-change tool holder, which is the core of the dissertation.
In Chapter 3, a comparison is made in production conditions of the obtained average roughness Ra and the durability of the cutting tool for two cases: using a standard holder and applying the new holder design. The comparison is made with the same geometry of the cutting edge and constant technological parameters (speed, feed and depth of cut). It is found that the new holder provides less scaterring of the average roughness and greater durability of the tool. In addition, the effect of two types of lubricating-cooling fluid and two cutting speeds on the accuracy of two dimensions (D and L) of the machined part was evaluated. Based on the results obtained, an assessment of the effectiveness of implementing the new holder in production conditions was made on a specific part (bearing ring).
In Chapter 4, using the new holder, the influence of the control factors (speed and feed) on two objective functions: average roughness and tool life is studied. ANOVA and regression analyses are performed. In this case, the results of ANOVA are completely sufficient and make multi-objective optimization meaningless. Very rightly, the statistical results from QStatLab are shown in the appendix so as not to dilute the main text.

5. Contributions of the dissertation work

The contributions systematized by the author are impressive: an attempt at conciseness and accuracy is commendable. However, regardless of the author's view, I have edited, summarized, and classified the contributions that I have acknowledged as follows:
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A. Scientific-applied contributions

A.1. Creation of new classifications, methods, constructions, models, methodologies, algorithms

♦ Innovative design of quick-change tool holder, increasing tool life, reducing dispersion of average roughness Ra and reducing auxiliary time.
♦ Statistical approach to tool selection.
♦ Mathematical models of the dependence of the average roughness Ra and tool life on cutting speed and feed.

A.2. Obtaining and proving new facts

♦ The use of ECOCOOL MACH 40 coolant leads to less scattering of controlled diametrical and axial dimensions.

B. Applied contributions

• Workable construction quick-change tool holder.

6. Publications on the dissertation

The author has made a total of 6 publications, as follows:

1) 3 reports at scientific conferences in Bulgaria;

2) 2 articles in a journal in Bulgaria;

3) 1 utility model.

In all reports and articles, the doctoral student is the first author (no information is provided about the authorship of the utility model).

Based on the above data, it can be concluded that the results of Eng. Georgi Karlovski's dissertation have been disseminated and discussed well enough.

7. Notes on the dissertation

The dissertation is well structured and written. I highly appreciate the innovative work of the dissertation candidate and the experimental research conducted in production conditions. I have no remarks of a principled nature.

I was a reviewer of the version of the dissertation presented at the pre-defense. This version contained numerous weaknesses, which I had described in detail in the previous review. The doctoral student took into account all my comments, answered the questions posed, and made the necessary revisions. The result was a nice, concise dissertation with a clearly experimental character, with clearly highlighted conclusions and contributions.

However, there are some points that the doctoral student should pay attention to in his future work:

▪ When commenting on the mechanism of the cutting wedge wear process, keep in mind that it is always combined, and the dominance of any of the mechanisms is not general, but refers to individual points of the studied geometric area;

▪ In Chapter 4, the term hard turning is used and nowhere in the text is it explained what is meant. In English-language literature, the term hard turning is used, i.e., turning of heat-treated steels with a hardness of HRC46 and higher. But the hardness of the steel you used is 33-35 HRC (after heat treatment).

▪ There is no physical explanation for the observed phenomenon caused by the new holder: the reasons for the reduced dispersion of the average roughness and increased tool durability are not commented on.

8. Other questions

1) I am impressed by the innovative work of the doctoral candidate.

2) I strongly believe that the educational function of doctoral training has achieved its goal. The doctoral candidate has significantly increased his knowledge of the problem studied in the dissertation.

9. Conclusion

I believe that the presented dissertation work "Study of the parameters of the turning process when working with quick-change tool holders" with the author Eng. Georgi Veselinov Karlovski meets the requirements of the Act on the Development of Academic Staff in the Republic of Bulgaria. The achieved results give me reason to

propose to the esteemed scientific jury to award the educational and scientific degree "Doctor" to Eng. Gergi Veselinov Karlovski, in the field of higher education 5. Technical sciences, professional field 5.1. Mechanical engineering, doctoral program "Cutting of materials and cutting tools".

20.08.2025 Reviewer:

Professor Jordan Maximov, DSc, PhD