

REVIEW

of dissertation for the award of educational and scientific degree "**doctor**"
scientific field 5. "Technical sciences", professional field 5.2 "Electrical engineering,
electronics and automation", doctoral program / specialty "Automated systems for
information processing and control",
topic: "INNOVATIVE METHODS FOR TECHNOLOGICAL DIAGNOSIS OF AUTOMATIC
MACHINES AND LINES"
author of the dissertation: mag. MIGLENA MARINOVA PANEVA
Scientific adviser: Prof. Dr. DIMITAR KARASTOYANOV
Member of the Sci. Jury Prof. Dr. Lyubomir Vankov Dimitrov, Technical University - Sofia,
appointed by Order 53 / 01.03.2022. of the Director of IICT-BAS

General characteristics of the dissertation

The dissertation has a volume of 153 pages with 5 chapters, contributions, a list of publications on the dissertation and a bibliography of 163 literature sources. 113 figures and 47 tables are attached. There are Applications in the amount of 38 pages.

1. Relevance of the problem developed in the dissertation in scientific and scientific-applied terms.

The dissertation of mag. Miglena Paneva is in the scientific and scientific-applied direction for automation in the production of tubular furniture - modules and entire products, through the design of automatic machines controlled by programmable controllers (PLC), as well as appropriate application software. The main goal is to increase reliability and productivity through innovative methods of technological diagnostics. There is a lot of research and development in the world on individual topics, but in total they are rare in our country. This determines the relevance and innovation of research and development of mag. Paneva.

2. Degree of knowledge of the state of the problem and the literature.

An extended detailed literature review of the considered practices in our country and around the world, existing, new and innovative methods, techniques and technologies for research and analysis has been made. The presented material shows in-depth knowledge of the developed topic, what are the current problems in the field, as well as the potential opportunities for their solution. On this basis, the purpose and tasks of the dissertation are formulated.

3. Compliance of goals and objectives with the achieved results.

The review, analysis and conclusions of the theoretical researches, made and realized by the PhD student, existing methods and means for engineering expert analysis, give an opportunity for development and application of approaches for improvement of efficiency and productivity, for solving the set goals and tasks of the dissertation. Modern solutions are realized through the application of innovative approaches and calculation procedures.

From well-formulated, substantiated and motivated goals and tasks, the PhD student has contributed to the realization of the dissertation and the real contributions. The obtained results show that the PhD student has successfully chosen the research apparatus for obtaining new results with scientific-applied and applied contributions.

The requirements to the materials used in the manufactured products are considered, the criteria used in research and evaluation of their capabilities and the modern scientific developments and achievements in this field are analyzed.

The main goal of the dissertation is to study the progress and integration of new technologies in modern diagnostics of automatic machines and lines and to propose an innovative approach to creating test methods. To fulfill this goal in the dissertation the following tasks are solved:

1. After a detailed review to analyze and systematize approaches and methods for integrating intelligent technologies in technical diagnostic procedures.
2. To study the existing methods and tools for modern diagnostics of automatic machines and lines.
3. To study the impact of ICT on technical diagnostic methods.
4. To propose and substantiate innovative methods for types of diagnostics of automatic machines and lines.
5. To conduct experiments and simulations of different methods in industrial environments.
6. The obtained results should be analyzed and tested.

4. Brief analytical characteristics and assessment of the reliability of the material.

Chapter 1 presents Bulgarian and world producers of metal and pipes; hardware methods and means for intelligent measurement and analysis of materials, machines, lines

Chapter 2 presents the innovative approach to the operation of technological equipment; the standards and brands of steels are described, as well as the types of pipes and profiles produced; the innovative procedures for quality control in the production of thin-walled electric welded pipes and profiles, as well as the defects that occur in the production process are analyzed.

Chapter 3 contains methodologies for using the necessary equipment; attention is paid to the main functions influencing the measurements. On the basis of the compiled methods the preparation of a test body for testing with spectral analysis, tensile strength in low-carbon steel and the production of high-strength steel is carried out; measurement of roughness and hardness, as well as the measurement of geometric parameters with a 3D industrial computer tomograph.

Chapter 4 presents the results of research in the industry. An analysis of the chemical and mechanical parameters of low-carbon metal during its transformation from hot-rolled metal to cold-rolled metal, results of high-strength steel production, as well as analysis of measured parameters carried out during the technological process.

Chapter 5 presents future projects:

- Quick implementation of new profiles.
- Production of pipes and profiles from high-strength material.
- Production of complex profiles from material with high tensile strength.

5. Scientific and scientific-applied contributions of the dissertation.

The contributions in the dissertation have mainly scientific-applied and applied character and are presented as follows:

1. After a detailed review, a critical analysis and systematization of methods and tools for technical diagnostic procedures is made.
2. Existing problems and solutions concerning the modern diagnostics of automatic machines and lines are discussed and the influence of ICT on the methods for technical diagnostics is studied.
3. Innovative approaches for diagnostics of automatic machines and lines are proposed.
4. Methods have been developed for: technical diagnostics (testing) through a test body of plastic deformation and tensile strength, graphs of carbon steel at tensile strength, transformation from hot-rolled to cold-rolled sheet, creation of high-strength cold-rolled steel for precision electric welds pipes.
5. Methods have been developed for: design of a new type of innovative test body holder, innovative measurement of geometric characteristics by 3D computed tomography, analysis of the characteristics of the test body before and after sharpening the trench.
6. Methods have been developed for: spectral analysis of a metal test body, machining and research of the hardness and roughness of working shafts, testing of the roughness of low-carbon steel after cold rolling
7. Experimental developments and simulations of different methods in industrial environment are made.
8. The results are analyzed and tested.

I accept and evaluate positively formulated by the PhD student the scientific-applied and applied contributions, reflected in the dissertation and the abstract.

6. Assessment of the degree of personal participation of the PhD student in the contributions.

I believe that the dissertation and its contributions are the personal work of the PhD student, with the extremely skilled guidance of the supervisor and with the help of the participants from his team.

7. Evaluation of the publications on the dissertation.

The PhD student has presented 7 publications on the dissertation, of which: 4 are independent. Of the publications, 2 are at International Events Abroad (1 SCOPUS visible), 1 in an English journal in Bulgaria, 4 at Conferences in Bulgaria. There is 1 document for protection of intellectual property - utility model.

In general, the publications presented in the dissertation reflect the essential part and the main results of the conducted research. With the publications, the results of the dissertation have become available to our scientific community.

8. Using the results of the dissertation in practice.

The PhD student has performed a large amount of work, characterized by comprehensiveness, depth and competence. The work describes well the innovative

approaches and methodologies in order to improve efficiency and productivity. Specific methodologies for research and tests have been developed.

9. Assessment of compliance of the abstract and the requirements for its formation.

The abstract is 44 pages long and fully reflects the content of the dissertation. It meets the requirements and essentially reflects the set and solved goals and objectives, the results obtained and the main scientific-applied and applied contributions and presents exactly the main achievements in scientific work.

A summary in English is attached.

10. Opinions, recommendations and remarks.

I have no notes that would call into question the reliability of the results presented in the dissertation and the contributions.

I have shared some remarks of a technical and stylistic nature with the PhD student.

I also recommend the PhD student to write more independent articles in foreign journals.

CONCLUSION

The remarks are mainly of a technical nature. In conclusion, I believe that the author has made an in-depth study of the problem, analyzed the results of the study and proposed a comprehensive solution in a new and promising area. The basic requirements of ZRASRB, of the Regulations for its application are fulfilled, as well as the specific requirements for acquiring a scientific degree in IICT-BAS in terms of scope, volume and quality of the dissertation. **On this basis, I appreciate the work and offer it to the mag. Eng. Miglena Marinova Paneva to be awarded the scientific and educational degree "DOCTOR" in field 5. Technical sciences; direction 5.2. Electrical engineering, electronics and automation; scientific specialty: Automated systems for information processing and management.**

Sofia

March 28, 2022.

Reviewer: .

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