

REVIEW

form Prof. Eng. Ivan Mladenov Kralv, D.Sc., Technical University of Sofia

of the materials submitted for the competition for the occupation of the academic position of "Professor" in field of higher education – Technical Sciences, in the professional field - Mechanical Engineering, specialty – “Metrology and Metrological Assurance” (Quality Management Systems)

In the competition for professor, announced in the State Gazette, issue 58 of 23 July 2019 and on the site of the Technical University - Gabrovo for the needs of the Department of Mechanical Engineering Equipment and Technology at the Faculty of Mechanical Engineering Equipment and Technology, with the only candidate participating is Assoc. Prof. Iliya Slavov Zhelezarov - Department of Mechanical Engineering Equipment and Technology, Faculty of Mechanical Engineering Equipment and Technology at the Technical University of Gabrovo.

1. Brief biographical information

Assoc. Prof. PhD Iliya Zhelezarov graduated with a degree in Mechanical Engineering Equipment and Technology from the Technical University of Gabrovo in 1994. Until 1995, he worked in manufacturing as a programmer, adjuster and CPU machine operator. In 1995 he enrolled at the Technical University of Gabrovo as an assistant in the Department of Mechanical Engineering Equipment and Technology. In the period 1998 - 2006 he was an assistant in the same department. In 2006 he defended his PhD thesis on "Systems for measuring and managing the quality of training in technical colleges" and became assistant professor. In 2007 he was habilitated as an "associate professor" in the specialty "Metrology and metrological insurance".

Since 1999 Assoc. Prof. Zhelezarov has been the manager of the Bulgarian-German Institute for Quality Management and Industrial Management at TU-Gabrovo.

In the period 2004 - 2012 he is the Deputy Director of the Training Quality Center of TU-Gabrovo, and from 2012 until now he is the Deputy Rector for Research and Development.

2. General description of the materials presented

The submitted papers for participation in the competition include 1 monograph (B.3), 5 scientific referenced publications, indexed in world-famous scientific information databases (Г.7), 23 scientific publications in non-refereed journals with scientific review or in edited collective volumes (Г.8), 1 textbook (E.23), 1 study manual (E.24) and 8 other publications. Three of the publications presented in the competition were published in international journals with “Impact Factor” and the other 2 were in the SCOPUS database. Of the 34 publications (articles and reports), 12 are independent, 22 are co-authored (7 with two authors, 10 with three authors and 5 with more than three authors), in 10 of which the candidate is the first author. There are 12 papers in scientific conferences, 2 in Russian and 20 in English. The candidate is also the author of 2 manuals of quality management systems of TU-Gabrovo according to the standards ISO 9001: 2008 and ISO 9001: 2015.

Competition publications do not duplicate articles, reports, textbooks, and teaching manuals used in defending the educational and scientific degree "PhD" and in the occupation of the academic position of "Assistant Professor".

3. Reflection of the applicant's scientific publications in the scientific community

Applicant's developments are on a topic of high practical relevance, a large number of studies and publications are available, which proves their relevance. A major sign of the dissemination of the results is not only the number of publications in reputable and referenced issues, but also their citation.

In the list of citations for participation in the competition, the applicant submitted 8 citations in scientific publications, referenced and indexed in world-wide databases of scientific information, 9 in monographs and collective volumes with scientific review and 12 in non-refereed journals with scientific review. This significant number clearly shows the national and international recognition of the applicant as a competition researcher.

4. Review of the content and results of the submitted works

The submitted publications of the candidate in the competition for the academic position of "professor" are distinguished in four areas of applied metrology.

The first involves methods and means of measuring the dynamic and static magnitudes of moving objects and measuring certain parameters of them - characterizing the space-time position, mode of movement of cars, ships, planes and other vehicles (Г.7.1, Г. 7.4, Г.7.5). Г.7.2 also analyzes the design of inductive systems for contactless transmission of energy during the dynamic charging of electric vehicles. Mathematical models of static and dynamic characteristics for measuring instruments are presented, which are convenient for practical use because of their clear physical meaning and their easy connection with the structural data of the measuring instrument. Mathematical models can accurately determine the characteristics of linear and angular meters. This provides the conditions for uniformity of measurement of a constant value under a known dispersion (Г.8.19, Г.8.23).

The publications in the second direction are related to quality management systems based on the standards of the International Organization for Standardization (ISO), the analysis of their applicability in the field of higher education, the internal and external evaluation of these systems, and the possibilities for improvement and increasing customer satisfaction. Methods, models and algorithms are presented to ensure the performance of quality management systems, their measurement, analysis and evaluation, as well as their improvement based on the analyzed data. The components of the system for internal and external measurement and evaluation of the quality management system in higher education and the application of methods and techniques for measuring and managing the quality of the educational product during the implementation of its life cycle are identified. (B.3.1, Г.8.9, Г.8.4, Г.8.15). The quality management system, which is developed in accordance with the requirements of ISO 9001 and IWA2 standards, meets the requirements of the Law on Higher Education in Bulgaria and is at the heart of the accreditation documentation (institutional and/or programmable) of the higher technical schools (Г.8.12, Г.8.15, Г.8.21, Д.1, Д.2).

In the third direction statistical methods and tools for quality management are analyzed as well as their applicability. Performance indicators, elements for analyzing and evaluating the performance of a quality management system are presented, as well

as standard tools for evaluating performance. When selecting and applying models and methods for system analysis, it is necessary to plan for risks and opportunities related to the applicability of the methods selected, the adequacy of performance indicators, the need for additional information, resources, competency and staff motivation, the needs and expectations of stakeholders (B.3.1, Г.8.1, Г.8.2). Analyzes of measuring instruments and measurement systems have shown the ability to evaluate the statistical capability of measuring instruments and systems, the quality of measurements and controls, the objectivity of measurement results and data, the identification of consequences of control errors, and the decisions to dispose of a product or process (Г.8.6, Г.8.11, Г.8.13). A classification of statistical methods for quality management and improvement and their practical application is presented. Possibilities for application of statistical management of technological processes with control cards by quantitative indication and pre-control cards are considered (B.3.1, Г.8.8, Г.8.10, Г.8.18, Г.8.20).

In the fourth direction are publications related to quality management and control systems and to the metrological characteristics of the systems and measuring instruments specific to the mechanical engineering industry. A non-contact echological method for identifying materials using pulses in the ultrasonic range is presented. Another method of analysis is to investigate the roughness of a carbon steel surface treated by an abrasive water stream using full factor planning with three factors at two levels. It uses averages and dispersion analysis to determine the influence of the factors on the surface roughness. Regression analysis was applied to find the correlation between surface roughness and process factors. A third method of analysis is for the control of evolvent cylindrical gears with asymmetric tooth profile by means of measuring rollers and dependencies for determining the size of rollers for asymmetric tooth profile with and without slope of the teeth (Г.7.3, Г.8.5, Г.8.7). The prerequisites for the normal functioning of a laboratory for calibration of measuring instruments having control systems developed and implemented in accordance with the requirements of the international standard ISO/IEC 17025 (Г.8.7, Г.8.16) are analyzed. Processes for optimizing measurement and quality control using a planned experiment based on the Taguchi approach are proposed (Г.8.14).

5. General characteristics of the applicant's activities

5.1. Educational-teaching activity (work with students and PhD students)

Assoc. Prof. Iliya Zhelezarov has participated in the development of the curricula and lectures in the disciplines "Quality management systems", "Industrial control systems", "Quality control and management" and "Metrology", "Integrated management systems" for full-time and part-time students in Bachelor's and Master's degrees.

The published textbooks on quality management systems and manual for laboratory exercises in metrology and measuring technique correspond to the curricula in these disciplines.

The candidate has supervised over 50 Bachelor's and Master's degree students and one PhD student defending a PhD's degree on the topic "Modeling of non-circular small-sized gears with an asymmetric tooth profile".

5.2. Research and research and applied activity

To participate in the competition, the applicant submitted 1 monograph, 34 scientific publications (journal articles and conference papers), 5 of which are in refereed and indexed publications (3 are with "impact factor" and 2 are in the database

on SCOPUS). Of the 34 publications (articles and reports), 12 are independent, 22 are co-authored (7 with two authors, 10 with three authors and 5 with more than three authors), in 10 of which the candidate is the first author. There are 12 papers in scientific conferences, 2 in Russian and 20 in English. He is the author of 1 textbook, co-author of 1 textbook and 2 manuals. The publications do not replicate the publications, reports, textbooks and teaching aids for the educational and scientific degree "PhD" and the academic position "Associate Professor" attached to the competition documentation.

The candidate is involved in a large number of national and international scientific and educational projects. He has 9 national projects in the competition documentation, 6 of them being a coordinator and 3 a participant. He has also coordinated 2 international projects, and in 3 others he is a participant. Of particular importance for the development of scientific infrastructure at national and regional level, I consider the projects under the Operational Program "Science and Education for Smart Growth".

The competition documentation presents evidence of meeting the national minimum requirements for occupying the academic position of "Professor":

A set of metrics	Content	Minimum required points by groups of indicators for occupation of the academic position "Professor"	Declared points by groups of indicators for occupation of the academic position "Professor"
A	Indicator 1	50	50
Б	Indicator 2	-	-
B	Indicators 3 or 4	100	100
Г	Sum of the Indicators from 5 to 11	200	377.66
Д	Sum of the Indicators from 12 to 15	100	131
Е	Sum of the Indicators from 16 to the end	150	387

as well as fulfillment of the minimum requirements of TU-Gabrovo for the candidates for occupation of the academic position "Professor":

Content	Minimum requirements of TU - Gabrovo to the candidates for occupation of the academic position "Professor"	Declared indicators from the candidate for occupation of the academic position "Professor"
Total number of publications (articles and reports)	30, from which at least 5 independent and 3 with IF (WoS)	34, from which 12 independent and 3 with IF (WoS)
Number of citations from other authors	20	29
Textbooks and manuals published	2	2
Number successfully defended PhD students	1	1

Project and contract management	3	8
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5.3. Implementation activities

The applicant has many years of experience in implementation of applied projects, and has coordinated projects in over 200 organizations for the development, implementation and improvement of quality management systems according to ISO 9001; ISO 14001 environmental management systems; health and safety management systems according to ISO 45001 and OHSAS 18001; energy management systems according to ISO 50001; control systems for testing laboratories according to ISO 17025 and others. The high level of his professional competence is also evidenced by the large number of certificates held.

6. Contributions (research, research and applied, applied).

I accept the contributions presented in the applicant's copyright statement as follows:

Research contributions:

1. A new method for measuring the parameters of moving objects is proposed. The method allows the creation of new generation metering systems with significantly better quality indicators and metrological characteristics. The basic concept of the method consists, on the one hand, in simplified technical implementation of inertial mechanical elements, which allows to minimize instrumental errors, and, on the other, to the elimination of dynamic error in real time by a module whose adaptive algorithm is based on the integration of sensory data systems in a software platform.

2. A mathematical apparatus has been developed to allow the determination of the dynamic error of means for measuring the angular deviations of moving objects. The models created provide extensive opportunities for the analysis and synthesis of measurement systems, whose dynamic accuracy is ensured by real-time dynamic error correction.

3 A method for analyzing models for the presentation of management systems based on standards of the International Organization for Standardization (ISO) has been developed, and methods for measuring, analyzing and evaluating the efficiency and effectiveness of quality management systems and tools for their implementation have been systematized. The presented method includes methodologies, models and algorithms for ensuring the operation of quality management systems, their measurement, analysis and evaluation, as well as their improvement based on the analyzed data.

Research and applied contributions:

1. A measurement system for measuring the parameters of moving objects has been developed. The high dynamic accuracy of the system is ensured by a correction module using signals from differentially coupled MEMS gyroscopes and an adaptive algorithm based on the Kalman method, whose algorithm is designed as a measurement and calculation analogue of the current motion of the sensing element of the system. The algorithm of the system is automatically adjusted according to the instantaneous values of the external effects, received in real time by MEMS gyroscopes and accelerometers..

2. A measuring system is provided to measure board and kill rolling, heeling and trim on a ship. The system consists of two measuring channels operating in parallel.

The first measuring channel was constructed on the basis of the positional properties of the physical pendulum for the construction of the base vertical. The second channel ensures the dynamic accuracy of the system. The principle of operation of the second channel is to correct the signals from the first channel by information obtained from linear MEMS accelerometers.

3. A model and system for internal and external measurement and evaluation of the quality management system have been developed by applying statistical methods and techniques for measuring and managing the quality of the realized product during its life cycle.

4. Comparative analysis of the models of quality management systems is made, as well as the methods for registering, measuring, systematizing, analyzing and evaluating the information and their applicability for a specific presentation model. On this basis, a model for analyzing and evaluating the performance of a quality management system is developed.

5. A model for risk management and uncertainty of measurement results in a quality management system based on the requirements of the ISO 9001: 2015 standard is presented, as well as a methodology that makes it possible to achieve an adequate analysis of the measurement system. This is done through measuring devices that have metrological features that provide the measurement process and risk management at all stages of the measurement and control process based on the PDCA management cycle.

6. An algorithm for the analysis of measuring instruments and measurement systems for quantitative and alternative control has been developed, as well as the evaluation of the statistical ability of the measuring and control tools, the objectivity of the measurement results, the identification of the consequences of control errors and the decisions for disposition with a product or process.

7. A method for controlling evolvent cylindrical gears with an asymmetric tooth profile using measuring rollers and dependencies for determining the size of rollers for an asymmetric tooth profile with and without tooth slope is proposed. A modified device has been developed to determine the size of rolls for an odd number of teeth and to eliminate tangential errors in measurement.

8. A model of integrated management system has been developed in accordance with the requirements of the standards for quality management systems ISO 9001, environmental management systems ISO 14001 and occupational health and safety management systems OHSAS 18001/ISO 45001, and methods are also proposed to improve the integrated management system.

9. Mathematical models of static and dynamic characteristics of measuring instruments are presented, which are convenient for practical use, as they have a clear physical meaning and can be easily linked to the structural data of the measuring device and can accurately determine the characteristics of measuring instruments for linear and angular dimensions.

Applied contributions:

1. It is developed, implemented and certified a model of quality management system for training and research at the Technical University of Gabrovo, in accordance with the requirements of the standard ISO 9001: 2008 and ISO 9001: 2015.

2. Model of system for management of the university laboratory for calibration of measuring instruments in accordance with the requirements of ISO/IEC 17025 standard

- Prerequisites for accreditation and improvement of the laboratory management system.

3. Statistical methods for optimizing management and production have been systematized to improve the flexibility, efficiency and effectiveness of processes and improve the performance of the quality management system.

4. A model for the evaluation of the quality management system of higher education was developed by applying statistical methods and techniques for measuring and managing the quality of the educational product during the implementation of its life cycle.

7. Assessment of the candidate's personal contribution

The large number of independent publications, international and national projects, numerous graduates, as well as the successfully defended Ph.D. student are indisputable proof of the candidate's significant personal contribution to the submitted materials for the competition. This gives me reason to categorically accept a high degree of personal contribution of Assoc. Prof. Ph.D. Iliya Zhelezarov in these studies.

8. Critical notes and recommendations

The educational and scientific work presented by Assoc. Prof. Ph.D. Zhelezarov for participation in the competition is impressive and exceeds the requirements for this academic position. I have no principal objections to these developments.

I would recommend the applicant to increase the number of articles in foreign journals in class "A", as well as to increase their common publication with foreign researchers.

9. Personal impressions

I know personally the candidate Assoc. Prof. Ph.D. Eng. Zhelezarov from our many years of working together as deputy rectors, organizers and operational coordinators of national scientific projects, as well as our participation in scientific forums. My opinion is that he is an erudite lecturer and an excellent researcher. The candidate is able to create and manage good working research teams. He is distinguished for propriety and responsiveness, has teamwork, organizational and management skills, and is a very positive colleague.

I am convinced that the candidate fulfills the requirements for occupying the academic position of "professor" and meets the requirements of the law for the development of the academic staff in the Republic of Bulgaria, the regulations for the implementation of the law for the development of the academic staff and the rules for the acquisition of academic degrees and academic positions at the Technical University of Gabrovo.

10. Conclusion:

In view of the above, I propose Assoc. Prof. Ph.D. Iliya Slavov Zhelezarov to be selected as a "professor" in field of higher education – Technical Sciences, professional field - Mechanical Engineering, specialty - Metrology and Metrological Assurance (Quality Management Systems).

15.11.2019

Reviewer:

/Prof. D.Sc. Eng. Ivan Kralov/