R E V I E W

by Prof. Dr. Eng. Nikolay Dimitrov Madzharov - Technical University of Gabrovo

of the materials submitted for participation in the competition

for available academic position "Associate Professor"

in the field of higher education - 5. Technical sciences,

professional field 5.2. Electrical engineering, electronics and automation,

specialty - "Electrical Engineering" (Electromechanical devices, Electrical machines)

In the competition for associate professor, announced in the State Gazette, issue 60 of 20.07.2021 and on the website of the Technical University - Gabrovo, for the needs of the Technical College - Lovech, as a candidate participates Assistant Professor Dr. Eng. Milko Ganchev Dochev, from the Technical College - Lovech at the Technical University - Gabrovo.

The review was prepared according to Order № 3-01-408 / 04.10.2021. of the Rector of the Technical University - Gabrovo and a decision of the first meeting of the appointed Scientific Jury, held on 01.10.2021.

1. Brief biographical data

Assistant Professor Dr. Eng. Milko Ganchev Dochev, is a full-time lecturer at the Technical College - Lovech at the Technical University of Gabrovo. He was born on November 17, 1958 in the town of Lovech. He graduated from the „Yuri Gagarin“ Mathematical High School in Lovech in 1976. He studied at the Technical University of Sofia from 1978 to 1984, receiving a master's degree in „Electrical Machines and Apparatus “. At the same University he obtained two more master's degrees - in "High Current Engineering and Technology" in the period 1984 - 1985 and in "Technical diagnostics of electrical machines" in 1993 - 1994. After training from the company "QUALICON AG" Schweiz, in 2000 he acquired the qualification "Quality Expert". The work in the educational plan continues at the same pace and in 2016 the candidate defended a dissertation for the award of the scientific degree "Doctor" (diploma ТУС-ЕФ83-НС1-024) on "Dynamic modes and technical diagnostics of hand tools" in the professional field 5.2. Electrical engineering, electronics and automation, specialty "Electrical machines".

The professional career of Assistant Professor Dr. Eng. Milko G. Dochev began in 1985 as a tester of electrical machines in "Silnotokov Zavod" - Sofia. In the period 1985-1999 he was a research associate in the laboratory "Electromechanics" at the Institute of "Electrical Industry" - Sofia.

The candidate has 29 years of teaching experience. From 1992 until now, he has held the academic positions of Assistant and Assistant Professor at the Technical College - Lovech in the Departments of „Electrical Engineering“ and „Mechanical Engineering, Computer Systems and Electrical Engineering“. During this period, he lectures and conducts seminars and laboratory exercises in 12 disciplines. He is a supervisor of over 200 students who have successfully defended their dissertations.

In addition to in-depth research, Assistant Professor Dr. Eng. Milko G. Dochev, also participates in the administrative and public activities of TC - Lovech. From 2003 to 2013 he was the head of the Department of „Electrical Engineering“ and provided the administrative, scientific and methodological management of the specialties "Electrical Engineering" and "Computer Systems and Technologies".

Member of the MENSA - Bulgaria, USB - Lovech branch, FNTS - SEES.

2. General description of the presented materials

The candidate has presented a list of the titles of 11 scientific publications on the topic of the dissertation for the scientific-educational degree "Doctor", 83 scientific publications for participation in the competition, 1 monograph, 3 textbooks and 2 teaching aids. One monograph, 3 textbooks, 2

teaching aids, 82 scientific articles and reports and a list of participation in 19 international, national scientific or educational projects, which are outside the dissertation and are taken into account in the final evaluation, are accepted for participation in the competition. 11 scientific papers on the dissertation and article number 35 "Design of a women's blouse with elements of the Bulgarian national costumes", which is rather informative and outside the scope of the competition, are not reviewed.

Of the peer-reviewed scientific papers, 2 are scientific publications in conference proceedings and journals, which are referenced in Scopus. The remaining 80 articles and reports are presented at scientific forums in Bulgaria (76) and abroad (4), which are not referenced in world-famous databases.

13 scientific papers have been written in Latin and 69 in Cyrillic, 18 are independent (22%) (19 are incorrectly indicated in Appendix 2.5), with one co-author - 29, with two co-authors - 22; the other 13 have three or more co-authors. The candidate is in first place in 48 publications (58%) and second in 21. There are no scientific papers in journals with impact factor.

3. Reflection of the scientific publications of the candidate in the scientific community

Assistant Professor Dr. Eng. Milko G. Dochev presented a list of 35 well-known citations of 26 scientific papers, including the monograph and a textbook. Four citations are in scientific publications referred to in Scopus. The citations indicate that the candidate's scientific publications are used by the scientific community. It is clear from the accompanying text that these references are positive. As a result of his research work, publication and relevant reflection by citation from other authors, the candidate has a Hirsch index of 1 (auto-citations are excluded). Here it is not clear why from the reference in Scopus, Assistant Professor Dr. Eng. Milko G. Dochev belongs to the Technical University of Sofia.

4. Overview of the content and results in the presented works

The research and scientific-applied activity of the only candidate in the competition is in the field of improvement of the operational and price indicators of the electromechanical devices. New methods have been created for modeling, research and achieving better technical parameters of elements and units of electrical machines, electrical products and hand power tools. Much of the analytical and experimental work performed is multiplied in engineering practice, industry and student education.

The candidate, Assistant Professor Dr. Eng. Milko G. Dochev which fully covers the minimum national requirements for holding the academic position of "Associate Professor" for the field of "Technical Sciences" in higher education, laid down in Art. 2b of the Act on Development of the Academic Staff in the Republic of Bulgaria and the minimum requirements according to PPNSZAD of the Technical University of Gabrovo. The points by groups of indicators for which the applicant has submitted evidence are presented in Table 1.

Table 1.

GROUP OF INDICATORS	NUMBER OF POINTS BY MAIN INDICATORS BY GROUP		NUMBER OF POINTS OF THE CANDIDATE	MINIMUM NUMBER OF POINTS BY GROUP INDICATORS
А	**А1**	*50*	**50**	**50**
Б	**Б2**	*100*	**-**	**-**
В	**В3**	*100*	**100**	**100**
Г	**Г6**	*60*	**934,85**	**200**
	Г7	*40*		
	Г8	*834,84*		
Д	**Д12**	*40*	**106**	**50**
	Д13	*66*		
Е	**Е18**	*10*	**-**	**-**
	Е22	*3,22*	**-**	**-**

The summary of this information is as follows:

Group of indicators A - Dissertation work for awarding degree "Doctor" (at least 50 points) - 50 points;

Group of indicators B - monograph (at least 100 points) - 100 points;

Group of indicators Г - published book on the basis of defended dissertation and scientific publications in refereed and non-refereed editions with scientific review or in edited collective volumes (at least 200 points) - two books and 82 pcs. publications (2 publications in refereed and 80 publications in non-refereed editions) with different number of authors - 934.85 points.

Group of indicators Д - citations or peer-review in scientific journals, referenced and indexed in world-famous databases or in monographs and collective volumes and in non-refereed journals with scientific peer-review (at least 50 points) - 4 citations in refereed scientific journals of 2 scientific publications (40 points), 33 citations or reviews in unreferred journals with scientific review (66 points) - 106 points.

In addition, information on "E" indicators is presented, which is not required in the Report on the fulfillment of the minimum requirements for holding the academic position of "Associate Professor", but it has great weight because it provides information about the candidate's fame both in scientific circles and in business.

Group of indicators E - research and implementation activity (not required for "Associate Professor") - participation in a national scientific or educational project (10 points), attracted funds worth BGN 16,100 for 7 projects, led by the applicant (3, 22 points) - a total of 13.22 points.

5. General characteristics of the candidate's activity

5.1. Educational and pedagogical activity (work with students and doctoral students)

The candidate for AD "Associate Professor" Assistant Professor Dr. Eng. Milko G. Dochev is an established lecturer with many years of lecturing in TC-Lovech - 1 year as a habilitated lecturer with a total of 29 years of teaching experience. He has lectured in 12 disciplines, mainly for the Professional Bachelor's degree. Its study load for the academic year 2019 - 2020 is 675.2 hours and 710.6 hours for 2020 - 2021, which significantly exceeds the accepted minimum standard.

For the competition he participated with one monograph, 2 textbooks and 3 teaching aids, all of which are peer-reviewed. The language and style of the author in the monograph is precise and clear. He is a research supervisor of students, champions in national student conferences and over 200 successfully defended the graduate.

Assistant Professor Dr. Eng. Milko G. Dochev develops curricula and programs in ПН 5.2 and ПН 5.3 and participates in working groups on program and institutional accreditations in TC-Lovech. Under his leadership, 3 laboratories were created and renovated - "Electrical Machines and Apparatus", "Operation and Repair of EMA" and "Training Practice". He is responsible for the specialty "Electrical Engineering" in TC - Lovech and for conducting internships in companies in the electrical industry. Organizes and is responsible for the candidate-student admission to the college and the holding of the National Competition in Electrical Engineering, together with the Association of Vocational High Schools in Electrical Engineering, Electronics and Automation.

My conclusion is that the candidate has authority in the academic community. His good teaching work and pedagogical training fully meet the requirements of TU-Gabrovo for the academic position of "Associate Professor".

5.2. Scientific and scientific-applied activity

Assistant Professor Dr. Eng. Milko G. Dochev was the leader and coordinator of 19 scientific projects under the Scientific Research Fund, and was the head of 7 of them. There are 18 projects under the Research Fund of the Technical University of Gabrovo and one under the National Project (BG 2004 / 016-711.11.01 - 1.034) under the EU PHARE program with beneficiaries Sparky-Eltos - Lovech and BIC-IZOT AD - Sofia, where is a lecturer in the discipline "General Electrical Engineering" with a schedule of 120 hours.

Dr. Dochev has participated in the following scientific forums: TechCo 2017, 2018, 2020; magazine "Automation of discrete production", issue. 1/2019, 2/2020; VII International Scientific Conference "Technology, Technology, Education, Security" 2019; ADP 2011, 2013, 2014, 2015, 2016, 2017, 2018; UNITECH 2004, 2006, 2008, 2009, 2010, 2011, 2014, 2015, 2016, 2017, 2018; ELMA 2015; COFRET'14, Paris; RaDMI 2011, 2013; Yearbook "Science-Education-Art", USB - Blagoevgrad, 2012; COFRET 2012; EF 2011; Proceedings "Trends in the development of industrial systems and technologies, South - Blagoevgrad, 2011; Mechanics of Machines, Technical University of Varna, 2010, 2011; Wissenschaftliche Zeitschrift der Hochschule Mittweida, Nr.5, 2011; ELECTRONICS 2010; International Scientific Conference, Technical College - Smolyan, 2003, 2005, 2006, 2007, 2009; Jubilee scientific session "60 years of USB - Ruse", 2004; ELMA 2017; Energy Procedia, 2014.

The works of the candidate can be systematized in 6 thematic areas:

1. Developments in the field of hand power tools - technical diagnostics, mathematical models, simulations, control and regulation, energy research, operation and repair, accessories, etc. In the publication [I. 4, 5, 6, 10, 14, 23, 24, 25, 26] the results of the analysis, research and activities in the field of technical diagnostics of REI and improvement of their operational indicators are presented. The second group of publications [I. 7,8,9,18,19,21,22] covers design and technological solutions and equipment for power tools, such as multi-stage reducer for electric screwdrivers, wrenches and threading machines, two- and three-speed reversible planetary gearboxes, designed for installation in cordless hand tools and implemented in "SparkyEltove".

2. Laboratory and training modules and stands in the field of electromechanical devices and household electrical appliances. This thematic area covers publications related to the development and implementation of test benches for testing of electric motors, electromechanical devices, household electrical appliances and others, implemented in the educational process and research activities in TC-Lovech [II1,2,12,13], educational training stands for electromechanical devices, household electrical engineering and automation [II.4,5,6,7], stands for control, monitoring and software of process simulation [8,9,10].

3. Electric drives and mechatronics

The main stages in the design of metal-cutting machines are analyzed and systematized, which must be taken into account in the practical implementation of the main and auxiliary systems. The results of the modernization, research and implementation are presented in [III 1,3,4].

4. Sewing equipment, textile materials and technologies

The development of a mathematical model of the electromechanical system of electric drive of a sewing machine with a DC electric motor [IV.1] is presented, the consumption of electricity of a sewing machine at different electric drives [IV.3, IV.5] is studied and a measuring system for precise determination of the static resistance moment, depending on the angle of rotation [IV.4].

5. Technical and economic developments

The publications in this group are of scientific and applied nature and consider the possibilities for improving the economic efficiency of power tools through the introduction of energy saving methods and tools [V.1], market analysis and developed product strategy for the production of hand tools for a certain period of time [V.3], the results of the adaptation of a methodology for determining the economic reliability of a machine-building product to the peculiarities of the production of microelectric motors for hand-held power tools [V.4].

6. Technologies, machine building, metalworking and other areas

The possibilities and advantages of using a CAD / CAM automated system in the conditions of large-scale production in the construction of new and modification of existing products are presented [VI.1]. Devices have been developed for mechanized feeding of details in the machining area with the possibility of application in various production systems [VI.6], for winding of coils of copper profile [VI.5], for increasing the quality when cutting internal threads by milling of the thread of a specially designed tool [VI.8, 11]. Methods and means for diagnostics of power cables [VI.3, 4], Brown gas generator for internal combustion engine [VI.6], synchronizing mechanism with the phase arrangement of the knees of the two shafts of the pantograph disconnector [VI.10].

5.3. Implementation activity

Assistant Professor Dr. Eng. Milko G. Dochev presented 13 official notes proving his multifaceted implementation activities in companies in Bulgaria. A list of 13 implemented rationalizations, developments and patent applications is presented. Their subject is in the field of design, research, diagnostics and analysis of the electrical and mechanical parameters of some types of electromechanical systems and power tools.

A methodology and a mathematical model of hand-held power tools for studying their operating and energy characteristics in dynamic and established modes and a monitoring system for experimental and analytical determination of energy performance of inverter and classical drive with single-phase collector motor of power tools have been developed. They have been tested in the company "Sparky - Eltos" EAD - Lovech in the manufactured power tools, as well as in the training process in TC - Lovech and UFT Plovdiv.

A methodology and program for testing, electromagnetic and resource calculations of single-phase collector motors has been developed, which is used in research and research in Sparky EAD-Lovech, companies in the field of power tools and in the learning process of students in TC - Lovech from the specialty "Electrical Engineering", in the disciplines "Design of electrical machines", "Control and diagnostics of electrical machines and appliances" and "Operation and repair of electrical machines and appliances" and "Household electrical engineering".

6. Contributions (scientific, scientific-applied, applied)

In accordance with Art. 29, para 1, item 3 of Act on Development of the Academic Staff in the Republic of Bulgaria and art. 57, para 1 of PPNSZAD in TU Gabrovo the candidate has presented a monographic work "Highly efficient electric drives for power tools". The topic of the presented monograph is extremely relevant due to the constantly growing operational and price requirements for industrial and domestic electric drives. I believe that the contributions in this work have a **scientific-applied character with a strong applied component** and in my opinion can be summarized as follows:

• Compilation of mathematical models and analysis of circuit solutions to increase the energy efficiency of electric drives of hand tools [Chapter 2,3];

• Analysis and provision of a high level of electromagnetic compatibility of electric drives, in the specific case of collector high-speed electric motors [Chapter 1,2].

• Development of a magnetic conductor on the stator with anisotropic geometry, allowing an increase in the resulting magnetic field in the air gap and a decrease in the transverse reaction of the armature [Chapter 2,3];

• Development of an adaptive magnetizing current monitor for a power tool with a single-phase collector motor to determine the angular velocity of the rotor [Chapter 2,3].

• Development of a microprocessor system for optimal energy management and monitoring of hand power tools based on a generalized mathematical model for analytical and experimental determination of energy performance of hand power tools [Chapter 3].

I accept the contributions formulated by the author regarding the publications with which he participated in the competition for "Associate Professor" - a total of 82 scientific articles and reports, 26 of which are in the field of technical diagnostics of electric machines and hand tools, and the rest are in electromechanics , electric drives, automation and laboratory facilities and equipment.

Scientific and applied contributions

• Development of methods and technical means for research and diagnostics of anchor and stator windings for electric machines and hand power tools [5,66,73]; to determine the technical parameters and the life of a hand-held power tool [61]; to identify the diagnostic condition of coils and windings with different applications [29].

• Determining the impact of technological deviations on energy indicators of single-phase collector electric motors and hand-held power tools by applying tolerance analysis [44,45].

• Development of multifunctional microprocessor control devices, smooth start-up, identification of the connection scheme, determination of the energy characteristics of the inverter electric drive and monitoring of power tools [28, 29, 31, 41, 82, 83].

• Design of a reversible reducer for a multi-stage manual drilling machine and study of the factors defining the choice of the optimal gear ratio [50, 53, 60].

• Development of a methodology for determining economic and reliability indicators and compiling an algorithm for market analysis and a marked product strategy in the production of electric motors for hand tools [46, 70, 74].

Applied contributions

• Adjustable electric drive for asynchronous electric motor and driving mechatron with microcomputer control for industrial sewing machines have been developed and implemented [56, 65, 71].

• A structurally new type of drive unit with electromagnetic clutch and brake for electric motors for industrial sewing machines has been designed [54, 55].

• New circuit solutions for modernization of lathes have been introduced through the introduction of digital-program control of the system "FANUK - 3T", of a machine for cleaning the collecting racks of mini-HPPs, of technology and device for winding busbar windings on a rib, of system for automating the process of counting and arranging jar caps [8, 30, 33, 37, 48, 49].

• A device (gas generator cell) for hydrogen production, improvement of energy performance and electric start of internal combustion engines in severe winter conditions has been developed and tested [39, 42].

• Schematic solutions have been developed for the control of a dome meter for examination of the human vestibular apparatus and for the control of a rotating chair for medical examinations IV generation [76].

Teaching contributions

The teaching and methodological contributions are contained in the presented by Assistant Professor Dr. Eng. Milko G. Dochev 1 monograph, 3 textbooks and 2 teaching aids, as well as in the developed curricula and programs, multiple activities on program and institutional accreditations in ПН 5.2 and ПН 5.3.

Additionally, the candidate's activities related to the improvement of the training and research base in TC Lovech, related to the development and implementation of stands for determining the characteristics of an induction motor with inverter (frequency) control, to determine the characteristics of coil springs by strain gauge, for pneumatic and electric drive training. A list of developed 14 laboratory stands used in the learning process in the lab is presented. "Electrical machines and apparatus" and lab. "Operation and repair of electrical machinery and apparatus". 3 laboratories in TC Lovech have been created and renovated - "Electrical machines and devices", "Operation and repair of EMA", "Training practice".

7. Assessment of the personal contribution of the candidate

The active publishing activity (110 publications and 35 well-known citations from a reference in NACID) and the large number of real implementations in companies with authority in the production of hand power tools shows that Assistant Professor Dr. Eng. Milko G. Dochev is an active researcher, knows very well the state and scientific achievements in the field in which he works and has a vision for the directions of his future scientific research. Based on this information, I believe that he is an experienced and well-trained lecturer in Electrical Engineering and Electromechanical Devices, and in particular in the design, operation, repair and diagnostics of electrical machines, electrical products and hand-held power tools. I believe that the formulated scientific-applied, applied and educational-methodical contributions are the personal work of the candidate and show that the work done by him as a lecturer and researcher is largely innovative and fully complies with the requirements of the competition for the academic position „Associate Professor“.

8. Critical remarks and recommendations

1. I recommend the candidate in the future to start working with PhD students in order to share their extensive experience and training of young teachers in the Department of Mechanical Engineering, Computer Systems and Electrical Engineering of TC - Lovech.

2. It would be good to put a little more effort in the preparation of documents, such as: articles and citations with one numbering for all documents; more complete evidence for the indexing of articles and citations.

3. To increase its presentation to the world scientific circles through publications in journals with impact factor.

4. Most of the citations submitted for participation in the competition for AD "Associate Professor" are from co-authors and colleagues of the candidate from TC Lovech (18 out of 35 citations). I believe that it is normal for a lecturer with such experience to have a significant number of citations from his colleagues from other Technical Universities in Bulgaria.

5. The points from publication 57 in the report on the fulfillment of the minimum requirements for holding the academic position of "associate professor" are incorrectly defined.

These remarks do not detract from the good performance of Assistant Professor Dr. Eng. Milko G. Dochev in the competition for the academic position of "Associate Professor".

9. Personal impressions

My assessment of Assistant Professor Dr. Eng. Milko G. Dochev is entirely based on the materials provided for the competition, from the available professional information on the Internet and from some scientific conferences in which he has participated. I have no joint publications with him, I have not participated in joint projects and I am not a related person with him within the meaning of paragraph 1, item 5 of the Additional Provisions of the Law on the Protection of Human Rights and Fundamental Freedoms.

CONCLUSION

Having in mind the above, I propose Assistant Professor Dr. Eng. Milko Ganchev Dochev to be elected "ASSOCIATE PROFESSOR" in the field of higher education – 5. Technical sciences, professional field - 5.2 Electrical engineering, electronics and automation, specialty "Electrical engineering" (Electromechanical devices, Electrical machines).

Date:02.11.2021 **Reviewer: /signature/**

(Prof. Dr. Eng. Nikolay D. Madzharov)