

REVIEW



For the competition for the acquirement of the academic position "PROFESSOR"

Scientific specialty: Machines and equipment for the chemical oil, gas and oil refinery industries

Professional field: 5.1 Mechanical Engineering

Announced in State gazette issue 45/17.06.2022

Reviewer **Prof. Dr. Eng. Gencho Stoykov Popov**
Rousse university "Angel Kanchev"

Scientific specialty: Hydraulic and pneumatic machines and equipment

Professional field: 5.1. Mechanical Engineering

1. Information about the competition

The competition has been announced for the Department of "Electronics, electrical engineering and machine engineering" of the Faculty of technical sciences at the University "Prof. Dr. Asen Zlatarov" - Burgas.

I take part in the scientific jury for the competition according to Order of the Rector of the University "Prof. Dr. Asen Zlatarov" № RD-293/19.09.2022.

The only candidate in the competition is Assoc. prof. PhD Eng. Dimitar Rusev Rusev.

2. Information about the candidates

The only one candidate for the competition is Assoc. prof. PhD Eng. Dimitar Rusev Rusev has graduated the Moscow institute of chemical engineering in 1985 as master engineer with specialty "Design of machines and equipment for chemical industry", Moscow, Russia.

From 1986 to 1990 he has been regular PhD student at the University "Prof. Dr. Asen Zlatarov", Department of Processes and apparatuses. In 1990, he defended his PhD thesis before the specialized scientific council at the Higher attestation commission to obtain the scientific degree of "Candidate in technical sciences" (which is now educational and scientific degree Philosophy doctor) in professional field 5.1. Machine engineering, scientific specialty „02.01.25 – Machines and equipment for the chemical, oil, gas and oil refinery industries.

He began his professional career in 1990 as Research fellow III degree in Production and scientific research laboratory "Fluidized bed" at the University "Prof. Dr. Asen Zlatarov" - Burgas. From 1992 to 1995 he was Deputy director of ZMM – Burgas.

From 1995 to 2006 he was Chief assistant and since 2006 – Associate professor in the Department of Electronics, electric engineering and machine engineering at University "Prof. Dr. Asen Zlatarov" – Burgas. During this period he has been Director of the Technical College at the University "Prof. Dr. Asen Zlatarov" (from 2008 to 2012 and from 2020 till now).

The facts described above indicate for classis academic development of Eng. Rusev which naturally resulted in his candidacy for the academic position Professor.

3. General description of the provided materials

In the competition for the academic position of "Professor" Assoc. prof. PhD Eng. Dimitar Rusev Rusev participates with 1 monograph which is not indicated as habilitation work and 66

scientific publications in the scientific specialty of the competition, among them:

- 16 publications in journals referred and indexed in world-known databases with scientific information - Scopus; Web of Science;

- 50 publications in non-referred journals with scientific reviewing or in redacted collective works. Of the publications submitted, 29 are published in Proceedings of conferences and are included in the National reference list of modern Bulgarian scientific issues with scientific reviewing, 4 of them published abroad.

The candidate provided also Protocols for equal contribution to the publications published together with co-authors.

The analysis of the materials provided with respect to the complying with the requirements of the National Center for Information and Documentation for acquiring the academic position of "Professor" showed the following:

- **Group A – 50 pts.** Covered by the Dissertation thesis of the candidate.

- **Group B – 100 pts. (Total number of points 217)** – the indicators are covered by 10 scientific publications in journals indexed in world-known databases with scientific information, among which the candidate is the only author and he is co-author in the rest of them. Six papers were published in „Journal Of The Balkan Tribological Association“, three – in „Journal of Chemical Technology and Metallurgy“ and one in „Oxidation communication“.

- **Group G – 200 pts. (total number of points of the candidate 609,09 pts.)**

In this group the provided scientific works are classified into three subgroups:

Subgroup G5. (30 points) Published monograph which is not indicated as the main habilitation work.

Subgroup G7. (190 points) Scientific publications in journals referred and indexed in world-known databases with scientific information. Six publications were provided, of which in 4 the candidate is the only author and in 2 he is a co-author.

Subgroup G8. (389,09 points) Scientific publications in non-referred journals with scientific reviewing or in redacted collective works. The highest number of publications is in this subgroup – 50 pcs, among which 29 a published in Proceedings from conferences and 4 of them are published abroad.

The publication in indexed scientific issues, as well as abroad, certainly helps for the wider recognition of Assoc. prof Rusev among the scientific community in the field of his scientific interests.

- **Group D – 100 pts. (Total number of points of the candidate 602 pts.)**

In this group, evidence is provided in 2 subgroups:

Subgroup D12. (590 points) citations or reviews in scientific journals referred and indexed in world-known databases with scientific information. In this group, the candidate indicates for a total of 59 citations of 14 publications.

Subgroup D14. (12 points) citations or reviews in non-referred journals with scientific reviewing. In this subgroup evidence is provided for 6 citations of 5 publications.

The information mentioned above clearly indicates that the applicant is well known in the scientific field where he works which resulted in the substantial number of citations of his publications. This determines the high number of points in this group which is by far higher than the minimum required.

- **Group E – 150 pts. (Total number of points of the candidate кандидата 350 pts.)**

Subgroup E17. (60 points) Tutorship of successfully defended PhD student. This is a very

important indicator for every habilitated scientist. The candidate provided certificate to confirm that he has been the scientific tutor of three successfully defended PhD students.

Subgroup E18. (70 points) Participation in national scientific or educational project. Here, the points are accumulated for 1 participation in 1 project financed by the European Social fund; 1 project financed by the National scientific program EPLUS, 5 participations national scientific projects financed by the Ministry of education and science, 3 projects financed by the Grant system of competitive financing of scientific and art activity at the University "Prof. Dr. Asen Zlatarov"- Burgas and 4 projects financed by the Scientific research sector of the University..

Subgroup E23. (60 points) Published university textbook. Two textbooks were published: „Technical documentation“ in 2013 and electronic edition of “Machines and equipment in chemical industry” – in 2021.

Subgroups E25 and E26. (160 points) the candidate supplied 1 patent application and 1 application for useful model. Three patents for invention are also presented.

It can be concluded from the analysis of the information given above that the candidate complies with the minimum national requirements in all the groups of basic criteria and the total number of points is 1828,09 pts while the minimum required is 600 pts. Obviously, the number of points of Assoc. prof. PhD Rusev are three times higher than the minimum required. This certainly indicates for the large volume and high quality of the scientific production of the candidate for the academic position of “Professor”. All this characterizes Assoc. prof. PhD D. Rusev as well-known scientist among the fellow researchers in this field and he is recognized as thorough and well-informed scientist.

4. Estimation of lecturing activity

Assoc. prof Rusev is highly experienced lecturer – he began his lecturing activities back in 1995 and has been university lecturer continuously since then.

It can be seen from the report on his lecturing activity that he had lectures and exercises with students from the educational and qualification degree (EQD) Bachelor during the academic year 2019-2020 – 461 hours, EQD Professional bachelor – 51 hours and EQD Master – 407 hours, for 2020-2021 academic year – 551, 36 and 482 and for 2021-2022 r. – 491, 36 and 287 hours, respectively.

The applicant supplied certificate for scientific tutorship of 3 successfully defended PhD students and 12 diploma students from EQD “Master”.

Undisputable indicator for good educational activity is the authorship of textbooks and handbooks. Assoc. prof. Rusev is the author of two university textbooks in the disciplines he is teaching: „Technical documentation“ (2013) and “Machines and equipment in chemical industry” (2021, electronic edition). He has reviewed a textbook on “Mechanical engineering” and “Handbook for solving problems in technical mechanics”.

He took part in the elaboration and improvement of the educational documentation of various specialties of the Faculty of technical sciences through – 22 curricula for EQD “Bachelor” on the disciplines “Engineering graphics”, “Computer technology in transportation technics”, “Application software”, „Machines and equipment in chemical industry”, „Introduction to AutoCAD”, „Applied software in engineering chemistry”, „Processes and apparatuses in chemical industry part I”, „Processes and apparatuses in chemical industry part II”; for EQD “Professional bachelor” – 3 curricula on the disciplines „Basics of design and CAD”, „Applied CAD systems in electronics”, „Technical documentation”; for EQD “Master” - 13 curricula on the disciplines: „CAD

technology in transportation", „Design automation", „Computer methods in design", „Reservoirs and vessels under pressure", „Computer graphical systems", „Computer aided 3D design", „Web design", „Computer animation", „Simulative design of electronic circuits", „Computer design in electronics", „Computer design of electric machines and equipment", „Simulative computer design of machines and equipment", „Fluidized systems technics and technologies".

The candidate has developed 8 lecture courses for EQD “Bachelor”, 5 lecture courses for EQD “Professional bachelor” and 12 lecture courses for EQD “Master”. Furthermore, 6 video lecture courses on the discipline “Engineering graphics” and 6 video exercises on the same discipline are also provided.

All the information referenced above shows the very good training and acquired lecturing experience of Assoc. prof. Rusev which characterizes him as well established and erudite university lecturer.

5. General characteristics of the provided scientific work/publications

The scientific interests of Assoc. prof. Rusev are mainly in the development and study of machines and equipment, simulative studies of hydrodynamic, heat and mass transfer and mechanical processes, deposition of coatings, energy efficiency of ORC-installations.

As can be seen from the information supplied, the main fields where the research and applied research activity of the candidate are: design of machines and equipment, simulative studies of hydrodynamic and mechanical processes, hydrodynamics, deposition of surface coatings, energy efficiency and management, organization and optimization of the educational process. They are structured in the following fields:

1. Development and design of machines and equipment and improvement of the energy efficiency and design of turbines for ORC-installations;
2. Hydromechanics studies and optimization of mechanical constructions;
3. Deposition and study of the mechanical characteristics of surface coatings deposited onto metal and polymer substrates;
4. Simulative studies and optimization of mechanical constructions and the tensile properties of deposited coatings;
5. Synthesis of new materials;
6. Management, organization and optimization of the educational process.

The scientific research and applied research contributions in each of these fields are described in details.

6. Estimation of the scientific and applied research contributions

The scientific works of the applicant for “Professor” degree Assoc. prof. PhD Dimitar Rusev contain mainly applied research and applied contributions and they can be classified into the following categories: substantiating by new means essential new aspects of already existing scientific fields, problems, theories, hypotheses; creation of new classifications, methods, constructions, technologies and obtainment of confirming facts. The number of contributions is predominating in the second group where a number of technologies and technological processes for the chemical industry are suggested.

- ***Substantiating by new means essential new aspects of already existing scientific fields, problems, theories, hypotheses***
- The mathematical model for description of the hydrodynamic processes in fluidized

bed apparatuses developed using computer systems for 3D design. (B4(1,7), G7(2), G*8(16,17,18,42)).

- The results obtained by the optimization of the heat and hydrodynamic processes of expansion in the turbine using computer aided modelling and simulation of the operation of ORC-installations. (G5, G7(4), G*8(28,46)).

- The results obtained from the simulation study of the distribution of stress and deformations of the suggested new design of the shaft of a generator turbine working with Freon. (G*8(25)).

- The suggested mathematical model for determination and prediction of ship viability after impact and the suggested mathematical formulation for determination of the function of failure distribution (G*8(11,24)).

– ***Creation of new classifications, methods, constructions, technologies and obtainment of confirming facts***

- The suggested meshes with optimized constructive characteristics for granulation of finely dispersed materials. (B4(1,7), G7(2), G*8(8,10,16,17)).

- The design of direct stream reverse vortex cyclone for purification of the waste fluid (G*8(44)).

- The design of a new type of disintegration-cavitation pump created for fine grinding of solid state and its dispersion in liquid phase to obtain stable suspensions (G*8(32)).

- The suggested design of a reactor for separation of emulsions using fractal systems, for which a mathematical model for description of the separation process was developed (B4(3), G*8(39)).

- The suggested design of blades for the working wheels of the turbine in ORC-installations, optimized depending on the hydrodynamics of the Freon used. (G5, G*8(26,27,34)).

- The developed new type of nozzle unit of the turbine in ORC-installations allowing polytropic expansion of Freon. (G5, G7(4), G*8(28,46)).

- The suggested new method for deposition of wear resistant coating of aluminium oxide Al_2O_3 onto polyamide structures **Polipa®PA6** и **Polikes®PA6G** using fluidized bed. (B4(7), G7(5), G*8(35,50)).

- The suggested new method for formation of metal matrix composites of stainless steels X2CrTi12, X5CrNi18-10 and X1NiCrMoCuN20-18-7 containing SiC and TiC, as well as the same steels containing tungsten carbide (WC) and Stellite 6. (B4(6), G*8(23,30,31)).

- The suggested new technology for formation of SiC based surface metal composites in metal structure using electric arc technology and the established influence of the technologic regimes for coatings deposition on the main technologic characteristics (adhesion, hardness, wear resistance) of the multicomponent system (B4(5), G*8(22)).

- The suggested technology and optimal regimes for high voltage sputtering of graphene and deposition of monolayer of graphene coating onto polymer and metal substrate to obtain capacitive nano-coating. (B4(10), G*8(49)).

- The suggested method for deposition of metal copper nano-coating by high voltage technology onto polymer material Polikes®PA6G. (G*8(45)).

- The suggested method for simulation prediction of the geometric, mechanic and tribologic characteristics of coatings and optimization of the deposition regimes at given main

criteria: adhesion strength, microhardness and wear resistance of coating of X18H9T and Ti onto PS/SB190 crystal, PS/SB793 shockproof **POLIPOM@POM**. (B4(8), Г*8(33,41)).

- The suggested method for simulative structure modelling and analysis of the stress in orifices located on spherical bottoms of pressure vessels and analysis of the stresses in thin-wall vessels. (G*8(3,14,40)).

- The suggested technology, technological scheme of an installation and design of a device for manufacturing glass microspheres sized up to 50 mm in hydrodynamic stream of high temperature gas, based on mathematical apparatus and a software product for optimization of the operation regimes of the installation. (B4(2), G*8(7)).

- The suggested technology for granulation of volatile coal ash – industrial waste from thermal power stations and production of sintered granules with good heat insulation properties and sorption properties for cleaning oil spills. (B4(1), G*8(8,10))

- The suggested technology for granulation of waste soot to obtain granules with desired shape, composition, size and density which can be used in rubber industry. (G*8(21))

- The suggested technologies for production of highly porous ceramics on the basis of SiO₂, Al₂O₃, graphite, CaCO₃ and barium titanate with high dielectric constant for which the technological regimes are optimized and a method for oxidation of fine iron silicates in high temperature fluidized bed was suggested. (B4(4), G7(6), G*8(6,9,19,48)).

- The suggested technology for manufacturing of light weight ceramic materials with clay matrix and filler from bio-wastes (rice husks, rye thatch, etc.), as pore forming for use in modern construction industry. (G*8(13,36,37)).

- The suggested technology for synthesis of porous wollastonite ceramics by a two-stage technology. (G*8(20)).

- The suggested technology for manufacturing of glass-ceramics from natural materials, as well as from industrial wastes (ash from thermal power stations, metallurgical slag, etc.) containing oxides. (G*8(12)).

- The suggested technology for preparation of graphite based electrically conductive paste (B4(9)).

– ***Obtainment of confirming facts***

- The data obtained about the wear resistance and the adhesion of the aluminium oxide Al₂O₃ coating onto polyamide structures **Polipa@PA6 and Polikes@PA6G**, on the basis of which particular operation regimes were elaborated. (G7(5), G*8(35,50)).

- The created 3D model and physical model for simulation of the equivalent stresses arising in the walls of the spherical bottom for different values of the angle γ and the corps of the apparatus and the software developed for studying and optimization of the design (G*8(3,14,40)).

7. Critical remarks and recommendations

I have the following questions and recommendations to the candidate:

- What is the value of the critical ratio between the pressures by the outflowing of Freon from a nozzle (these issues are studied in several works).

- It would be good to provide a cumulative list of the scientific publications (ordered by the groups of criteria) which would facilitate for the easier clarification and formulation of the scientific contributions disambiguation.

- I would recommend focusing further efforts to publications in international journals of higher reputation and higher impact factor.

8. Personal impressions and opinion of the reviewer

I do not know the candidate in the competition personally. I can certainly note that I am impressed by the volume and scope of his scientific production. He works in perspective scientific fields. He searches and finds science-intensive problems and he has ideas and suggests solutions. He is recognizable in the scientific field of work. This defines him as an established and recognized scientist and specialist in his field which is a prerequisite for his future development.

9. Conclusion

After I acquainted myself with the presented scientific works, their significance and the scientific, applied research and applied contributions contained in them, as well as taking into account the fact that the scientometric data of the candidate are by far higher than the minimum required for the acquirement of the competed position, I find enough grounds to propose to the honorable scientific jury to vote POSITIVELY and to propose to the Faculty council of the Faculty of technical sciences of the University "Prof. Dr. Asen Zlatarov" – Burgas

Assoc. prof. PhD Eng. DIMITAR RUSEV RUSEV

To occupy the academic position "PROFESSOR"

In specialty "Machines and equipment for the chemical, gas, oil and oil refining industries" in professional field 5.1 „Mechanical Engineering“.

23.10.2022 г.
Ruse

REVIEWER: _____

/Prof. Dr. Gencho Popov/