

## SCIENTIFIC REVIEW

under a competition for the academic position "Associate Professor" in professional field 5.4 Energy, scientific specialty "Industrial Heat Engineering" at the Department of Thermal Engineering at the Faculty of Shipbuilding at the Technical University of Varna announced in the State Gazette No. 13/07.02.2023 with candidate Krastin Krasimirov Yordanov ch. ass. Ph.D. eng. Reviewer: Georgi Ivanov Valchev, Full prof. Ph.D. eng.

### 1. General provisions and biographical data

Ch. Assistant Dr. Eng. Krastin Krasimirov Yordanov was born on June 4, 1986 in Tutrakan. He completed his secondary education at the Vocational High School of Mechanical Engineering - Ruse in 2005 and acquired the specialty "refrigeration technician". From 2005-2009, he was a student at TU-Varna and obtained a bachelor's degree in mechanical engineering in the field of heating technology, and in the period from 2009-2011 he obtained a master's degree in the same specialty. On 21.09.2017 he successfully defended the educational and scientific degree "Ph. D." in the scientific specialty: 02.06.01 "Theoretical thermal engineering" at TU-Varna. Since 05.02.2013, he has been an "assistant" on a labor contract in the professional direction 5.4 Energy, specialty " Heating Engineering" in the Department " Heating Engineering " at the Faculty of Shipbuilding, and since 19.12.2018, after winning a competition, he holds the academic position of "Chief Assistant" in the same department of an open-ended employment contract until now at TU-Varna.

On the basis of art. 32, Paragraph 1, Item 1 of the ZVORB, art. 4, Paragraph 8, Item 3 of the ZRASRB, art. 57, Paragraph 3 of PPZRASRB, art. 21, paragraph 3 of PURZAD in TU-Varna, decision of the scientific jury of 19.05.2023 - protocol No. X-103.2 and Order No. 332/22.05.2023 of the Rector of TU-Varna I have been designated as a reviewer.

### 2 . General description of the presented materials

The candidate for the academic position "Associate Professor" ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov has attached all the necessary documents certifying the fulfillment of the minimum national requirements according to the current: Law on the Development of the Academic Staff in the Republic of Bulgaria, as well as the Regulations for the Application of the law on the Development of the Academic Staff to it and Regulations for the terms and conditions for occupying academic positions at TU-Varna. The necessary documents are in the required form on an electronic medium in a sequence such as: content of the documents from item 1 to item 9; a reference to the original scientific contributions, item 6, is presented; reference for the scientific works related to the competition item 7-for ESD "Ph.D." item 7.1, for the academic position "principal assistant" item 7.2, for the academic position "associate professor" item 7.3, declaration of originality item 7.4 and declaration of plagiarism item 7.5. Item 9 presents documents (reference) proving the scientific, teaching and pioneering activities: for the study load for the last three years item 9.1; for graduate students under the scientific supervision of the candidate item 9.2; for participation in research projects item 9.3; for participation in national research projects item 9.4; for membership in an authoritative creative organization item 9.5; for participation in the development of study programs item 9.6; for participation in scientific conferences, seminars and symposia item 9.7; for participation in mobility carried out under the Erasmus program item 9.8; reference to documents for acquired qualifications item 9.9; for additional employment contracts item 9.10; and for scientific or scientific-applied developments item 9.11.

Ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov has presented a report on the fulfillment of the minimum national requirements for the acquisition of the ESD "Ph.D." for a protected dissertation on the topic "Identification of thermal regimes of chamber-type furnaces for heat treatment" in the scientific specialty 02.06. 01 "Theoretical heat engineering". There are 7 scientific publications on the dissertation. Of them, 3 is the independent author of 3 nos. is the lead author. A certificate of fulfillment of the minimum national requirements for winning the competition for the academic position of "ch. assistant professor " at the Technical University-Varna is also presented. There are 5 scientific publications included in the competition.

For acquired qualifications related to a PD 5.4. the following documents have been submitted:

\*member of CEID - regional college Varna part of HVACREHGS with a certificate of limited design competence - reg. number №16459 for parts, heating, ventilation, air conditioning, refrigeration equipment and heat and gas supply;

\* Certificate of legal capacity in welding - reg. No. 10002 / 26.02.2014;

\* Completed course on "Working with thermal imaging camera FLIR E60bx" - reg. No. C-4731 / 27.10.2014;

\* Completed course on "Working with equipment for microstructural analysis of materials" - reg. No. C-4749 / 27.10.20;

\* Completed course on "Working with the thermal conductivity analyzer C-THERM TCi" - reg. No. C-4744 / 27.10.2014;

\* Completed course on "Application of statistical methods in scientific research" - No. NI-SM 203 / 30.11.2016;

\* Completed course for "Internal auditor of management systems in control bodies" - No. TRB-16-0147 / 16.04.2016.

For participation in the competition for the academic position "docent" ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov submitted 36 pieces for review scientific publications that are not included in the list for the defense of the ESD "Ph.D.", as well as in the materials for the competition for the academic position of "principal assistant". Of them, 2 pcs. is an independent author, and on 7 no. is the lead author. Since no separate protocol for co-authorship of scientific publications is presented, the reviewer assumes that they are equal for all authors.

Distribution of scientific publications by group of indicators: according to indicator B.4 - scientific publications equivalent to (habilitation thesis-monograph), published in editions, referenced and indexed in world-famous databases with scientific information are 10 psc. [B.4.1, B.4.2, B.4.3, B.4.4, B.4.5, B.4.6, B.4.7, B.4.8, B.4.9, B.4.10] under indicator Г.7 – scientific publications in editions that are referenced and indexed in a world-renowned database of scientific information 3 nos. [B.7.1, Г.7.2, Г.7.3]; according to indicator Г.8 scientific publications in non-refereed journals with scientific review or in edited collective volumes 26 psc. [Г.8.1, Г.8.2, Г.8.3.....Г.8.26].

The scientific publications in the abstract for the acquisition of the ESD "Ph.D.", as well as the scientific publications related to the competition for the academic position of "Chief Assistant Professor" and scientific works outside the issues of the competition are not reviewed. Regardless, when forming the complex evaluation of the potential candidate, the reviewer will take into account all submitted materials on the competition.

The candidate Ch. Ph.D. Eng. Krastin Krasimirov Yordanov meets the minimum national requirements for holding the academic position "docent", specified in the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for the Application of the Law on the Development of the Academic Staff to it as well as the Regulations on the terms and conditions for occupying academic positions at TU-Varna in scientific field 5. Technical sciences, Professional direction 5.4 Energy, scientific specialty "Industrial thermal engineering". With a minimum requirement of 430 points per group of indicators for the academic position "Associate Professor", the candidate's personal total number of points is **889,37**. The points for indicator A are 50 with the required 50, for indicator B [B.4] are 220 with the required 100. The sum of the points for indicator Г [Г.7 and Г.8] are a total of 214,37, with the required 200. The sum of the points under indicator Д [quoted Д.12] are a total of 60 out of the required 50. The requirements under indicator Ж [Ж.29] (hourly for those led in lectures at TU-Varna for the last three years) are also fulfilled 345 points out of the required 30.

### **3. General characteristics of the research and scientific applied activity of the candidate.**

A certificate of the candidate's participation in national research projects in a team is presented:

\*FSR project: For funding of a scientific research project in the competition "YOUNG SCIENTISTS-2011" - DMU03/98 - 13.12.2011 on the topic: "Investigation of the strength of new sintered materials with application in the automotive industry under cyclic loading". Project manager: chap. Assistant Dr. Diyan Dimitrov with his team...and ass. eng. Krastin Krasimirov Yordanov was

included in the project with a report. No. 100114/8 of 31.07.2013 under contract DMU 03/98 of 2011 with the task of designing and manufacturing a cooling system;

\*Project: SP under FSR "Analysis of the annual change of microclimate parameters in rooms to assess the influence of passive heating", 2013. Project manager Iliya Hadjidimov and team;

\*Project in support of PhD students-2014, on the topic: "System for designing and analyzing heat fields and mass transfer processes in furnaces". Project manager Iliya Hadjidimov, Krastin Yordanov;

\*Project: SP under FSR "Methodology for inspection of water heating boilers", 2014. Project manager Penka Zlateva and team;

\*Project: SP under FSR "Investigation of the fatigue durability of structural elements subjected to irregular loads", 2015. Project manager Viktor Chirikov,...other, the candidate's task is to create and use a system for non-contact temperature measurement, as well as records the received data in an appropriate format;

\*Project: SSP 4 "Synthesis of composites by the capillary molding method and creation of a mathematical model of the thermal interaction between the matrix and the reinforcing phase", 2015. Project manager Radko Radev,... and team. The candidate's task is to create a mathematical model of the thermal interaction to recreate and use in capillary molding of composites.

Ch. assл Ph.D. eng. Krastin Krasimirov Yordanov actively participated in the construction of a laboratory on Renewable Energy Sources, which includes: a research complex of microprocessor systems and sensors for measuring thermotechnical quantities; an installation for comparative analysis of the performance between monocrystalline and polycrystalline photovoltaic panels with surface temperature reading and an installation offering a measurement system and method for measuring heat flow through vertical walls, roofs and ceilings of buildings of heterogeneous layer materials.

It also participates in the provision of a meteorological measuring station for measuring the surrounding parameters in the yard of TU-Varna. He has developed methods for conducting laboratory exercises, including statistical processing of data from the weather station, conducting both field experiments on the operability of photovoltaic solar panels, and determining the type of equipment used in the conversion of wind energy into electricity, etc..

Participates in the development of curricula for the following academic disciplines: "Thermodynamics and heat transfer" for "Engineering ecology" and "Protection of the population from disasters and accidents" majors; "Heat Power Engineering" for "Electric Power Engineering" and "ESEO" specialties; "Heat exchange devices" for "HERES", "RES" and "HEID" specialties; "Computer systems for engineering design for specialties" "HERES" and "HEID" and "Thermal engineering measurements and control" for specialty "HEID".

My assessment of the candidate's scientific research and applied scientific activity is **positive**.

#### **4. Assessment of the candidate's pedagogical training and activity.**

Ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov has pedagogical experience (10 years) in teaching students for the "Bachelor's" and "Master's" EQD - conducted in laboratory, seminar classes, lectures, course projects and scientific supervision of diploma theses at the students from the Shipbuilding, Mechanical and Electrical Engineering Faculty. It is clear from the Information on the study load from the EMD for the last three years (2019-2020, 2020-20201, 2021-2022) that the conducted classroom teaching activity (ALA) consists of: 552.4 hours of lectures; 86.8 hours of seminar exercises, 871.9 hours of laboratory exercises and 122.0 hours of course work/course project. The reference is derived from any university system for reporting learning activity.

Ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov has lectured on the following subjects included in the bachelor's study plans: "heat exchange devices", "thermodynamics and thermal engineering", "thermotechnical measurements", "biogas sources and technologies" and "thermal part of the TPP". He also led exercises in the listed disciplines for the Master's degree in EQD, as well as in "fuel technology and technologies", "computer systems and engineering design", "renewable energy sources", heat engineering", "heat supply and gas supply", "modern methods and means of presentation", "refrigeration equipment". He was the scientific supervisor of 6 pcs. successfully defended diplomas in EQD "bachelor" as well as 3 pcs. in EQD "master".

8 pcs. were made mobilities under the Erasmus program for the period 2016-2022: for the purpose of teaching, one foreign assignment was made, related to lectures on fuels and combustion processes; for the purpose of training, 7 pcs. foreign business trips related to familiarization with the methods of training, testing and visiting scientific research bases. The result of the current attestations of the candidate at TU-Varna is positive with a rating of "Very good" accepted at a meeting of the FC at the SF in 2018 and 2022.

My overall assessment of the candidate's educational and pedagogical activity is **positive**.

### **5. Main scientific and applied contributions.**

I accept the contributions from the mentioned studies in the materials to the documents of Ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov. The contributions of the presented scientific publications can be summarized as contributions of a scientific and applied nature in two groups.

**Group A.** Contributions of a total of 10 scientific publications united as equivalent to a monographic work on the topic "**Research and modeling of heat transfer and mass transfer in various industrial processes**" [B.4.1, B.4.2, B.4.3, B.4.4, B.4.5, B.4.6, B.4.7, B.4.7, B.4.8, B.4.9, B.4.10].

#### Scientific and applied contributions

\*3D simulation models based on the finite element method were developed, showing the distribution of both temperature fields and allowing the simultaneous determination of the magnitudes and distribution of stresses from different load cases from the operation of machines using software products -[B.4.1, B.4.2, B.4.4, B.4.8].

\*Infrared thermography processing software has been developed, by which a connection is made between the temperature measurements and the heat given off by the surfaces of the processed electronic elements - [B.4.6, B.4.7].

\*An algorithm has been developed for simulation modeling of stationary heat conduction in different types of walls made of ceramic grid bricks and walls with a matrix of clay and sand with and without straw additives, which adequately recreates the ongoing thermal processes and shows good repeatability of the obtained results of experimental studies-[B.4.9, B.4.10].

#### Applied Contributions

\*Values of some parameters of the microclimate in houses made of natural wood and results for the seasonal efficiency of the air-water heat pump system in heating mode at precisely measured outdoor air temperatures, characteristic of the Black Sea climatic zone, were experimentally obtained, which can be used in design of air-water heat pump systems, and when surveying buildings for energy efficiency - [B.4.3, B.4.5].

**Group B.** Contributions of scientific publications from the list of a total of 26 are distributed and thematically systematized in the following 5 pcs. scientific fields.

1. Research and modeling of heat energy utilization devices - [Г.8.12, Г.8.15, Г.8.16, Г.8.17, Г.8.21].

#### Scientific and applied contributions

\* A device has been developed for the utilization of low-potential thermal energy from waste water of domestic hot water supply systems in buildings, called "arch thermosyphon"-[Г.8.12].

#### Applied Contributions

\*The dependences of the internal thermal resistance and the average temperature of the wall in the cooling zone of inclined thermosyphons on the power of the transmitted heat flow and on their angle of inclination relative to the horizontal, on which their operability depends, were experimentally investigated, under the relevant operating conditions - [Г.8.15, Г.8.16, Г.8.17, Г.8.21].

2. Research and modeling of the thermal behavior of buildings from traditional and alternative building materials - [Г.8.1, Г.8.13],

#### Scientific and applied contributions

\*A methodology for researching the energy efficiency of a building with a complex geometry through 3D modeling has been developed and applied to a real object - [Г.8.1].

\*An algorithm has been developed for 3D modeling of thermal processes with different thermal insulation materials and coatings, allowing the use of software products with the help of which the course of processes can be predicted by varying the output parameters -[Г.8.13].

3. Research and modeling of heat and mass exchange processes during various heat treatments -[Г.7.1, Г.7.2, Г.8.2, Г.8.3, Г.8.4, Г.8.5, Г.8.6, Г.8.7, Г.8.8, Г.8.9, Г.8.10, Г.8.11, Г.8.14, Г.8.18, Г.8.19 и Г.8.20].

#### Scientific and applied contributions

\*3D simulation models of heat transfer processes and stress state evaluation under different surface treatments have been developed in the environment of suitable software products, which allow testing of different technologies, by changing the initial parameters of the regimes or by using different materials - [Г.7.1, Г.7.2, Г.8.2, Г.8.3, Г.8.5, Г.8.6, Г.8.7, Г.8.8, Г.8.9, Г.8.10, Г.8.11, Г.8.18].

#### Applied Contributions

\*A theoretical-experimental study of the relationship between the technological parameters of the air-plasma surface treatment processes and the quality characteristics of the resulting surface layers was made. A three-factor experiment was conducted to determine the effect of the factors on the resulting hardness in the heat-affected zone and a regression equation was obtained and isolines were drawn showing the effect of these factors-[Г.8.4, Г.8.14, Г.8.19, Г.8.20].

4. Study of energy resources for energy production -[Г.7.3 и Г.8.23].

#### Scientific and applied contributions

\*An algorithm has been developed combining the assessment of the solar potential of two energy systems, the solar resources and various integration models, the solutions of which give results for a realistic assessment of the use of solar energy in Bulgaria - [Г.8.23].

#### Applied Contributions

\*A theoretical study of the different renewable energy sources has been made to present the need for an energy mix in the energy system of Romania and Bulgaria for the period 2017-2019, which can help in the development of projects related to the energy strategy of both countries - [Г.7.3].

5. Analysis and evaluation of a natural gas transmission chain -[Г.8.22]

#### Applied Contributions

\*In order to optimize the natural gas supply chain, it is necessary to represent the path of natural gas from its extraction in natural gas fields to its distribution to the end user. For this purpose, a transmission and supply chain has been developed, presented as a model of a single product (natural gas), in which four stages have been introduced - [Г.8.22].

### **6. Significance of contributions to science and practice.**

The scientific publications of ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov have established the state of the scientific community working in PD 5.4 Energy in the country and the country. They have been reported at scientific conferences with international participation, seminars and symposia in total 19 pcs., publications in refereed and indexed in world-renowned databases of scientific information, as well as in non-refereed journals with scientific review or in edited collective volumes. Of the scientific publications submitted for review, 9 pcs. were noted citation.

### **7. Critical notes and recommendations.**

The analysis of the submitted materials for participation in the competition for academic position "Associate Professor" shows no gaps, which is why I believe that it is not necessary to make critical comments. I allow myself to make the following recommendations in the future work at the university of ch. ass. Ph.D. Eng. Krastin Krasimirov Yordanov: to publish more independent scientific publications; to activate work on scientific projects under his leadership with the participation of students and doctoral students; to carry out scientific supervision of doctoral students.

### **8. Personal impressions and opinion of the reviewer.**

I do not personally know ch. ass. Ph.D. Eng. Krastin Krasimirov Yordanov. My personal impressions after familiarizing myself with the materials provided to me and formulating the review for the candidate, that he is a built academic teacher with a very good theoretical and professional training in a wide range in the field of professional direction and specialty.

## CONCLUSION

My assessment of the overall teaching, research, publication and full fulfillment of the minimum national requirements for holding the academic position of "associate professor" of the candidate in accordance with the LDAS in the Republic of Bulgaria and the Regulations for the implementation of the law on the development of the academic staff to it, as well as the Regulations for the conditions and the order for occupying academic positions at TU-Varna is **positive**.

On the basis of the positive assessment, I find it justified with full conviction to propose ch. ass. Ph.D. eng. Krastin Krasimirov Yordanov to take the academic position "**associate professor**" in professional direction 5.4 Power Engineering, scientific specialty "Industrial Heat Engineering" at the Department of "Heat Engineering" at the Faculty of Shipbuilding in TU-Varna.

Date: 06.06.2023 г.  
Plovdiv

Заличена информация  
по Регламент (ЕС)  
2016/679  
Review  
/Full prof. Ph.D. eng. G. Valchev/