

OPINION

by Prof. Evdokia Nikolaeva Sotirova, PhD

University "Prof. Dr. Asen Zlatarov"- Burgas

of a dissertation for awarding the educational and scientific degree Doctor of Philosophy (PhD)

in the field of higher education: 4. Natural Sciences, Mathematics and Informatics;

Professional field 4.6. "Informatics and Computer Science",

PhD Program "Informatics"

PhD student: Borislav Enchev Georgiev

Topic: "Investigation of oil refining processes using intercriteria analysis"

Scientific supervisors: Acad. Krassimir Atanassov, DSc, DSc and prof. Dicho Stratiev, DSc

1. General presentation of the procedure and PhD student

The opinion was drawn up on the basis of order No. 73 / 24.01.2024 of the Director of the Institute of Biophysics and Biomedical Engineering (IBBFMI) - Bulgarian Academy of Sciences Prof. Dr. Tanya Pencheva and Protocol No. 1, by which I am designated as a member of the scientific jury and to prepare an opinion on the defense procedure of a dissertation work on the topic "Investigation of oil refining processes using intercriteria analysis" with author Master Eng. Borislav Enchev Georgiev, for the acquisition of an educational and scientific degree "doctor" in the field of higher education 4. Natural sciences, mathematics and informatics, Professional direction 4.6. Informatics and Computer Sciences, doctoral program "Informatics" at the Department of "Computer Systems".

The materials presented by Borislav Enchev Georgiev materials are in accordance with the Regulations for the Institute of Biophysics and Biomedical Engineering - Bulgarian Academy of Sciences.

Thus, the dissertation work presented to me for the preparation of the present opinion has a volume of 203 pages, which include an introduction, 5 main chapters, a conclusion of the obtained results, scientific and scientific-applied contributions, a bibliography in which 289 sources are cited, a list of publications of PhD student, list of noted citations.

2. Content analysis of scientific and scientific applied achievements

The aim of the dissertation is to apply the Intercriteria Analysis Method (ICA) to data from the LUKOIL Neftohim Burgas AD refinery, aiming to study the processes "Hydrocracking of tar H-Oil" and "Catalytic cracking type fluid" in the processing conditions of oil derivatives originating from different types of oil.

Modern oil refining is highly dependent on the efficiency of deep oil refining processes. Many measurements and evaluations are performed on complex objects such as oil and its derivatives. Typically, many such measurements are slow and resource-intensive. Therefore, I believe that the use of a mathematical apparatus, allowing to eliminate part of such „unfavorable measurements“ by establishing their sufficiently high dependence with other measured criteria (cheaper and easier to evaluate), would greatly support the whole process and especially decision making.

In the dissertation, ICA's possibilities for finding economically and technologically favorable conditions in the processing of technologically unfavorable types of oil are investigated. By applying the ICA method to experimental data, the PhD student obtained significant original results:

1. A new algorithm for evaluating the suitability of a specific type of oil for processing its tar fraction in the "H-Oil Tar Hydrocracking" process is presented.
2. For planning the production process in a refinery and optimizing the profitability of oil refining, quantitative relationships between the characteristics of vacuum residues from H-Oil and the products obtained during catalytic cracking have been derived.
3. An approach for determining the content of saturated components in the vacuum residue, which can be applied to the yields of products obtained during non-catalytic aquathermolysis of heavy types of oil is presented.
4. Catalysts and additives have been established that minimize the production of sludge in the industrial installation for catalytic cracking in "Lukoil Neftohim Burgas", which improves the economic results of the refinery.

In proof of the results of the work is the attached certificate of high economic effect in the amount of 6.8 million USD/month from the practical application of ICA in the assessment of the factors contributing to the increase of tar conversion and reduction of the rate of contamination in an installation " Hydrocracking of H-Oil tar" in the refinery when replacing the cascade with a parallel scheme for supplying fresh catalyst to the reactors of the plant.

3. Approbation of the results

The results presented in the dissertation have been published in a total of 7 publications, all by a collective of authors. 5 of them are indexed in the scientific databases Web of science and Scopus, with 4 having an impact factor, 3 being in quartile Q2, 1 being in quartile Q3, and 1 being in quartile Q4.

Excluding self-citations of all authors, 31 citations of the doctoral student's publications and h-index=3 were noticed, which proves the high value of his research.

There is no evidence of proven plagiarism in the submitted dissertation and scientific works under this procedure.

The PhD thesis and research work of Borislav Enchev Georgiev are up-to-date. The PhD student demonstrates competence and a very good knowledge of the issues related to the research area.

4. Abstract

The abstract is well structured and correctly and fully reflects the content of the dissertation, the results obtained and the conclusions drawn from the study.

5. Conclusion

After I got acquainted with the presented PhD thesis, the scientific publications related to it, as well as the quality and originality of the results and achievements presented in them, I confirm that they fully cover and even exceed the requirements of ЗРАСРБ, the regulations for its implementation, the Regulations on the terms and conditions for acquisition of scientific degrees and for the occupation of academic positions at the BAS for the acquisition of the educational and scientific degree of PhD in the scientific field 4. Natural sciences, mathematics and informatics, professional direction 4.6. Informatics and Computer Science.

The obtained results represent an original contribution to science and show that the doctoral student has a thorough theoretical training, critical analysis capabilities and independent research.

Based on the above, I give a positive assessment and recommend to the esteemed Scientific Jury to award Eng. Borislav Enchev Georgiev the educational and scientific degree “PhD” in professional field 4.6 “Informatics and computer sciences”, PhD program 01.01.12 “Informatics”.

26.04.2024

Burgas

Prepared the opinion:..

(Prof. E. Sotirova)