

## Supervisor's opinion on the dissertation thesis

Supervisor: doc. Ing. Marek Kubalčík, Ph.D.  
Student: Samuel Emebu, MSc  
Title of the thesis: The Mathematical Modelling of Waste Fats Treatment into Biogas

Samuel Emebu, MSc is a graduate of the Master's degree in Chemical Engineering-Process Systems, which he graduated in 2018 from the Norwegian University of Science and Technology, Trondheim, Norway. He was accepted to study in the doctoral study program Engineering Informatics in 2020. His dissertation topic was focused on mathematical modelling of chemical processes. The student devoted himself fully to the chosen topic throughout his studies.

The student passed the prescribed professional exams in accordance with the study plan, including the state doctoral exam. He actively participated in solving projects of the Internal Grant Agency IGA and Junior Grant Program, provided by the Ministry of Education, Youth & Sport (Czech Republic) and the European Union. When solving these projects, he fulfilled the assigned tasks responsibly and on time.

In 2021, he completed a study stay at Lappeenranta University of Technology. His professional cooperation with the Lappeenranta workplace resulted in a joint publication in a journal listed in the WoS database. The student published the results of his work not only at conferences, but especially in journals indexed in the WoS database. He is the author or co-author of 9 journal papers listed in the WoS database.

The dissertation thesis submitted by Samuel Emebu, MSc for the defence is focused on mathematical modelling of biomass treatment into biogas. As part of the work, a new multi-stage model of anaerobic digestion of biomass treatment into biogas was developed. The model is based on a one-stage degradation model. Compared to existing models of anaerobic digestion, the model developed in the work models most properties of liquids as a function of temperature. Compared to other models, the proposed model enables easier and faster evaluation of unknown parameters. The model can be used for simulation, optimization and control of anaerobic digestion processes in practice.

The submitted thesis was checked for plagiarism on 8 November 2023 via the STAG information system with the result of the highest similarity rate of 0% and the number of similar documents 0. I confirm that the submitted thesis is not a plagiarism.

The student regularly consulted his work with his supervisor, he approached the solved problem very actively. Based on the facts described above, I state that the submitted dissertation is at a very good professional level, with sufficient contribution to science and practice.

**I recommend the dissertation thesis for the defence.**

Zlín 7th November 2023

doc. Ing. Marek Kubalčík, Ph.D.

