

Supervisor's opinion on the dissertation

Student Ing. Anas Elbarghthi

Mr. Ing. Anas Elbarghthi was born on the 2nd of December 1984 in Benghazi-Libya. He finished his bachelor studies in Mechanical Engineering in the Faculty of Mechanical Engineering Technology, Benghazi – Libya, in 2014. In 2017 he became a graduated Master's in Mechanical Engineering in Szent István University, in Godollo – Hungary. Since January 2018, he has been a student of the doctoral study program at the Faculty of Mechanical Engineering of the Technical University in Liberec, majoring in Applied Mechanics.

After the start, he began to get acquainted with the issue of compressible fluid flow, numerical calculations and also with the methods of experimental flow investigation. He fulfilled the prescribed tasks of the individual study plan during the period from 2018 to 2020 (studies and examinations in 5 professional subjects with an average grade of excellent). He concluded the basic part by taking the state doctoral examination in January 2021.

As part of his studies, Ing. Elbarghthi completed an internship abroad at a workplace dealing with ejector cooling. From January to June 2020 he stayed at Energy and Process Engineering Department at Norwegian University of Science and Technology (NTNU), in Trondheim, Norway. During these stays, Ing. Elbarghthi performed comprehensive experimental work on a two-phase ejector supported CO₂ transcritical refrigeration system and obtained essential results for his work.

During his studies, Ing. Elbarghthi became involved in teaching in the subjects Applied Fluid Mechanics. Furthermore, in 2020 and 2021, he was project team manager of the internal grant of the Student Grant Competition (SGS) *Experimental and numerical study of ejector cooling*.

Ing. Elbarghthi co-authored 7 publications, five of which have a non-zero impact factor and the other two are in conference proceedings included in the SCOPUS or Web of Science databases.

The submitted dissertation is very actual in terms of the problem of cooling and its processing corresponds to the requirements of the doctoral study program, the dissertant contributed to the knowledge and solution of the selected problem. The focus of the presented dissertation is the research of a transcritical cooling system with CO₂ as a refrigerant using an ejector with two-phase flow. The focus of the work lies in experimental research. Ing. Elbarghthi focused on the effect of working conditions on ejector performance, as well as the effect of ejector on the performance, efficiency and operation of the transcritical cooling device.

In particular, the analysis of the destruction of exergy in the whole system, incl. the ejector itself and also the comparison of both systems, i.e. the classical system with an expansion valve and the system using the ejector for partial recuperation of the expansion work are very beneficial.

Although Ing. Elbarghthi focused on the smallest ejector available in the system's ejector block, the results clearly show the benefits of ejectors. Not only energy savings have been demonstrated, but also an increase in the performance of the transcritical cooling system. The obtained results have a high application potential, especially with regard to the needs of today's world, the search for maximum energy savings and at the same time in the use of ecological refrigerants.

The submitted dissertation meets the criteria required by the study regulations of FS and TUL. I therefore recommend sending the dissertation to reviewers for assessment and, in the case of positive assessments, preparing its defence before the committee of the doctoral study field Applied Mechanics.

In Liberec 29. 10. 2021



prof. Ing. Václav Dvořák, Ph.D.

Supervisor