

Zápis z obhajoby disertační práce
v rámci Joint supervision ve spolupráci s partnerskou institucí
The College of Engineering, The National Tsing Hua University

Obhajoba se koná dne 1.6.2022 na ČVUT Fakultě strojní v Praze a na NTHU v režimu MS Teams od 10:30 hodin.

Disertant **Ing. Václav Novotný**

Na téma: „**Absorption power cycle with aqueous salt solution for low temperature heat utilization**“

Studijní program Strojní inženýrství, obor Energetické stroje a zařízení

Stručné zhodnocení průběhu obhajoby:

The main goal of the thesis is the theoretical investigation to identify the application potential of absorption power cycle (APC) systems for waste heat recovery (WHR) and combined power and cooling. The potential is evaluated in comparison to other suitable benchmark technologies such as absorption systems with different working fluids (typical water-ammonia mixture from Kalina cycle) or organic Rankine cycle (ORC). The second goal was to prove the technical feasibility of the APC and its components by design and building an APC experimental unit as a proof-of-concept. Results from the experiments provided important knowledge that can define actual range of applicability and future development of the salt solution APC.

The doctoral student based his work on the thesis on a detailed research of APC and WHR processes. He used his excellent theoretical knowledge of thermodynamic cycles as well as the acquired practical experimental experience with the APC and its elements, which he gained especially in the development and production of an expander manufactured by 3D rapid prototyping. As a part of the defence, he presented theoretical and experimental procedures that have been used to achieve the main and partial goals of his work.

His doctoral thesis comprises of novel results and knowledge defining position of the absorption cycles among other thermal cycles that are used for low-potential energy conversion to electricity and combined electricity generation and cooling. In summary an actual range of APC application feasibility and major issues for future research and development were identified. The results of the thesis have practical impacts for future projects of decentralized energy sources as well as for co- and tri-generation operation mode of the absorption systems

Dotazy a připomínky:

The student gradually answered the individual questions of the opponents formulated in the reviews.

In the following discussion the candidate answered all the questions and comments. Among them the question of high corrosiveness of LiBr was raised. Ing. Novotný answered that the use of the standard corrosion inhibitors is possible. The question of toxicity of LiBr was raised. The answer was that the LiBr solution itself is nontoxic. The corrosion inhibitors have to be carefully selected as some of them are carcinogenic. Doc. Hoznedl asked about the turbine design. The answer was that the design was performed based on the ATLAS profiles. Prof. Liu asked regarding the prediction of the component efficiency. It was shown that the prediction bounds coincide well with the experimental data. The temperature profiles of the APC did not closely

follow the experimental data as the not all the real effects (e.g. mixing) were considered. Prof. Šafařík asked how to understand negative efficiency of power cycle presented in Fig. 6.28. The answer was that the figure shows not only the cycle efficiency but also the system consumption. Therefore, some points of the efficiency were negative.

According to the evaluation of the committee and the opponents, the dissertation is up to date and beneficial for the areas of decentralized energy, WHR and CHP. The dissertation clearly formulates the current real scope of APC applications. All opponents clearly agreed on the usability of the results in practice and in follow-up research. The committee agrees that the objectives of the work have been met. The results of the work are excellent, original, and valuable for practice.

The presentation about the main benefits of the dissertation was well understandable and concise. While answering the questions from the opponents and members of the committee, Ing. Václav Novotný demonstrated the ability to defend the results of his independent theoretical and creative activities and confirmed his excellent knowledge of this scientific field.

Hlasování proběhlo tajnou formou přes A-Doodle.

Výsledek tajného hlasování:

počet odevzdaných hlasů 7, hlasů pro 7, hlasů proti 0.

Komise na základě výsledku tajného hlasování

doporučuje - nedoporučuje děkanovi udělení titulu Ph.D.

doc. Michal Hoznedl, Ph.D.
předseda komise

Obhajoba skončila ve 12.12 hodin

Obhajoba DP Ing. Václava Novotného, která se koná dne

1.6.2022

Dotazy a připomínky:

JAK BYLA NAVRŽENA TURBÍNA,
NA ZÁKLADĚ JAKÝCH PROFILŮ ATO.?

Jméno tazatele (hůlkovým písmem): MICHAL HOZNEDL