

Supervisor Report on

Ing. Yogender Pal Chandra

with the topics

Stratification in storage tanks for heat pumps

Ing. Yogender Pal Chandra started full-time doctoral studies at the Department of Environmental Engineering, Faculty of Mechanical Engineering, Czech Technical University in Prague in April 2017. The original topic Storage tanks for heat pumps was changed and made more specific based on the dissertation study to the topic of stratification in storage tanks with special focus to the operation of heat pumps. The research focused on theoretical and experimental work in the field of description and modelling of stratification in water tanks, which student carried out in the high-quality equipped laboratories of the University Centre for Energy Efficient Buildings (ČVUT UCEEB). At the same time, the topic was supported by a number of research projects ongoing within Department of Building Energy Systems (UCEEB).

Ing. Yogender Pal Chandra was a student and researcher who independently solved his research and advanced modelling tasks using modern methods. He passed the exams with excellent results in accordance with the study plan. He presented the summary critical review to committee on 13.6.2018 and successfully passed with the dissertation study on 29.3.2019. He passed the state doctoral exam in the field of Environmental Engineering on 30.11.2021. The very good level of his scientific work is reflected in his original publications in the form of 5 impact papers ranked within Q1 (one even within D1). His main publications in a short time have collected about 100 citations in the Web of Science database. Publications summarizing his scientific work are:

CHANDRA, Y.; MATUŠKA, T.: Stratification analysis of domestic hot water storage tanks: A comprehensive review, *Energy and Buildings*. 2019, Volume 187, pp. 110-131. ISSN 0378-7788.

CHANDRA, Y.; MATUŠKA, T.: Numerical prediction of the stratification performance in domestic hot water storage tanks, *Renewable Energy*. 2020, Volume 154, pp. 1165-1179. ISSN 0960-1481.

CHANDRA, Y. P., MATUSKA, T.: Energy modeling of thermal energy storage (TES) using intelligent stream processing system, *Energy Reports*, Volume 8, pp. 1321-1335, November 2022, doi: 10.1016/j.egy.2022.08.012

CHANDRA, Y. P.; MATUSKA, T.: Intelligent data systems for building energy workflow: Data pipelines, LSTM efficiency prediction and more, *Energy and Buildings*, Volume 267, 15 July 2022, doi: 10.1016/j.enbuild.2022.112135

CHANDRA, Y. P., KIM, G. J., MATUSKA, T.: Second law performance prediction of heat pump integrated stratified thermal energy storage system using long short-term memory neural

networks, Journal of Energy Storage, Volume 61, No. 106699, May 2023, doi:
10.1016/j.est.2023.106699

Ing. Yogender Pal Chandra worked from 2018 to 2023 in the Department of Building Energy Systems at the Czech Technical University UCEEB in Buštěhrad and was involved in the work within research projects in the field of heat storage in connection with renewable energy sources.

The thesis submitted for defense in the form of his publications supplemented with an accompanying text summarizes the theoretical and experimental work of Ing. Yogender Pal Chandra since 1.4.2017. His research and practical results are beneficial for the development of the field of thermal engineering.

I recommend the dissertation thesis of Ing. Yogender Pal Chandra for defense.

In Prague 20.2.2024

Assoc. Prof. Ing. Tomáš Matuška, Ph.D.
supervisor of Ph.D. student