

# Jan Špale

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PhD candidate at Faculty of Mechanical Engineering, CTU in Prague

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## Objective statement:

I am seeking industrial partners for research collaboration in the field of high temperature heat pumps, organic Rankine cycle, combined heat and power systems and waste heat recovery for industrial buildings.

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## Education

- **09/2018-01/2021 FME CTU in Prague** – Master studies in Energy engineering, graduated with honours
- **02/2021 – 04/2023 FME CTU in Prague** – Doctoral studies in Energy & Process Engineering, graduated with honours
- **04/2023 – now FME CTU in Prague** – PhD candidate, dissertation topic: Small-scale vapour expansion machines for distributed energy systems

## Research experience

- **05/2017 – now – Energy engineer in R&D – Energy systems in buildings**, laboratory of Organic Rankine Cycles at University Centre for Energy Efficient Buildings (**UCEEB**), **CTU** in Prague. Development of a biomass fired micro-CHP ORC plant. Thermal cycles modelling. Experimental investigation of energy systems in buildings. Mechanical design and engineering. Energy consultancy for industries.
- **02/2021 – now – Research and teaching assistant – Department of Energy Engineering, FME CTU in Prague**, delivering excercises and classes to Master students of Energy Engineering study track; responsible for two experimental laboratory units – reversible heat pump with climate chambers and demonstrational small scale steam power plant
- **08/2023 – 05/2024 – Fulbright scholar** at Ray W. Herrick Laboratories at **Purdue University** – R&D in high temperature heat pumps, thermodynamic modelling

## International experiences

- **07/2016 – Sustainable engineering** summer school at **KU Leuven**
- **09/2018 - 02/2019 – Energy engineering** - Renewable energy sources, focus on turbomachinery, renewable energy and computational fluid dynamics; Erasmus+ study exchange programme at **Politécnico di Milano**
- **01/2020-02/2020 – Research visit** in Additive manufacturing for small-scale turbomachinery at **OTH Amberg-Weiden** – funded by BTHA
- **07/2021** – International summer school for PhD students in **Methods and Technologies for Energy Transition and Climate Protection** at **Silesian University of Technology Gliwice**
- **08/2023 – 05/2024 – Fulbright scholar** at Ray W. Herrick Laboratories at **Purdue University** – R&D in high temperature heat pumps, thermodynamic modelling

### Professional honors, awards and fellowships

- **Fulbright-Masaryk scholarship** awardee
- Graduated with honors (summa cum laude)
- Awardee of “Scholarship for gifted students 2021” by CTU in Prague
- Honorable mention of the jury of “Visionary 2020” – commercialization of a biomass-fired microcogeneration unit Wave120
- Erasmus+ scholarship holder – Politecnico di Milano 2018/2019, Renewable energy sources
- Award for long-term extraordinary study results at Grammar school (summa cum laude)

### Selected publications and proceedings

- [1] Spale J, Vodicka V, Zeleny Z, Pavlicko J, Mascuch J, Novotny V. Scaling up a woodchip-fired containerized CHP ORC unit toward commercialization. *Renew Energy* 2022;199:1226–36. <https://doi.org/10.1016/j.renene.2022.08.144>.
- [2] Basta A, Basta V, Spale J, Dlouhy T, Novotny V. Conversion of combined heat and power coal-fired plants to Carnot batteries - Prospective sites for early grid-scale applications. *J Energy Storage* 2022;55:105548. <https://doi.org/10.1016/j.est.2022.105548>.
- [3] Spale J, Pavlicko J, Vodicka V, Mascuch J, Novotny V. Experimental investigation of combustion engine with novel jacket and flue gas heat recovery. *Energy Reports* 2022;8:593–604. <https://doi.org/10.1016/j.egyr.2022.07.073>.
- [4] Novotny V, Basta V, Smola P, Spale J. Review of Carnot Battery Technology Commercial Development. *Energies* 2022;15. <https://doi.org/10.3390/en15020647>.
- [5] Novotny V, Spale J, Szucs DJ, Tsai H-Y, Kolovratnik M. Direct integration of an organic Rankine cycle into an internal combustion engine cooling system for comprehensive and simplified waste heat recovery. *Energy Reports* 2021;7:644–56. <https://doi.org/10.1016/j.egyr.2021.07.088>.
- [6] Mascuch J, Novotny V, Spale J, Vodicka V, Zeleny Z. Experience from set-up and pilot operation of an in-house developed biomass-fired ORC microcogeneration unit. *Renew Energy* 2021;165:251–60. <https://doi.org/10.1016/j.renene.2020.11.021>.
- [7] Novotny V, Szucs DJ, Špale J, Tsai H-Y, Kolovratnik M. Absorption Power and Cooling Combined Cycle with an Aqueous Salt Solution as a Working Fluid and a Technically Feasible Configuration. *Energies* 2021;14. <https://doi.org/10.3390/en14123715>.
- [8] Novotny V, Vitvarova M, Spale J, Jakobsen JP. Intermediate pressure reboiling in geothermal flash plant for increased power production and more effective non-condensable gas

abatement. Energy Reports 2020;6:20–7. <https://doi.org/10.1016/j.egy.2019.10.014>.

- [9] Novotny V, Szucs DJ, Spale J, Vodicka V, Mascuch J, Kolovratnik M. Investigation of novel configuration for dual organic rankine cycle configurations for maximization of waste heat utilization. Refrig. Sci. Technol., vol. 2020- July, International Institute of Refrigeration; 2020, p. 36–43. <https://doi.org/10.18462/iir.rankine.2020.1108>.
- [10] Weiß AP, Novotný V, Popp T, Streit P, Špale J, Zinn G, et al. Customized ORC micro turbo-expanders - From 1D design to modular construction kit and prospects of additive manufacturing. Energy 2020:118407. <https://doi.org/10.1016/j.energy.2020.118407>.
- [11] Mascuch J, Novotny V, Vodicka V, Spale J, Zeleny Z. Experimental development of a kilowatt-scale biomass fired micro – CHP unit based on ORC with rotary vane expander. Renew Energy 2018. <https://doi.org/10.1016/j.renene.2018.08.113>.
- [12] Novotny V, Spale J, Stunova BB, Kolovratnik M, Vitvarova M, Zikmund P. 3D Printing in Turbomachinery: Overview of Technologies, Applications and Possibilities for Industry 4.0. ASME Turboexpo 2019, Phoenix: ASME International; 2019. <https://doi.org/10.1115/gt2019-91849>.

## Membership and activities in professional associations

- **Knowledge Center on Organic Rankine Cycle technology (KCORC)** – member since 11/2018
- **American Society of Mechanical Engineers (ASME)** – student member since 02/2019, attendee of Student Advisory Committee meetings of the Gas Turbine Institute at ASME TurboExpo conferences
- **International Energy Agency (IEA)** – Energy Storage Technology Collaboration Program (ES-TCP) – Alternate delegate of the Czech Republic in the executive committee since 01/2021; active member of Task36 on Carnot Batteries

## Extracurricular activities and community service

- **Board of European Students of Technology (BEST)** – member since 07/2016, an international non-profit and non-political organisation providing communication, co-operation and exchange possibilities for students of technical universities in Europe since 1989;
  - **President of the IXth local board** (07/2017 – 07/2018) at CTU in Prague – leading a local branch consisting of over 40 students;
  - Main organizer of Summer course 2017 focused on Engineering psychology;
  - Long-term member of Public relations working group focusing on social media and promotion of possibilities to study abroad for CTU students
- Opponent of project proposals aimed at transformation of energy sector and energy transition (Theta programme) under **Technology Agency of Czech Republic**
- Member of the **CTU Student Union** parliament 07/2017-07/2018
- Lecturer in natural sciences at **Kladno Grammar school** – Biology and Physics, 2013-2015, organizing field trips and laboratory experiments