



DOCTORAL RESEARCH TOPIC:

Decarbonising energy in buildings with heat pumps

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

In order to reduce climate change, increase energy efficiency and the integration of advanced technologies in the building sector, heat pumps are emerging as one of the solutions that are increasingly being applied. The building sector is planned to become zero CO₂ by 2050. Heat pumps are becoming an increasingly popular source of thermal energy for space heating/cooling and hot water production in buildings. However, their performance is influenced by outdoor and indoor conditions; this is particularly noticeable in colder climates where evaporator freezing is an issue with air source heat pumps. The thermo-economic optimum integration of heat pumps in buildings, both new and existing, needs to be considered when addressing energy efficiency and decarbonisation of buildings.

The aim of the research is to develop a thermo-economic multi-criteria model for the integration of heat pumps in buildings for the decarbonisation of the building sector. To achieve this, the following objectives are addressed:

1. To analyse heat pump integration schemes in combination with PV or other renewable energy technologies;
2. To develop a thermodynamic analysis model from primary energy to consumption;
3. To perform an experimental study on the operation of heat pumps under realistic conditions;
4. Develop a model for optimal heat pump integration through a multi-criteria thermo-economic assessment for the decarbonisation of building energy consumption.

The results of the work would include a separately developed thermo-economic model from primary energy sources to the consumption loop, a model for heat pump integration in cool climate countries to achieve zero CO₂ emissions in buildings. The results of the work are published in international journals, Clarivate Analytics Web of Science database, participation in international conferences.

SCIENTIFIC SUPERVISOR:

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