

Digital HP Lab

DTU Construct, Section of Thermal Energy

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Heat pumps convert excess heat or ambient heat and electricity into heat at higher temperatures. This heat can be used in various ways, such as warming our homes or supplying industrial processes. In doing so, heat pumps significantly contribute to reducing CO₂ emissions from the heating sector and help lessen our dependence on imported fossil fuels. The number of installed heat pumps has been increasing and this trend is projected to continue.

Given the growing number of heat pump units that need to be designed, built, installed, and maintained in the upcoming years, digital tools that assist engineers and technicians are highly valuable. These tools use available data to enhance energy efficiency, cut operation costs, minimize downtime, and ensure optimal integration with surrounding systems like buildings, district heating networks, or industrial processes.

These digital services are made possible by collecting data about the current operation of the heat pump. Models and algorithms can then derive useful information and recommendations from the data. The heat pump unit and its digital counterpart can be connected through the internet of things. The design and implementation of these digital tools is a topic of ongoing research. In this project, we will build a digital heat pump laboratory at DTU Construct, Section of Thermal Energy. This laboratory will serve as a platform for developing, testing and learning about digital services that support the efficient and fault free operation of heat pumps and refrigeration units. The project will run from 1 August 2024 to 31 August 2025. The first half of the project will focus on implementing the laboratory, including the digital infrastructure. The second half will concentrate on demonstrating the laboratory's capabilities by assessing potential digital services. This work will be conducted in collaboration with COWI and will include two Master's theses.

The laboratory will be a place where research, companies, and education meet. Thereby, we can offer state-of-the art education and tap into the creative potential that lies within collaboration for applied research. We expect that the laboratory will support future research activities in the field. Moreover, the integration of experiments and hands-on experience in our courses is expected to motivate our students and equip them with highly relevant skills for their future career as engineers.