

Master's thesis project at Division of Energy Technology, Department of Space, Earth and Environment, Chalmers University of Technology

Drying of sludge with heat pump

Background

About 40% of the 2 to 3 million tons of sludge yearly produced in the EU (17 kg/ha) are applied on farmland. The other share is incinerated (27%), composted (about 10%), or landfilled (currently estimated at 11%, and phasing out). Organic compounds, pathogens, pharmaceuticals, and microplastics are present in sewage sludge. The risks which they pose when sludge is used on farmland need to be assessed and addressed through risk management measures. Increased burying of sludge is therefore discussed in many EU MS. To burn sludge, a moisture content of less than 30% must be achieved. Drying of sludge can be done by drying with industrial excess heat, and also assisted by heat pumps. In this diploma work you will gain knowledge about how a heat pump works and finding heat pump solutions that work for this specific industrial application.

Research tasks:

This diploma work comprises of:

- Understanding the heat pump thermodynamic cycle
- Developing the scope of the study
- Understanding the concepts and requirements for drying of sludge and corresponding treatment techniques
- Designing a heat pump concept that is adaptable and robust to fit requirements from industry
- Evaluate total cost of ownership and other critical KPI's
- Interpretation of the results
- Presenting the finding to internal and possibly external audiences"

Requirements: Master programme Sustainable Energy Systems (MPSES) or Sustainable Chemical Engineering (MPISC) Background in chemical, energy, or mechanical engineering, interest in process modelling and industrial energy systems analysis. Experience with process modelling software (e.g. Aspen Plus is a plus).

Group size: 1 student

Supervisors:

Co-supervisors: Roger Nordman (CIT Renergy)

Examiner: Simon Harvey

Timeframe: 5 months for M.Sc.; 4-6 months for research internship

Start: January 2024

CIT Renergy is a subsidiary company of Chalmers Industriteknik, and thus part of the Chalmers family. We offer our clients energy and resource efficiency solutions within the areas of built environment, society, industry, and indoor climate.