**Jobbnorge ID:** 185034
**Deadline:** 4/13/2020
**Website:** http://www.ntnu.no
**Scope:** Fulltime
**Duration:** Fixed Term

The Department of Energy and Process Engineering has a vacancy for a

# PhD Candidate: process heat generation by high temperature heat pumps

## This is NTNU

At NTNU, creating knowledge for a better world is the vision that unites our 7 400 employees and 42 000 students.

We are looking for dedicated employees to join us.

Video: https://www.youtube.com/watch?v=clgKd1SwGLI

## About the position

We have a vacancy for a PhD candidate within the research area of “Heat pumping systems utilizing natural working fluids”, at the Department of Energy and Process Engineering (EPT).

The climate targets of the 2015 Paris agreement require a significant reduction of climate gas emissions and consequently also industrial process heat needs to be de-carbonized. Process heating accounts for approximately 40% of the European energy demand in the industrial sector and steam is often used as a universal heat carrier. Up to now industrial process steam is mostly generated by fossil fuel driven boilers.

Heat pumps are a promising technology for substitution of this fossil fuel-based process heat. However, their current limitation is within a heat sink temperature of 100°C. NTNU is investigating technical feasible solutions for high temperature heat pumps which can supply process heat of up to 250 °C.

This high temperature heat pump technology will contribute in two ways, both reducing the CO2 emission, and reducing energy consumption for the heating process by using low-grade waste heat from the industrial process as the heat source.

The project will investigate methods and alternative systems to minimize the energy consumption for steam production utilizing heat pump technologies in complex industrial applications with focus on given real cases. The project is a part of the Research Centre HighEFF (www.HighEff.no)

Professor Terese Løvås is the Head of the Department. The NTNU part of the project is led by Professor Trygve M. Eikevik. The position`s supervisor is Professor Trygve M. Eikevik.

## Duties of the position

- Independently set up research plans and conduct them accordingly in cooperation with the research center
- Evaluation of different system solutions and integration concepts for high temperature heat pumps
- Experimental investigation of prototype components for heat pumps
- Take lead in writing research papers under supervision
- Contribute in supervising master students within the field
- Comply with the PhD training program of the Faculty of Engineering

## Required selection criteria

**Essential qualifications:**

- The PhD-position's main objective is to qualify for work in research positions. The qualification requirement is that you have completed a master’s degree or second degree (equivalent to 120 credits) with a strong academic background in mechanical engineering or equivalent education with a grade of B or better in terms of NTNU’s grading scale. If you do not have letter grades from previous studies,

you must have an equally good academic foundation. If you are unable to meet these criteria you may be considered only if you can document that you are particularly suitable for education leading to a PhD degree.
- Proven, strong theoretical skills within thermodynamics, heat pumping cycles and an interest to further develop these skills
- Interested and skilled within theoretical as well as experimental studies
- Good written and oral English language skills

**Desirable qualifications:**

- Lab. facility set up, instrumentation and experimental skills
- Modelling experience
- Published scientific papers

The appointment is to be made in accordance with the regulations in force concerning State Employees and Civil Servants and national guidelines for appointment as PhD, post doctor and research assistant.

## Personal characteristics

- Team player and ability to work independently
- Creative and goal-oriented personality
- Passion for a renewable energy economy and sustainability
- Reliable and thorough at work

In the assessment of which candidate is best qualified, emphasis will be placed on education, experience and personal suitability, in terms of the qualification requirements specified in the advertisement.

## We offer

- Exciting and stimulating tasks in a strong international academic environment
- An open and inclusive work environment with dedicated colleagues
- PhD linked to an FME research center HighEFF (Centre for an Energy Efficient and Competitive Industry for the Future)
- Favourable terms in the Norwegian Public Service Pension Fund
- Employee benefits

## Salary and conditions

PhD candidates are remunerated in code 1017, and are normally remunerated from NOK 479 600 per annum before tax, depending on qualifications and seniority. From the salary, 2% is deducted as a contribution to the Norwegian Public Service Pension Fund.

The period of employment is 3 years.

Appointment to a PhD position requires that you are admitted to the PhD programme at the Faculty of Engineering within three months of employment, and that you participate in an organized PhD programme during the employment period.

The engagement is to be made in accordance with the regulations in force concerning State Employees and Civil Servants, and the acts relating to Control of the Export of Strategic Goods, Services and Technology. Candidates who by assessment of the application and attachment are seen to conflict with the criteria in the latter law will be prohibited from recruitment to NTNU. After the appointment you must assume that there may be changes in the area of work.

The position is subject to external funding.

It is a prerequisite you can be present at and accessible to the institution on a daily basis.

## About the application

The application and supporting documentation to be used as the basis for the assessment must be in English.

Publications and other scientific work must accompany the application. Please note that applications are only evaluated based on the information available by the application deadline. You should ensure that your application shows clearly how your skills and experience meet the criteria which are set out above.

Joint works will be considered. If it is difficult to identify your contribution to joint works, you must attach a brief description of your participation.

Information Act (Offentleglova), your name, age, position and municipality may be made public even if you have requested not to have your name entered on the list of applicants.

Questions about the position can be directed to Professor Trygve M. Eikevik, phone number 930 59 196, e-mail trygve.m.eikevik@ntnu.no. For questions about the recruitment process, please contact Megan Norris, e-mail: megan.norris@ntnu.no

Please submit your application electronically via jobbnorge.no with your CV, diplomas and certificates. Applications submitted elsewhere will not be considered. It is necessary to include a Diploma Supplement with European Masters` Diplomas from outside Norway. Applicants with qualifications from China are required to provide confirmation of Masters` Diplomas from China Credentials Verification (CHSI).

If you are invited for interview you must include certified copies of transcripts and reference letters. Please refer to the application number IV-64/20 when applying.

**Application deadline: 14.04.2020**

## General information

A good work environment is characterized by diversity. We encourage qualified candidates to apply, regardless of their gender, functional capacity or cultural background.

NTNU is committed to following evaluation criteria for research quality according to The San Francisco Declaration on Research Assessment - DORA.

As an employee at NTNU, you must at all times adhere to the changes that the development in the subject entails and the organizational changes that are adopted.

**The city of Trondheim** is a modern European city with a rich cultural scene. Trondheim is the innovation capital of Norway with a population of 200,000. The Norwegian welfare state, including healthcare, schools, kindergartens and overall equality, is probably the best of its kind in the world. Professional subsidized day-care for children is easily available. Furthermore, Trondheim offers great opportunities for education (including international schools) and possibilities to enjoy nature, culture and family life and has low crime rates and clean air quality.

# NTNU - knowledge for a better world

**NTNU - knowledge for a better world**

The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

**Department of Energy and Process Engineering**

We conduct research and teaching covering the entire energy chain, from resources to the end-user. We look at how energy is produced and used by humans and machines in a sustainable way with regard to health, climate change and the resource base. The Department of Energy and Process Engineering is one of eight departments in the Faculty of Engineering.

## Additional information

### Place of service:

Gløshaugen 7491 Trondheim (Trondheim Municipality)