Professur für Thermofluiddynamik

Master Thesis

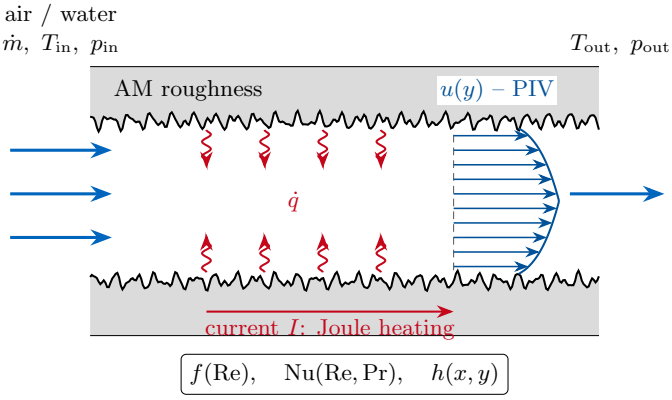
Start: March 2027 (7 months) Ad published: 30.10.2026

☐ theoretical
☐ numerical
☒ experimental
☐ constructional

Experimental Investigation of Heat Transfer, Pressure Loss and Flow Fields over Additively Manufactured Rough Surfaces

External thesis at Siemens Energy AB, R&D Fluid Dynamic Lab, Finspång (Sweden)

Additive manufacturing (AM) enables complex internal cooling geometries for gas turbine components, but the process-induced surface roughness strongly affects heat transfer, pressure loss and the near-wall flow. In four experimental master theses at Siemens Energy, these effects are quantified, each using one of the following methods developed and verified in-house:



JHT / JHTh2o: Joule-heated AM test objects with varying internal geometries are cooled by air or water flow. The Darcy friction factor and Nusselt number are obtained as functions of Re and Pr via an inverse procedure coupled to STAR-CCM+.

SRHT: Local heat transfer on upscaled AM roughness coupons from a step change in flow temperature, transient IR thermography and an in-house conjugate FEM solver.

PIV: Pulsed laser and high-speed camera measurements of the boundary-layer velocity profile over the same coupons, linking roughness, near-wall flow and heat transfer.

The work covers literature review, rig preparation, testing, data analysis and iterative improvement of rig, procedure or analysis, concluded by a report and presentation. It is carried out on site in Finspång under an experienced Siemens Energy supervisor, aiming at publishable results (previous student work: J. Turbomach., ASME Turbo Expo, Int. J. Heat Mass Transfer).

How to apply: Apply **directly to Siemens Energy** via `jobs.siemens-energy.com` (Job ID 305602) by **16.12.2026**; selection is ongoing, positions may be filled earlier. TFD acts as TUM-side supervisor only and becomes involved after the student has been accepted by Siemens Energy.

Requirements:

Courses in fluid/gas dynamics, heat transfer,
dimensional similarity and numerical methods
Knowledge of Matlab or Python
Fluent English, spoken and written
Laboratory testing experience is a plus

Contact Information (TUM supervision):

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