Institut für Thermodynamik

Leibniz Universität Hannover

Call for a Student Research Project at the Institute of Thermodynamics (IfT)

Setup and Commissioning of a Cryogenic Flow Densimeter based on Commercial Vibrating-Tube Densimeter

Type of thesis:	☒ Bachelor thesis ☒ Student project ☐ SC (WiIng) ☒ Master thesis
Start date / Language:	Immediately / English
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Background:

In line with the European Green Deal, the EU has set a legally binding target to reduce greenhouse gas emissions by at least 55% by 2030 relative to 1990 levels. To achieve this, increased use of liquefied energy gases is essential, with LNG thermodynamic properties identified as a research priority. The currently accepted LNG density uncertainty of 0.45% ($k = 2$) limits industrial practice. Reducing in-field uncertainties below 0.3% ($k = 2$) demands rigorous control of sampling and vaporization biases, enabling traceable and rapid cryogenic density measurements.

Task Definition:

Within the framework of the CryoMet project, IfT will develop a cryogenic measurement system based on a commercial high-pressure vibrating-tube densimeter (see Fig. 1). The objective is to measure LNG density under low-flow conditions across a temperature range of 100–140 K and at pressures up to 10 MPa, with a target density measurement uncertainty below 0.3%.

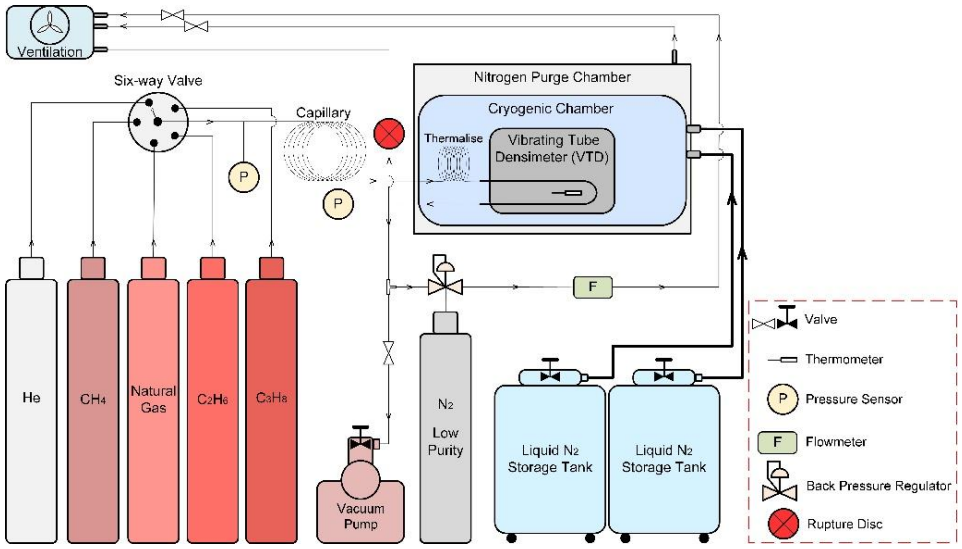

Fig. 1: Schematic of the cryogenic vibrating-tube densimeter system.

Key points of the work:

- Designing and assembling the key components of the cryogenic apparatus
- Developing software for system control, data acquisition, and data evaluation
- Performing calibration of the densimeter and all associated instrumentation
- Conducting validation density measurements both at ambient and cryogenic temperatures
- Conducting LNG density measurements under low-flow and cryogenic conditions.

Requirements:

- Solid thermodynamics background; LabVIEW/MATLAB experience preferred
- Interested in experimental work and able to work independently and responsibly