



**Institute of New Energy Systems (InES)**

*The Institute of New Energy Systems (InES) is one of the institutes for applied research at Technische Hochschule Ingolstadt (THI). The research activities of InES are focusing on the following fields of research: Domestic Energy Technology, Industrial Energy Systems, Energy Systems Technology, Geo-Energy and Technology Transfer & International Projects. Bachelor and master students will find excellent career opportunities at the InES.*

**Master Thesis**  
**Experimental investigation of a novel non-disruptive method  
to measure the volume flow in pipes**

**Research project and background:**

Optimizing and retrofitting heating systems of buildings can reduce the worldwide CO<sub>2</sub>-emissions significantly. The so called heat load of a building is used to dimension and parametrize a heating system. One way is to calculate the heat load via equations. Identifying the necessary parameters of the building is time consuming and sometimes not possible. Errors in the calculation can lead to over dimensioning or wrong parametrization of the heating system which then results in high costs and increased CO<sub>2</sub>-emissions. To tackle this challenge, the heat load can be evaluated by measuring the heat demand of the building. For that, the volume-flow of the heating water needs to be measured. Existing volume flow measurements require an invasive installation of the equipment, are high in costs, or are not accurate enough.

**Objective of the thesis:**

A novel non-invasive method to measure the volume flow inside pipes should be developed and verified experimentally. A first experimental set up was tested which can be used as a starting point for further developments. First the question should be answered, whether the investigated method is able to capture the volume flow. Second the accuracy should be evaluated.

**Tasks:**

1. Development of an experimental set up
2. Perform measurements
3. Develop methodology to calculate the volume-flow inside a pipe
4. Evaluate measurement data according to developed methodology
5. Documentation

**Target Group:**

Students of the subject areas/study courses:

- Mechanical Engineering
- Electrical Engineering
- ...

**Period of time:**

6 months, start possible anytime

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