**Automatic design optimization of a fuel supply line in domestic hydrogen boilers**

**MSc Project Proposal**

**Problem Description**

Automatic optimization of designs can be performed using adjoint techniques. In this design workflow, an accurate CFD simulation is used as input for an adjoint computation, which gives the sensitivities of an objective (for instance pressure drop or flow uniformity) to a design perturbation. Many heating applications need to be redesigned to make the transition from traditional fossil fuel (methane gas) to hydrogen. At Bosch Thermotechnology, the open source design optimization tool SU2 is used for such design optimizations. The goal of the project is to validate the workflow of adjoint optimization of multi-species mixing problems and to optimize the mixing and flow uniformity of a fuel supply line in a hydrogen system.

**Tasks**

● Literature study on previous work related to CFD and adjoint optimization of fuel-air mixing

 problems

● Validation of the existing CFD-adjoint workflow for optimization of designs using existing

 objectives

● Implementation and validation of objectives for species mixing in 2D

● Setup of 3D testcase and optimization of 1. mixing, 2. flow uniformity, and 3. mixing + flow

 Uniformity

Knowledge of C++ and Linux will be an advantage.

**Contact information**

For details and general info please feel free to contact:

dr.ir. Edwin van der Weide

**E-mail:**  e.t.a.vanderweide@utwente.nl