Bachelor/Master Thesis

Numerical Investigation of Surface Ignition in Hydrogen Combustion Engines

Hydrogen is a promising fuel for the transition of the transport sector towards clean energy sources, as it can be produced by electrolysis using renewable power without any further chemical processing and burns without emitting any CO₂, CO, unburnt hydrocarbons or soot. However, the use of hydrogen as fuel in internal combustion engines is challenging due to a multitude of reasons. One of these reasons is the low ignition energy of hydrogen, which can lead to unwanted pre-ignition on hot surfaces in the cylinder ("knocking").

Within this work, the surface ignition of hydrogen shall be investigated using detailed numerical simulations. As a first step, 1D simulations resolving all scales close to the wall shall be performed using detailed chemistry. The resulting data set is then investigated and used to develop a simplified model for use in 3D full engine simulations.

Your Tasks

- Literature Research
- Become acquainted with our in-house high-fidelity CFD-Solver
- Set up and perform 1D-Simulations
- Analysis of the simulation results, development of a surface ignition model

Prerequisites/Requirements

- Interest in numerical simulations
- Self-motivation, reliability and ability to work independently
- Some background in combustion and CFD and basic programming knowledge would be preferable

Contact

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