Measurement of hydrogen leaks: Development of an optical measuring system

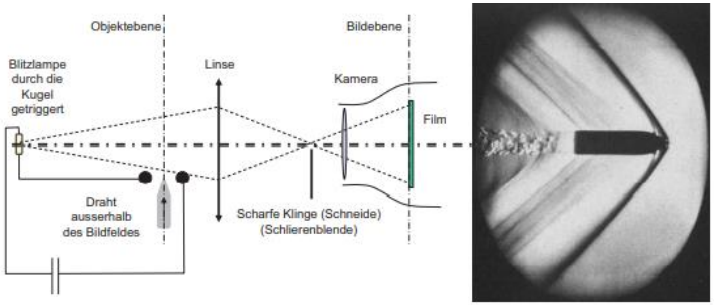

Fig. 1: Historical schlieren photography: Experimental setup by ERNST MACH and PETER SALCHER [1]

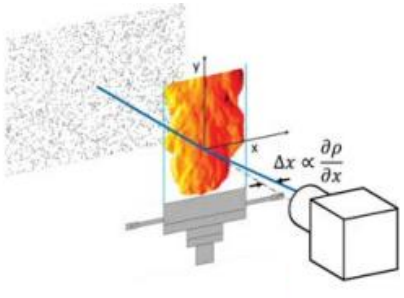

Fig. 2: Background oriented schlieren [1]

Description

The detection and visualization of dynamic gaseous hydrogen flows is challenging due to its physical properties. The small molecular size, high diffusion rate and invisibility for the human eye make hydrogen difficult to be detected or visualized. In addition, hydrogen is not infrared-active and therefore cannot be detected by infrared cameras. This thesis focuses on line-of-sight methods for hydrogen detection.

The aim is the visualization of hydrogen leakages at typical connections, valves and fittings in the gas industry. A literature review will be carried out to identify the most economically and technologically appropriate technology for the specific application. As part of the test design, a test setup for the visualization of gaseous hydrogen will be planned and set up. The applicability of the identified technology for the visualization of hydrogen leaks will be tested by performing and analyzing a reference measurement.

Content / Time table:

- Literature research to identify the appropriate measurement principle and required measurement devices (1 month)
- Planning of experimental setup (2 months)
- Test setup and execution of the reference measurement (1 month)
- Data Analysis and thesis writing (2 months)

Start: as of now

Duration: approximately 6 months

Paid Master Thesis

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[1] Jakob Woisetschläger (2024): Schlieren und Schatten. Arbeitsgruppe Messung in Turbomaschinen - Laseroptische Messtechnik. Institut für Thermische Turbomaschinen und Maschinendynamik, TU Graz