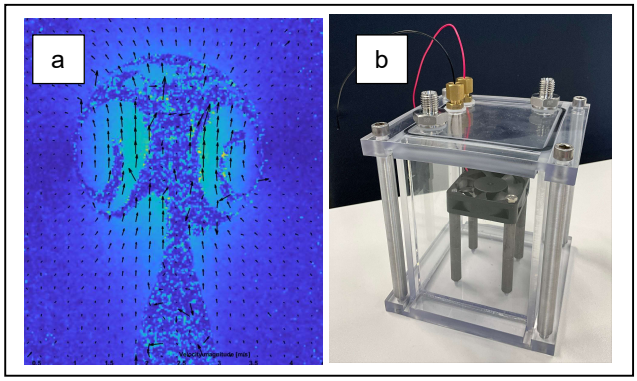
UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

EMPI REACTIVE FLUIDS
Institute for Energy and Materials Processes

Bachelor / Master Thesis

Design and Implementation of a Particle Seeder for Low-Flowrate Particle Image Velocimetry Applications



Background

Particle Image Velocimetry (PIV) is a widely used optical measurement technique employed in various fields of science and engineering to gain insight into fluid flow patterns, such as induced vortices in flow systems (see figure a). It relies on the tracking of tracer particles suspended in a fluid to visualize and quantify flow characteristics. PIV has proven invaluable in fields ranging from aerodynamics and fluid dynamics to biomedical research and environmental studies. It facilitates the understanding of fluid flow phenomena, e.g. by determining velocity fields, turbulence, and vorticity. This allows further design optimization, improving efficiency, and characterization of a given application, e.g. burners, reactors, flow channels, etc... However, its widespread applicability is often hindered by the limitations of existing particle seeding methods, which are mainly designed for high flow rate applications. In this project, you will design, implement, and characterize a low flow rate particle seeder, e.g., like the one shown in Figure b.

Tasks

The core of this project focuses on creating a seeder that enables particle-laden flows less than 1 standard liter per minute (slm). The primary objectives include:

a) Research low-flow seeders for PIV and brainstorm designs for such seeders.
b) Construct or improve prototypes of the seeders using research findings.
c) Select suitable solid particles as PIV tracers, considering size, density, and optical properties.
d) Perform PIV experiments to evaluate the seeder's efficiency, utilizing existing burners or flow setups.

Requirements

Degree in engineering, physics, or chemistry; interest/basic knowledge in optics, imaging, and measurement technologies; and enjoy experimental work. Initiative and ability to work in a team are expected.

Language requirements: German or English skills

Contact

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