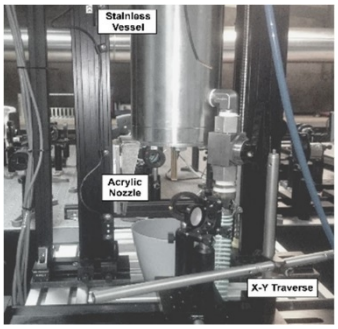
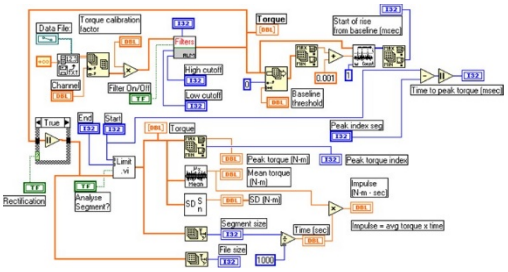
Integration, control, and fast-start for repeatable spray imaging

Background



The chaotic and quasi-steady behavior of high-pressure turbulent sprays remains a challenging frontier for fluid physics and computational fluid dynamics. Precise, repeatable measurements that push the limits of this frontier are essential for advances in this field, which covers applications ranging from fuel injection, to industrial cutting, to nanomaterials processing.

New research at the division of Combustion and Propulsion Systems (CaPS) on fundamental spray breakup mechanisms relies on a high-resolution imaging measurements which focus on the Chalmers stead spray. Given the interdependent nature of the spray experiments and numerical modeling, it is important that these separate measurements system timing, and control of the spray apparatus be integrated in a robust framework allowing safe, repeatable measurements at well-controlled conditions.



Project description

This project will be carried out by a team of two students. The goal of project is to reduce the turn-around and start-up time required to run the steady spray rig for laser diagnostics, while maintaining the robust, precise, and repeatable operation of the high-pressure spray rig.

The project is expected to proceed roughly in three phases:

1. A technical report prepared on the current system, its synchronization requirements, and issues, including proposed ideas for improving the system.
2. Starting from the control software of the working system, implement improvements in the operation of the spray, signaling hardware, and system diagnostics for fast-start and safety.
3. On-line testing and spray measurements in the Chalmers steady spray.

In addition, documentation of the full project and recommendations for further work will be summarized in a final report.

Formalities

The project (30 credit points, two students) is a master thesis project which is coupled to ongoing research at CaPS. This project requires creative engineering solutions for integration of software control and precision hardware. Good candidates for the position should be familiar with programming (e.g., Labview, Python), and some experience with hardware timing and synchronization. Experience with fluid dynamics, pressure systems, and scientific measurements is also desirable. Please contact Dr. David Sedarsky (sedarsky@chalmers.se, +46 31-772 8360) for more information.