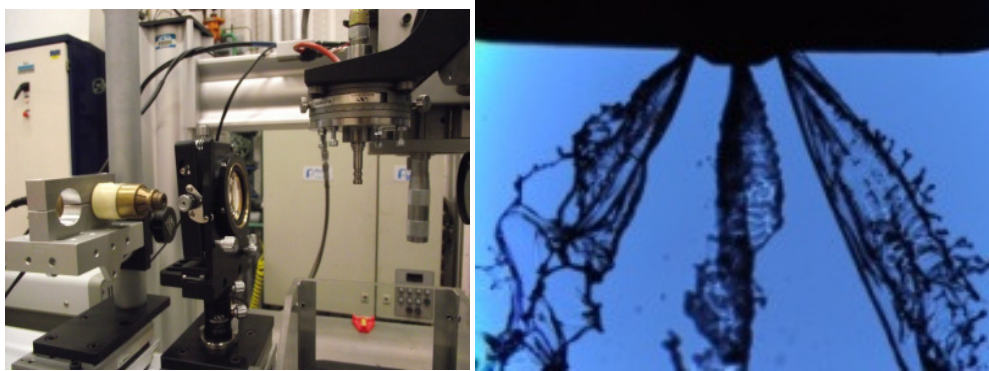


Internship -Diploma Thesis - Sujet de stage 2012 (5to 6 months)

Application of Droplet sizing by direct visualization to real high pressure spray



Droplet size is one of the most important result of any atomization system (fire suppression, fuel atomizer, medical devices, chemical processing), as it influences directly the ability of a spray to evaporate (through the surface $\sim D^2$) to penetrate (through the inertia $\sim D^3$) and to transfer momentum (through the drag on the surface $\sim D^2$) –then directly the quality of combustion and pollutant.

Precise Droplet sizing is still a challenge in practical real applications, especially when droplets and ligaments are mixed, with non spherical drops, when velocities are high and liquid phase density is huge.

Continental uses a wide range of technologies to measure droplets size: diffractometry, Doppler anemometry. Even powerful and recalibrated, these laser techniques remain complex and uncertain due to the post-treatment applied to the brut data and their limited validated range.

A recent, totally different, approach uses direct imaging (pictures) of the two-phase medium in order to treat the images and correct the out of focus. The diploma thesis is focused on quantitative and reliable droplet sizing. To reach this objective, the student will :

- Measure calibrated targets to establish the correction law for the bench optic
- Measure real spray with long-range microscope and macro-optics;
- Review the approaches proposed in the literature for droplet sizing and uses an existing software where algorithms are implemented
- Couple both using Matlab for the post-treatment and Matlab-Simulink RT for the control the spray bench actuators
- Compare the droplet sizing obtain with this approach to the diffractometry, and Doppler anemometry ; compare results between them in order to estimate the effort in recalibration that can be requested by such approach

Student profile: Engineering School, Master

Contact : Dr. J. Hélie, Continental Automotive SAS. Engineering - Advanced Engine System – Hydraulic jerome.helie@continental-corporation.com