August 20 -25, 2023
Location: UC Irvine
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UCI Combustion Institute Summer School 2023

Experimental Combustion:
Past, Present, & Future

UCI CI-SS Laboratory Exercise

High Speed Video/Image Processing Spray and Physical Properties

Room: 209
Time: 80 min

In combustion research, the utilization of image processing techniques has emerged as a powerful tool for investigating the intricate dynamics of combustion sprays. These sprays, which play a pivotal role in various combustion systems, exhibit complex behaviors influenced by factors such as droplet size distribution, spray angle, and ambient conditions. Employing image processing methods to analyze combustion spray phenomena allows researchers to obtain valuable insights into spray structure, evaporation rates, and flame propagation. By extracting quantitative data from high-speed visualizations, image processing not only enhances our fundamental understanding of combustion processes but also facilitates the optimization of combustion efficiency, emissions reduction, and design of advanced propulsion and energy conversion systems. Many aspects can be quantified. Often the key factors of interest for design include the average spray droplet size (why?), the spray cone angle (why?), intact liquid sheet length (why?), and the fuel nozzle capacity or Flow Number (why?)

Objective

Students will perform the setup of experiments for high-speed video of a liquid spray. Understand the different tools needed to obtain data from images. They will be able to apply detailed procedures and test specifications to obtain spray parameters of interest:
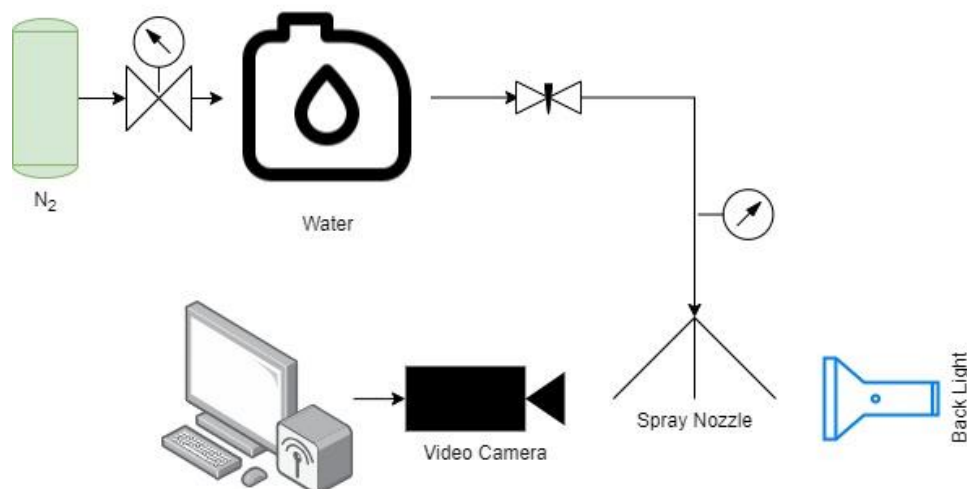
- spray angle and intact liquid sheet length,
- spray droplet size, and
- injector flow capacity

Figure 1. Experiment Schematic