Experimental Investigation and Spray Characterization of Liquid Jet Atomization of Conventional Fuels and Liquid Bio-Fuels

Soumik Mahapatra[1*], Souvick Chatterjee[1], Swagata Shannigrahi[2], Achintya Mukhopadhyay[1], Swarnendu Sen[1]
[1]Mechanical Engineering Department, Jadavpur University, India
[2]Automobile Engineering Department, MCKV Institute of Engineering, India
hisoumik@gmail.com, souvickchat@gmail.com, swagatashannigrahi@gmail.com, a_mukho@rediffmail.com and sen.swarnendu@gmail.com

Abstract

Liquid atomization has always been a key topic of research in both academic and industrial world because of its importance from both fundamental and applied perspective. The application of efficient atomization ranges from biomedical purposes, inkjet printers and others in the micro scale to Gas Turbine and I.C. Engines in the macro world. Efficient atomization facilitating combustion is crucial for the macro-scale application and is addressed in this study. In this work, using different experimental techniques, fuel spray characteristics like spray cone angle, breakup length, droplet size and velocity distributions are studied. Simple shadowgraphy technique has been used to measure the spray cone angle. The breakup length are measured using an innovative image processing algorithm on images obtained using a laser based imaging technique. In addition, Phase Doppler Particle Analyzer (PDPA) is used to measure the droplet size and velocity. The commercially available fuel injection system used here allowed us to vary the injection pressure over a wide range. Also observed, is the effect of change in viscosity of the fuel on the breakup length and the spray cone angle. Tests were carried out for different commercially available fuels like diesel, kerosene and also bio-fuels like vegetable oils.

* Corresponding author: hisoumik@gmail.com