

Rotary Atomizer Spray in an Air Cross Flow

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Abstract

This poster presents an experimental investigation of fuel sprays generated by a rotary atomizer exposed to a cross flow of air. The effects on the droplet size due to injector rotational speed and air flow velocity were studied. The rotary atomizer was driven at speeds up to 15,000 rpm with a fuel flow rate of 4.2 g/s and cross flows ranging from 10 m/s to 150 m/s. For any given rotational speed, fuel droplet sizes were found to decrease as air cross flows increased, reaching a Sauter mean diameter (SMD) of 8 μm at 150 m/s. At cross flow velocities less than 50 m/s, fuel droplet sizes decreased as rotational speed increased. At intermediate air velocities, fuel droplet sizes were unaffected by the nozzle's rotational speed. Of the two variables studied, each of them is shown to influence the droplet size differently in certain cross flow regimes. This effect can be generalized into three distinct zones based on Weber number defined by orifice diameter and the non-dimensional droplet size.

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