Aerospace Engineering Thesis Defense

A Computational Study of Non-reacting Sydney Burner Jet Using the Quadratic Formula as the Primary Atomization Module

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Abstract

Sydney University has developed a variant of the well-known Sydney/Sandia piloted jet burner. The introduction of this new burner is for a purpose referred to airblast atomization. This variant comprises a retractable needle that can be translated within the co-flowing airstream. The performance of the computational simulation is based on a high-pressure turbulent jet having three different recess lengths considering acetone as the fuel. The computational analysis is performed by using the primary atomization process in which the bulk number of liquid transitions into small droplets. In the Volume-of-Fluid (VOF) model, the velocity field and pressure field are used to get the atomization locations. The quadratic formula is applied to atomization locations to calculate the mean drop size (Sauter Mean Diameter). The droplets are injected from the atomization locations and tracked considering as the point particles. By using the User Define Memory (UDM) code, the steady-state Sauter mean diameter particles are computed. The velocity field, droplet size (Sauter mean diameter), and droplet trajectory are compared with the experimental data for the validation protocol.

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