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Eulerian CFD modeling and X-ray validation of non-evaporating diesel spray QINGLUAN XUE, SIBENDU SOM, Argonne National Laboratory, SHAOPING QUAN, ERIC POMRANING, P.K. SENECAL, Convergent Science Inc. — This work implemented an Eulerian single-phase approach by Vallet et al. [1] into CFD software (Convergent) for diesel spray simulations. This Eulerian approach considers liquid and gas phase as a complex mixture of a single flow with a highly variable density to describe the near nozzle dense sprays. The mean density is obtained form the Favre-averaged liquid mass fraction. Liquid mass fraction is transported with a model for the turbulent liquid diffusion flux into the gas. A mean gradient-based model is employed for the diffusion flux in this study. A non-evaporating diesel spray was measured using x-ray radiography at Argonne National Laboratory. The quantitative and time-resolved data of liquid penetration and mass distribution in the dense spray region are used to validate this approach. The different turbulence models are also used for the simulations. The comparison between the simulated results and experimental data and the turbulence model effect are discussed.

[1] Vallet et al., Atomization and Sprays, vol. 11, pp. 619-642, 2001.

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