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# Modeling and Simulation of Turbulence Induced in Nozzle Cavitation and Its Effects on Internal Flow in a High Torque Low Speed Diesel Engine

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**Abstract :** To control combustion inside a direct injection diesel engine, fuel atomization is the best tool. Controlling combustion helps in reducing emissions and improves efficiency. Cavitation is one of the most important factors that significantly affect the nature of spray before it injects into combustion chamber. Typical fuel injector nozzles are small and operate at a very high pressure, which limits the study of internal nozzle behavior especially in case of diesel engine. Simulating cavitation in a fuel injector will help in understanding the phenomenon and will assist in further development. There is a parametric variation between high speed and high torque low speed diesel engines. The objective of this study is to simulate internal spray characteristics for a low speed high torque diesel engine. In-nozzle cavitation has strong effects on the parameters e.g. mass flow rate, fuel velocity, and momentum flux of fuel that is to be injected into the combustion chamber. The external spray dynamics and subsequently the air – fuel mixing depends on a lot of the parameters of fuel injecting the nozzle. The approach used to model turbulence induced in – nozzle cavitation for high-torque low-speed diesel engine, is homogeneous equilibrium model. The governing equations were modeled using Matlab. Complete Model in question was extensively evaluated by performing 3-D time-dependent simulations on Open FOAM, which is an open source flow solver and implemented in CFD (Computational Fluid Dynamics). Results thus obtained will be analyzed for better evaporation in the near-nozzle region. The proposed analyses will further help in better engine efficiency, low emission, and improved fuel economy.

**Keywords :** cavitation, HEM model, nozzle flow, open foam, turbulence
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