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Interaction of Multiple Fuel Sprays in a Heavy-Duty Diesel Engine

This paper aims to study numerically the influence of the number of fuel sprays in a single-cylinder diesel engine on mixing and combustion. The CFD simulations are carried out for a heavy-duty diesel engine with an 8 hole injector in the standard configuration. The fuel spray mass-flow rate was obtained from 1D-simulations and has been adjusted according to the number of nozzle holes to keep the total injected fuel mass constant. Two cases concerning the modified mass-flow rate are studied. In the first case the injection time was decreased whereas in the second case the nozzle hole diameter was decreased. In both cases the amount of nozzle holes (i.e. fuel sprays) was increased in several steps to 18 holes. Quantitative analyses were performed for the local air-fuel ratio, homogeneity of mixture distribution, heat release rate and the resulting in-cylinder pressure. The results show that an increased number of fuel sprays leads to a more homogeneous fuel distribution, but also to a more incomplete combustion.

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