Investigation of the fuel influence on the injection and mixture process for short injection periods under different diesel engine conditions

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Abstract

New diesel engine combustion systems for reduced emissions and lowered fuel consumption bear the risk of promoting combustion instabilities. Therefore, a multiple-injection strategy is employed. In this paper specifically, sprays generated by short injection timings at low ambient temperature conditions have been investigated using a visualization technique. In addition to the variation in operating conditions (injection pressure, injected amount, chamber pressure and chamber temperature), 3 different fuels (n-decane, IDEA, diesel) were investigated. The intention of the fuel variation was to identify a Diesel substitute for Computational Fluid Dynamics simulations.

Despite the short injection timing, the visualization measurements show comparable results to the literature report-ing experiments at long injection conditions. The main difference between the results of short and long injection timings can be observed in a rapid decrease in liquid penetration length. No stationary penetration length has been observed for short injection timings.

The fuel variation reveals a quite similar behavior for the 3 fuels, with a faster evaporation time for IDEA fuel and n-decane compared to diesel. Since the penetration curve for IDEA is very close to the one of diesel and no station-ary penetration length can be observed that may intensify the influence of the faster evaporation of IDEA, the re-placement of diesel by the IDEA fuel, in order to simplify the numerical simulation of the multi-component diesel engine sprays, seems reasonable.

Key words: diesel spray, visualization, short injection timings, fuel influence, evaporation behavior

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