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Quantitative measurements of fuel spatial densities from GDI sprays through optical and x-ray based techniques

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This paper reports the results of an experimental investigation to characterize the inner structure of a high-pressure gasoline spray injected by a 6-hole nozzle for Direct Injection Spark Ignition (DISI) engines. A desk-top facility based on polycapillary optics system, providing a high flux beam with low divergence has been used. Both x-ray μ-tomography and radiography techniques have been applied in the region just downstream of the nozzle to get quantitative information about the local mass distribution and fuel flow. Conventional optical techniques can generally provide data only at larger distance from the nozzle due to multiscattering phenomena linked to the high spray density. This paper aims in comparing the results of x-ray based techniques with conventional non intrusive-diagnostics. The local mass distribution of a single jet at different distances from the nozzle was estimated through x-ray tomography and radiography. The single-jet fuel mass-rate was obtained and compared with the injection rate one measured by the injection Gauge Rate System working on the Bosch tube principle. The comparison demonstrates the accuracy of x-ray tomography desktop facility as a reliable diagnostic tool.

Summary

This paper reports the results of an experimental investigation to characterize the inner structure of a high-pressure gasoline spray injected by a 6-hole nozzle for Direct Injection Spark Ignition (DISI) engines. A desk-top facility based on polycapillary optics system, providing a high flux beam with low divergence has been used. X-ray μ-tomography and radiography measurements in the region just downstream of the nozzle provided the local mass distribution of a single jet. The single-jet fuel mass-rate was obtained and compared with the injection rate one measured by the injection Gauge Rate System working on the Bosch tube principle. The comparison demonstrates the accuracy of x-ray tomography desktop facility as a reliable diagnostic tool.

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