

## Microscopic Visualization of Transient Spray from Multi-hole Injector of DISI Engine

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### Abstract

The main objective of this experimental study is to observe the atomization process very close to an injection hole nozzle exit of multi-hole injector of DISI engine and to examine the effect of injection pressure on characteristics of spray behavior. In order to investigate the atomization process, visualization of spray structure was performed using an ultra high-speed video camera (Max. camera speed 1Mfps), coupled with a long distance microscope and a Barlow lens. In order to clarify the effect of injection pressure, the experiments were carried out in a closed chamber at the atmospheric pressure. The experimental apparatus is shown in Fig. 1. Backlighting from a strong metal halide lamp was used. Figure 2 shows typical example for microscopic unprocessed magnified image. Quantitative exit flow velocity and droplet diameter of atomization process were obtained by using time-series images with high temporal resolution. In this study, the experimental results of average exit flow velocity of atomization process were compared with the predicted exit flow velocity from NOZZLE FLOW MODEL. And experimental results of mean droplet diameter were compared with the results obtained from both predicted KH-RT model and phase Doppler anemometry (PDA) experimental results. It has been shown that Microscopic visualization results for exit flow velocity show good agreement with predicted results from NOZZLE FLOW MODEL. Both different measurement techniques, microscopic visualization method and PDA method, give qualitatively similar trends for droplet size distribution and the value of SMD. Microscopic visualization of average droplet sizes results show agreement with droplet sizes predicted by KH-RT model and average droplet sizes of PDA results at the low injection pressure. The success of the microscopic visualization technique has demonstrated that the visualization technique is well suited for study spray behavior from multi-hole injector of DISI engine

Key words: - DISI Engine, Multi-Hole Injector, Cavitation, Droplet Diameter, Flow Visualization.

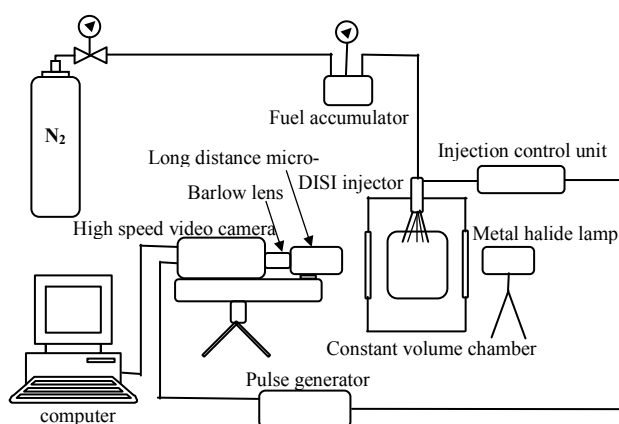


Figure 1. Experimental apparatus

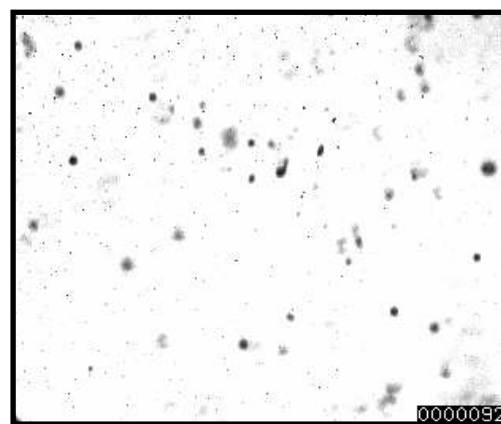


Figure 2. Unprocessed magnified image

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