# Characteristics of impact driven supersonic liquid jets



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**Abstract:** In this paper, a technique for the generation of supersonic liquid (water and diesel fuel) jets is presented. The supersonic liquid jet is generated by the use of a purpose-developed vertical, single-stage powder gun. The characteristics and behavior of supersonic liquid jets were obtained by visualization using the shadowgraph technique. The visual evidence related to supersonic liquid jets (velocity around 2000 m/s) generated from a variety of nozzle types is presented and the effects of nozzle parameters on the jet behavior are described. The characteristics of the leading edge shock wave and jet shape were found to be significantly related to the nozzle geometry. A one-dimensional analysis of the multiple, reflected shock waves inside the liquid sac and nozzle during the process of supersonic jet generation is presented. The method allows impact pressure. particle velocity and effect of shock wave reflections inside the nozzle cavity on the liquid jet velocity to be obtained. Jet shock waves obtained from the shadowgraph image and CFD simulation are also compared, The jet outflow characteristics and its leading edge shock wave in air were assessed for their potential for auto-ignition using fuel with cetane numbers from 50-100. The contribution of the strong leading edge shock wave to the auto-ignition is discussed. (C) 2003 Elsevier Science Inc. All rights reserved.

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