STUDY ON SECONDARY BREAKUP PROPERTIES OF SPRAY FOR MICRO GAS TURBINE ENGINE

PIPATPONG WATANAWANYOO[1,c], HIROFUMI MOCHIDA[1], TERUYUKI FURUKAWA[1], MASANORI NAKAMURA[2], HIROYUKI HIRAHARA[2] SUMPUN CHAITEP[3]

[1]Graduate School of Science and Engineering, Saitama University, 255 Shimo-Okubo, Japan
[2]Department of Mechanical Engineering, Saitama University, 255 Shimo-Okubo, Japan
[3]Department of Mechanical Engineering, Chiang Mai University, 239 Suthep, Thailand

[c]Corresponding author: Tel.: +81488583448; Fax: +81488583711; Email: s09dh052@mail.saitama-u.ac.jp

KEYWORDS:
Main subjects: liquid droplets breakup
Fluid: high speed flows
Visualization method(s): shadowgraph
Other keywords: air assisted atomizer, sauter mean diameter(smd), spray, secondary breakup, micro gas turbine

ABSTRACT: This paper reports secondary breakup properties and droplet size measurement of spray through nozzle of air assisted atomizer. The atomizing air pressure supply was regulated of 68.9 to 689 kPa (gauge), correspondingly consumed 1.4×10^{-3} to 3.3×10^{-3} kg/s of water. The air mass flow rate was varied between 0.2×10^{-3} kg/s to 1.2×10^{-3} kg/s, in order to establish an empirical relation between the air mass flow rate and the air supply pressure. The secondary breakup properties of spray were studied by taking the flow images at different air supply pressures by using a shadowgraph method. By traversing the measurement section, the spray images were acquired at 5 axial locations of 50, 100, 150, 200 and 250 mm downstream from the atomizer. The accuracy of the measurement of droplet size by the present method was verified by using silica particle. The exact diameters of silica particles were measured by a microscope and were 6, 56.5, 78 μm. The investigated air assisted atomizer provided droplets with Sauter Mean Diameter (SMD) was distributed in the range of about 23-98 μm.

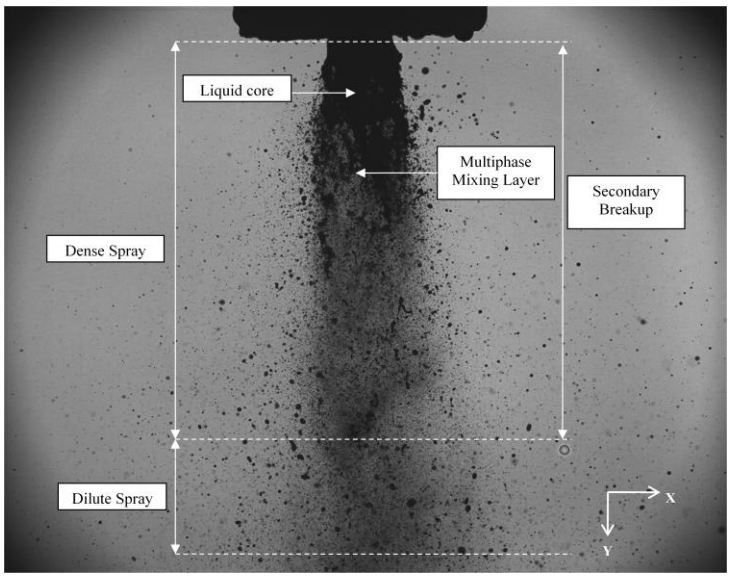

Fig. 1 Atomization regions of the spray from the air assisted atomizer using air assisted pressure 413 kPa

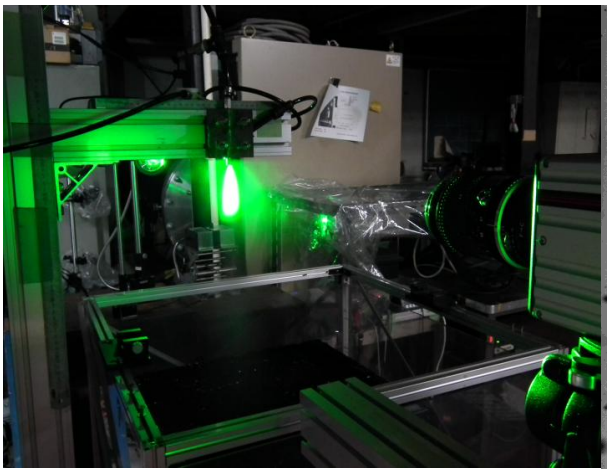

Fig. 2 Shadowgraph technique

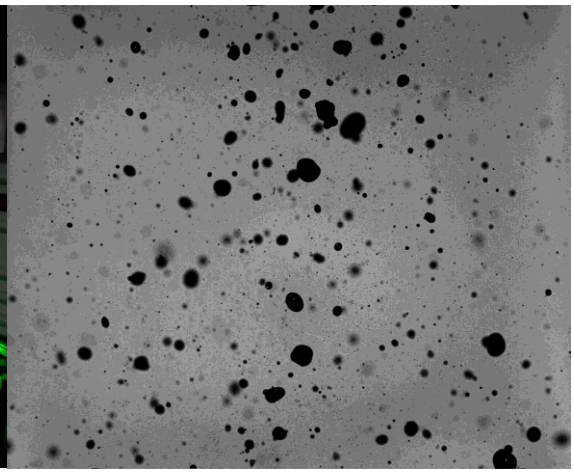

Fig. 3 Sauter Mean Diameter (SMD) about 23-98 μm.

Fig. 3 Micro gas turbine

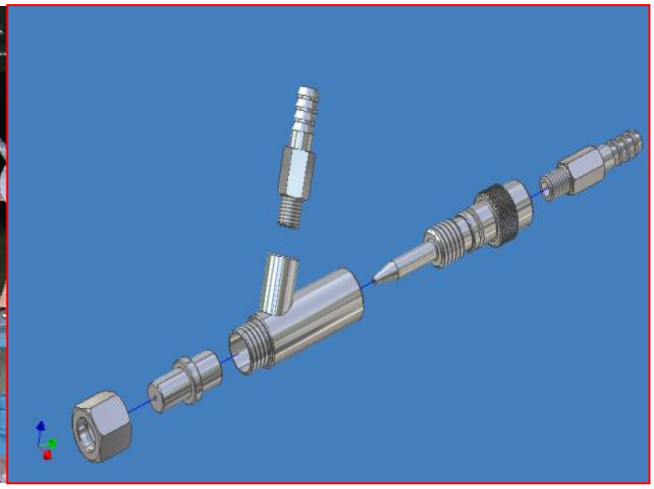

Fig. 4 Air assisted atomizer

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