

Design and Experimental Studies of a Centrifugal SWIRL Atomizer

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Abstract : In a swirl atomizer, fluid undergoes a swirling motion as a result of centrifugal force created by opposed tangential inlets in the swirl chamber. The angular momentum of fluid continually increases as it reaches the exit orifice and forms a hollow sheet. Which disintegrates to form ligaments and droplets respectively as it flows downstream. This type of atomizers used in rocket injectors and oil burner furnaces. In this present investigation a swirl atomizer with two opposed tangential inlets has been designed. Water as working fluid, experiments had been conducted for the fluid injection pressures in regime of 0.033 bar to 0.519 bar. The fluid has been pressured by a 0.5hp pump and regulated by a pressure regulator valve. Injection pressure of fluid has been measured by a U-tube mercury manometer. The spray pattern and the droplets has been captured with a high resolution camera in black background with a high intensity flash highlighting the fluid. The unprocessed images were processed in ImageJ processing software for measuring the droplet diameters and its shape characteristics along the downstream. The parameters such as mean droplet diameter and distribution, wave pattern, rupture distance and spray angle were studied for this atomizer. The above results were compared with theoretical results and also analysed for deviation with design parameters.

Keywords : swirl atomizer, injector, spray, SWIRL

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020