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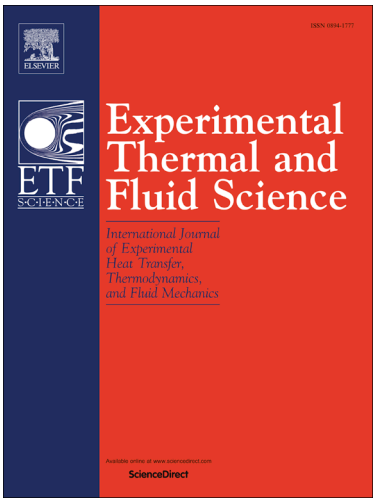


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# Dynamics of the Impingement Region of a Circular Turbulent Jet

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**Abstract**

This study used a flow visualization method to characterize the turbulent structures at the impingement surface and the movement of the impingement region of a normally impinging jet for two different nozzle geometries. Although the structures within an impinging jet have been studied previously there are no published results presenting the movement of the impingement zone.

Air injected into the fluid was used to visualize the jet impinging on the surface. This technique was used with a digital imaging system to record the flow field surrounding the impingement region of the jet for the following variable test conditions: Reynolds number, nozzle standoff height, and nozzle geometry. The measurements were compared to pressure measurements, numerical simulations, and other visualization methods. The presented work shows that the imaging system was capable of capturing the flow field at the impingement surface.

Proper orthogonal decomposition (POD) was used to evaluate the modes of the structures close to the surface. Three distinct modes were observed and compared to those created in free jets. It was observed that the mode types and energy distribution of the modes were dependent on the distance of the impingement surface from the nozzle and the fluid velocity at the nozzle.

The size and the movement of the impingement region were observed to increase linearly with the standoff distance of the nozzle. The size of the impingement region was independent of the fluid velocity at the nozzle. The movement of the impingement region was correlated to the fluid velocity when the impingement surface was near the nozzle (H/D = 2.5) and independent of the fluid velocity when the surface was farthest from the nozzle (H/D = 8.5).

Keywords: Impinging Jet, Flow Visualization, POD

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