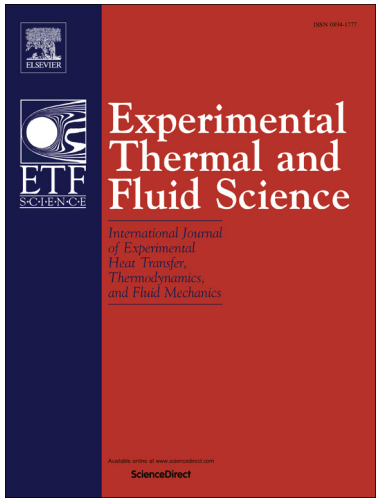

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Experimental and computational analysis of thermal mixing characteristics of a coaxial jet

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Abstract

In this study, experimental and numerical analyses have been performed to investigate the mixing behavior of hot and cold fluids for a coaxial jet. Thermal mixing phenomenon is an important issue for many industrial applications, since thermal stress occurs when fluids do not mix completely. Several test cases were considered to investigate the mixing quality and frequency of temperature fluctuations. Computational study was performed using Large Eddy Simulation (LES) turbulence model, since this model is proven in this type calculations. A commercial CFD code, ANSYS-Fluent is used for numerical calculations. The study is performed for governing parameters as ratio of mass flow rate of hot (annular) jet to cold (central) jet and temperature difference between hot and cold jet. It is found that there is a good agreement between experimental and numerical studies with respect to spectral analyses. The dominant frequency of temperature fluctuation is found as 5 Hz as compatible with literature. Thermal mixing efficiency increases with increasing temperature difference between hot and cold jet. Also, thermal mixing performance getting better with enhancing flow rate of hot jet in the first half of the channel and the best mixing observed at $\dot{m}_h / \dot{m}_c = 2$ along second half of the channel.

Keywords: *Coaxial jet, heat transfer, LES, thermal mixing.*

Nomenclature

$\dot{m}$	Mass flow rate
n	Number of jet
S_t	Standard deviation of fluid temperature
t	Time
T	Temperature of fluid

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