Seminar

Institute for Plasma Research

Title : Experimental and Numerical Investigation of Spacer Effect on Turbulent Mixing Phenomena of AHWR Rod Bundle

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Date : 16th November 2018 (Friday)

Time : 03.30 PM

Venue : Committee Room 3, (New Building), IPR

Abstract :

The thermal energy in the reactor, from its origin is fission heat energy in the fuel until it is finally removed from the reactor core by the coolant. Fuel rod bundle is the heart of the nuclear reactor system. Fuel pallets enveloped by the cladding tubes and bundled together using tie plates and spacers. The requirements for spacers are thus challenging and so it is easy to understand why the spacer grid is at the heart of any successful fuel assembly design. The objective of present talk is to establish spacer effect on mixing in subchannels of AHWR rod bundle due to turbulent mixing and finally determination of combined effect of Reynolds number and gap-to-centrodial ratio, on variation of average mixing number. The void fraction in the case of two phase flow is varied from 0 to 0.3 which is same as that of actual bundle. The spacer induces enhancement of not only mixing between subchannels, but also deposits droplet rate in the subchannels.

Numerical simulation has been carried out for the study of natural mixing of a Tracer (Passive scalar) to characterize the growth of turbulent diffusion in an injected sub-channel and, afterwards on, crossmixing between adjacent sub-channels. The Computational Fluid Dynamics (CFD) methodology can be useful for investigating the natural mixing to predict turbulent flow behavior such as dimensionless mixing scalar distributions, radial velocity and vortices in the nuclear fuel assembly. The numerical investigation has been performed to find out the effect of three turbulence models: Realizable k-ε, RSM and SST k-w on the accuracy of the predictions and compared the results with experiment.

Keywords: *Spacer, AHWR, Turbulent Mixing Rate, Subchannel Analysis, Species Transport, Enhancement Factor, Mixing Number, Passive Scalar.*