

Nuclear Engineering Seminar Dr. Hitesh Bindra

Kansas State University – Associate Professor

Wednesday, January 19, 2022

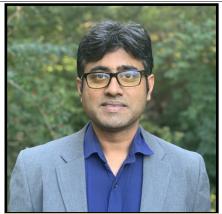
3:30pm | PHYS 112

Experimental study on the stratification and mixing in liquid metal-cooled reactors

Abstract

Stratification and mixing in large enclosures such as plena can significantly impact the safety of liquid metal-cooled reactors (LMRs). Particularly, thermal stratification in the hot plena of LMRs under off-normal transients is one of the least understood problems that have Multiphysics effects on thermo-mechanics and neutronics. This is primarily due to the lack of highfidelity experimental data for validating Computational Fluid Dynamics (CFD) or system scale models, which are essential for improved understanding. A scaled liquid metal (Gallium) thermalfluidic setup with a scaled hot plenum has been developed at Kansas State University to study different transients. Experimental results of cold-shock transients were obtained from Optical Frequency Domain Reflectometry and Acoustic Backscattering instrumentation deployed in the liquid metal loop. Time-dependent velocity and temperature field data in the scaled plenum are obtained using these sensors. Critical parametric estimates such as critical Richardson number and turbulent Prandtl number are identified from the experimental studies to classify the molecular, transitional, and energetic regimes of mixing extent. The sustained thermal fluctuations in the plenum were observed when flux Richardson number is less than or equal to the critical value. CFD codes with large eddy simulations (LES) were used to simulate the cold-shock transients and were validated against the experimental data.

This talk will further present the broader research focus and educational vision of Dr. Bindra on nuclear engineering and nuclear energy systems.



Hitesh Bindra is the Steve Hsu