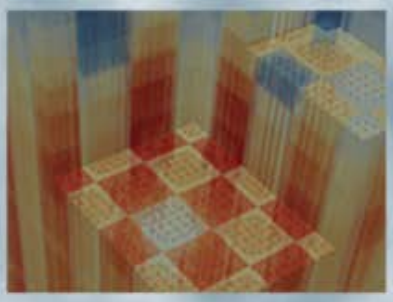
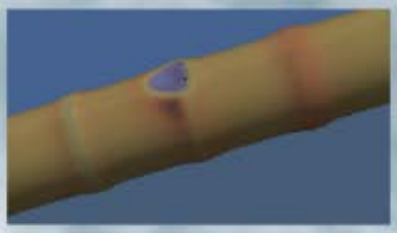
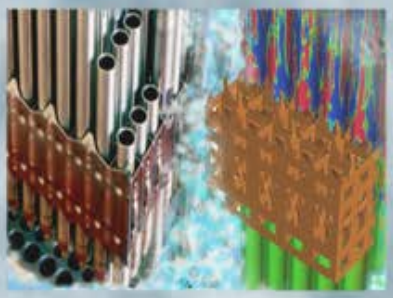
CASL-U-2015-0243-000

CFD Simulations of Experiments in a Twin Jet Water Facility







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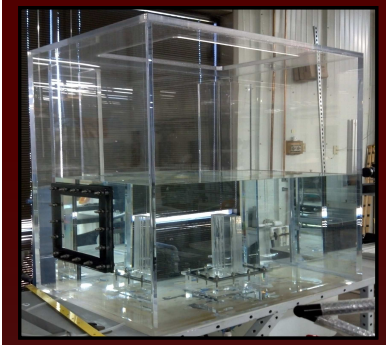
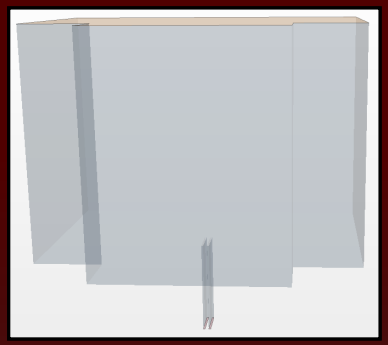
CFD Simulations of Experiments in a Twin Jet Water Facility

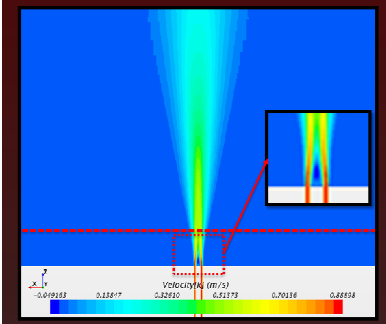
Lane Carasik, Graduate Research Assistant and NEUP Fellow
Dr. Yassin Hassan, Professor

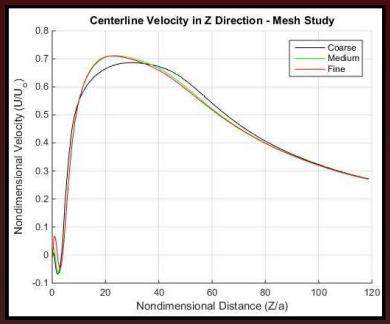
Twin Jet Studies

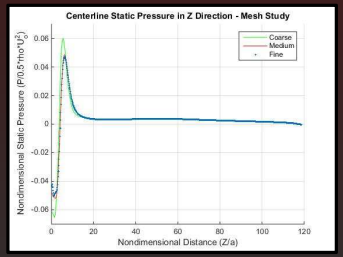
Turbulent twin jets shooting into quiescent surroundings provide a physics rich platform for developing and validating new simulations. The jet properties can be controlled in the TJWF built to test physics involving fluid dynamics and heat transfer phenomena. This allows for large amounts of experimental data to be developed from varying parameters such as jet velocities and temperatures in the same facility. Newer measurement instruments and techniques can be utilized to investigate steady or instantaneous velocity, temperature and pressure fields producing high resolution data sets. These higher resolution data sets in turn can be compared against newer simulation methodologies and CFD tools. CFD tools are used to analyze complex geometry and situations that are unable to be extensively tested experimentally before implementation. Twin jets in a close planar geometry can be used to test the strength of current and future CFD simulations while comparing to empirical models for validity. This project focuses on the CFD modeling of the TJWF for developing Verification and Validation (V&V) methodologies and mixing in nuclear and other types of energy systems.

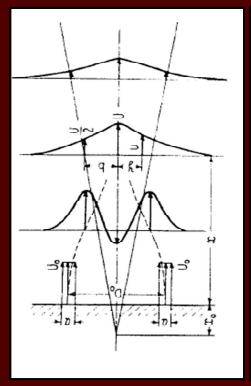


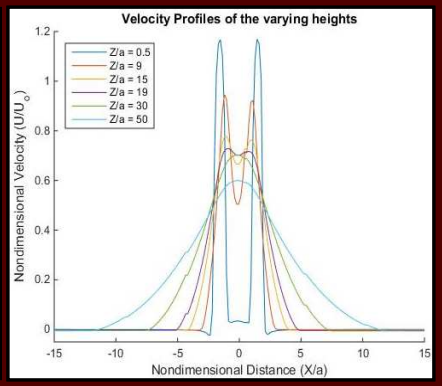






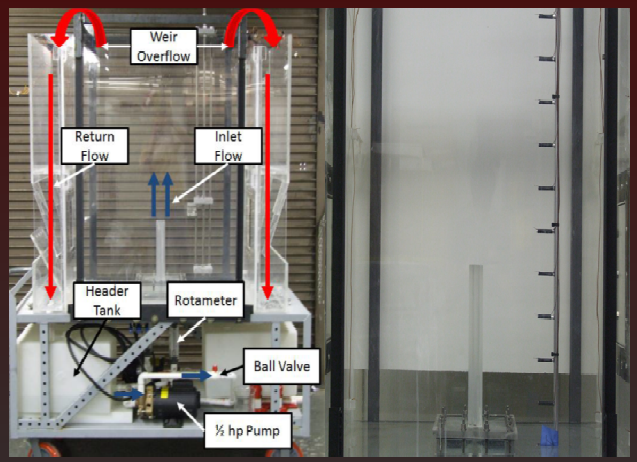


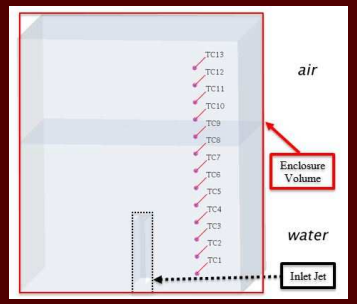


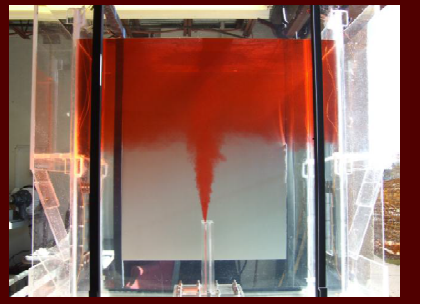


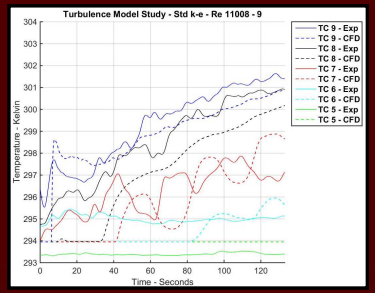
Thermal Stratification Studies

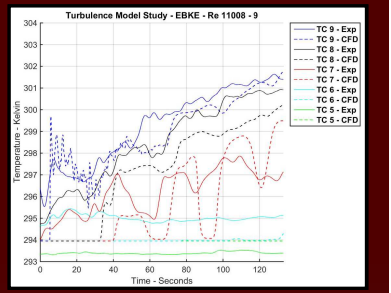
The introduction of a jet of fluid into a more or less stationary body fluid at a different temperature can lead to thermal stratification, and these processes are expected to be important in some severe nuclear accidents. Thermal stratification within the secondary containment could affect the ability of the containment to reject decay heat, for example. An ability to predict the behavior of the fluid under these circumstances is thus important. Such flows are complex, and computational fluid dynamics approaches are needed to resolve them, but they do present modeling challenges that go beyond those of more common 'forced' flows. This work focuses on a single slender planar heated jet entering cooler water, and in which stratification is then seen to occur with a raising water level. For this project, CFD analyses using unsteady Reynolds averaged (URANS) turbulence models and Large Eddy Simulations (LES) are conducted, and the experimental data from the TJWF for the same test cases are compared to the computational results.

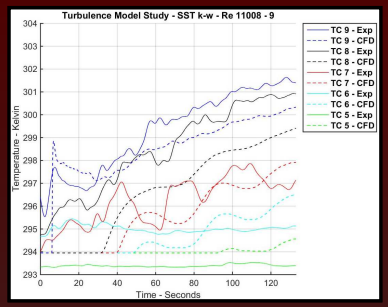












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Collaborators

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