UNIVERSITY OF WISCONSIN-MADISON

THERMAL HYDRAULICS LABORATORY – LIQUID-SODIUM GROUP

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Research Project: Accident Analysis for Generation IV Sodium Fast Reactors

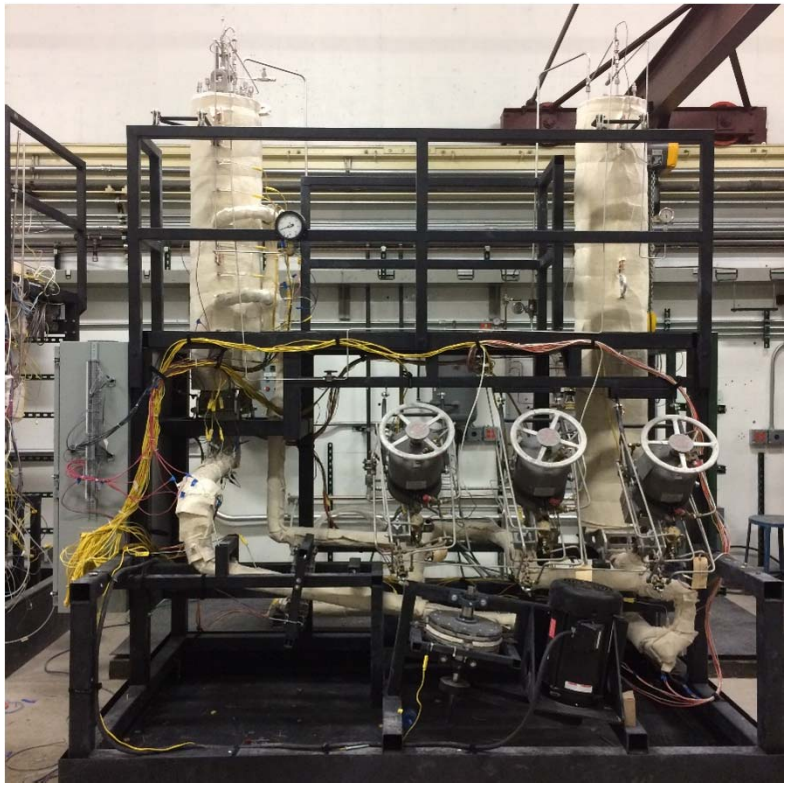
Thermal Stratification Project Overview

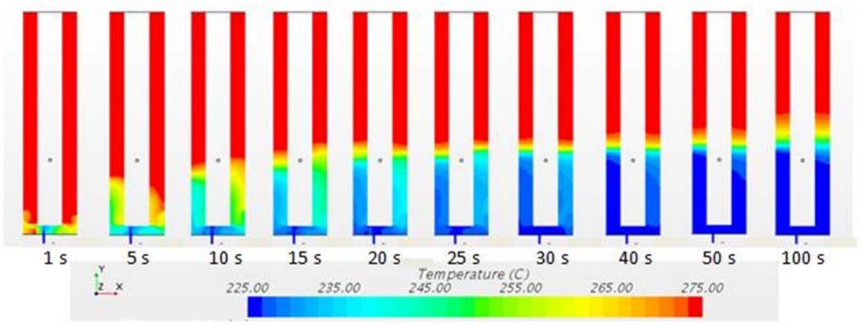
- Conduct a series of thermal stratification experiments with advanced temperature and fluid measurement instrumentation. A specific geometry will be considered both experimentally and computationally.(UW, MIT,VCU, ANL)
- Use the STRUCT modeling approach along with URANS methods to analyze the low Prandtl number (sodium) heat transfer, thermal stratification and thermal striping experiments (UW-MIT)
- Development of improved models for thermal stratification and thermal striping to be implemented in system level codes such as SAM and SAS4A/SASSYS-1· (VCU-ANL)
- Train several students in the aspects related to the SFR technology from working with sodium by conducting the experiments to detailed state of the art CFD for the low Prandtl number fluids and ultimately development and implementation of models into relevant systems code (UW, VCU, MIT)

Thermal Stratification Test Facility (TSTF)

- Stratified layers between hot and cold sodium can develop an oscillating temperature field on mechanical structures which can lead to thermal fatigue. It is necessary to understand and find solutions to mitigate these issues.
- Primarily seen during loss of flow scenarios
  - PLOF – protected loss of flow (successful reactor scram) cold sodium from core into a hotter pool (200[C] into 250[C])
  - ULOF – unprotected loss of flow (no reactor scram) hot sodium from core into colder sodium pool (250[C] into 200[C])

- Instrumentation and Data Acquisition
  - Distributed fiber optical temperature sensors
  - Type K Thermocouples
  - Electro Magnetic Flow Meter
  - Remote operation capabilities with LabVIEW data acquisition and control system





Simulated PLOF scenario in current Test Section Geometry (courtesy of MIT)

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