



College of Engineering
UNIVERSITY OF WISCONSIN-MADISON

Ryder Belgarde

Masters of Science student
Mechanical Engineering
Advisor: Mark Anderson
Office: ERB 809
Email: rbelgarde@wisc.edu
Hometown: Fargo, ND

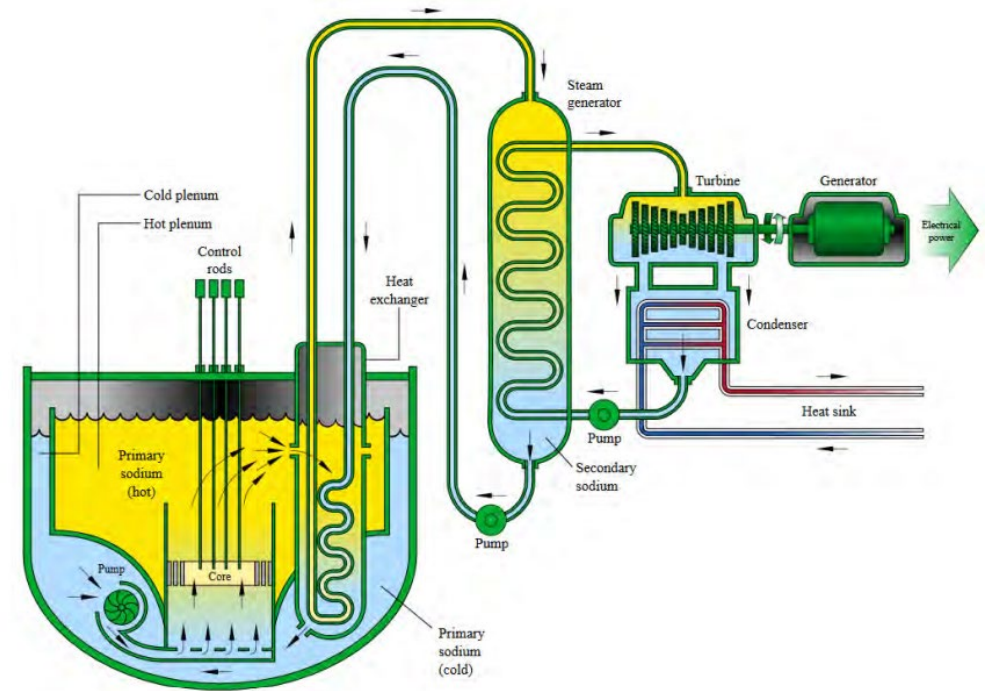


Research Project: Thermal Stresses in Sodium Fast Reactors due to Thermal Oscillations (Thermal Stratification and Thermal Striping)



Project Background

- Thermal stratification/stripping occur throughout sodium fast reactors and can cause cyclical thermal fatigue and mechanical failure in reactors
- Thermal stratification is defined by large temperature gradients with an oscillating stratification interface in large bodies of fluid
 - Typically found near the hot primary sodium pool of the reactor
 - Thermal Oscillation rate (0.01 – 2 Hz)
- Thermal stripping characterized by turbulent mixing of non-isothermal fluids or jet instabilities in the sodium
 - Typically found at the core exit or piping junctions where two dissimilar temperature flows mix
 - Higher oscillation rate than stratification (0.1 – 10 Hz)



Project Goals

- Thermal Stratification Testing

- Conduct testing to assist in the validation of a 1D model in piping subjected to thermal stratification
 - Testing will investigate pipe temperatures in vulnerable pipe sections of varying geometries

- Thermal Striping Testing

- Conduct a test which measures internal stresses induced by thermal oscillations both inside metal pipe walls and a sodium thermal plume in varying pipe geometries
 - Measure stresses with optical fiber
 - Validate a CFD model of both wall stress and oscillations in flow loop temperatures

