WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

Nikona Rousseau

M.S. Student
Nuclear Engineering & Engineering Physics

Office: ERB 809
Email: ngrousseau@wisc.edu
Hometown: Palmer, AK

Project: Sodium Heat Pipes; Design and Failure Mode Assessment for Micro-Reactor Applications
Advisor: Mark Anderson
Sponsor: DOE

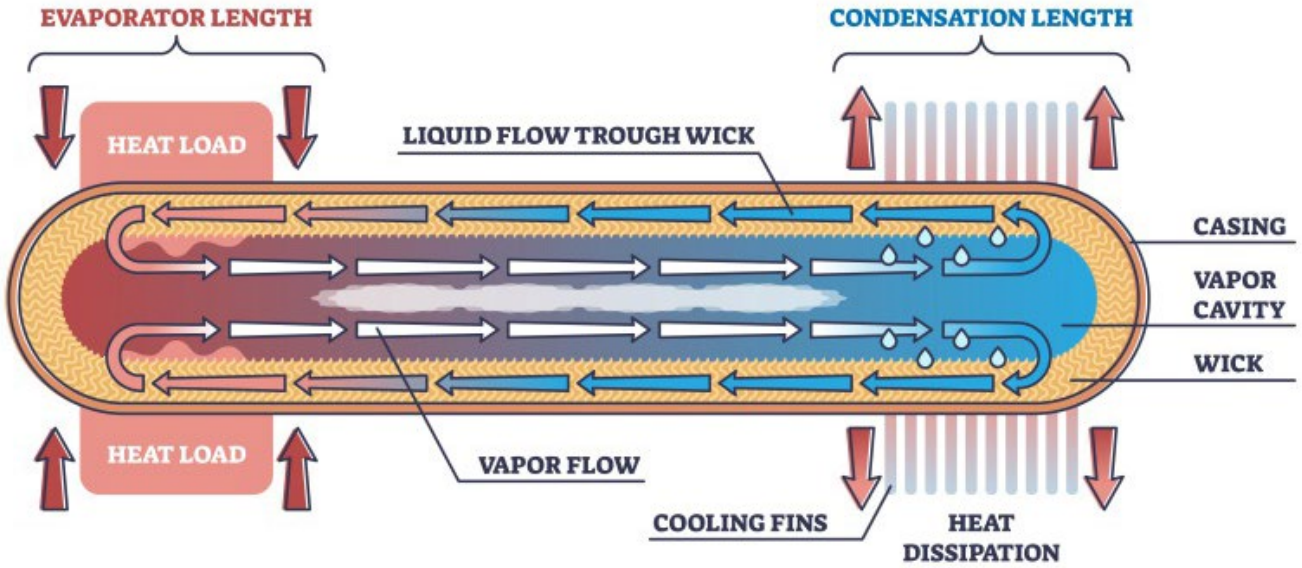
SCL

THL Thermal Hydraulics Laboratory

Background

- *Microreactors* offer an emission free energy solution for remote applications
- Westinghouse's eVinci microreactor:
  - 15 MWth core design
  - Core cooled passively with *Heat Pipes*
- *Heat Pipes* transport heat using the phase changes of the working fluid:
  - Evaporation: heat enters one end (evaporator) and vaporizes the working fluid
  - Pressure gradient transports the vapor to the opposite end (condenser)
  - Condensation: vapor cools as heat leaves and the fluid condenses into liquid
  - Wick structure transports liquid back to evaporator via capillary action

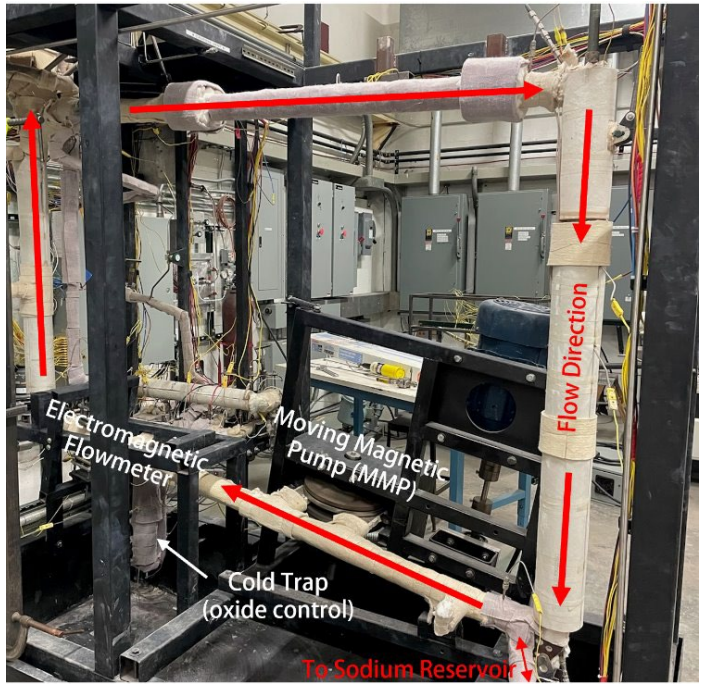
Westinghouse eVinci Microreactor



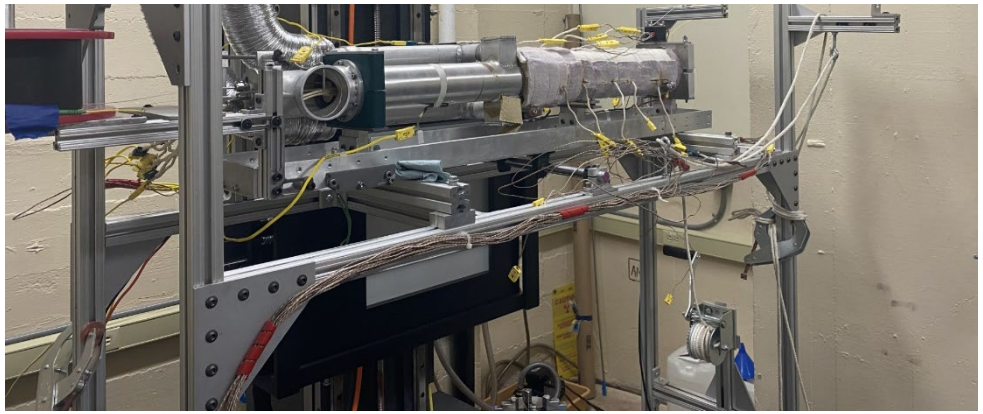
Heat Pipe Diagram

Project Goals

- Construct sodium heat pipes instrumented with:
  - Fiber Optic Temperature Sensors
  - X-ray imaging
- Characterize theoretical performance with Computational Fluid Dynamics (CFD)
- Assess heat pipe failure modes and their effects on performance
- Characterize the effects of non-condensable gases on performance
- Evaluate the effects of oxygen concentration on performance
- Design and construct heat pipes with optimized wick structures



THL Oxygen Control Loop for Sodium



Current THL Heat Pipe test facility