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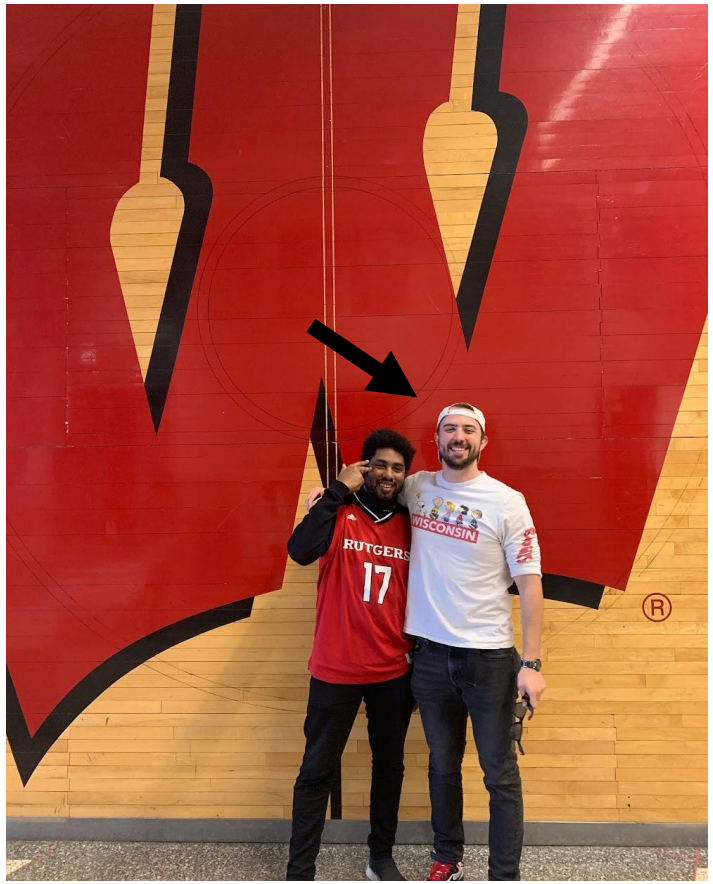

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Project: Corrosion Orifice Plates
Advisor(s): Mark Anderson
Sponsor: TerraPower LLC

SCL

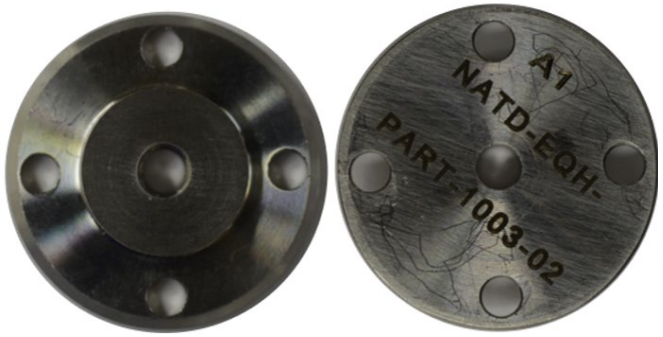
THL Thermal Hydraulics Laboratory

Background

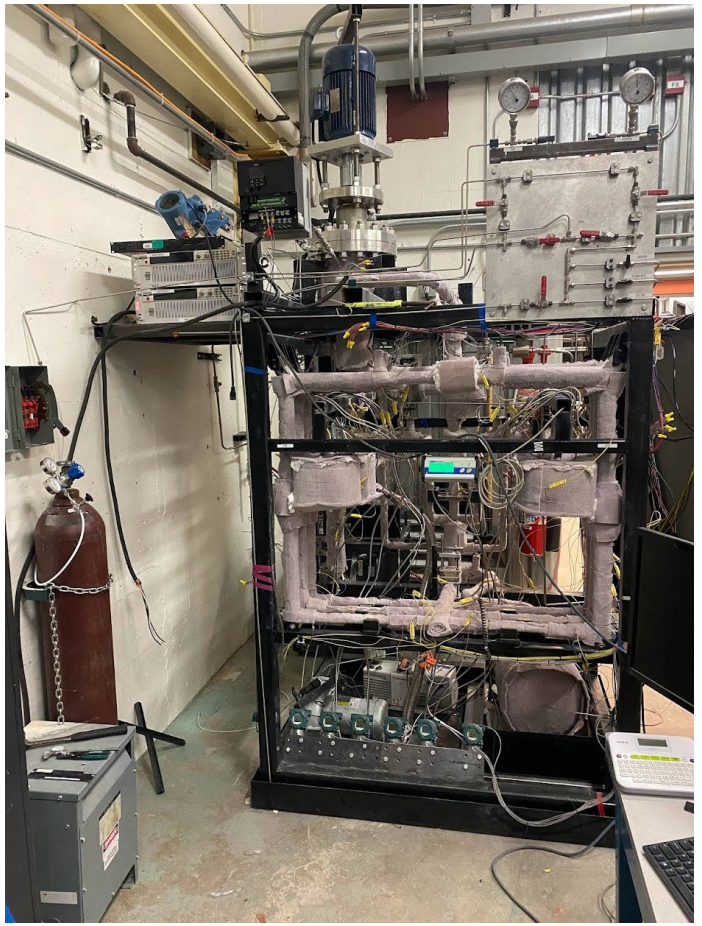
- Sodium fast reactors offer significant upside in efficiently, safety, fuel cycle etc. with one of the main drawbacks being its corrosivity
- A key component of reactor design is the distribution of flow through the core to match power generation and ensure key design goals such as:
  - Proper cooling
  - Uniform exit temperatures
  - Optimal exit temperature
- Core designs must accommodate variation in power generation over the course of a fuel cycle. Deviation in flow rate can result in:
  - Overcooling/undercooling
  - Thermal oscillations
  - Vibration
- Distribution through the core is commonly accomplished through orifice plates. Flow to a given fuel assembly is determined by the area fraction that is covered by the orifice openings
  - Changing this area fraction through corrosion is a concern with the Nuclear Regulatory Comission and so studies are needed to verify the long term impacts of corrosion to orifice plates

Project Goals

- The orifice corrosion project is studying the corrosion of six orifice plates in liquid sodium.
- These orifices vary in entrance geometry, flow rates, and material
- Sodium is held at a constant temperature and oxygen concentration (which impacts corrosion rates) for the duration of testing
- The orifice plates are removed to be inspected on a regular basis.



Example of the Orifice Plates



Corrosion Test Facility