Liquid Metal Thermal Test Facility for Fast Reactor Applications and Boiling Thermosyphon Facility for LWR/SMR applications

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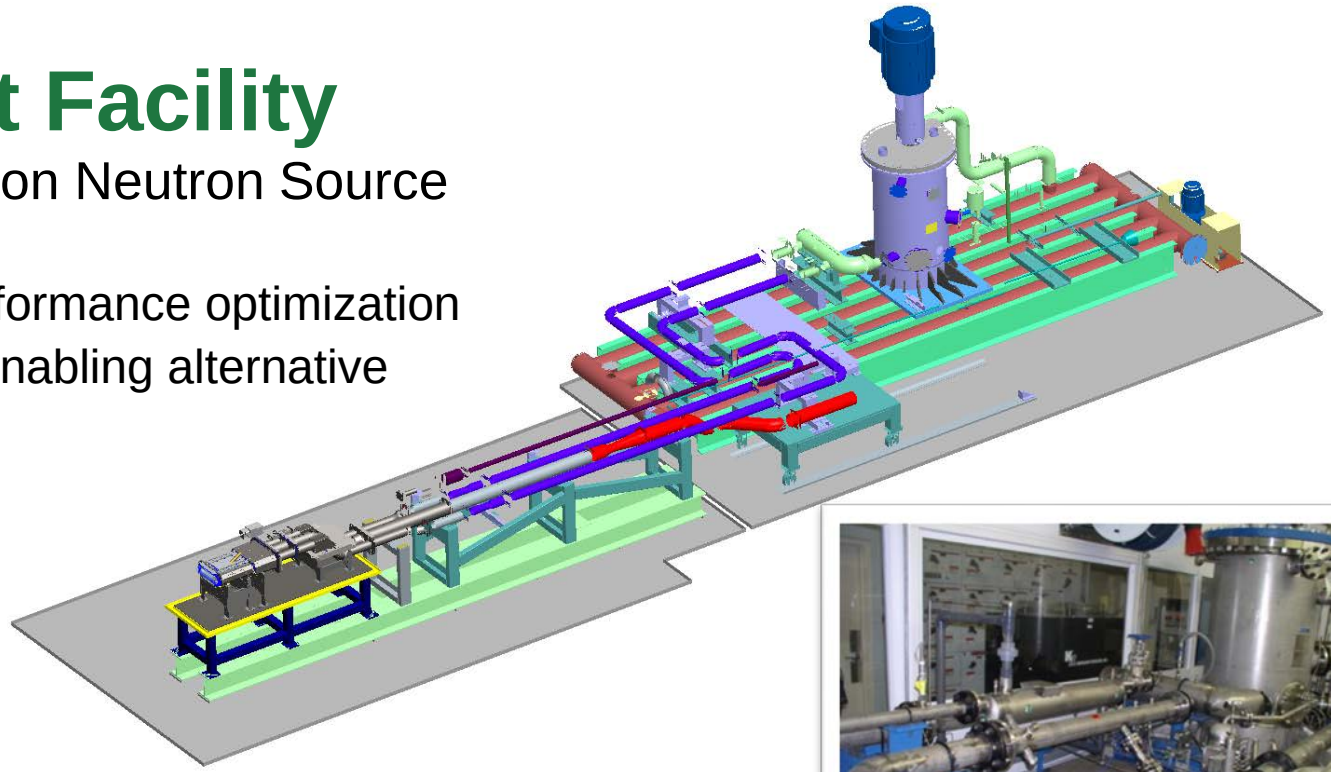
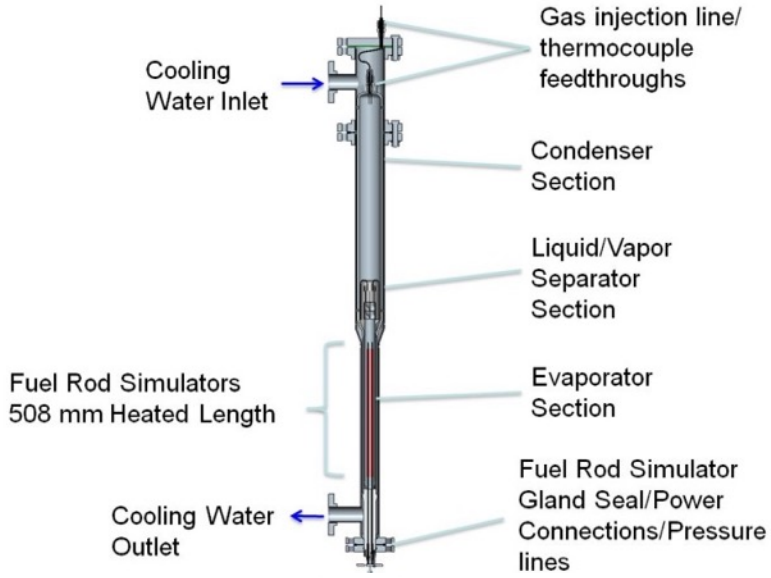
Liquid Metal Thermal Test Facility

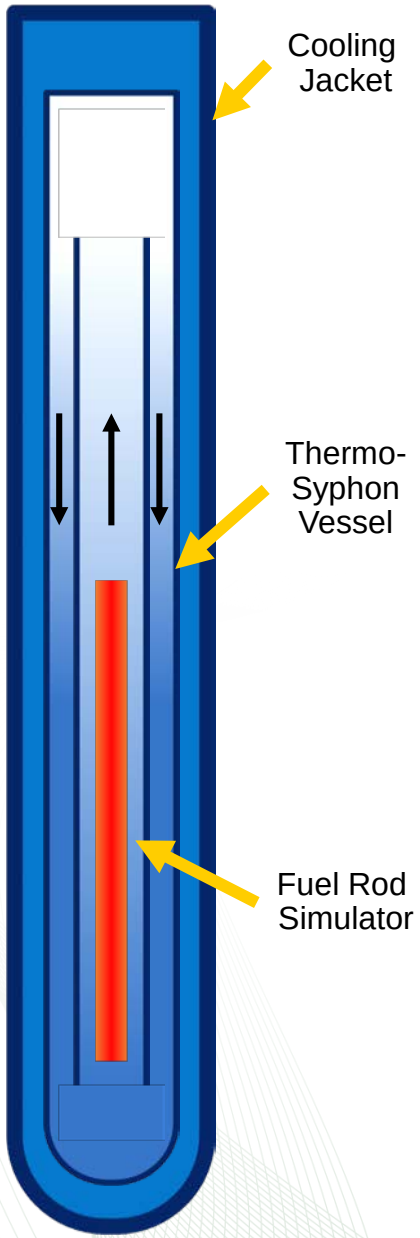
- Constructed and operated as the Spallation Neutron Source Target Test Facility
  - Supports spallation target design and performance optimization
  - Designed to easily change test sections enabling alternative geometries to be considered
- Specifications
  - Approx. Mercury inventory:
    - ~19,000 kg or ~1.4 m^3 or ~360 gallons
  - Flow Rate
    - Max.: 2071 l/min (547 gpm)
    - Nominal: 1438 l/min (380 gpm)
    - 2 primary inlet lines, 1 secondary inlet flow line, 1 return line
  - Pump
    - 60 to 600 rpm with Variable Frequency Drive
    - Pump discharge pressure at max. flow: 105 psig
    - Pump discharge shutoff pressure: 181 psig
  - Heat exchanger capacity: 16.1 kW
    - Sized to remove pump heat – limited excess capacity
  - Hg (average) bulk temperature range: ~ 20ºC to 38ºC
- Companion Water Thermal Hydraulic Loop (WTHL) facility supports high resolution PIV, LDA.



HFIR Thermosyphon Test Loop

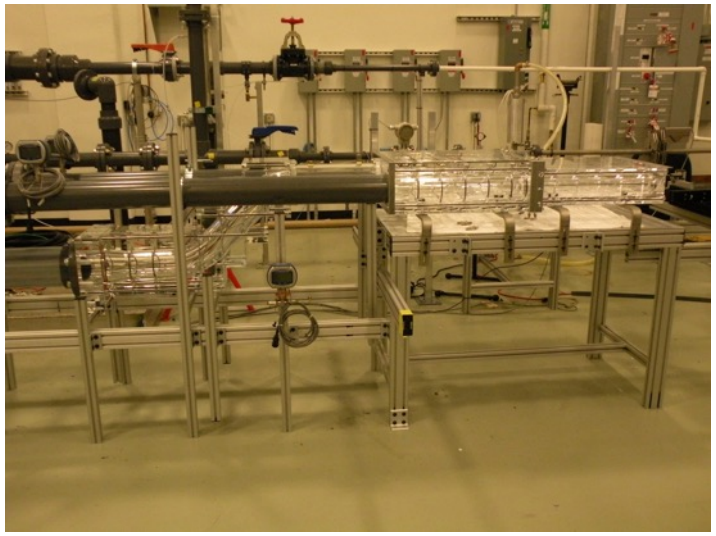
- Constructed to evaluate alternative cooling strategy for HFIR fuel and materials irradiation experiments
  - Natural convection flow boiling experiment
  - Rated for prototypic reactor pressures
  - Each power level corresponds to a particular operating pressure and temperature
    - modified by initially filling the condenser with an inert gas.
  - 508 mm electrically heated fuel rod simulators
  - Integral external cooling jacket for forced convection heat removal





Ongoing and Future Work

- Liquid Metal Target Test Facility
  - in active use for optimization of mercury spallation target designs
    - Proof of principal testing and validation data for numerical models
    - Focus on optimization of microbubble and gas layer injection to mitigate pressure pulse fatigue in target structure
    - Technology developed also supports optimization of gas bubble seeding for ultrasonic velocimetry methods
- Thermosyphon Facility
  - Initial proof of principal testing for HFIR capsule cooling concept has been completed; facility available
- Facility Access
  - Facilities accessible through direct contract or in partnership responding to DOE opportunity. Project may leverage existing infrastructure but should support full cost of safety review of facility modifications and facility operation.



Acrylic SNS Jet Flow Target installed in Water Loop

Thermosyphon Test Loop