

Liquid Salt Test Loop

The liquid salt test loop (LSTL) is a versatile facility for the development and demonstration of high-temperature fluoride-salt technology. It is made from a high nickel alloy and operates at up to 700 °C. The major components include a centrifugal pump to circulate the salt, a salt-to-air heat exchanger, three tanks, pressure control and trace heating systems, and associated instrumentation. The loop builds on Oak Ridge National Laboratory's (ORNL's) historic leadership and expertise in fluoride salt technology.

The LSTL is being used to develop and demonstrate technology for high-temperature fluoride salt systems through a number of planned tests. For example, one test includes heat transfer measurements in a heated pebble bed using a 200 kW induction heater. This testing demonstrates the use of a 1.07 m (42 in.) silicon carbide (SiC) tube as a structural component. The next phase of testing will focus on characterizing the pump performance. During these early tests, instrumentation (salt pressure, level, temperature, flow rate) will also be evaluated. Future testing may be conducted on new flanges and valves, instrumentation such as that used for optical diagnostics, heat exchanger performance, and other heat transfer experiments.

Near-Term Goals

- Provide infrastructure (operational knowledge and equipment) to test high-temperature salt systems.
- Develop a nonintrusive, inductive heating technique that can be used for thermal/fluid experimentation.
- Measure heat transfer characteristics in a molten salt-cooled pebble bed.
- Demonstrate the use of SiC as a structural material for use in molten salt systems.

Contact

Graydon Yoder
Group Leader,
Thermal Hydraulics &
Irradiation Engineering
Oak Ridge National Laboratory
865.574-5282
yodergljr@ornl.gov
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ornl.gov

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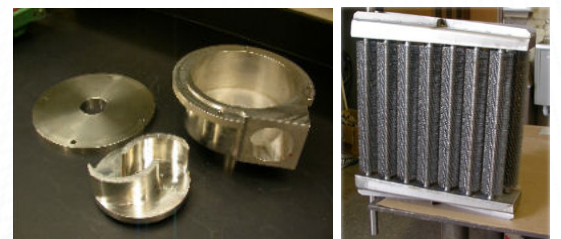


Overview image of LSTL

Salt	FLiNaK
Operating temperature	≤ 700 °C
Flow rate	≤ 4.5 kg/s ~3.5 m/s (1 in. pipe)
Operating pressure	Near atmospheric
Construction material	Inconel 600, SiC
Operating run time life	2+ years
Primary piping ID	2.67 cm (1.05 in.)
Loop volume	75 L
Heating	~20 kW trace heating 200 kW test section
Thermocouples	~92 (7 in bed)
Pressure gauges	1 in salt (0–0.34 MPa) 4 in gas spaces
Flow rate	Ultrasonic flow meter
Vibration accelerometers	6 on pump
Salt level	1 radar level 3 heated thermocouple arrays



Thermal image of LSTL during operation



Pump impeller and volute

Salt-air heat exchanger