

Profile SFR-53

ITSL

Republic of KOREA

GENERAL INFORMATION

NAME OF THE FACILITY ITSL
ACRONYM Instrumentation Test Sodium Loop
COOLANT(S) OF THE FACILITY Liquid sodium
LOCATION (address): Fast Reactor Demonstration Division, Korea Atomic Energy Research Institute, 989-111 Daedeok-daero, Yuseong-gu, Daejeon, Korea
OPERATOR KAERI
CONTACT PERSON Jewhan Lee, 989-111 Daedeok-daero, Yuseong-gu, Daejeon, Korea, (name, address, institute, function, telephone, email): leej@kaeri.re.kr

STATUS OF THE FACILITY

In operation
Start of operation (date): Currently refurbishment up to 2016

MAIN RESEARCH FIELD(S)

- Zero power facility for V&V and licensing purposes
- Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
- Thermal-hydraulics
- Coolant chemistry
- Materials
- Systems and components
- Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

ITSL consists of two buffer tanks, a cold trap, a plugging meter, an electro-magnetic pump, and the sodium storage tank with 2 tons of sodium. The auxiliary system includes the air compressor and argon gas supply system. The maximum operating condition is 550 °C and the design temperature of the facility is 600 °C.

Two buffer tanks and the electro-magnetic pump in the middle enables the experiment conditions of co-flow and counter-flow. Therefore, sodium flow characteristics can be verified in a short time with a simple procedure.

The components of this facility are as follows.

- Sodium buffer tanks: ~5 m in height to make sodium flow from one to another
- Sodium storage tank: the sodium is safely stored at the lowest point of the facility with the capacity of 2 tons

- Cold trap: for purification, the cold trap with the same design in STELLA-1 facility is installed
- Vapour trap: the material is SUS304 and it is mesh type
- Preheaters and cooler: to provide required heating and cooling, heaters and cooler are installed
- Plugging meter: to check the cold trap performance vertical counter-flow type plugging meter is installed
- Sodium valve test device: valve test device includes the level sensor, heater, and thermocouples
- Electro-magnetic flowmeter test device: there are several test section points to install multiple flowmeter with different type
- Gas distributor: Argon gas is depressurized with the regulator included in gas distributor
- Sodium tray: to prevent and mitigate the sodium leak accident the lowest floor of the facility is equipped with large sodium tray

Acceptance of radioactive material

No

Scheme/diagram

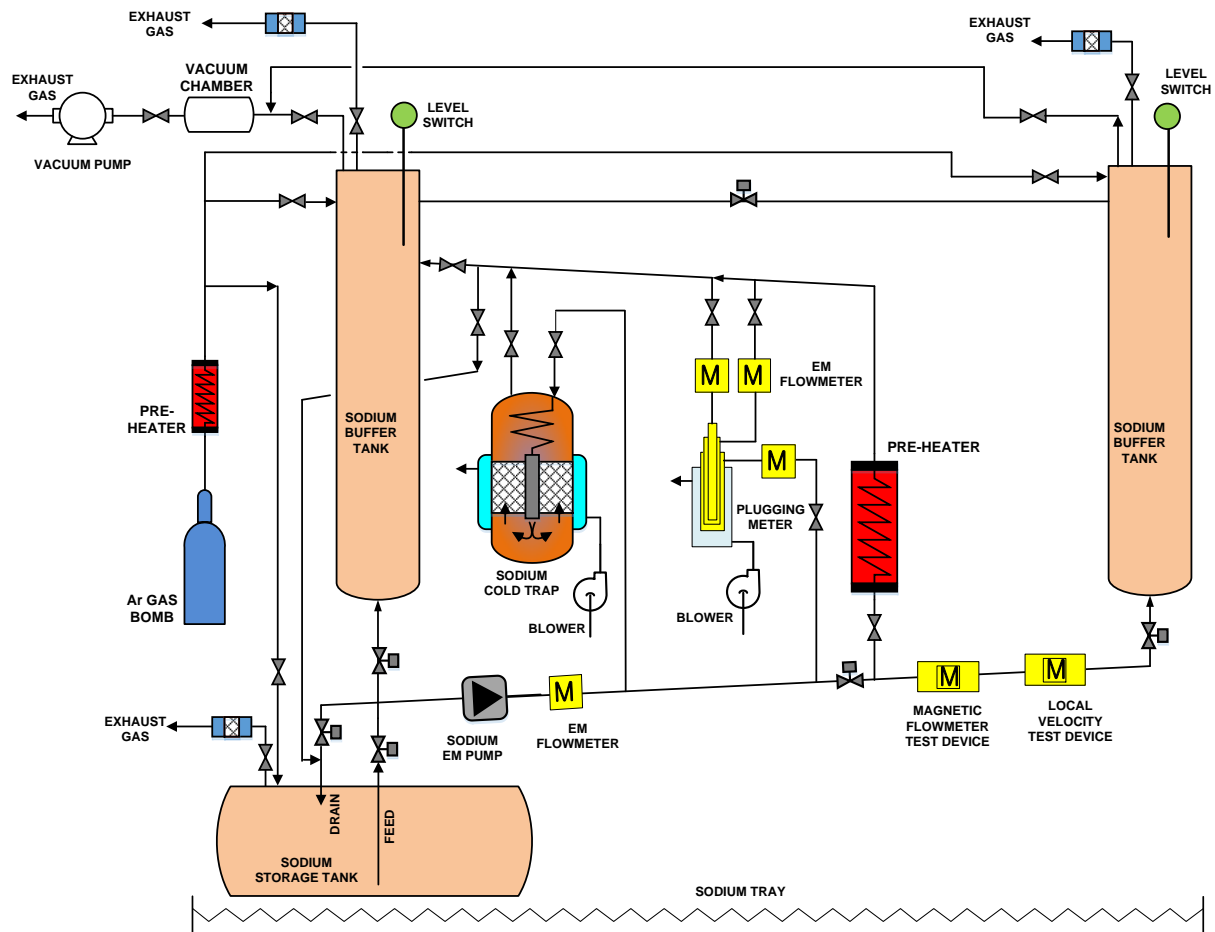


FIG. 1. Scheme of the ITSL facility

3D drawing/photo

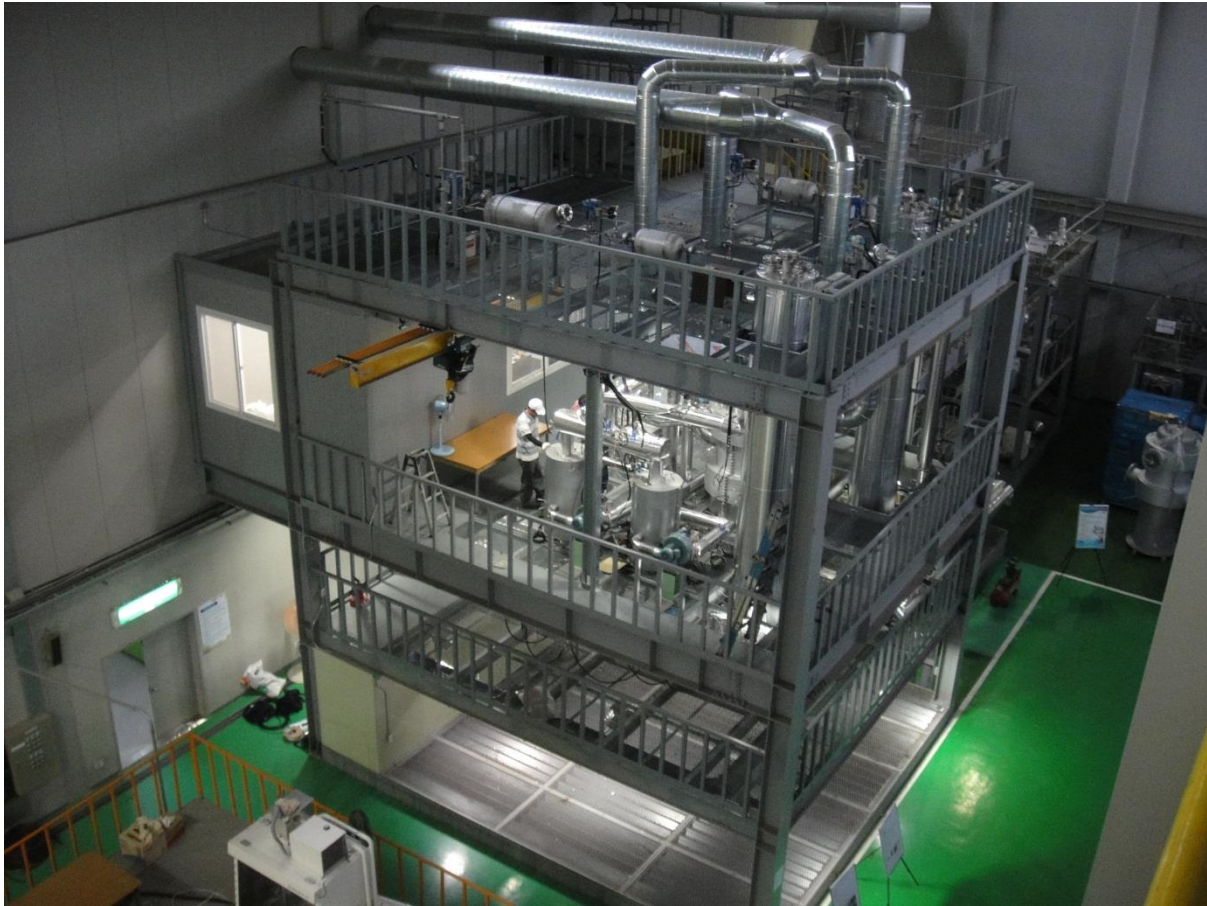


FIG. 2. View of the ITSL facility

Parameters table

Coolant inventory	2 tons at maximum
Power	100 kW
Test sections	
TS #1	<u>Characteristic dimensions</u> Approximately, 0.5 m by 0.5 m
	<u>Static/dynamic experiment</u> Static/Dynamic
	<u>Temperature range in the test section (ΔT)</u> 150 °C ~ 550 °C (Temperature is not the main target)
	<u>Operating pressure and design pressure</u> Operating Pressure: 10 kPa ~ 50 kPa Design pressure: 300 kPa
	<u>Flow range (mass, velocity, etc.)</u> - 15 m/s ~ 15 m/s (co-flow and counter-flow)
Coolant chemistry measurement and control (active or not, measured parameters)	The purification is conducted with the cold trap and the major impurities are oxygen and hydrogen. The impurities are calculated from the plugging temperature measurement of plugging meter and it is operated on-line.
Instrumentation	Thermocouples, electro-magnetic flowmeter, pressure transducer, leak detector, smoke detector, level gauge

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

The primary objective of this facility is to support for the instrumentations in Prototype reactor as well as the STELLA-1 experiment facility. The short range level transducer and long range level transducer have been tested in this facility. Four different electro-magnetic flowmeters have been compared at the same time with same experiment condition and the selection basis for the most appropriate type has been established. Moreover, prototype local velocity transducer was tested and differential pressure transducer was also tested.

The test result was used to support mainly the instrumentations in STELLA-1 facility and the sodium handling experience is shared among many other small test facilities.

PLANNED EXPERIMENTS (including time schedule)

The primary objective has been achieved and the planned experiments are to check the cold trap performance with different design. The experiment will be starting in year 2016.

With some modifications on the facility, it will be utilized as a training basis for the sodium experiment. The modification and renewal is planned in year 2018.

TRAINING ACTIVITIES

Training activities can be arranged under the KAERI supervision.

REFERENCES (specification of availability and language)

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4. LEE, H.Y., LEE, S.H., KIM, J.B., LEE, J.H., "Creep-fatigue damage for a structure with dissimilar metal welds of Mod 9Cr-1Mo and 316L stainless steel," International Journal of Fatigue, 29, p.1868, 2007. (En)
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6. JEONG, J.H., HWANG, S.W., CHOI, K.S., "Local flow distribution analysis inside the reactor pools of KALIMER-600 and PDRC performance test facility," Korea Atomic Energy Research Institute, KAERI/CM-1276/2009 (Kr)
7. HAHN, D. et al., "KALIMER-600 Conceptual Design Report," Korea Atomic Energy Research Institute, KAERI/TR-3381/2007 (Kr)
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