

Profile SFR- 43

SILVERINA SODIUM LOOP

INDIA

NAME OF THE FACILITY	SILVERINA SODIUM LOOP
ACRONYM	NA
COOLANT(S) OF THE FACILITY	Sodium
LOCATION (address)	Fast Reactor Technology Group (FRTG), Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, India
OPERATOR	FRTG, IGCAR
CONTACT PERSON	Dr. P. Selvaraj, Director, Fast Reactor Technology Group, Indira Gandhi Centre for Atomic Research, Kalpakkam – 603102, India, +91 44 27480083, pselva@igcar.gov.in

STATUS OF THE FACILITY	In operation
Start of operation (Date)	1998

MAIN RESEARCH FIELD(S)	<input type="checkbox"/> Zero power facility for V&V and licensing purposes
	<input type="checkbox"/> Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
	<input type="checkbox"/> Thermal-hydraulics
	<input type="checkbox"/> Coolant chemistry
	<input checked="" type="checkbox"/> Materials
	<input checked="" type="checkbox"/> Systems and components
	<input checked="" type="checkbox"/> Instrumentation & ISI & R

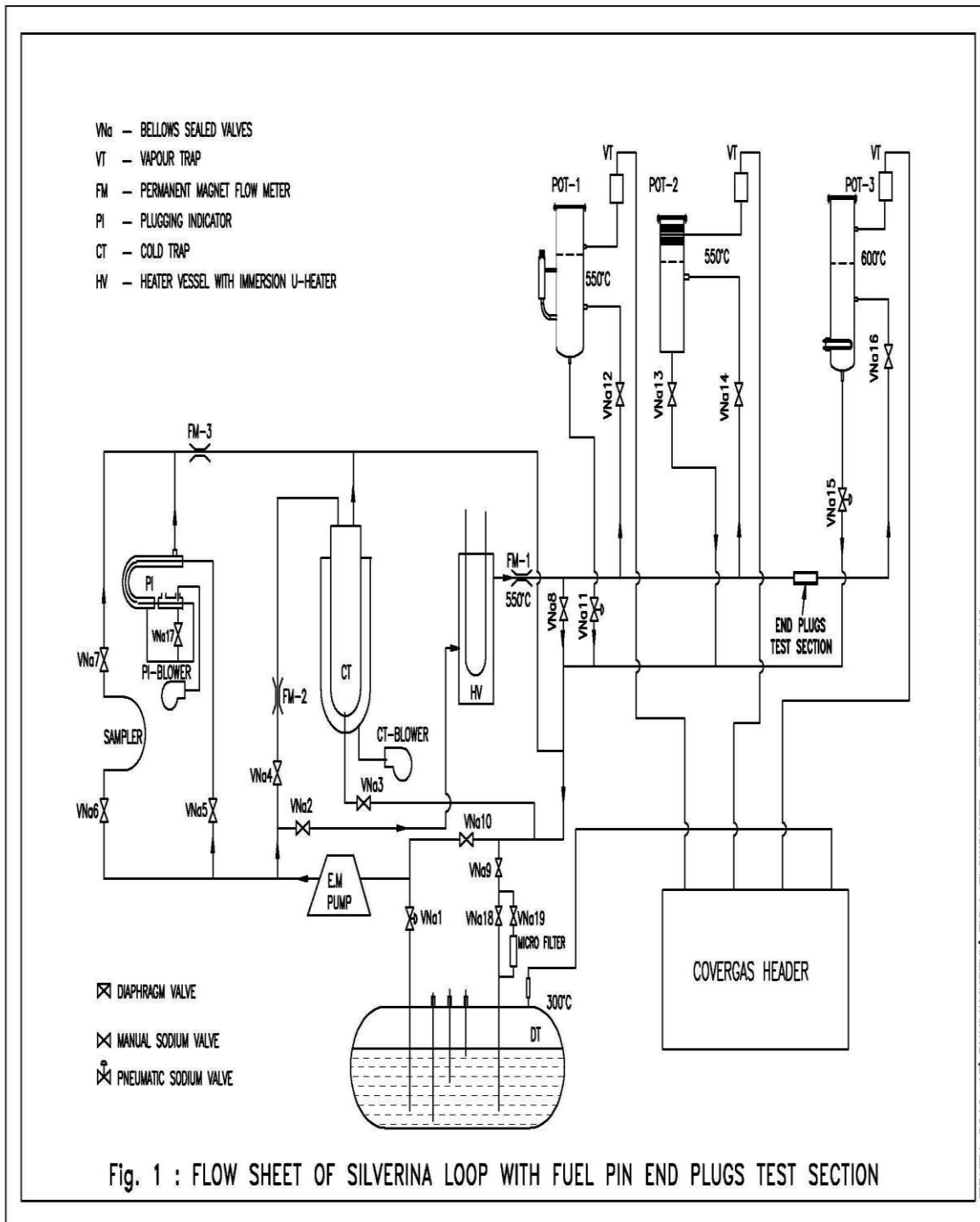
TECHNICAL DESCRIPTION

Description of the facility

SILVERINA is a multi purpose sodium loop in which variety of sodium experiments can be carried out. There are three test pots in the loop, in each of which independent tests can be carried out. There is an AC conduction pump, for circulation of sodium in the loop. Maximum sodium temperature in the loop is 550°C. So far, the loop was operated for more than 50,000 h.

ACCEPTANCE OF RADIOACTIVE MATERIALS - No

Scheme/Diagram



TIRKEY-2012-13\PUNYAMURTHY\FIG.1 FLOWSHEET - FUEL PIN END PLUG

3D Drawing/Photo

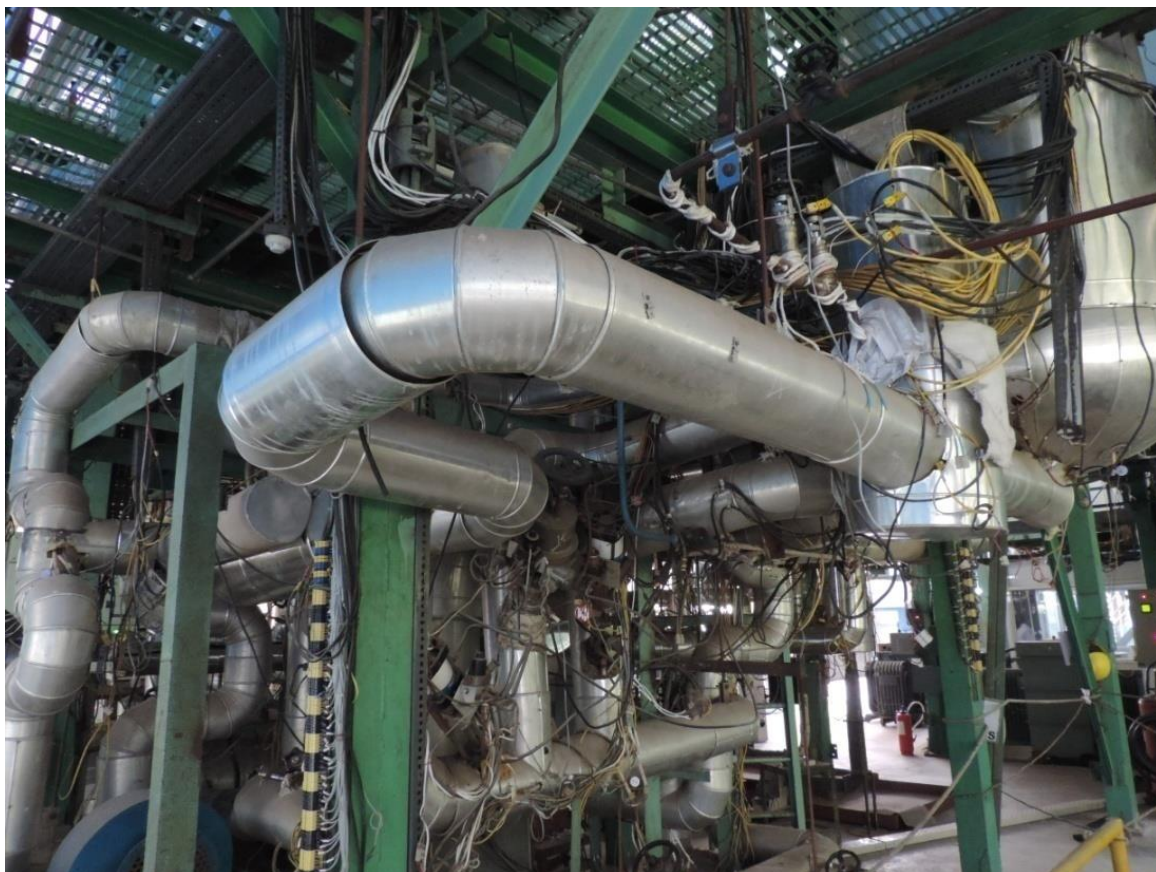


FIG.2. SILVERINA Loop Structure with Pipe lines, Test Pot-1



FIG.3. Test Pot-2 and Test Pot-3

Parameters table

Coolant inventory	1.3 tonnes of sodium
Power	Heater power of 180 kW
No of test sections	Three
Test sections	
	<u>Characteristic dimensions</u> Test pot-1 : 750 mm ID, 6 mm thick, 2.2 m height Test pot-2 : 415 mm ID, 6 mm thick, 1.2 m height Test pot-3 : 400 mm ID, 6 mm thick, 1.6 m height
	<u>Static/Dynamic experiment</u> Dynamic
	<u>Temperature in the test section</u> Upto 550°C
	<u>Operating pressure and design pressure</u> Operating pressure : 0.3 bar (g) Design pressure : 5.0 bar (g)
	<u>Flow range (mass velocity etc)</u> Sodium flow : 8 m ³ /h
Coolant chemistry measurement and control (active or not, measured parameters)	Coolant is not active Coolant purity is maintained by cold trapping and monitored using online plugging indicator, and periodical sampling and analysis
Instrumentation	Thermocouples for temperature measurement Permanent magnet type flow meter for sodium flow measurement Wire type and spark plug type leak detectors, and sodium aerosol detectors for sodium leak detection Resistance type discontinuous and mutual inductance type continuous level probes for monitoring sodium level

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

Electromagnet assembly of DSRDM was tested and qualified. Bearing of the transfer arm assembly was subjected to performance testing in sodium. Performance testing of Sodium Ionization Detectors (SID) was successfully carried out. Eddy current position sensor for DSRDM of PFBR was tested. Compatibility of flow meter magnet and inflatable seal rubber material to sodium aerosols was tested. Mutual Inductance type level probes were calibrated. Friction and wear studies on materials in sodium were carried out using reciprocating type tribometer. Performance testing of three-in-one thermocouple in sodium was completed. RADAR level probes for sodium level measurement was tested and qualified. Sodium vapor concentration measurement in cover gas was also carried out. Sodium aerosol sampling in cover gas space for concentration and particle size measurement and performance evaluation of Sodium Aerosol Detectors. Testing of bearings of Inclined Fuel Transfer Machine.

PLANNED EXPERIMENTS (including time schedule)

Testing of indigenously developed lifting tool mechanism
Performance testing of RADAR level sensors for sodium level measurement
Testing of Inflatable seal rubber specimens in sodium aerosols.

TRAINING ACTIVITIES

Training activities can be agreed with IGCAR Kalpakkam for the operation of experimental campaign under the supervision of IGCAR qualified staff.

REFERENCES (*specification of availability*):

1. Commissioning and Operation of SILVERINA sodium loop, National Conference of Nuclear Reactors and Power Plants OPENUPP-2006, Mumbai, Nov.2006
2. Studies on Geometrical Effect on sodium aerosol characteristic in cover gas region, Aerosol and Air Quality Research, 16, 1832-1840, 2016.
3. Testing in sodium and qualification of the bearings used in inclined fuel transfer machine of PFBR, International Journal of Nuclear Energy Science and Technology, Vol. 12, No.1, 2018.