Profile SFR-41
SAMRAT
INDIA

NAME OF THE FACILITY       Scaled Model Reactor Thermal Hydraulics Test Rig
ACRONYM                   SAMRAT
COOLANT(S) OF THE FACILITY  Water
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 (Year)  2002

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
This is a model of PFBR primary pool with geometrical scale factor of 1:4. The purpose of this facility is to carry out various thermal hydraulic and Flow Induced Vibration (FIV) studies for thermal hydraulic design validation of PFBR primary circuit as well as assessment of flow induced vibration of various reactor primary circuit components. Two large pumps each having capacity of 1200 m³/h at 10 bar caters the required flow rate. Plate type heat exchangers are provided to maintain the water temperature during study. This facility has provision to fix rod type heaters with controller for carrying out thermal transient studies. This facility is also equipped with a dedicated control room with data acquisition system to acquire data during experiments.

Acceptance of radioactive materials – No
Scheme/Diagram of the loop
3D Drawing/Photo
### Parameters Table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Coolant inventory</td>
<td>Model + loop: 20 m³; Reservoir Tanks: 50 m³</td>
</tr>
<tr>
<td>Power</td>
<td>Maximum power requirement for pump operation: 1 MW, Heater Power: 200 kW</td>
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<tr>
<td>No. of test section</td>
<td>One</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>30 °C to 70 °C</td>
</tr>
<tr>
<td>Operating Pressure</td>
<td>Operating Pressure: 10 bar</td>
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<tr>
<td>Design Pressure</td>
<td>Piping design Pressure: 15 bar</td>
</tr>
<tr>
<td>Flow range</td>
<td>40 m³/h to 2400 m³/h</td>
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<tr>
<td>Coolant chemistry measurement and control</td>
<td>Use of potable water, pH is controlled</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>Resistance Temperature Detector, Pressure Gauge, Thermocouples, Pressure transmitters, Averaging pitot tube flow meters, Rotameters, Accelerometers and strain gauges for FIV measurements, Data acquisition system and control system</td>
</tr>
</tbody>
</table>

**COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS**

Experimental studies to investigate various thermal hydraulic and FIV phenomena related to PFBR hot pool and cold pool have been completed. Some of the major studies are; gas entrainment phenomena from hot pool free surface, mapping of flow pattern in hot pool and around the IHX inlet window, measurement of temperature fluctuation in the vicinity of above core structural materials, thermal stratification studies, temperature evolution in the hot pool during safety grade decay heat removal by decay heat exchanger, Inner vessel instability studies etc. All these experimental results have been used to validate the thermal hydraulic design of PFBR primary circuit components. The FIV measurement data have been used to assess the components design against structural integrity. This model and test facility has been used to develop passive devices to mitigate gas entrainment from PFBR hot pool free surface which is a major achievement of this test facility.

**PLANNED EXPERIMENTS (including time schedule)**

All the planned studies for PFBR have been completed. Presently this test facility has been kept reserved to support the ongoing commissioning activities of PFBR.

**TRAINING ACTIVITIES**

Training activities can be considered with IGCAR Kalpakkam for the operation of this experimental facility under the supervision of IGCAR qualified staff.

**REFERENCES**

Nil