

Profile SFR-87

iHELP

Republic of KOREA

GENERAL INFORMATION

NAME OF THE FACILITY iHELP
ACRONYM Intermediate Heat Exchanger Test Loop for PGSFR
COOLANT(S) OF THE FACILITY Water
LOCATION (address): Thermal Hydraulics and Severe Accident Research Division, Korea Atomic Energy Research Institute, 989-111 Daedeok-daero, Yuseong-gu, Daejeon, Korea
OPERATOR KAERI
CONTACT PERSON Dong-Jin Euh, 989-111 Daedeok-daero, Yuseong-gu, Daejeon, Korea, (name, address, institute, KAERI, Thermal Hydraulics and Severe Accident Research Division, function, telephone, email): Tel. +82 42 868 2594, djeuh@kaeri.re.kr

STATUS OF THE FACILITY In operation
Start of operation (date): 2017

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

The iHELP test section was designed and built to simulate the pressure drop characteristics at the shell side of the IHX, focusing only on the tube bundle regions with the grid plates (TG). The test section maintained the height of the p-IHX and preserved the hydraulic diameter in the tube bundle region and the flow hole area ratio on the grid plates. In addition, the configurations of the HTTs and flow holes in the p-IHX were preserved in the 7 test section. As shown in Fig. 2, the test section was slab-shaped and mainly consisted of an entrance region, a tube bundle region, a flow passing region on the grid plate, and an exit flow channel. The experiments were conducted using water (35 °C, 1 atm) instead of sodium (467.5 °C, 1 atm) in the scaled-down test section, and the flow rate conditions were determined by preserving the Reynolds number in the p-IHX. The design parameters adopted in the test section are listed in Table 1.

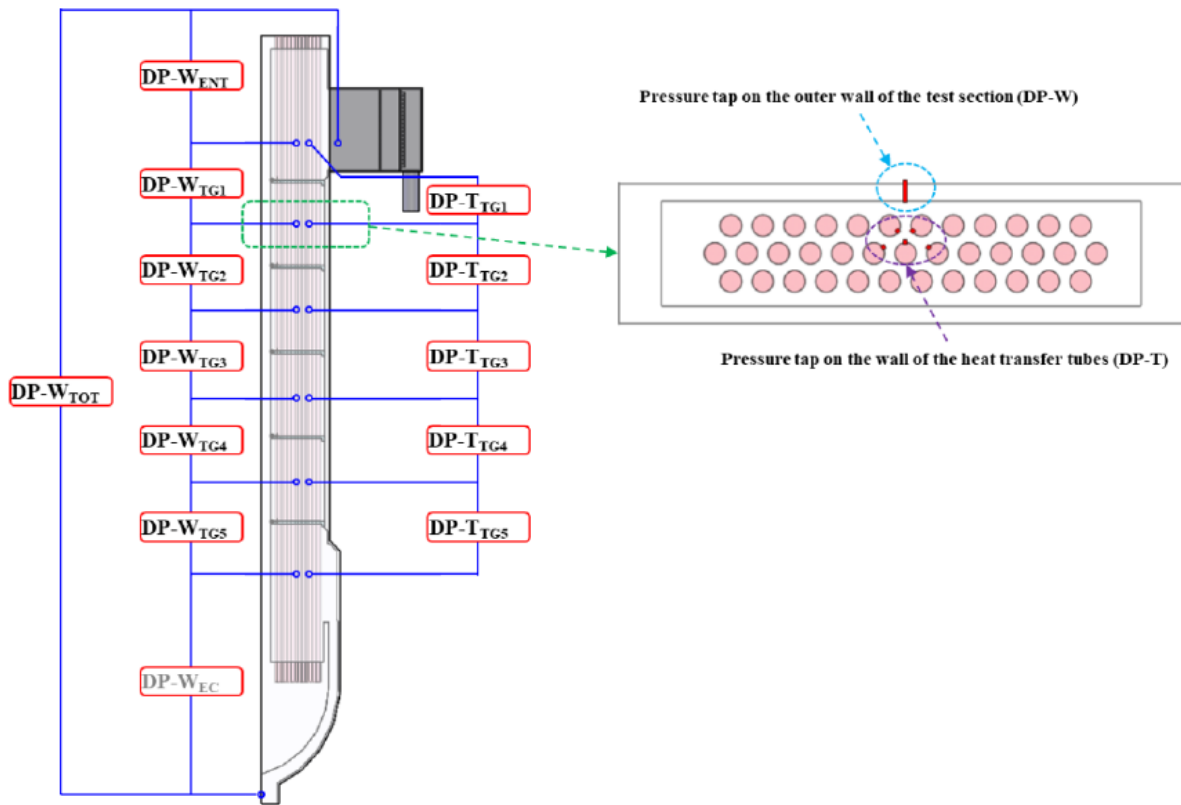
Table 1 Specifications of PRESCO Test Facility

	PGSFR IHX	iHELP
Coolant	Sodium	Water
Temp. (°C)	467.5	35
Press. (MPa)	0.1	0.1
Density (kg/m ³)	849.8	994.0
Viscosity (Ns/m ²)	2.53×10^{-4}	7.20×10^{-4}
Height ratio	1	1
Width ratio	1	1
Volume ratio	1	1/29.6
Hydraulic diameter ratio	1	1
Reynolds number ratio	1	1
Flow hole area ratio	1	1

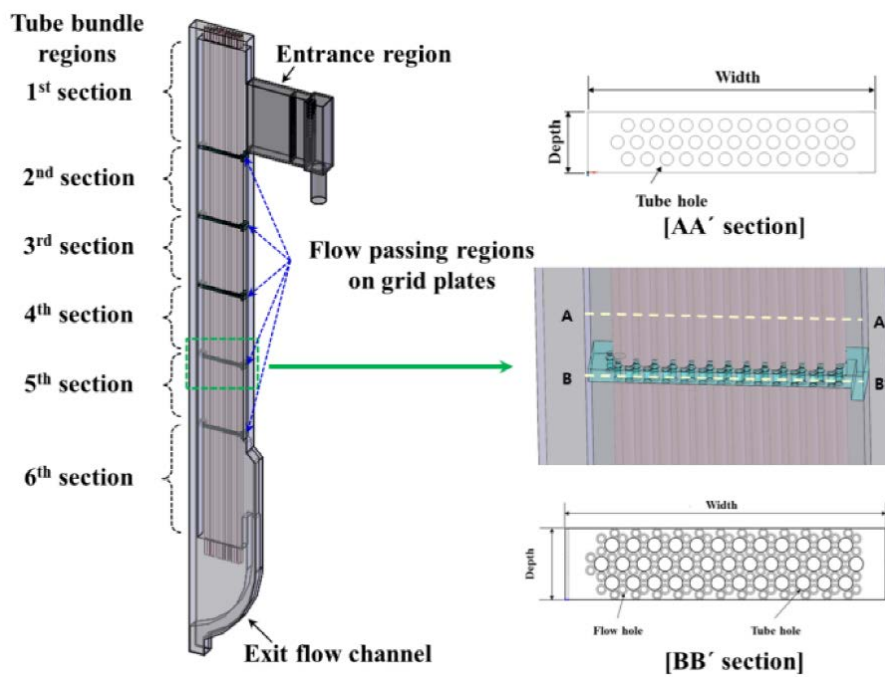
Acceptance of radioactive material

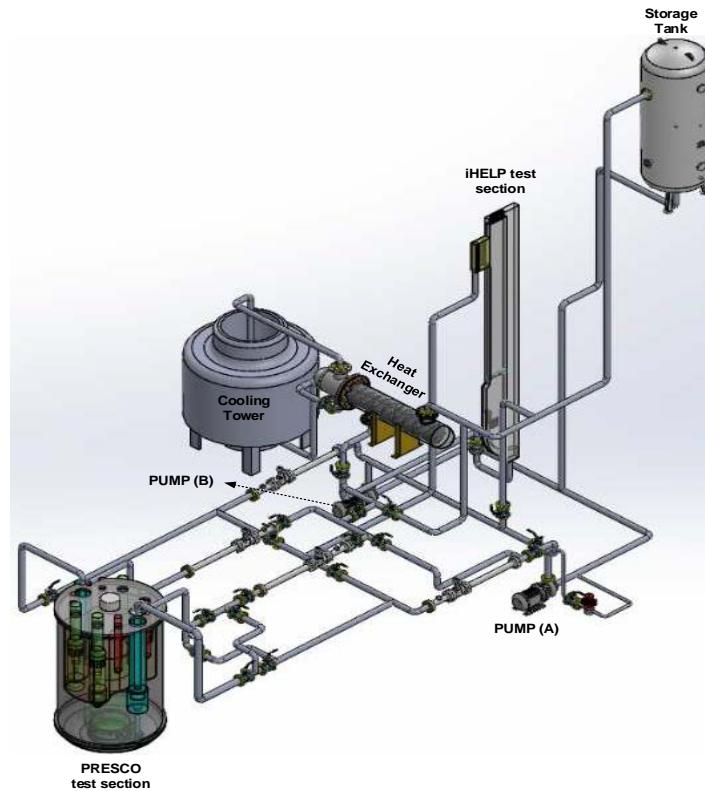
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Scheme/diagram



3D drawing/photo





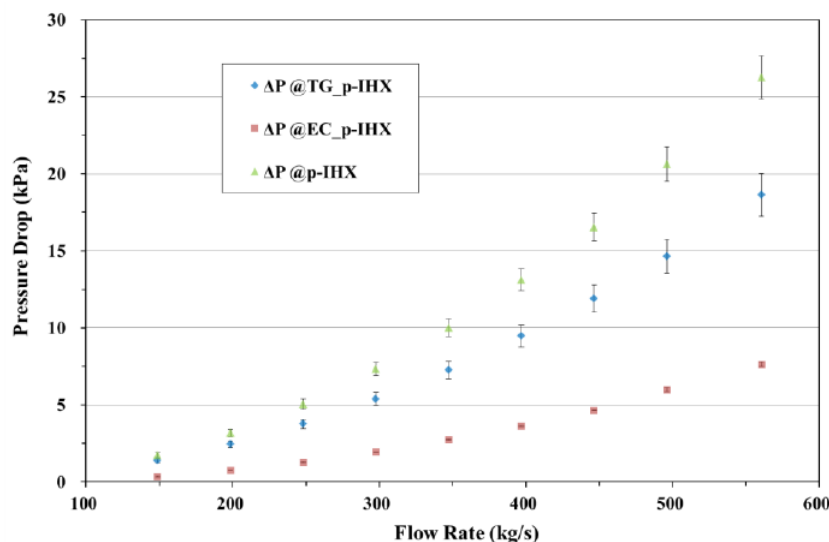
Parameters table

Coolant inventory	9 m ³ at maximum
Power	120 kW
Test sections	
TS #1	<u>Characteristic dimensions</u> Approximately, 6 m (height), 0.12 m (slap width)
	<u>Static/dynamic experiment</u> Static
	<u>Temperature range in the test section (Delta T)</u> 35 °C
	<u>Operating pressure and design pressure</u> Operating Pressure: 101.3 kPa ~ 400 kPa Design pressure: ~0.5 MPa
	<u>Flow range (mass, velocity, etc.)</u> 14.3 ~ 53.9 kg/s
Coolant chemistry measurement and control (active or not, measured parameters)	Not measured
Instrumentation	RTD, Vortex flow meter, Pressure transducer

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

Experiments in the iHELP test facility were performed to identify the pressure drop characteristics at the tube bundle regions with the grid plates. Water (35 °C, 1 atm) instead of sodium (467.5 °C, 1 atm) in the iHELP test section was used as a working fluid and flow rates ranging from 14.3 kg/s to 53.9 kg/s were determined by preserving the Reynolds number in the p-IHX. In each test condition, experiments were conducted six times for repeatability; three times for the tests that used pressure taps manufactured on the outer wall of the test section (TEST ID: DP-W-01~03) and three times for the tests using pressure taps fabricated on the heat transfer tube wall (TEST ID: DP-T-01~03). All data were recorded using the data acquisition system when physical variables reached a steady state.

The pressure drop data base for the shell side of the p-IHX over a wide range of flow rates obtained in the present study was used to improve and verify the pressure drop correlations in the SHXSA code. Moreover, the methodologies used in the study would be useful in dimensional analysis and similarity applications.



Pressure drop at the shell side of the prototype IHX as a function of flow rate

PLANNED EXPERIMENTS (including time schedule)

.

TRAINING ACTIVITIES

REFERENCES (*specification of availability and language*)

- Kong, M., Kim, W.S., Chung, H.J., Choi, H.S., Kim, J.W., Euh, D.J. , “Characterization of Flow Resistance for the Shell Side of IHX in a Prototype SFR”, Transactions of the Korean Nuclear Society Autumn Meeting, Yeosu, Korea, October 25-26, 2018 (En)
- Euh, D.J., Kim, W.S., Choi, H.S., Chang, S.K., Chung, H.J., “Experimental Methods for Flow Identification of the PGSFR Primary Heat Transfer System”, The Twelfth International Topical Meeting on Nuclear Reactor Thermal-Hydraulics, Operation and Safety, Qingdao, China, October 14-18, 2018 (En)
- Chung, H.J., Kong, M., Kim, W.S., Youn, Y.J., Park, J.K., Choi, H.S., Euh, D.J., “Construction Report for Flow Characteristics Test Facility of the SFR IHX,” Korea Atomic Energy Research Institute, KAERI/TR-6629/2016 (Kr)

- Kong, M., Kim, W.S., Chung, H.J., Euh, D.J., “Test Report on the Flow Characteristics of the SFR IHX,” Korea Atomic Energy Research Institute, KAERI/TR-6949/2017 (Kr)