

**Profile LFR-20**  
**KYLIN-II TH MC**  
**CHINA**

**GENERAL INFORMATION**

NAME OF THE FACILITY	KYLIN-II Thermal-Hydraulic Mixed Circulation Loop
ACRONYM	KYLIN-II TH MC
COOLANT(S) OF THE FACILITY	Lead bismuth, lead
LOCATION (address):	Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences (CAS)
OPERATOR	INEST
CONTACT PERSON (name, address, institute, function, telephone, email):	Chao Liu, FDS Team, No.350 Shushanhu Road, Hefei, Anhui, China, INEST, CAS . +86 55165593681, <a href="mailto:Contact@fds.org.cn">Contact@fds.org.cn</a>

<b>STATUS OF THE FACILITY</b>	In operation
Start of operation (date):	2014

<b>MAIN RESEARCH FIELD(S)</b>	<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 checked="" type="checkbox"/> Thermal-hydraulics
	<input checked="" type="checkbox"/> Coolant chemistry
	<input type="checkbox"/> Materials
	<input checked="" type="checkbox"/> Systems and components
	<input checked="" type="checkbox"/> Instrumentation & ISI&R

**TECHNICAL DESCRIPTION**

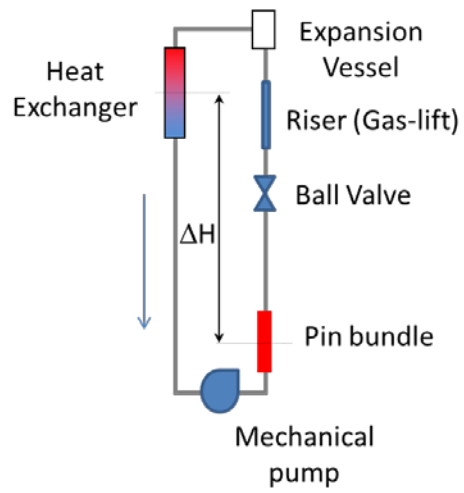
**Description of the facility**

The KYLIN-II mixed circulation loop will allow performing experimental campaigns in the field of the thermal-hydraulics, fluid-dynamics and heat transfer and to essential for the design of nuclear plant cooled by heavy liquid metals. It basically consists of two vertical pipes (O.D. 2.5"), working as riser and downcomer, connected by two horizontal pipes (O.D. 2.5"). In the bottom of the riser a heat source (fuel pin bundle simulator - FPS) must be installed, while a heat exchanger is placed in the upper part of the downcomer. A mechanical pump will be installed in the lower horizontal branch. The loop can use both lead and the lead bismuth eutectic as working fluid. It has been designed to work with 550°C and 10 bar.

**Acceptance of radioactive material**

No

**Scheme/diagram**



**3D drawing/photo**



### Parameters table

Coolant inventory	800L
Power	500kW
Test sections	
TS #1	Integral circulation test and key component validation
	<u>Static/dynamic experiment</u> Dynamic experiment under natural convection, forced convection, and mixed convection
	<u>Temperature range in the test section (Delta T)</u> 250°C to 500°C
	<u>Operating pressure and design pressure</u> 1.2MPa
	<u>Flow range (mass, velocity, etc.)</u> Max. Velocity : 2m/s (FC) , 0.15m/s(NC), 0.5m/s(GEC)
Coolant chemistry measurement and control (active or not, measured parameters)	YES, Oxygen Control System
Instrumentation	Thermocouples, pressure transducer, Gas injection system, Induction flow meters.

### COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

- ✓ FPS test natural circulation start up; loss of flow accident; gas injection circulation.
- ✓ Thermal-hydraulics characterization of natural and forced circulation under steady and transient condition

### PLANNED EXPERIMENTS (including time schedule)

Experiments:

- ✓ Heat transfer, pressure drop, cladding temperature on fuel pin assembly
- ✓ Overall heat transfer coefficients and efficiency of heat exchanger
- ✓ Thermal-hydraulics model development and validation
- ✓ Gas injection enhanced circulation research
- ✓ Gas phase oxygen control, filtering and getter
- ✓ LOFA

### TRAINING ACTIVITIES

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

### REFERENCES (*specification of availability and language*)

- [1] Sheng gao, liuli chen, kefeng lv, chenchong yue, mariano tarantino, qunying huang, yican wu, Experimental study on natural circulation and gas injection enhanced circulation in KYLN-II mixed circulation loop, NURETH-16, CHICAGO, IL, AUGUST 30-SEPTEMBER 4, 2015, 7426-7433.
- [2] Kefeng Lv, Liuli Chen, Chenchong Yue, Sheng Gao, Tao Zhou, Qunying Huang, Preliminary thermal-hydraulic sub-channel analysis of 61 wire-wrapped bundle cooled by lead bismuth eutectic, Annals of Nuclear Energy 92 (2016) 243–250.