

Profile SFR-1

CEDI

CHINA

GENERAL INFORMATION

NAME OF THE FACILITY	CEDI
ACRONYM	CEDI
COOLANT(S) OF THE FACILITY	SODIUM
LOCATION (address):	China Institute of Atomic Energy(CIAE), Fangshan District, Beijing,China
OPERATOR	CIAE
CONTACT PERSON (name, address, institute, function, telephone, email):	XU Yijun, China Institute of Atomic Energy, Department of Fast Reactor Research and Design, Tel:+86-10-69358195 , Mail:juntaxu2008@163.com

STATUS OF THE FACILITY	Standby
Start of operation (date):	1976

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

TECHNICAL DESCRIPTION

Description of the facility

As one of few large-scale high temperature sodium test loop in the world, CEDI can accommodate sodium fast reactor full-size fuel assembly simulators and simulates its thermal hydraulic characteristics under the condition of operation temperature and flow rate in the reactor. The facility also can be used to the long-time high temperature test for a single fuel assembly simulator or a set of typical 7 fuel assemblies in the similar condition to the reactor.

The thermal shock test can be used to check the mechanical characteristics of the fuel subassembly when the reactor was in accident conditions or non-typical operation condition.

The CEDI test loop consists of a main loop and some auxiliary loops, including the sodium filling and discharging loop, sodium purification loop, cover argon gas loop, sodium overflow loop and so on. The main loop consists of a sodium centrifugal circulation mechanical pump, a heater section without air chamber, an air cooler with only pipes, a test section with air chamber and pipes and sodium valves connecting all above-mentioned equipment. It is connected by 10 inch pipes from the exit of experimental section, to the heater and air cooler, then to the entrance of centrifugal pump. In the main loop, there is a bypass of the experimental section where an electric control valve of 2-inch caliber is settled. This bypass is used for the long-time high temperature test and thermal shock experiment of assemblies in PEC reactor.

As to the purification system loop, it is composed of an electromagnetic pump, two reverse-flow heat regenerators, a continuous measurement meter of oxygen content, two alternative cold traps, a straight-through sampler. Connecting above-mentioned equipment with 1/2 inch pipe and then forms the sodium purification system. It can purify the sodium loaded for the first time, then maintain the purity quality of the main loop during the operation time.

About the Cover Ar gas system, it is composed of 2-inch pipes and special pneumatic valves (or hand-operated valves). It connects free surface of all chambers of equipment of the loop to realize the protective functions.

Sodium discharging loop is composed of 2 inch pipe and pneumatic valves (or hand-operated valves). It connects with main loop and purification system. To discharge all the sodium in the kinds of pipe and equipment in the main loop, this loop connects the sodium storage tank. Sodium filling loop is same as the sodium discharging loop except that the filters are used in this loop.

About the Sodium overflow loop it is actually the same pipe with the cover Ar gas system. Its main function is that sodium can run back to sodium storage tank automatically when sodium surface overpasses the pre-set level. It can also balance pressure between sodium loop system and sodium storage tank. This function has an important significance when discharging sodium urgently.

Auxiliary cleaning facility can be used the heated nitrogen to clean the post-test assemblies. It's composed of 1 inch nitrogen pipe, washing well and an exhausting gas filter. Armored electric heating wire is settled along the pipes.

Acceptance of radioactive material

No

Scheme/diagram

Coolant inventory	15000kg
Power	Max 450 kW
Test sections	
TS #1	<u>Characteristic dimensions</u> inside diameter 411 mm Overall height →8000 mm
	<u>Static/dynamic experiment</u> Dynamic
	<u>Temperature range in the test section (Delta T)</u> The maximum operation temperature is 600°C for sodium and the maximum temperature difference is 200°C for the subassembly simulator thermal shock test.
	<u>Operating pressure and design pressure</u> Operating Pressure →0.9MPa (gauge) Design pressure →1.2MPa (gauge)
	<u>Flow range (mass, velocity, etc.)</u> The maximum sodium flow rate is 320m ³ /h
Coolant chemistry measurement and control (active or not, measured parameters)	There are two cold traps in the circuit to guarantee the sodium purification process on line. The plugging temperature in the meter is lower than 130 °C when the circuit is on operation. The off-line measurement of the oxygen content dissolved in the melt can be used and the limits for this is lower than 12ppm.
Instrumentation	Thermocouples, pressure transducer, Gas injection system, flow meters,

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

CEDI test loop rebuilt in CIAE in 1995 to 2000. After that it was not used until now.

PLANNED EXPERIMENTS (including time schedule)

Neither the new fuel rods subassemblies nor the other steel shielding rods, they should have the high temperature lasting tests before they will be put into the reactor. So in the future, homemade rods will be tested in this facility and a series of tests including thermal shock tests will be done.

TRAINING ACTIVITIES

Training activities can be available for the CEDI facility, especially for the new staff of reactor operators and sodium loop designer and researcher.

REFERENCES (*specification of availability and language*)

- [1] BASILI R., , Maintenance Manual of CEDI loop , 1987.10,VI-WGB00017, ENEA - Brasimone Research Centre (Italy).
- [2] BENOIST E., CABBILLARD M., QUINET J.L.: Experience with sodium purification of large-scale operation test loops in France. Int.Conf.on Lip.Met.Tech.in English,Prod.Champion May 1976.Conf760503-P1.