Profile SFR-23

PENELOPE

FRANCE

GENERAL INFORMATION

NAME OF THE FACILITY	PENELOPE
ACRONYM	PENELOPE
COOLANT(S) OF THE FACILITY	Sodium
LOCATION (address):	CEA Cadarache, 13108 Saint Paul Lez Durance FRANCE
OPERATOR	CEA
CONTACT PERSON (name, address, institute, function, telephone, email):	. GASTALDI CEA Cadarache Building 208, 13108 Saint Paul Lez Durance, FRANCE Sodium Technology and Components Project Manager +33 4 42 25 46 40 Olivier.gastaldi@cea.fr
STATUS OF THE FACILITY	In operation
Start of operation (date):	1980

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

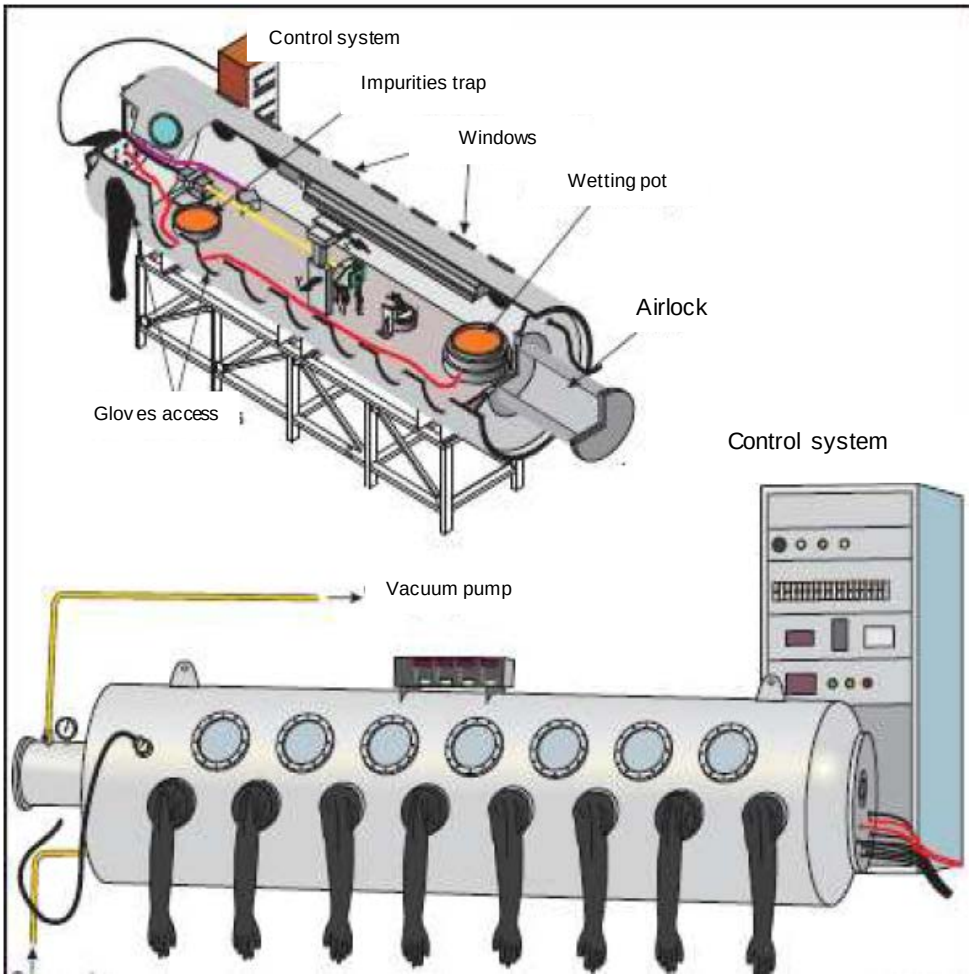
PENELOPE is a versatile glove box in which up to 3 pots of static sodium can be implemented. The largest sodium pot capacity is about 8 litres. This glove box has many accesses (16 gloves) to facilitate handling of experimental devices. It does not have any sodium purification unit. Argon is used as cover gas in order to limit sodium pollution and a slight overpressure is maintained (3 to 5 mbar). In order to trap oxygen and moisture a dedicated sodium pot is used and acts as a trapping

system. It allows to maintain oxygen content in Ar below 200 vpm. A new purification argon unit must be implemented soon. The glove box is dedicated to run instrumentation and materials short tests in liquid sodium with a temperature not exceeding 500 °C.

Acceptance of radioactive material

No

Scheme/diagram



3D drawing/photo

Parameters table

Coolant inventory	20 kg of liquid sodium
Power	~ 7 kW
Test sections	
TS #1	*Characteristic dimensions* Size of the glove box: 3500 mm length, volume of 3 m^3 3 Sodium pots : - maximum mass of sodium per pot : 8 kg - diameter : 326 mm
	Static/dynamic experiment static
	Temperature range in the test section (Delta T) 110-500°C for experimentation in liquid sodium
	Operating pressure and design pressure Operating pressure: 3-5 mbar Pressure of relief valve: 70 mbar
	Flow range (mass, velocity, etc.) N.A.
Coolant chemistry measurement and control (active or not, measured parameters)	none
Instrumentation	Temperature and pressure measurement

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

- Welding tests on samples of stainless steel after sodium wetting, YAG laser sodium cleaning on samples wetted with sodium, sodium cleaning tests by hot argon blowing hot and brushing.

- Laser telemetry on sodium wetted metallic target.
- Filling and sodium wetting of models representing specific retentions located in the tanks and auxiliary circuits of Fast Neutron reactors Sodium type Rapsodie, Phenix and SUPERPHÉNIX. These models were then transferred to the test Carnac or ENCRINE devices for conducting qualification tests carbonation process.
- Realization of mechanical cutting of small components filled with sodium
- First qualification tests of ultrasonic sensors for inspection and monitoring of fast neutron reactors cooled sodium (piezoelements based transducers or EMAT transducers).
- Evaluation of behaviour of different mechanical connection.
- Evaluation of optical fibres compatibility and response in liquid sodium.

PLANNED EXPERIMENTS (including time schedule)

Evaluation of new ultrasonic transducers:

- New monoelement transducers : 2014-2015
- full array matrix transducers 2014-2016 in different configurations

Evaluation of behaviour of robotics development in liquid sodium (small electrical motor, rotatable connection) 2014-2015

TRAINING ACTIVITIES

none

REFERENCES (*specification of availability and language*)

C. Lhuillier, O. Descombin, F. Baqué, B. Marchand, J.F. Saillant
In Sodium Tests of Ultrasonic Transducers
ANIMMA, international conference, Gand, Belgium, June 2011

J-F.Saillant, O.Martin, S.Charrier, F.Baqué, J.Sibilo
Ultrasonic transducers for Sodium cooled reactors
10th International Conference on NDE in Relation to Structural Integrity for Nuclear and Pressurized Components, Cannes, France, october 2013

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