

Profile SFR-26
SUPERFENNEC
FRANCE

GENERAL INFORMATION

NAME OF THE FACILITY	SUPERPHENIX boucle sodium Ecole (Superphenix training sodium loop)
ACRONYM	SUPERFENNEC
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):	O. 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)	<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 type="checkbox"/> Thermal-hydraulics
	<input checked="" type="checkbox"/> Coolant chemistry
	<input type="checkbox"/> Materials
	<input type="checkbox"/> Systems and components
	<input checked="" type="checkbox"/> Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

The SUPERFENNEC facility is designed to introduce trainees to the operation of a sodium loop. This circuit is also used to test small components and instrumentation.

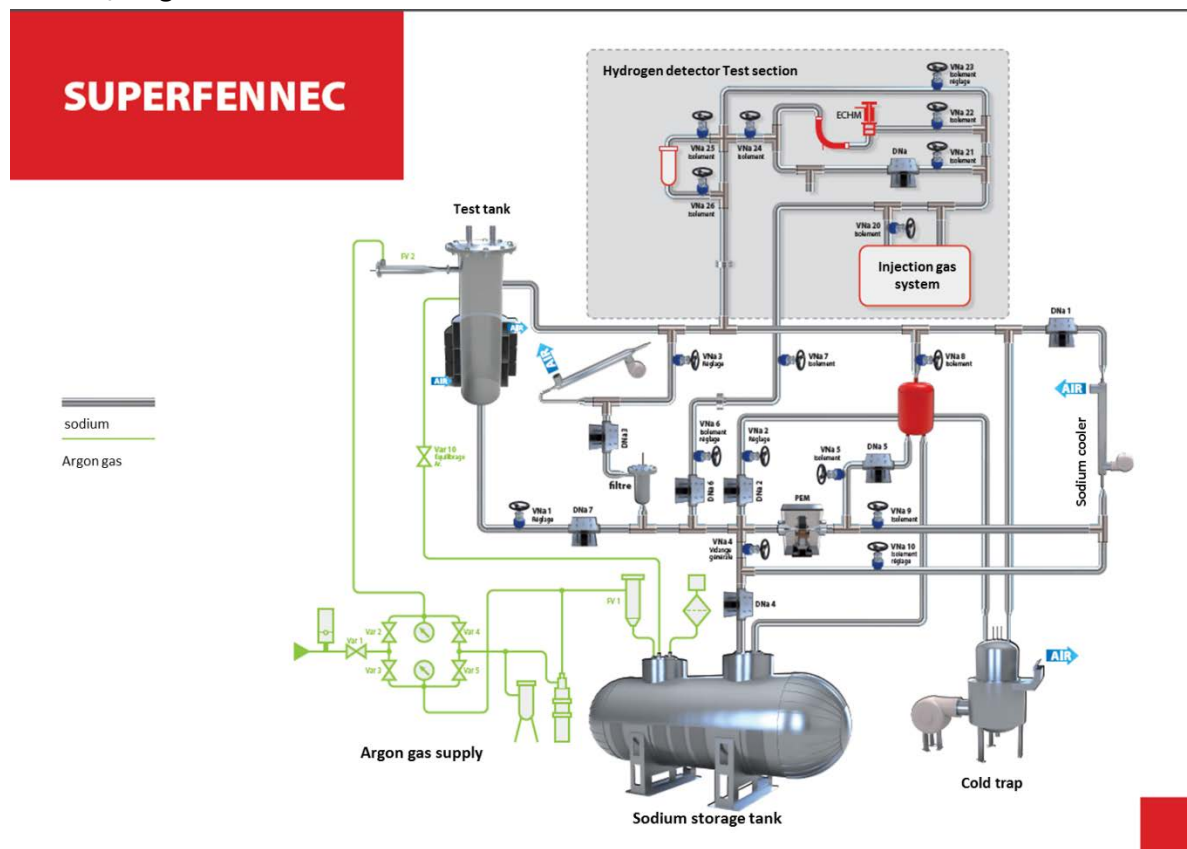
This loop is composed of 2 tests sections. The first one is a sodium pot of about 60 liters operating at a maximum temperature of 500°C. The second tests section is a dynamic test section. Between two flanges separated by a distance of about 1 m, a specific test section can be adapted to a dedicated need.

This facility handles sodium with a high chemical quality obtained through an active purification system. The classical subsystems of such sodium facility are present: storage vessel, cold trap, plugging indicator... The atmosphere above sodium surface is composed of Argon which its pressure is regulated at a slight overpressure, to prevent air ingress.

Acceptance of radioactive material

No

Scheme/diagram



3D drawing/photo



Parameters table

Coolant inventory	150 L
Power	Click here to enter text.
Test sections	
TS #1	<u>Characteristic dimensions</u> Maximum sodium capacity: 45 liters Inner diameter: 200 mm Total height of the vessel: 1400 mm
	<u>Static/dynamic experiment</u> Static or dynamic (low sodium velocity $\sim 1.75 \text{ cm}\cdot\text{s}^{-1}$) experiments can be achieved
	<u>Temperature range in the test section (Delta T)</u> 150°C to 500°C
	<u>Operating pressure and design pressure</u> Maximum operating pressure: 0.5 rel. bar
	<u>Flow range (mass, velocity, etc.)</u> $2 \text{ m}^3\cdot\text{h}^{-1}$
TS #2	<u>Characteristic dimensions</u> A length of about 1 m is available between the flanges of this test section. The geometry can be adapted to the need.
	<u>Static/dynamic experiment</u> Dynamic
	<u>Temperature range in the test section (Delta T)</u> 150°C to 500°C
	<u>Operating pressure and design pressure</u> Maximum operating pressure: 0.5 rel. bar

	<u>Flow range (mass, velocity, etc.)</u> 2 to 4 m ³ .h ⁻¹
Coolant chemistry measurement and control (active or not, measured parameters)	Active coolant quality measurement and control (purification with a cold trap on a by passed flow: 1 m ³ /h and impurities level < few ppm and impurities content evaluation by a plugging indicator)
Instrumentation	Thermocouples Argon pressure measurement Sodium pressure measurement Inductive level probes Electromagnetic flowmeters

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

Most of the experimental campaigns achieved on SUPERFENNEC facility are devoted to teaching and training of sodium circuit operators (learning and recycling). The main points of this training programme are:

- Purification of sodium
- Operation on sodium circuit
- Intervention on sodium circuit

In parallel SUPERFENNEC is used for scientific purpose. For example the two last campaigns were dealing with instrumentation testing:

- Hydrogen detection (Electrochemical probe and permeation system))
- Eddy current flow meter, small components (sodium valve prototype)

PLANNED EXPERIMENTS (including time schedule)

Experiments on hydrogen introduction in sodium mock-up (permeation system) are planned in 2019. Main objective is to develop a method to trap tritium in SFR.

TRAINING ACTIVITIES

Yes

REFERENCES (*specification of availability and language*)

G. RODRIGUEZ., F. BAQUE, J.C. ASTEGIANO, "Evolution of Sodium Technology R&D Actions Supporting French Liquid-Metal Fast Breeder Reactors", Nuclear Technology, Volume 150, Number 1, April 2005, pages 3-15.

G. RODRIGUEZ, L. AYRAULT, J. DUMESNIL E. SANSEIGNE, F. DUJET, B. COLLARD, F. SERRE, C. JOURNEAU

Development of experimental facility platform in support of the ASTRID program, Proc of IAEA FR13 conference, Paris, France, march 4-7, 2013

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Experimental platforms in support of the ASTRID program: existing and planned facilities,
Proceedings of ICAPP 2014, Charlotte, USA, April 6-9, 2014, Paper 14060

R. Sridharan, R. Ganesan, R. Parthasarathy, S. Nagaraj and S. Premalatha : Materials Chemistry
Division (AED), Indira Gandhi Centre for Atomic Research, Kalpakkam, India

M. Girard, K. Paumel : CEA Cadarache, France

Testing of electrochemical hydrogen meter in a sodium facility in Cadarache

Fr 17_ International Conference on Fast Reactors and Related Fuel Cycles (AIEA), June 26-29, 2017,
Yekaterinburg, Russian Federation

K. Paumel and al., "Eddy current flowmeters at core outlet in French sodium fast reactors", 10th
PAMIR International Conference - Fundamental and Applied MHD, Cagliari, Italy, June 20-24, 2016.