Profile SFR-22

PEMDYN

FRANCE

GENERAL INFORMATION

NAME OF THE FACILITY	PEMDYN (Electromagnetic Pump in Dynamic Conditions)
ACRONYM	PEMDYN
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):	2015

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

This facility called PEMDYN consists in a simple closed loop connecting in a serial arrangement an ALIP EMP (Annular Linear Induction Pump, Electro Magnetic Pumps), heat exchangers and a regulating valve. A test section is placed for reservation for implementing additional instrumentations. The facility is instrumented in order to acquire data on mass flow measurement, pressure drop and to measure the magnetohydrodynamic instabilities. The objective of this facility is

to reach a sufficient sodium velocity in order to obtain instabilities to better understand and model them. It implies to reach a sodium velocity of about 8 to 10 $m.s^{-1}$.

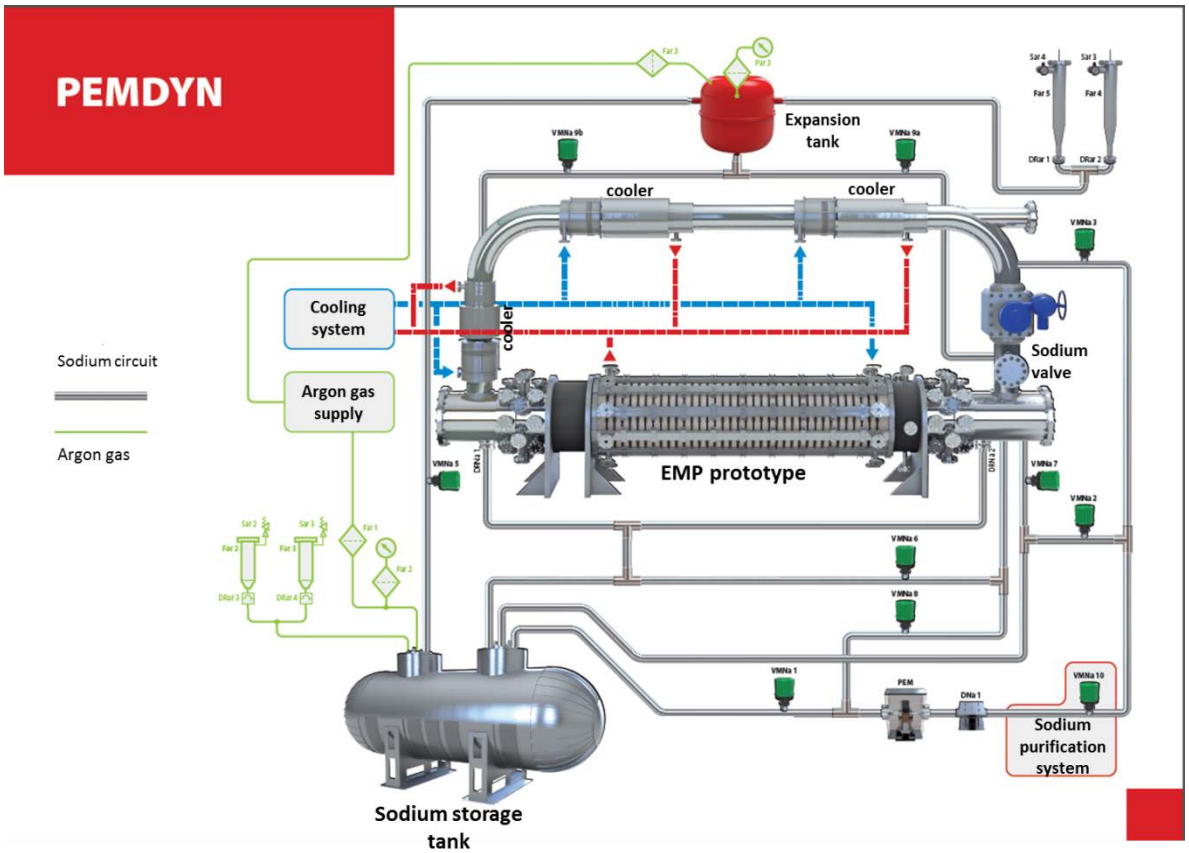
The ALIP EMP pump used on this facility has an active length of 2 m, gap thickness: 0.02 to 0.05 m, electrical input frequency : 5-25 Hz, typical value of the magnetic field : from 0.05 to 0.1 T, sodium average velocity: up to 10 $m.s^{-1}$ (with 200 mm pipe diameter, flowrate is about 1200 $m^3.h^{-1}$), magnetic Reynolds number : higher than 10, operating temperature of sodium : 115°C to 220°C.

All classical components of a sodium loop are present: storage vessel, cold trap, plugging indicator… The atmosphere above sodium surface is composed of Argon.

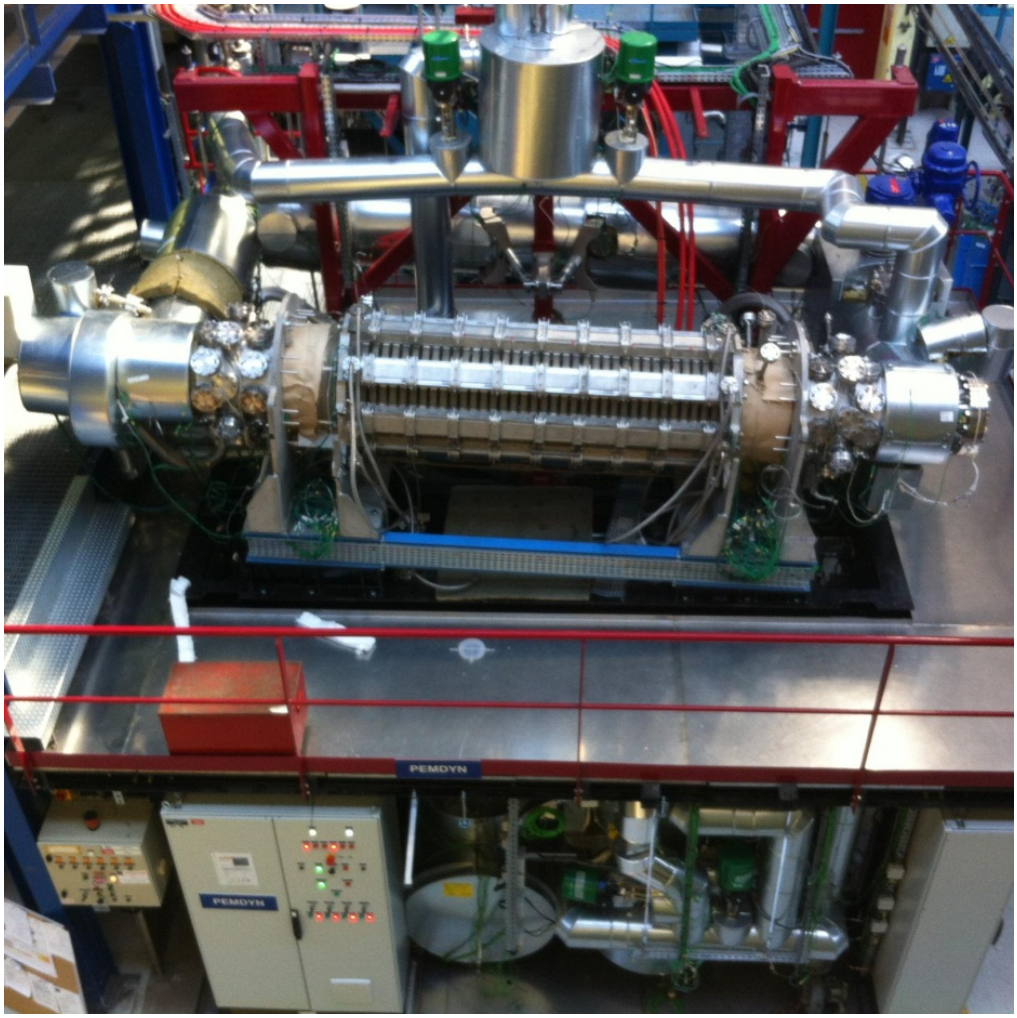
Acceptance of radioactive material

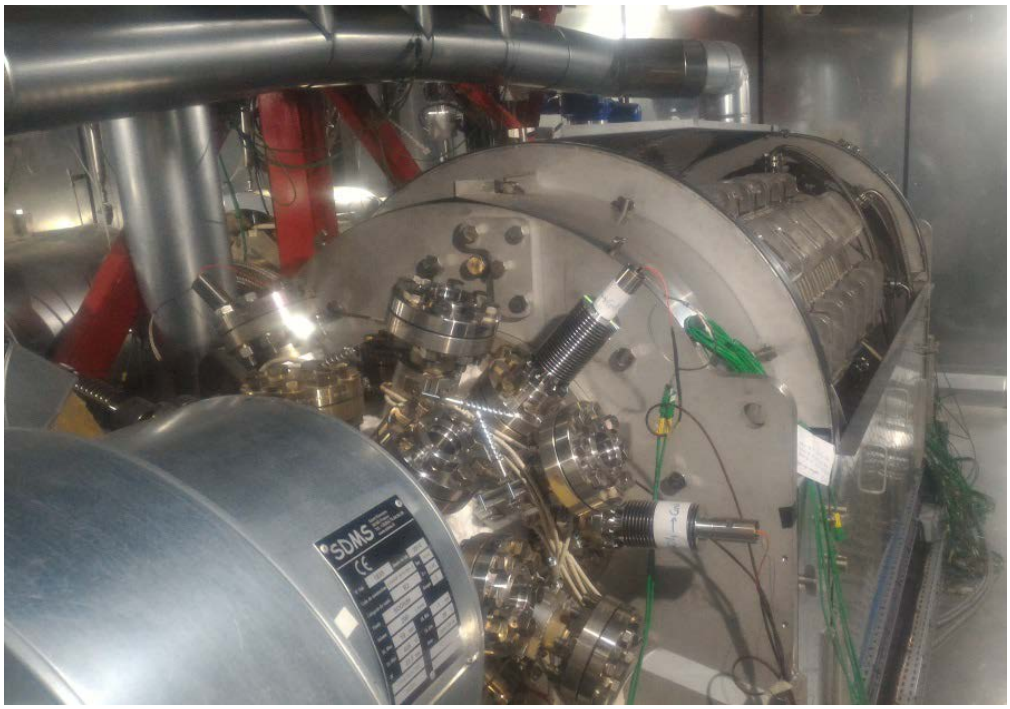
No

Scheme/diagram



3D drawing/photo





Parameters table

Coolant inventory	1 m^3
Power	400 kW
Test sections	
TS #1	*Characteristic dimensions* The test section is the EMP itself. • Active length of 2 m, • Gap thickness: 0.02 to 0.05 m, • Electrical input frequency : 5-25 Hz, • Typical value of the magnetic field : from 0.05 to 0.1 T, • Sodium average velocity: up to 10 $m.s^{-1}$
	Static/dynamic experiment Dynamic
	Temperature range in the test section (Delta T) 115 to 220°C
	Operating pressure and design pressure Maximum operating pressure: 10 bars abs
	Flow range (mass, velocity, etc.) Maximum sodium flowrate: 1450 $m^3.h^{-1}$
Coolant chemistry measurement and control (active or not, measured parameters)	Active coolant quality measurement and control (purification on a by passed flow: 1 m^3/h and impurities level < few ppm)
Instrumentation	Thermocouples Sodium pressure measurement Argon pressure measurement Inductive level probes Electromagnetic flowmeters Ultrasound Doppler Velocimetry (UDV)

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

By the end of 2015 PEMDYN facility was put in operation. EMP performance map experiments had been started in 2016 and achieved at the beginning of 2017. The second kind of experiment devoted to the study of magneto hydro dynamic instabilities at high has started in 2017 and magnetic Reynolds number has been performed until 2018.

PLANNED EXPERIMENTS (including time schedule)

In 2019, a new hydro-dynamic instabilities test campaign is planned.

TRAINING ACTIVITIES

No

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