

**Profile LFR-6**

**LILIPUTTER**

**BELGIUM**

**GENERAL INFORMATION**

NAME OF THE FACILITY LIquid Lead alloy Innovative PUmp Technology TEst Rig  
ACRONYM LILIPUTTER  
COOLANT(S) OF THE FACILITY Lead-Bismuth Eutectic (LBE)  
LOCATION (address): SCK•CEN, Boeretang 200, 2400, Mol, Belgium  
OPERATOR SCK•CEN  
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**STATUS OF THE FACILITY**

Start of operation (date):

In operation

**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

LILIPUTTER is a small loop constructed before 2010 to determine the behaviour of a screw spindle pump in lead-bismuth. More recently, the loop has been rebuilt into Liliputter-II in order to study the efficiency of several filter media to remove suspended solid impurities from LBE. This reconversion included the installation of a filter test section which houses either 4" diameter filter disks or 20" long filter cartridges, a differential pressure measurement and a dedicated tank for controlled addition of impurities such as nickel. In addition an automated gas-liquid oxygen control system was installed. Operation of LILIPUTTER-II has started in May, 2013. Liliputter II is also used as a test bench for instrumentation that, in a later stage, is to be installed in other experiments at SCK•CEN

### Acceptance of radioactive material

No

### Scheme/diagram

### 3D drawing/photo

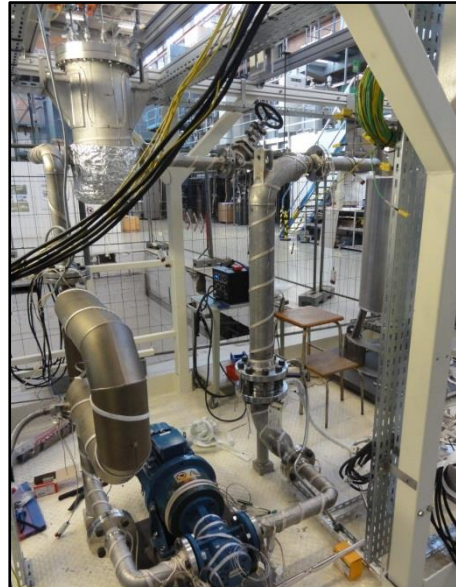
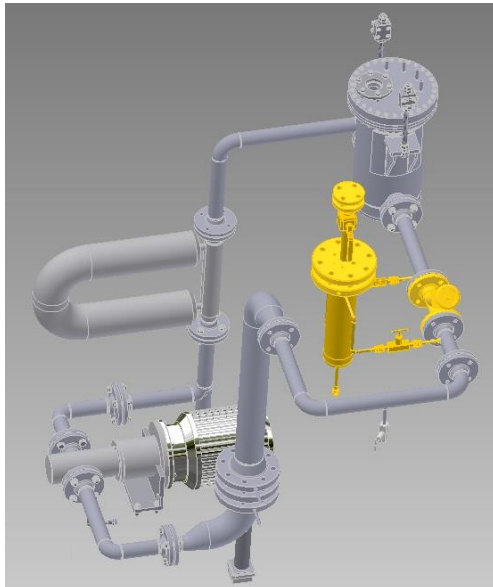


FIG. 1. View of the LILIPUTTER facility

### Parameters table

Coolant inventory	855 kg
Power	11 kW
Test sections	
TS #1	<u>Characteristic dimensions</u>
	Filter section for 4" filter discs
	<u>Static/dynamic experiment</u> dynamic
	<u>Temperature range in the test section (<math>\Delta T</math>)</u>

	200 °C in test section; 400 °C in impurity tank
	<u>Operating pressure and design pressure</u> <b>10 bar</b>
	<u>Flow range (mass, velocity, etc.)</u> 10 l/s max
Coolant chemistry measurement and control (active or not, measured parameters)	n/a
Instrumentation	thermocouples, Coriolis flow meter, differential pressure measurement, pump power monitoring

## COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

LILIPUTTER was used to investigate the behaviour of a near volumetric screw-spindle pump in LBE. Screw-spindle pumps are good solutions in cases where high pressures and controllable (volumetric) flow is needed. However, due to the relatively low viscosity of the liquid and high operation temperature, the management of the tolerances between the moving parts of the pump is critical. Experimental tests with this type of pump were performed including measurements of the pump performance, back stream flow, and reliability. These showed that the use of a screw-spindle type pump with LBE is feasible.

LiLiputter-II was also used for tests with 4" sintered SS and SS fiber filter discs, with a 20 – 60 µm filter rating. Differential pressure measurements over filters during operation at 200 °C were performed. After the tests, the collected slug was investigated by optical microscopy, SEM and EDX

## PLANNED EXPERIMENTS (including time schedule)

At present the LILIPUTTER-II loop is used for validation of instrumentation required for planned flow-induced vibration experiments in the COMLOT loop. These will run until mid 2015. After that, further filtering tests are foreseen.

## TRAINING ACTIVITIES

Training activities are possible, availability allowing and after prior agreement under supervision of SCK•CEN Qualified staff.

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