Profile LFR-12

MYRRHABELLE

BELGIUM

GENERAL INFORMATION

NAME OF THE FACILITY	MYRRHA Basic sEt-up for Liquid fLow Experiments
ACRONYM	MYRRHABELLE
COOLANT(S) OF THE FACILITY	Water
LOCATION (address):	von Karman Institute for Fluid Dynamics, Waterloosesteenweg, 72 – 1640, Sint-Genesius-Rode, Belgium
OPERATOR	VKI
CONTACT PERSON (name, address, institute, function, telephone, email):	Philippe Planquart, von Karman Institute for Fluid Dynamics, Waterloosesteenweg, 72– 1640 Sint-Genesius-Rode, Research Manager, Tel. +32 2 3599677, philippe.planquart@vki.ac.be

STATUS OF THE FACILITY	In operation
Start of operation (date):	2014

MAIN RESEARCH FIELD(S)

	Zero power facility for V&V and licensing purposes
	Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
X	Thermal-hydraulics
	Coolant chemistry
	Materials
	Systems and components
	Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

The MYRRHABELLE facility is a full Plexiglass model at a scale 1/5 of the design version 1.2 of MYRRHA. It has been named MYRRHABELLE for MYRRHA Basic SEt-up for Liquid FLow Experiments. The model follows the in-vessel design and combines the lower plenum and the upper plenum with the diaphragm separating the two plenums (figure 1). It is equipped with 16 electrical heaters to simulate the core (maximum heating capacity of 48 kW), with the two pumps immersed like in the MYRRHA design and with four water-cooled heat exchangers immersed in the upper plenum (cooling capacity of 12 kW each). The free surface of the water model is at atmospheric pressure.

The water model is designated for a nominal water flow rate of 5.6 kg/s but the flow rate can be increased to 10 kg/s. The model is mainly built in Plexiglas for optical access and non-intrusive optical measurements. The maximum □T that is allowed during the tests is limited to 30°C. The MYRAHHBELLE facility allows performing water model tests with a Richardson number ranging between 0.01 and 1000.

Figure 2 shows a picture of the water model representing the Upper Plenum illuminated by a Laser Sheet. The heating elements used to simulate the heat source at the core level can be seen in the background, which the feeding electrical cables leaving in zigzag the model at the level of the free surface. One copper heat exchanger is clearly visible in the frontal part of the picture. One the left side of the water model, we can distinguish partially one pomp.

Acceptance of radioactive material
No

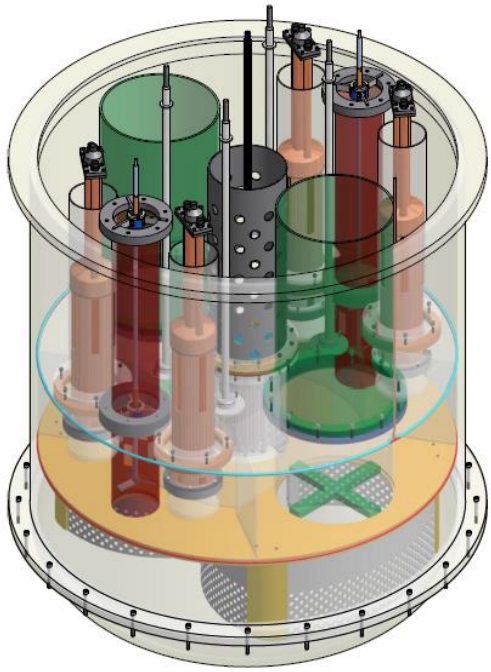

FIG. 1. CAD of the MYRRAHABELLE facility

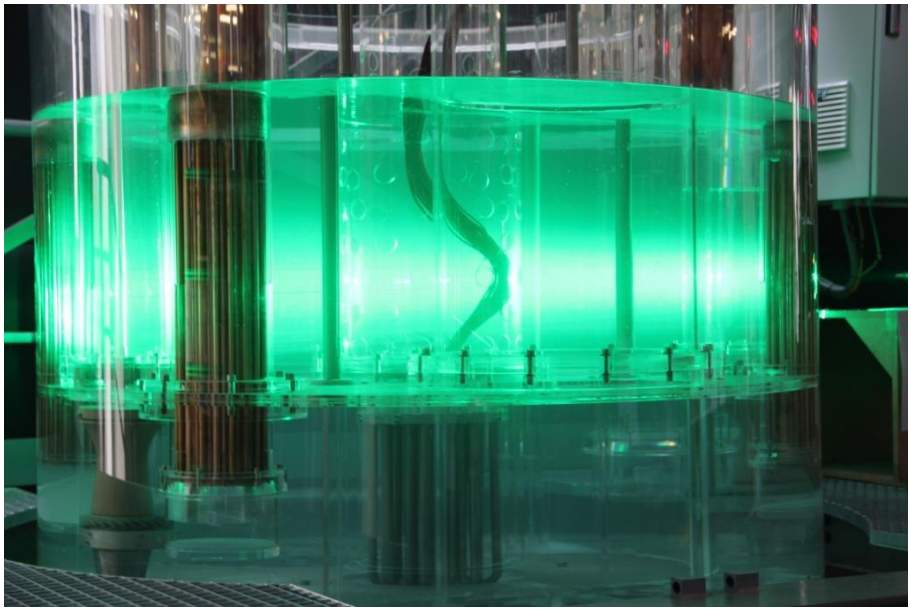

FIG. 2. Laser sheet through the Upper Plenum of MYRRHABELLE

Parameters table

Coolant inventory	Water → 4000 kg
Power	0-48 kW
Test sections	
MYRRAHABELLE	*Characteristic dimensions* Vessel diameter 1596 mm Overall height → 2048 mm
	Static/dynamic experiment Dynamic
	Temperature range in the test section (Delta T) Operating temperature: 30°C
	Operating pressure and design pressure Operating Pressure → atmospheric Design pressure → atmospheric
	Flow range (mass, velocity, etc.) 0-10 kg/s
Coolant chemistry measurement and control	
Instrumentation	Thermocouples, pressure sensors, PIV (Particle Image Velocimetry), LDV (Laser Doppler Velocimetry), Electromagnetic flow meter.

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

Thermal-hydraulic experiments have been performed since March 2014. The facility has been updated in 2014 to follow as close as possible the design version 1.2 of MYRRHA (Euler similarity). Velocity measurements using the PIV technique (Particle Image Velocimetry)

have provided 2D velocity maps inside the Upper Plenum. Temperature measurements with thermocouples have provided time-resolved thermal characterisation of the facility for the nominal condition and the natural convection situation.

PLANNED EXPERIMENTS (including time schedule)

The next experimental campaign to be completed within 2015 concerns further thermal-hydraulics characterization to provide experimental database for CFD code validation.
Thermal-hydraulic characterization will be performed for different Richardson number and different Euler number.
The facility will also be used to acquire a database in natural convection regime, simulating natural decay power.

TRAINING ACTIVITIES

Training activities can be agreed with VKI (after agreement from SCK•CEN).

REFERENCES (*specification of availability and language*)

1. PLANQUART P., SPACCAPANICCIA C., BUCKINGHAM S., VAN TICHELEN K., Water Model for the Thermal-Hydraulic Study of MYRRHA, *THINS 2014 International Workshop*, Modena, Italy (2014), English