

The NICODEME contract, a new opportunity offered to European research teams or manufacturers

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EDF Research and Development Section has decided to offer a new opportunity to European research teams or manufacturers with the financial help of the European Commission. EDF R&D proposes an access to its research infrastructure in order to carry out experimental tests for assessment and improvement of nuclear safety.

CYHERE test facility description

The CYHERE test facility is able to perform thermal shocks cycling experiments on valves, fittings and others components by an alternate circulation of the cold and hot fluids through the test section. The maximum difference on temperature is 260°C under a maximum pressure of 176 bar. The flowrate can reach up to 100 m³/h.



CYPRES and CYHERE test facilities

CYHERE test facility performances

Fluid	Maximum service pressure	Temperature	Flowrate	Volume	Electrical power	Remarks
Pressurized water	$15 \leq P \leq 175$ bar	$50 \leq T \leq 295^\circ\text{C}$	$0,40 \leq Q \leq 15,5$ kg/s			Thermal shocks
Pressurized water	$15 \leq P \leq 175$ bar	$50 \leq T \leq 295^\circ\text{C}$	$0,40 \leq Q \leq 31$ kg/s		B01CT and B02CT : 650 kW for each tank	Water circulation
Pressurized water	$15 \leq P \leq 175$ bar	$50 \leq T \leq 295^\circ\text{C}$	Hot water ≤ 3 kg/s cold water ≤ 21 kg/s			Check valve test $\Delta T_{\text{max}} = 245^\circ\text{C}$

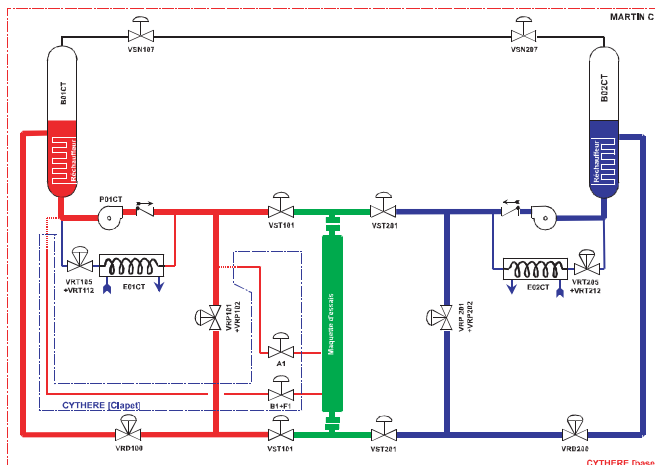
Main advantages of the CYHERE test facility and type of performed tests

- The main advantages of the CYHERE test facility are:
- Its capability to perform a high number of thermal cycles in a limited period of time,
 - The high amplitude of the thermal shock (up to 260°C),
 - The very good repeatability of the thermal and pressure parameters between each cycle,
 - The very short duration of the thermal transient (0,4 second).

On the CYHERE test facility, our team of researchers has experience of a large number of tests, including:

- Thermal shocks tests,
- Pressurized water circulation tests,
- Endurance measurements (swan neck for example),
- Check valve tests,
- Flowmeters apparatus comparison.

Apart from this kind of experiments, it is possible to combine both the CYPRES and CYHERE test facilities to optimize the parameters of the discharge tests, in order to avoid the depletion of the pressure during the experiment. By this way, very high flowrates could be reached (up to 950 m³/h).



CYHERE test facility



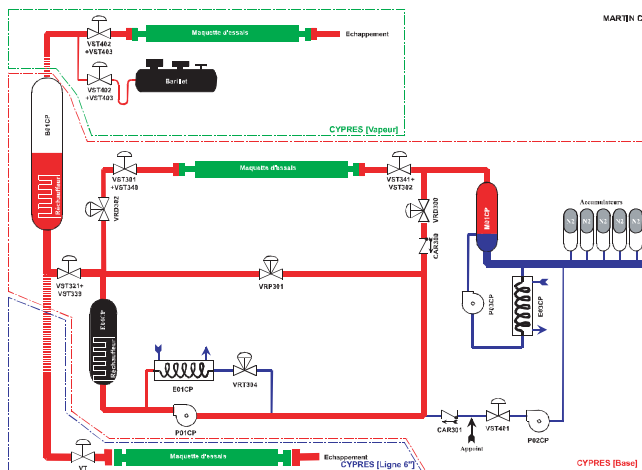
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CYPRES test facility description

The CYPRES test facility is able to test the endurance of valves components during opening/closing cycles under high differential pressures (up to 160 bar) and high flowrates (up to 100 m³/h). Moreover, a pressurizer allows to realize one-shot discharge tests with steam (through a drum of 3 inches diameter) or water (through a line of 6 inches diameter).



Component on the CYPRES test cell



CYPRES test facility

CYPRES test facility performances

Fluid	Maximum service pressure	Temperature	Flowrate	Volume	Electrical power	Remarks
Pressurized water	15 ≤ P ≤ 175 bar	40 ≤ T ≤ 300°C	0,40 ≤ Q ≤ 14 kg/s			Ø3" line, DN 80 AP _{max} ≤ 160 bar
Saturated steam	0 ≤ P ≤ 175 bar	100 ≤ T ≤ 355°C	Q ≤ 39.10 ³ kg/s (continuous) Q ≤ 2,5 kg/s (discharge)	2,5 m ³ rated volume	B01CP : 170 kW E04CP : 850 kW	
Pressurized water	1 ≤ P ≤ 175 bar	100 ≤ T ≤ 355°C	Q : 0 à 278 kg/s (cold water) Q : 0 à 231 kg/s (hot water)	2,5 m ³ rated volume		Steam or hot gas discharge Ø6" line, DN 150

Main advantages of the CYPRES test facility and type of performed tests

The main advantages of the CYPRES test facility are:

- Its capability to perform a high number of opening/closing cycles in a limited period of time (as an example, it's possible to perform up to 1000 cycles in only 4 days),
- The high differential pressure (up to 160 bar),
- The very good repeatability of the thermal and pressure parameters between each cycle.

During the 20 years of the operation of the CYPRES test facility, our team of researchers has experience of a large number of tests, including:

- Cycling under high pressure tests: opening under differential, closing under nominal flowrate, endurance and determination of major technical characteristics of the components,
- Coefficient of discharge,
- Safety valve set pressure measurements with or without water plug,
- Rupture disk tests,
- Steam extraction to reproduce accidental conditions (Loss of Coolant Accident),
- Hydraulic flow tests,
- Electric motor operator valves design.

Furthermore, the flexibility of CYPRES test facility also allows to perform other kind of tests, such as:

- Cold water, hot water or steam extraction tests,
- Hot gas extraction (nitrogen, other inert gas),
- Independent use of the pressurizer to perform steam tests,
- Others, to be define.

How to get access to our thermal-hydraulic test laboratory ?

The NICODEME contract, started in January 2007, is the "Trans-national Access to Large Infrastructure" in the frame of the EURATOM specific programme for research and training on nuclear energy.

All researchers and users throughout the European Community Members States or Associated States (except France) have an open access offered under the NICODEME contract. One experiment is planned to be carried out before the end of the year 2007. The submission of test proposal will be filled up on a specific application ⁽¹⁾. This test proposal will be evaluated by a selection committee in September 2007.

(1) The specific application can be downloaded from the EDF website.

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