Profile SFR-94

VAIANA

VAUTOUR

GENERAL INFORMATION

NAME OF THE FACILITY: Hydrolysis cell VAUTOUR
ACRONYM: VAUTOUR
MEDIUM (COOLANT(S)) OF THE FACILITY: Click here to enter text.
LOCATION (address): CEA Cadarache, 13108 Saint Paul Lez Durance, FRANCE
OPERATOR: CEA
CONTACT PERSON(S): O. GASTALDI
(name, address, institute, function, telephone, email): CEA Cadarache, Building 208, 13108 Saint Paul Lez Durance, FRANCE
Sodium Technology and Components Project Manager
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Olivier.gastaldi@cea.fr

STATUS OF THE FACILITY: In operation
Start of operation (date): 80’s

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 is mainly composed of a shielded cell able to receive a large overpressure (0.5 TNT equivalent). It is used to perform sodium or NaK / water interaction, for treatment, for training or for research aim. The reaction takes place in the cell, in air, the staff is outside, protected in another room of the building (technical room 1). A metallic liner protects the wall in order to avoid sodium or NaK interaction with concrete.
Sodium or NaK amount is 1.1 kg at maximum, regarding the robustness of the cell. The operator limits water supply, to avoid reaction runaway. Some windows are available for the operator to follow the treatment. In order to reduce smoke emission in the environment the smoke passes through a cleaning unit located before the smokestack. A tank with a sump in the cell are used in order to release liquid effluent.

The light used in the cell is compatible with explosive environment (ATEX directives).

**Acceptance of radioactive material**

No

Only tritium contaminated sodium is acceptable in the limit of the maximum permitted released.

**Scheme/diagram**

![Scheme/diagram](image)

**3D drawing/photo**
### Parameters table

<table>
<thead>
<tr>
<th>Medium (Coolant) inventory</th>
<th>&lt; 1.1 kg of sodium or NaK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Click here to enter text.</td>
</tr>
<tr>
<td>Test sections</td>
<td></td>
</tr>
<tr>
<td><strong>TS #1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Characteristic dimensions</strong></td>
<td></td>
</tr>
<tr>
<td>4.2 m wide, 7.7 m long, 5 m height: around 170 m³</td>
<td></td>
</tr>
<tr>
<td><strong>Static/dynamic experiment</strong></td>
<td></td>
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<tr>
<td>Click here to enter text.</td>
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<tr>
<td><strong>Temperature range in the test section (Delta T)</strong></td>
<td>From ambient to 500 °C</td>
</tr>
<tr>
<td><strong>Operating pressure and design pressure</strong></td>
<td>Design for 0.5 TNT eq.</td>
</tr>
<tr>
<td><strong>Flow range (mass, velocity, etc.)</strong></td>
<td>Smoke filter flow rate: 6000 m³/h</td>
</tr>
<tr>
<td>Medium (Coolant) chemistry measurement and control (active or not,</td>
<td>Click here to enter text.</td>
</tr>
<tr>
<td>measured parameters</td>
<td>Instrumentation</td>
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<tr>
<td>--------------------</td>
<td>--------------------------------------------------------</td>
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<tr>
<td></td>
<td>Thermocouples</td>
</tr>
<tr>
<td></td>
<td>Camera (security camera and high speed camera)</td>
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<td></td>
<td>Pressure sensor</td>
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<td>...</td>
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</tbody>
</table>

**COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS**

**Cleaning test (after carbonation or not):** the aim is to qualify the sodium water reaction in different configurations, to validate the chosen procedure, and to quantify the residual sodium content. This facility was used for Rapsodie and Phenix reactor dismantling studies. For example to perform sodium water interaction after carbonation to be sure that all the residual sodium content will be treated by immersion.

**Study of sodium (or NaK) / water interaction:** this facility was used to obtain a better knowledge on the sodium/water reaction phenomenology. We performed some tests with solid and liquid sodium to understand why and when the reaction becomes explosive.

**Study of sodium fire extinguishing media:** we performed extinction tests to understand the phenomenon involved in MARCALINA powder extinction and to qualify the extinguishing power of this powder despite its ageing.

**PLANNED EXPERIMENTS (including time schedule)**

In 2019-2020, this cell will be used mainly for extinguishing powder test, study of NaK/water interaction and dismantling of our facilities (cleaning).

**TRAINING ACTIVITIES**

This facility is used for the training of sodium operators through the French Sodium School. Different practical work are available:

- real sodium fire practical work
- cleaning operation for sodium or NaK
- sampling and endoscopy on a NaK vessel...

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


DAUDIN K., BEAUCHAMP F., PROUST C., “Phenomenological study of the pre-mixing step of sodium-water explosive interaction”, October 2017, Experimental Thermal and Fluid Science (EXP THERM FLUID SCI) 91,
DAUDIN K., BEAUCHAMP F., PROUST C., “Experimental investigation of solid sodium-water reaction: tests results and phenomenological analysis”, proceeding ENC 2014


PLANTAMP A., GILARDI T., MUHR H., PERRAIS C., “Modeling of the chemical behavior of sodium fire aerosols during atmospheric dispersion”, April 2016, Aerosol Science and Technology 50(7):00-00,