GENERAL INFORMATION

NAME OF THE FACILITY: PHEASANT
ACRONYM: PHenomena clarification Experimental Apparatus for Severe Accident
COOLANT(S) OF THE FACILITY: Water
LOCATION (address): Oarai Research and Development Institute, Japan Atomic Energy Agency (JAEA), 4002 Narita, Oarai-machi, Ibaraki-ken, 311-1393, Japan
OPERATOR: JAEA
CONTACT PERSON: Shuji OHNO, Reactor Systems Design Department, Japan Atomic Energy Agency (JAEA), 4002 Narita, Oarai-machi, Ibaraki-ken, 311-1393, Japan, Tel: +81-29-267-1919(ext. 6901), email: ohno.shuji@jaea.go.jp

STATUS OF THE FACILITY: In operation
Start of operation (date): 2016

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
PHEASANT is a visualization experiment facility using water, which simulates thermal-hydraulic phenomena in a reactor vessel as the decay heat removal system is operating. The target of PHEASANT is to investigate the thermal-hydraulic phenomena in the heat removal phase after the molten fuel relocation has finished in the severe accident. PHEASANT, a one-tenth scale model, represents a loop-type sodium-cooled fast reactor (SFR) designed in Japan. Its core simulates debris uniformly accumulating on the bottoms of the upper plenum and reactor vessel, and on the core catcher. PHEASANT employing a heater of 65 kW can perform experiments under various conditions of molten fuel relocation. It can also simulate the performance of its dipped-type decay heat exchanger,
penetrated-type decay heat exchanger, and ex-vessel cooling system. These allow us to understand thermal interaction in two cooling systems operating in parallel. Thermocouples and a particle image velocimetry (PIV) are used for measurement.

**Acceptance of radioactive material**
No

**Scheme/diagram**

**3D drawing/photo**

Dipped-type decay heat exchanger (Dipped-type DHX)

Debris (Upper plenum)

Core

Ex-RV cooling pipe (Simulation)

Penetrated-type decay heat exchanger (Penetrated-type DHX)

Multipoint thermocouple-tree

Multipoint thermocouple-tree

Debris (Core catcher)

Debris (Bottom of RV)

*FIG1. Schematic diagram of PHEASANT*

**Parameters table**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant inventory</td>
<td>2,500 kg in reactor vessel</td>
</tr>
<tr>
<td>Power</td>
<td>65 kW (Total electric power)</td>
</tr>
</tbody>
</table>

**Test sections**

<table>
<thead>
<tr>
<th>TS #1</th>
<th>Characteristic dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Height of reactor vessel: approximately 2.5 m</td>
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<tr>
<td></td>
<td>Inner diameter of reactor vessel: approximately 1.2 m</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Static/dynamic experiment</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Both</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Temperature range in the test section (Delta T)</th>
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<tbody>
<tr>
<td></td>
<td>Maximum temperature: 50°C</td>
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<tr>
<td></td>
<td>Delta T depends on the test conditions</td>
</tr>
<tr>
<td></td>
<td>(at present)</td>
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<tr>
<td></td>
<td>Core: 10 °C (inlet/outlet)</td>
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</table>
**Operating pressure and design pressure**

- Operating pressure: approximately 0.12 MPa
- Maximum pressure: 0.5 MPa

**Flow range (mass, velocity, etc.)**

Flow rate depends on the test conditions
(at present)

- The rate at the core outlet: approximately 0.02 m/s

- **Coolant chemistry measurement and control**
  - (active or not, measured parameters)
  - None

- **Instrumentation**
  - Thermocouples, flow meter, PIV

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

JAEA has performed steady state experiments and transient experiments during the operation of the dipped-type decay heat exchanger. The circulation behaviour was found in the reactor core where cold fluid from the decay heat exchanger flowed into the lower plenum through the outer region of the core, reached the debris on the core catcher, and then moved upward while being heated on the core catcher and in the core. JAEA experimentally demonstrated the flow path from the upper plenum to lower plenum and the cooling performance of the decay heat exchanger for the debris on the core catcher.

**PLANNED EXPERIMENTS (including time schedule)**

Experiments with two cooling systems operating in parallel

**TRAINING ACTIVITIES**

None

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