

Experimental Facility for Simulated Rod Bundle Cooling of Light-water Nuclear Reactors

Background

In response to Fukushima Daiichi nuclear power plant accident, it is necessary to improve the safety measures for the reactor core damage prevention in the case of severe accidents (SA) beyond the design-based phenomenon required by the previous safety review. In the safety assessment of a nuclear power plant,

it is important to evaluate the severe accident analysis under tougher conditions and to enhance accident management (AM) measures to prevent the SA. A large-scale experimental facility to visualize the detailed nuclear reactor thermal hydraulics is installed to advance the SA analysis code and AM measures.

Outline

The experimental facility consists of a test loop to simulate the nuclear reactor thermal hydraulics and an X-ray computed tomography (CT) / real-time radiography (RTR) system to visualize a boiling two-phase flow distribution. The test loop can operate under high-pressure high-temperature conditions corresponding to rated

operation in a boiling light-water reactor (BWR). The X-ray CT/RTR system has a function to take three-dimensional CT images of fuel rod bundles and thermal hydraulics in the pressure vessel and to record transmission images of a vapor-bubble and liquid-film behavior at a high-sampling rate.

Specifications

Thermal hydraulic test loop

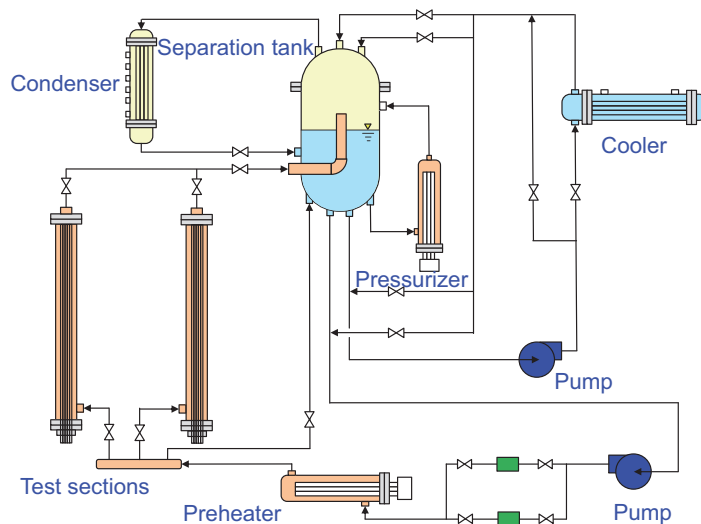
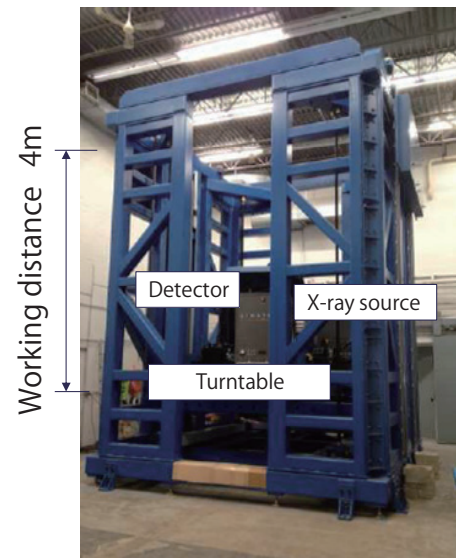
- Maximum system pressure: 9 MPa
- Maximum system temperature: 305°C
- Maximum flow rate : 24 m³/h

X-ray CT/RTR system

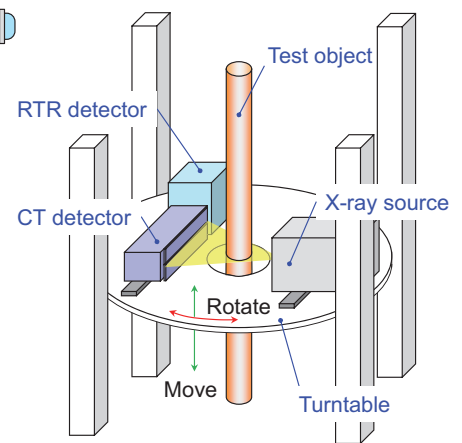
- X-ray source: High-energy linear electron accelerator
- Maximum field of view: 700 mm in diameter
- Working distance: 4 m in height

[Location and date of installation]

Yokosuka area / October, 2014



Thermal hydraulic test loop



X-ray CT/RTR system