

Similitude Tests

Optimization of components and processes

Fluid-dynamic and thermal-hydraulic tests validate and optimize design

The challenge

In industrial plants, industrial processes and industrial engines, complex system as well as individual components must be capable of performing their designated function at all times during normal operation as well as under other, specific conditions

The solution

Framatome validates and optimizes component design using fluid-dynamic and thermal-hydraulic tests.

- The first step in optimizing the tests and costs is to identify the relevant physical phenomena.
- The most relevant laws of similitude and nondimensional numbers for designing the test are then defined.
- The second step is to define the scale of the mock-up and the test fluid to reduce the costs.

Numerical codes (EF, CFD) simulate component and system responses for nominal or accident conditions. However, experimental verification is still indispensable for providing input data and validating code results.

Test parameters

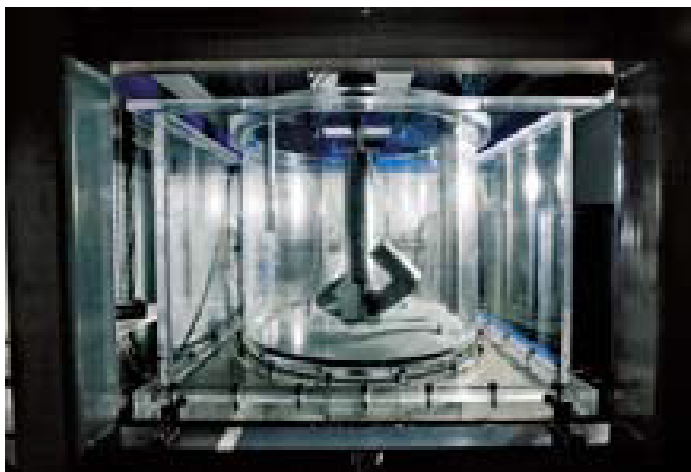
- Mock-up scaling from 1:15 to 1:2
- Water flow rates up to 850 kg/s
- Water temperatures up to 100 °C
- Pressures of up to 16 bar
- Lab floor area 1500 m²

Measured quantities and instrumentation

- Temperature
- Pressure
- Flow rate
- Heat flux
- Liquid density and viscosity
- Displacement (Laser vibrometer, accelerometer, eddy-current sensors, strain gauges, displacement sensors)

Data acquisition

- Powerful data acquisition and process control systems (HBM, B&K, LabVIEW)



Sedimentation of solid particles in a molten glass bed



Gas-liquid interface in a tank under micro-gravity conditions

Your performance
is **our** everyday **commitment**

Qualification of nuclear power plant components

- EPR™ reactor pressure vessel pressure losses, flow mixing and flow-rate distribution
- Thermal stratification and heat transfer in mixing areas
- Jules Horowitz Reactor facility: flow-induced vibrations of reactor vessel internals
- EPR™ flow-induced vibrations of the RPV internals Process Engineering Experiments
- Sedimentation of particles in nuclear-waste vitrification
- Fuel tank optimization for ballistic phase of ARIANE 5 rocket



EPR™ reactor pressure vessel mock-up: Romeo



EPR™ reactor pressure vessel mock-up: Juliette

Experience in all fields of fluid mechanics

Your benefits at a glance

- Well-equipped laboratory using sophisticated measurement systems
- More than thirty years of experience in testing and analysis
- Applicable to nuclear and renewable energy projects
- Integration with and access to Framatome's thermal-hydraulic platform

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