

Steam Generator Component Testing

Design Validation and Life Time Assessment

Comprehensive testing and competencies to support the hydraulic and mechanical design validation and the life time justification of reactor steam generator components

Challenge

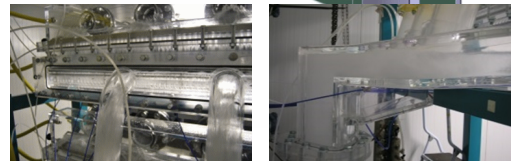
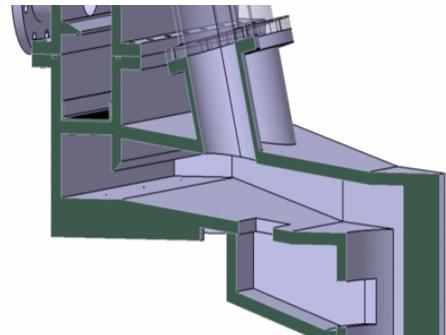
In nuclear power plants, steam generator (SG) and SG components must withstand situations like hydraulic forces, flow induced vibrations, fretting and wear in normal operation, dynamic loads and displacements during abnormal situations like earthquakes or Loss of Coolant Accidents.

Solution

Framatome offers a wide variety of test facilities and expert competencies for hydraulics, mechanics, vibrations and wear. Tests are related to design qualification, mechanical properties characterization and life time justification and provide input data for hydraulic and mechanical calculations.

Our scope of services includes:

- Characterization of wear mechanisms
- Identification of vibration modes and mechanical characteristics measured on full-scale SG tubes
- Measurement of wear between SG tube and anti-vibration bar on unique Aurore test bench
- Instrumentation of each apparatus (force, displacement, pressure, temperature, vibrations)
- Signal and data processing (friction coefficient, wear rate, etc.)
- Application of unique skills and expert knowledge to design, manufacture and operate test facilities in hydraulics and mechanics
- Development of specific software to pilot benches and to perform data acquisition



SG dryer drains mock-up

Customer benefits

- Increased safety and plant availability by understanding phenomena and validation of design
- Reliable test results through well-equipped laboratories with sophisticated benches and measurement systems
- Short reaction times even for complex tasks
- Available laboratory infrastructure in associated disciplines (materials, calibration)
- Comprehensive testing thanks to in-house competences in hydraulic, mechanical and vibration engineering, reducing interfaces

Your performance

is **our everyday commitment**

Technical information

Steam generator dryer drains mock-up

Maximum flow rate in drain per stage of dryer

- Reduced scale mock-up of SG dryers and drains
- Air and simulating fluid (instead of hot steam and water)

AURORE test bench

Wear on SG tubes and anti-vibration bars

- Sliding, impact, impact-sliding, fretting
- Force up to 240 N
- Steam environment up to 320°C and up to 154 bar

SOPHIE test bench

SG tube vibration modes, wear of SG tube/stabilization devices, assessment of tube-tube and tube-support plate junctions

- Mechanical and vibration tests on SG tubes and repaired SG tubes in air

SG support plate compression test bench

Support plate and local cells deformation versus load

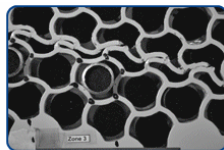
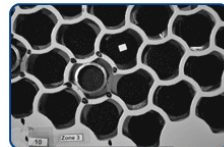
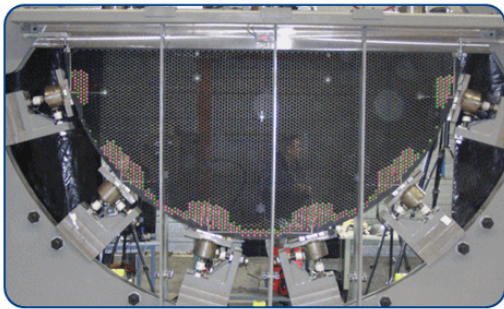
- Quasi-static compression test of a full scale half support plate



Sophie test bench: vibrations of SG tubes

Key figures

- More than thirty years of experience in vibration testing
- Comprehensive testing infrastructure



SG support plate compression test bench: deformation of SG support plate and cells under continuous compression load

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