framatome

Non-Destructive Examination Services

Highly qualified services from nuclear power industry experts for demanding NDE applications in nuclear power industry and beyond.

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

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Framatome – high caliper NDE service provider

Decades of NDE services experience in nuclear power industry, own accreditation laboratory and in-house capabilities in PAUT instrumentation design and manufacturing secure for Framatome's customers reliable NDE results and enable Framatome to solve complex examination tasks.

Our NDE capabilities

Accredited testing laboratory

nearly **80** qualified testing procedures

All testing services and products according to DIN EN ISO/IEC 17025

Accredited inspection body according to DIN EN ISO/IEC 17020

NDE Services

more than **80** certified experts

Nuclear and non-nuclear expertise

UT, ET, RT, MT, PT, VT

Own tooling engineering

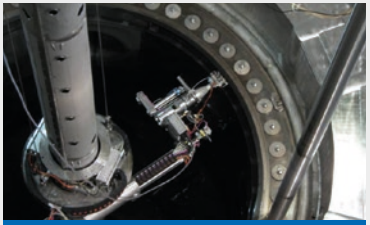
NDE Equipment

23 highly skilled engineers

Core components production for automated PAUT & ET equipment

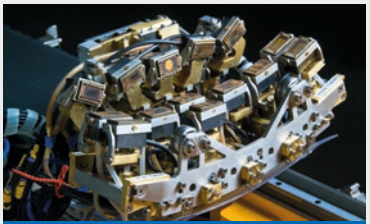
In-house aftersales services: calibration, maintenance and retrofit

Our main NDE services comprise of:



Primary circuit components PSI* and ISI* at nuclear power plants

Mobile in-maintenance PAUT of assembled train axles in railway industry



Tailor-made NDE solutions, designed around specific applications & in-house services

*PSI – pre-service inspection, ISI – in-service inspection

Primary circuit components
PSI and ISI at nuclear power plants

Framatome NDE services encompass:

Mechanized & remotely operated PAUT, ET and VT of critical components such as:

- Reactor pressure vessel
- Steam generator
- Pressurizer
- Main cooling line and piping

NDE engineering, including:

- Simulation of scanning path, trajectory and accessibility assessment of manipulator or ROV
- Preparation and carry out of inspection specific procedures and own personnel qualifications acc. to ENIQ or EPRI PDI performance-based requirements
- Tailor-made PAUT transducers design and manufacturing

Portable mechanized NDE solutions aimed for outage time reduction

BWR & PWR RPV nozzles NDE with a FRANIS underwater manipulator using PAUT, ET and VT

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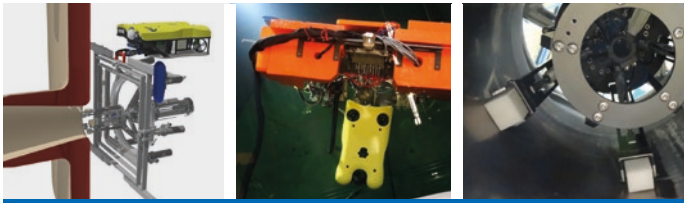
Framatome's FRANIS system is a lightweight and multi-functional underwater inspection manipulator, which can be set up, maneuvered and removed quickly to enable shortest possible vessel occupation time. State of the art motion control and UT, ET and VT inspection technology ensures fast, reliable and off-critical path inspection for our customers.

Customer benefits:

- Portable and autonomous, it doesn‘t require use of support bridge and minimize use of polar crane
- Parallel works and inspection in the vessel are possible
- Exact positioning and proven fixation at nozzles
- Multiple areas with the wide range of diameters can be examined in a short period of time:



FRANIS – CAD model, Framatome training center, telescopic arm for UT probes bearing

Nozzles inner radius and other complex geometry PAUT from outside with a Light Weight Robot (LWR)

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The LWR is a flexible 6-axis robot system providing high-end positioning accuracy and smooth motion for the inspection of complex shaped geometries. In combination with 3D-iMAV software UT-beam propagation and the probe head trajectory can be calculated and transferred to the LWR.

Customer benefits:

- 4 + 2 (optional) axis High-end robot system with a 30 m waterproof version for challenging inspection tasks
- Scan path and beam calculation in 3D-iMAV software (offline possible) to match right combination of UT probes
- High positioning accuracy of less than ±1 mm

LWR – Simulation of nozzle inspection from OD, inspection of nozzles welds

Portable mechanized NDE solutions aimed for outage time reduction

Shell welds & main metal NDE from outside of RPV and other vessels with a magnetic crawler MAGNUS

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Framatome's MAGNUS system is a lightweight and extremely versatile crawler System for the UT, ET and VT inspection of vessels and vessel welds. A built height of only 150 mm ensures accessibility to every difficult-to-reach inspection areas.

Customer benefits:

- Low profile of only 150 mm height with a carrying capacity of up to 50 kg
- Inspection speed up to 80 mm/s (can be increased if needed)
- Positioning accuracy of up to 3 mm in vertical and horizontal direction
- Scanning without movement in X/Y directions possible

Magnus inspection of vessel welds

RPV baffle bolts UT & VT with a multi-task submarine SUSI

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SUSI is the fastest and multi-purpose solution for underwater NDE, video surveillance as well as for search and retrieval of foreign objects. Its high maneuverability bounded with know-how in UT transducers customization enable Framatome to demonstrate flexibility in versatile baffle bolts UT & VT.

Customer benefits:

- Visual inspections of vessels and internals, piping and pressurizers
- Qualified according to several codes and standards
- Rapid setup & removal time – minimize impact to the overall outage

SUSI 420 in a RPV with different configurations

Portable mechanized NDE solutions aimed for outage time reduction

Primary circuit piping inspection with a BH-70 manipulator for Stress Corrosion Cracking and others flaws mechanisms detection using PAUT

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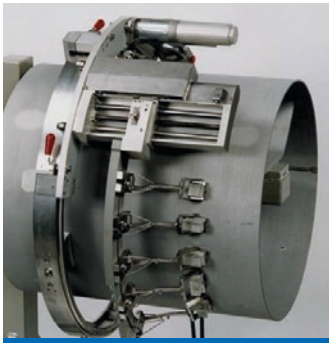
BH-70 manipulator enables to examine varied pipe diameters with high positioning accuracy and upscale defects recognition in difficult to access areas.

Customer benefits:

- Numerous deployments at NPPs on versatile pipe diameters [from 52 to 1060 mm]
- Small team for handling, data acquisition and analysis: up to 2 persons / per shift



BH-70 installed on pipe mock-up

- High positioning accuracy: up to 1,5 mm and fast data acquisition: 80 mm/s
- Unparalleled resolution of flaws
- Thanks to low profile BH-70 can be delivered to examination area through orifice of bio-shield

Steam Generator tubes inspection with a Ranger ET system

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Quick in setup and exact in positioning Ranger manipulator in combination with an option of remote ET data analysis ensures smooth, fast and confident ET of tubes preserving utilities' outage schedules and budget.

Customer benefits:

- Lightweight and intuitive robot for ET and light repair
- Quick setup and simple operation by one person – installs in less than 10 minutes and thus substantially reduces doses compare to previous generation robotics

Ranger in steam generator

- Optional remote ET data analysis for ever-ready data eva-luation during busy outage seasons and for mobilization costs savings
- Integrated machine vision ensures positioning accuracy & rapid access to the areas of interest
- Electric operation – no compressed air supply required

NDE Engineering: Modeling, simulation and qualification

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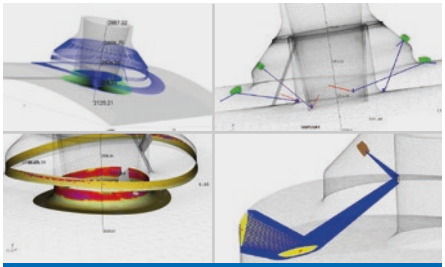
NDE modeling software has demonstrated the value of analytical design optimization in lieu of iterative prototype and test strategies. Framatome's modeling strength enables rapid development of probes and techniques to facilitate the qualification process.

Main Packages are:

CIVA: Developed and maintained by the CEA, this has become one of the most widely accepted modeling systems with specific modules for UT, ET, and RT. Framatome has numerous licenses and is active in the CIVA users forum.

IMAV: Co-developed by Framatome this package is optimized for scan coverage verification and qualification support.

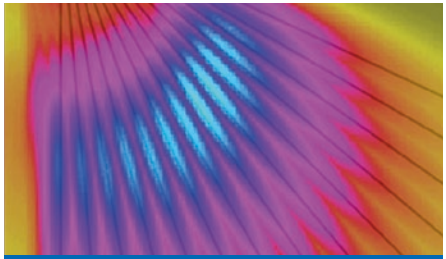


CIVA simulation of different incidence angles

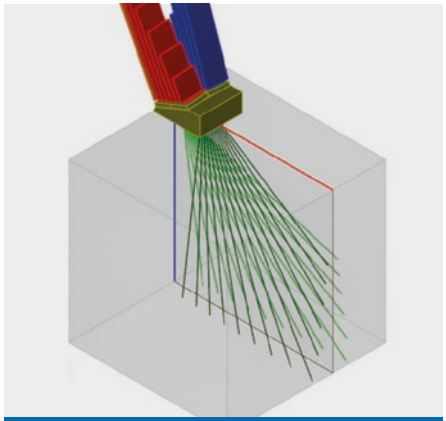
Shorter design and development cycles (with lower costs) produce inspection qualifications that can be easily explained to regulators or defended against peer reviews.

Features and benefits:

- Technique feasibility assessment without mockups or transducers
- Transducer design optimization without iterative prototype tests
- Visualization of sound path aids interpretation of observed signals
- Simulation can demonstrate critical flaw detectability throughout an inspection volume with very few reference mock-ups
- NDE simulations are accepted and even expected for complex geometry technique qualification



CIVA – UT beam calculation for new probe designs



UT coverage analysis for RPV nozzle examinatiom

Mobile in-maintenance PAUT of assembled train axles in railway industry

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Tailor-made, reliable and state-of-the-art inspection systems for various inspection tasks

Challenge:

The requirements for rail vehicles are very demanding: it is essential that they operate safe, dependably and reliably despite increasing cost pressure, continuous maintenance and repairs. Specifically for smaller fleet vehicles, investing in complex inspection techniques or specialized personnel is usually not economical.

Loading of the mobile ultrasonic inspection system

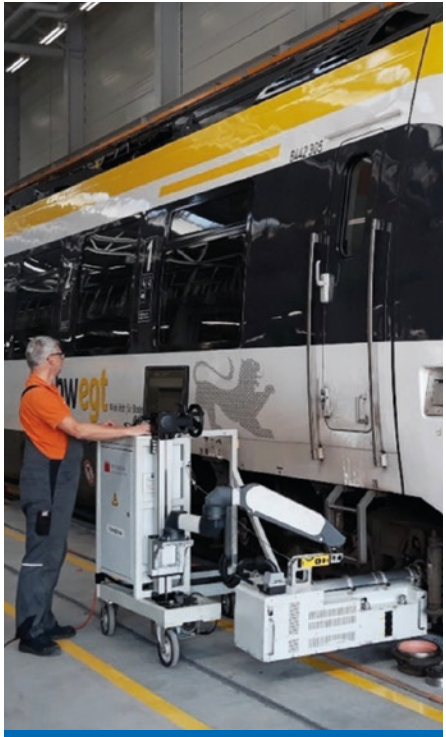
Solution:

Therefore, Framatome has mobilized the examination of wheel set axles. The mobile ultrasonic inspection system makes it possible to test wheel set axles in an installed, assembled or unassembled state. This includes the following longitudinal drills:

- Diameter 30 mm
- Diameter 40 mm to 60 mm
- Diameter 60 mm to 90 mm

Customer benefits:

- Inspection in mounted condition saves time and costs
- High testing reliability
- Rapid re-availability of rail vehicles
- Reproducible results due to data acquisition and a high level of positioning precision



Framatome PAUT service for trains' hollow axles

Tailor-made NDE solutions, designed around specific customer applications

PAUT of main bearings in offshore and onshore wind turbines

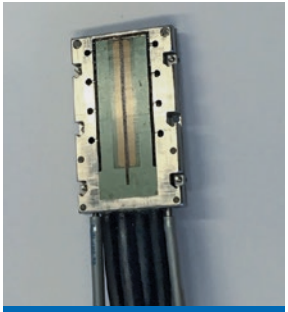
Download more information

Challenge:

Restricted access to inspection area for NDE methods which could examine a raceway below its surface.

Customer benefit:

Fast and advanced examination of volumetric defects without bearing dismantling allows predictable lifetime management and maximizes the availability of wind turbines.



Flat UT probe

Framatome solution:

- Feasibility of an access concept for the inspection technique
- Design and manufacturing of compact and low-profile PAUT probe (7 mm height)
- Provision of NDE services for the customer with the designed solution

Engineering of ET solution for valves hard-facing and sealing welds

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Challenge:

Conventional surface testing (PT) is time consuming and can be on the critical path of the maintenance task. Standard ET probes may not fulfil examination tasks.

Customer benefits:

Application centric ET solution saves time on examination, makes it chemicals-free and fully comparable data with the last in-service inspection.

ET probes holder in examination position

Framatome solution:

- Developed specially for this application ET probes and probes holders enable simple and fast surface discontinues detection
- Near-surface defects recognition
- Fast and traceable examination results compare to PT
- Clean and chemicals-free examination

In-house NDE services

Traceable PAUT of your prototype or small series parts in robotic cell

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Large nomenclature of PAUT probes and available mechanical properties test laboratory decrease your R&D costs and provide reliable and comprehensive data on structural integrity of your part or prototype

Robot arm in Framatome facility

Evaluation, transfer and archiving of conventional X-ray films

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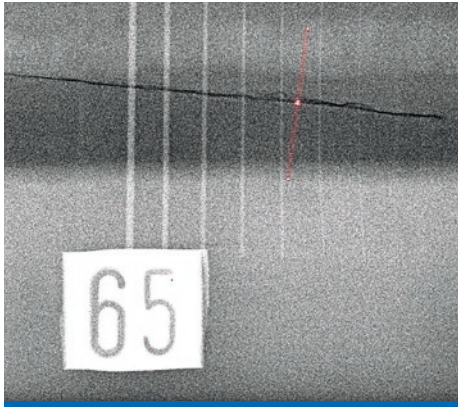
Reduced costs of storage, improved evaluation of defects and long term interpretability through digitization of radiographic films.



Digitized X-ray film

Feasibility studies for challenging PAUT tasks

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Assessment of accessibility to examination surface for automated UT, simulation of ultrasonic signals propagation into examination material, prototyping of custom PAUT probes to fit your specific requirements.

Custom made compact UT probe for inner-radii testing of CFRP structure

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Framatome is an international leader in nuclear energy recognized for its innovative solutions and value added technologies for the global nuclear fleet. With worldwide expertise and a proven track record for reliability and performance, the company designs, services and installs components, fuel and instrumentation and control systems for nuclear power plants. Its more than 15,000 employees work every day to help Framatome's customers supply ever cleaner, safer and more economical low-carbon energy.

Visit us at: www.framatome.com and follow us on Twitter: @Framatome_ and LinkedIn: Framatome.

Framatome is owned by the EDF Group (75.5%), Mitsubishi Heavy Industries (MHI – 19.5%) and Assystem (5%).

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For more info please contact:
examination@framatome.com

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