# framatome

# Heat Exchangers

## Design and Modernization Covering Thermal Strength and Seismic Sizing

**Engineering, optimization and manufacturing of classified and non-classified heat exchangers according to customer specification**

## Challenge

Heat exchangers are essential for the safe and reliable operation of nuclear power plants. As a passive component, heat exchangers are crucial for many safety-related systems to ensure the continuous removal of heat even during seismic events or other load cases.
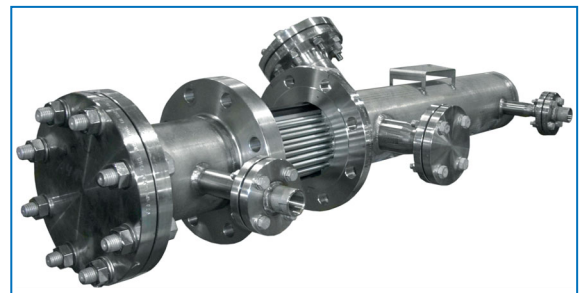
During operation, every heat exchanger is subject to the medium itself as well as changing operational states, which can reduce the component's integrity as well as its performance.



Condenser with removable tube bundle of the Radioactive Concentrates processing System
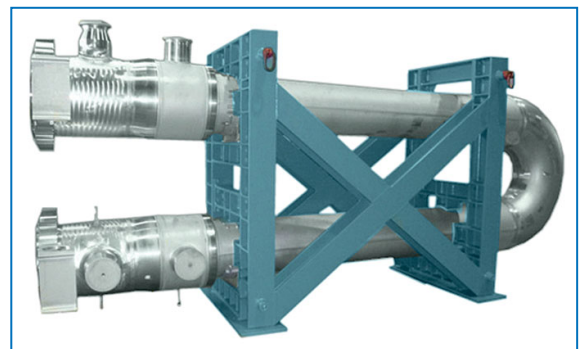
## Solution

Our heat exchangers are custom made for their individual purpose. Under strict adherence to quality manufacturing they are designed and manufactured to cope with the high pressures, temperatures and chemicals prevalent in most systems.

Our services include but are not limited to:

- Detail design according to nuclear (e.g. ASME Section III, RCC-M, KTA) and conventional codes (e.g. EN 13445, ASME Section VIII), considering internal loads, e.g. piping loads or water hammer and external loads, e.g. seismic loads or airplane crash (APC)
- Preparation of all operational analyses, like thermohydraulic design calculation and vibration analysis according to prevalent codes (e.g. VDI Heat Atlas, TEMA)
- Preparation of all necessary analyses like dimensioning, stress and fatigue analysis
- Supplier management and qualification
- Handling of document approval process with third parties and authorities
- Feasibility studies and concepts for authority acceptance
- Installation and dismantling studies
- Spare and wear parts management over the entire lifetime of the component
- Analysis and repair of damaged components
- Heat exchanger replacement (incl. studies, strategies)



High Pressure Cooler including support construction as part of the Volume Control System
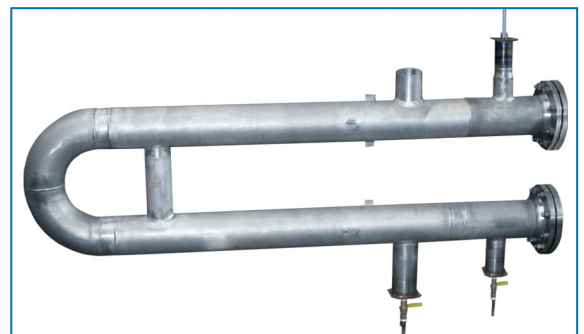


Condensate Cooler

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

## Key features

Our heat exchangers can be manufactured with the following key parameters:

- Pressure ratings from -1 bar to 210 bar
- Heat exchanger duty from 0,008 kW to 33600 kW
- Diameters from 60 mm to 2100 mm

The following materials are used for the construction:

- Carbon steel
- Austenitic steel
- Rubber lined carbon steel
- Austenitic cladded carbon steel
- Titanium (only for heat exchanger tubes)

Our heat exchangers are designed according to nuclear codes ASME Section III, RCC-M, KTA and ENSI



One of two tube sheets of hairpin heat exchanger for Volume Control System

## Key figures

Pressure rated up to **210 bar**

Up to **33600 kW** heat exchanger duty

## References

Basic and detail design has been performed among others for nuclear power plants in Brazil, China, Finland, France, Germany, Spain, Sweden, Switzerland and UK.

Applications range from heat exchangers for the volume control system to coolers for different operational systems, from spent fuel pool coolers to electrical heaters.
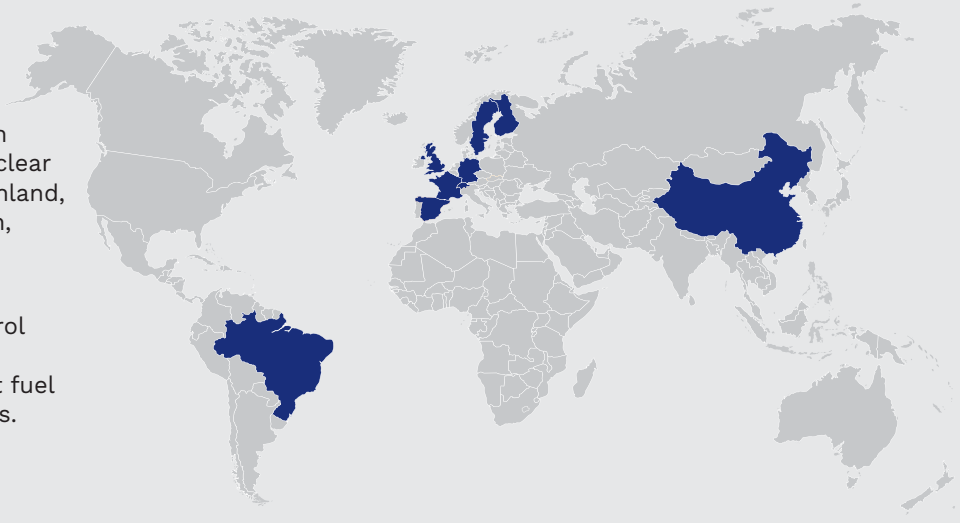


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