framatome

KOPRA - Test Section for Control Rod Drive Mechanisms

Dedicated test facility for CRDMs used in PWRs

Factory acceptance tests for all types of CRDMs used in PWRs

Challenge

Factory Acceptance Tests (FAT) of core components such as the CRDM (Control Rod Drive Mechanism) are crucial steps in manufacturing processes. They prove that the component fulfills all the functional requirements. The tests must be supported by a suitable test facility, as well as by experienced and qualified staff. This high level of quality is also required for research, developments and qualification activities.

Solution

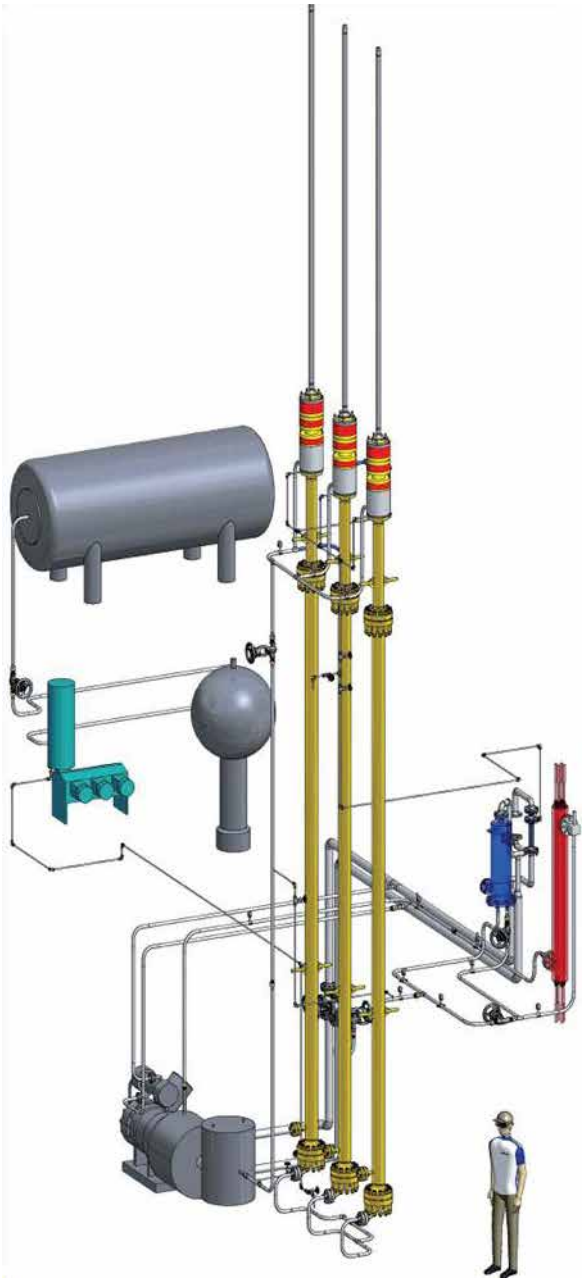
Framatome operate the KOPRA CRDM Test Section, which is designed for qualification tests of CRDM under operational conditions in order to fulfill all possible testing requirements. It consists of three test sections, a closed loop with circulation pump, heating and cooling systems, and a pressurizer.

The CRDMs are mounted on flanges on top of the test sections, and inside the drive rods are connected to dummy weights simulating the Rod Cluster Control Assembly (RCC-A) weights.

For testing, the flow circuit heats the CRDMs up to operating temperature. Stepping operation for the overall travel length and drops from the uppermost position are possible. At the end of the drop, a hydraulic damper slows the dummy weight.

The CRDM test sections can be adapted to all CRDM types used in PWRs.

The test facility can also be adapted to test other components that need to be tested at PWR conditions regarding pressure and temperature. Even the special water chemistry requirements can be set (oxygen content, conductivity, boron content).



Set-up for CRDM factory acceptance test

Customer benefits

- Relevant test results with tests performed at operational conditions
- Flexibility in testing different CRDM design and control systems
- Benefit from experienced personnel and comprehensive test laboratory
- Reliable test results through accreditation as test and inspection body in accordance with ISO 17025 and 17020, accepted by ILAC

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

Technical information

A typical FAT for CRDM testing is performed as follows:

After manufacturing and assembly, every CRDM must be qualified under operational conditions. The first functional test phase under operational conditions generates a magnetite layer on the sliding surfaces of the latch unit components, ensuring optimal antifriction properties. This is the basic requirement for dependable CRDM latch unit functionality.

The factory acceptance test ensures the three operational functions of the CRDM:

- Insertion and withdrawal of the mobile set (drive rod with coupled Rod Cluster Control Assembly dummy weight) in single steps to the required operating position.
- Holding of the mobile set at any selected position along the travel length.
- Releasing of the mobile set (for reactor trip).

In addition, qualification can be performed of the complete CRDM as part of special investigations for new designs, e.g. a rod position indicator system.

For CRDM operation, various generations of PWR rod control systems are available, (such as contactor control, ELSTABE, RodPilot® 10 and 40).

Set-up for CRDM factory acceptance test

Key figures

20 to **330°C** and **10** to **160 bar**
in **3** test sections

Components of the CRDM

RodPilot® 10 control cabinet

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