framatome

DISMANTLING SERVICES

Draining of Sodium pool type fast reactor

Primary sodium drainage equipment of a FBR reactor, permitting a total control of operation

Effective and reliable primary sodium drainage thanks to specifically-developed tools, allowing safety and security during operations thanks to reduced sodium risks.

Challenge

The elimination of chemical risk, during dismantling of a fast reactor, passes by the most complete possible draining of the sodium contained in the reactor vessel as well as in its internal structures. .

Drainage tools allow the recovery of the sodium in areas which are practically inaccessible, by using smart devices, according to a very precise sequence of operations.

In the case of Creys-Malville Reactor, primary vessel contains 3600 m^3 of sodium.

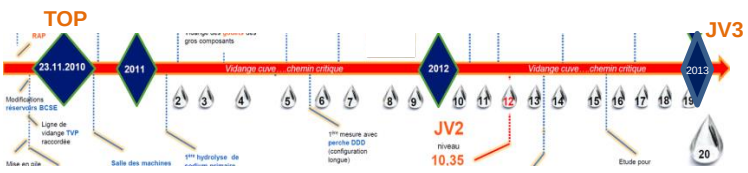
Solution

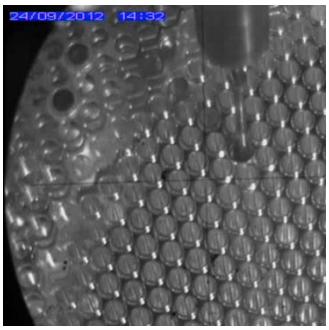
Framatome has developed a full range of tools in order to cover the situations met during a sodium reactor draining :

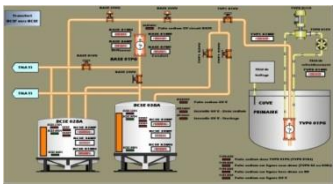
- Electromagnetic pumps immersed in sodium, achieving a suitable drainage flowrate (0.5 - several dozen m^3/h) and an easy connection to a drainage circuit,
- Flexible pumping end-pieces that can be introduced up to the most inaccessible structures in order to access the most remote corners of the reactor,
- Self-priming or remote-priming drains which can be introduced into complex structures and can also be used to transfer the sodium from the retention to a drainable area,
- Vacuum priming systems, which can be used to overcome high suction head without pressurization of the vessel.

These systems are qualified to be fitted and used in the temperature and irradiation conditions prevailing in the reactor core area.

At Creys-Malville, a convergence plan has been implemented with our EDF Customer, in order to integrate the many interfaces associated with this drainage process for the main vessel in the general dismantling schedule.







Electromagnetic pump drainage tool in the manufacturing process, which is introduced into the reactor, and is integrated in an automatic instrumentation and control system

Customer benefits

Thanks to its unique feedback, Framatome can propose a suitable solution to successfully manage all stages of your project:

- Qualified tools compatible with the complete drainage of the vessel and its internal structures.
- Process control and quantification of the volumes transferred
- Implementation in compliance with the safety and environmental limitations of a sodium reactor.

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

Technical information

Drainage tools allow to drain the sodium at flow rates of up to 20 m^3/h. The use of an electromagnetic pump (combined with an electromagnetic flowmeter) enables total control over the transfer of the sodium to the sodium treatment systems.

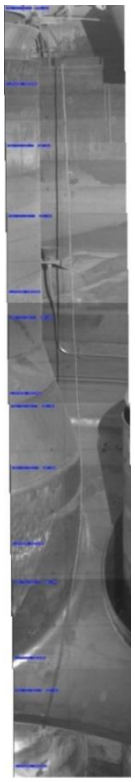
Pumping end-pieces and drains can access sodium retention area via orifices with a diameter of only 20 mm, ensuring the total drainage of the internal structures.

The residual thickness of the sodium after draining is approximately a few millimeters, which allows the sodium treatment to be subsequently finalized using a totally safe chemical method.

The due completion of drainage is monitored by measuring levels or via a remote visual inspection, which proves and quantifies the success of the operations.

Flexible drainage end-piece for an electromagnetic pump

Diagrid draining siphon



Drain hoses
in the vessel

Introducing a drainage tool
in the vessel

Key figures

- **3600 m^3** of sodium drained in just over 2 years
- **20 drainage batches** interfacing with over 25 main operations
- Several equipment with a height of **20m** were required
- The operations were finalized in 2013,

1 week early on the basis of a total schedule running over 5 years

References

EDF Creys-Malville reactor (Super-Phenix):

- Drainage of 3600 m^3 of primary sodium and 1500 m^3 of secondary sodium to a destruction unit
- Drainage of several sodium retentions in the internal structures of the reactor with siphons, pumping hoses and drainage rods.

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