

Unloading an FBR – Expertise and Operation

Handling and operations for the final unloading process

Framatome can meet the operator's requirements for the final unloading of an FBR, and take action at various levels for this purpose, such as by defining the scenario, and adjusting technical, operating and handling resources.

Challenge

Preparing for the dismantling of an FBR containing sodium initially requires final unloading, which involves removing the fuel assemblies and associated elements (control rods, reflectors, lateral neutron shield, etc.).

The aim is to remove these various objects to a suitable waste treatment unit, while controlling the different risks (criticality, drops, corrosion, hydrogen, sodium-water reaction, residual heat / power, etc.).

Note: the cleaning operations are described in a specific sheet.

Solution

First of all, the unloading scenario must be defined by integrating considerations such as:

- total or partial unloading, and justification for not using a dummy core,
- interfaces with other activities related to dismantling or scheduling,
- defining the need for complementary equipment,
- waste streams,
- defining the characteristics of the assemblies and unloaded items (radiological inventory, residual power, residual sodium mass, masses, dimensions, etc.).

As most existing equipment is ageing, an inventory is required in order to determine if it is compatible with the final unloading operation in terms of safety and reliability. As applicable, maintenance and operations to ensure reliability can be launched and it may be necessary to replace equipment.

Furthermore, specific resources must be developed in order to:

- extract some inaccessible objects using normal handling equipment (e.g. some lateral neutron shield assemblies),
- allow for the conditioning and removal of some exotic objects (e.g. adapter parts to be fitted),
- consider specific waste stream (loading of containers, etc.).



Replacing a lifting unit in a hot cell (Phenix)

Customer benefits

Thanks to the experience acquired with Super-Phenix and Phenix reactors, we can manage all subjects associated with final unloading :

- defining the scenario,
- renovating existing resources,
- defining and procuring new equipment,
- adapting existing systems,
- associated safety studies,
- assistance with operations,
- operation in some cases.

**Your performance
is our everyday commitment**

Technical information

Examples of Framatome achievements:

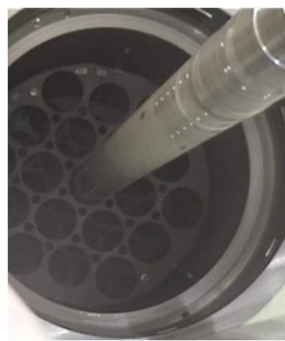
- In terms of primary handling operations, defining and procuring specific handling equipment in order to remove inaccessible lateral neutron shields (shield gripper and mini-shield gripper for Super-Phenix, new transfer arm for Phenix);
- For Phenix hot cells, renovating or replacing various items of obsolete equipment (lifting unit, heavy remote manipulator, jib, travelling crane, milling bench, etc.);
- Defining and procuring specific equipment (equipment associated with loading lateral neutron shields into containers, adapters relating to the specific geometry of some objects, remotely-operated drilling tools, inspection rods, etc.) for the Super-Phenix hot cells;
- Operator assistance (Super-Phenix, Phenix) in the fields of training, monitoring in service and contingency management;
- Super-Phenix handling system operator for unloading reflector assemblies and lateral neutron shields.



Remote handling in the hot cell for the Super-Phenix
Fitting an adapter on a lateral neutron shield



Dismantling of dummy
core assemblies
(Super-Phenix)



Unloading operation

Key figures

- Adaptation of several hot cells for unloading assemblies
- Around a dozen tools created for operations
- **1240** lateral neutron shield assemblies unloaded, cleaned and removed by our teams at Creys-Malville between **2005** and **2010**
- **394** fresh fuel assemblies transferred to the fuel pool between **2006** and **2008**

References

- EDF Creys-Malville reactor (Super-Phenix)
- CEA PHENIX reactor - Assistance with unloading in progress

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