CONDITIONING OF SPENT FUEL FOR INTERIM AND FINAL STORAGE 
IN THE PILOT CONDITIONING PLANT (PKA) AT GORLEBEN

H.-O. WILLAX, H. LAHR, H. SPILKER
GNS Gesellschaft für Nuklear-Service mbH, Hannover
GNB Gesellschaft für Nuklear-Behälter mbH, Essen
Germany

Abstract

Since 1979, tests for the direct final disposal of spent fuel have been carried out in Germany and since 1990, the PKA is being constructed. In the middle of 1999 the plant will be ready for service. The PKA is the first plant of its kind in the world.

1. THE PLANT PKA

In 1994, due to the change of the atomic law in Germany, the concept of direct final disposal was developed as an equivalent alternative to the concept of waste management which included reprocessing.

Since 1979, tests for the direct final disposal have been carried out in Germany. In 1985, the State and the utilities came to an agreement to develop this concept of waste management to technical maturity. GNS was commissioned by the utilities with the following tasks:

- the development and testing of components with regard to conditioning technology
- the construction and future operation of the pilot conditioning plant (PKA)
- the development of casks suitable for final disposal.

Since 1990, the PKA is being constructed on the Brennelementlager Gorleben GmbH (BLG) site. The PKA has been designed as a multi-purpose facility and can thus fulfill various tasks within the framework of the conditioning and management of spent fuel assemblies and radioactive waste. The pilot character of the plant allows for developments and testing in the field of spent fuel assembly conditioning.

The objectives of the PKA may be summarized as follows:

- the conditioning of spent fuel assemblies for interim and final storage
- the reloading of spent fuel assemblies and waste packages
- the conditioning of radioactive waste
- maintenance work on transport and storage casks as well as on waste packages.

The buildings of the PKA are completed; at present, the technical facilities are installed with a license based on the atomic law.

The conditioning procedure takes place in 3 hot cells of the PKA. The steps of the dry conditioning procedure are as follows:

- rod consolidation of the spent fuel assemblies
- loading of fuel rods into bins (2 PWR fuel assemblies or 6 BWR fuel assemblies to one bin)
- compaction of the structural parts of the assemblies and loading of the compressed parts into the basket for structural parts (or in special drums)
- loading of the bins and the basket for structural parts into the POLLUX cask
- closing of the POLLUX cask, i.e.
  - screwing on of the primary lid
  - welding on of the secondary lid
  - screwing in of the shielding lid.
As an alternative to this procedure, the basket designated for the compressed structural parts may also be loaded, e.g., with the fuel rods from 2 PWR fuel assemblies.

2. POLLUX CASK

The POLLUX is a self shielding final storage cask with a capacity of 8 or 10 PWR fuel assemblies, or of 24 or 30 BWR fuel assemblies. In each POLLUX there are 4 bins and one basket. The weight of the cask is approximately 65 tons.

The cask consists of the shielding cask with a screwed-in lid and the inner cask with bolted primary and welded secondary lid.

The cylindrical wall and bottom of the inner cask is extruded in one piece made of fine-grained steel 15 MnNi 6 3. The thickness of the cylindrical wall is 160 mm and is designed according to the mechanical and shielding requirements.

The primary lid of the inner cask is made of the same material as the base body.

The secondary lid is designed as a welded lid and made of the same material as the base body. It is welded to the inner cask. The ~50-mm-thick welded connection is produced by the narrow-gap welding procedure and forms the leaktight and permanent barrier for transport, interim storage and final disposal of the fuel.

The base body of the shielding cask is made in one piece consisting of ductile cast iron (GGG 40). The wall thickness of the base body is 265 mm on the side wall and designed according to shielding requirements.

The safety analysis report and the documents for licensing according to the nuclear regulations were prepared for the POLLUX final disposal cask and submitted to the licensing authorities to obtain the license according to the Transport regulations [type B(U)] and the storage license according to the nuclear regulations for an interim storage.

The prototype cask for cold handling in the PKA is fabricated and is already used for cold handling.

3. INTERIM STORAGE

For a better efficiency during the interim storage period of spent fuel the PKA is also able to fulfil the following functions:

- to reload fuel assemblies from smaller to bigger interim storage casks or
- after some years of cooling time consolidation of fuel assemblies for further storage in interim storage casks or in final disposal casks.