THE ECC COMPACTED WASTE INTERIM STORAGE FACILITY FOR UNIVERSAL CANISTERS IN LA-HAGUE, FRANCE

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ABSTRACT

The ACC compaction facility, which starts operation this year, will reduce the volume of hulls and end pieces, the structural waste from fuel reprocessing by a factor of 4. This facility will also considerably reduce the volume of the highly active worn out pieces of equipment. The compacted waste will be packaged in universal canisters also used for vitrified waste.
These Universal Canisters will be sent from ACC to the ECC interim storage facility before final shipment to COGEMA customers. The ECC facility is described in this paper, with details on the optimization of the design and its process and safety performance.

INTRODUCTION

SGN, COGEMA's nuclear engineering subsidiary has designed and is commissioning this year, on schedule, the hulls, end pieces and technological waste compaction facility known as ACC.

The ACC facility fulfills two main goals:

- Standardize high-level waste containers using the Universal Canister concept. The containers (Figure 1) used for compacted hulls and end pieces or technological waste (known as CSDCs) have the same external geometric characteristics as those used for vitrified fission products (known as CSDVs), which simplifies handling and transport operations.
- Package this waste in Universal Canisters (CSDCs) after a considerable volume reduction (by a factor of 4).

For the ACC concept to be fully effective, an interim storage facility which meets the same requirements with respect to efficiency, technical performance and economic competitiveness is necessary. The ECC interim storage facility for compacted waste CSDCs, has been designed to meet these requirements. Its basic characteristics are described below.

ASSURANCE OF CSDC INTEGRITY

In order to minimize the corrosion risks for CSDCs and their contents during interim storage, the ventilation system has been designed to heat the outside air, thereby maintaining a constant margin of 5 °C with respect to saturation, regardless of climatic conditions. In addition, outside air is filtered before entering the storage.
The CSDCs are therefore stored in a dry, clean atmosphere and protected from condensation.

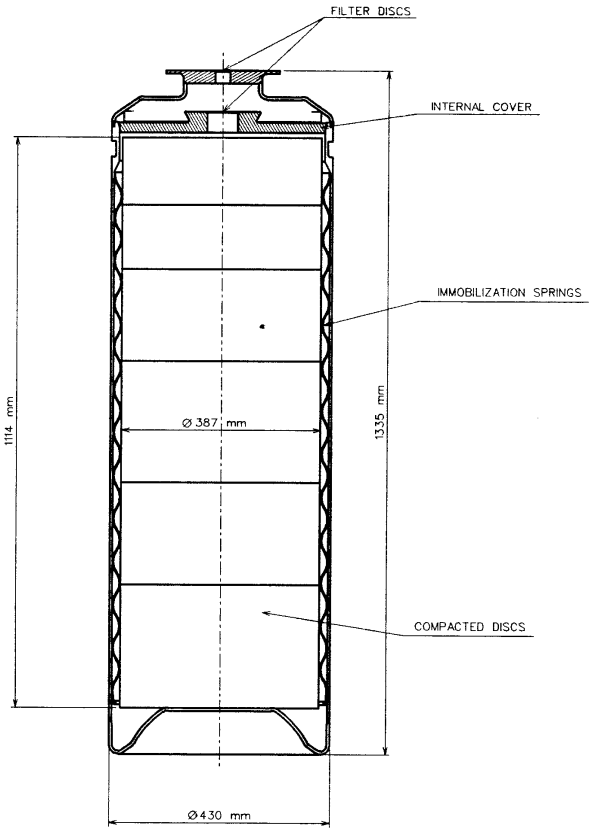

Figure 1 - CSDC Universal Canister

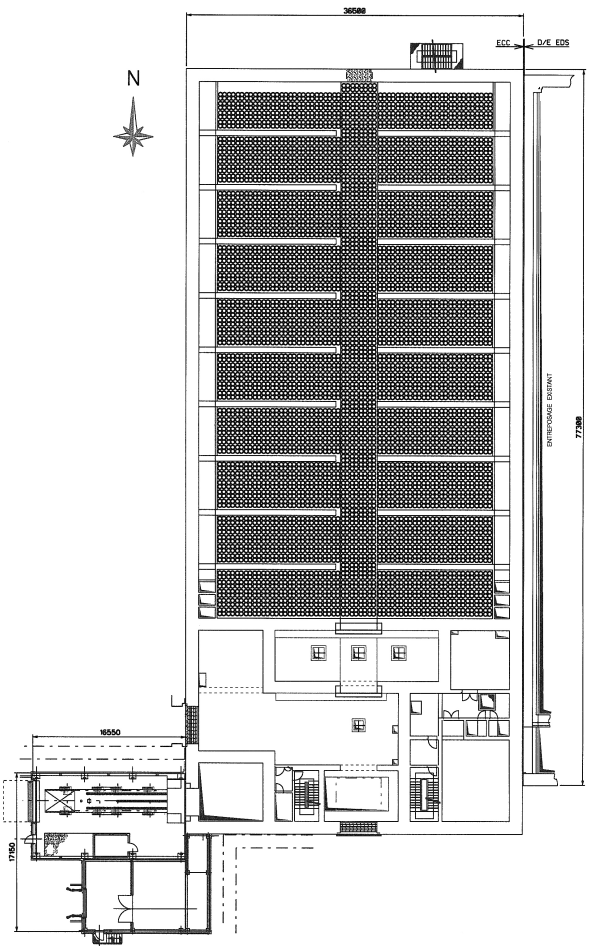

Figure 2 - ECC interim storage facility

The interim storage facility itself is built to last thanks to the following features:

- the mechanical and ventilation equipment and their instrumentation can be maintained in accessible areas;
- the ventilation and cooling stack is made of stainless steel;
- the fixed equipment located in inaccessible areas is maintenance-free due to the type of materials chosen and its resistance to both irradiation and corrosion.

COMPETITIVE INVESTMENT COSTS

A highly competitive investment cost is achieved for each storage position due to the savings resulting from civil works instead of mechanical structures, the simple design and the high storage density resulting from the ECC concept.

The facility comprises two adjacent parts:

- A station where shuttles running between the hulls compaction facility and the ECC interim storage area are unloaded. There, CSDCs are sent to the storage level being used, where packages are grouped into sets of four and loaded onto trolleys to be taken to the storage positions. The same equipment can be used to collect the CSDCs to be sent to COGEMA customers or to the repository.
- The interim storage area (Figure 2), in which 2 x 10 open cells are located on each side of a central corridor, on four storage levels. At each level, a system of trolleys (Figure 3) running along rails picks up CSDCs and sets down the canisters, four at a time in the cells and corridors. The master trolley moves along the central corridor and carries the secondary trolley in front of the perpendicular rails leading to the selected places in the cell.

On each floor, the CSDCs are stored on one level. The corridors in which the master trolley runs can be filled up, leaving only the space required for handling operations.
The basic ECC module is therefore an extremely compact storage area for 24,000 CSDCs. Other storage modules can be added to the building to increase its capacity by using the reception and dispatching facilities.

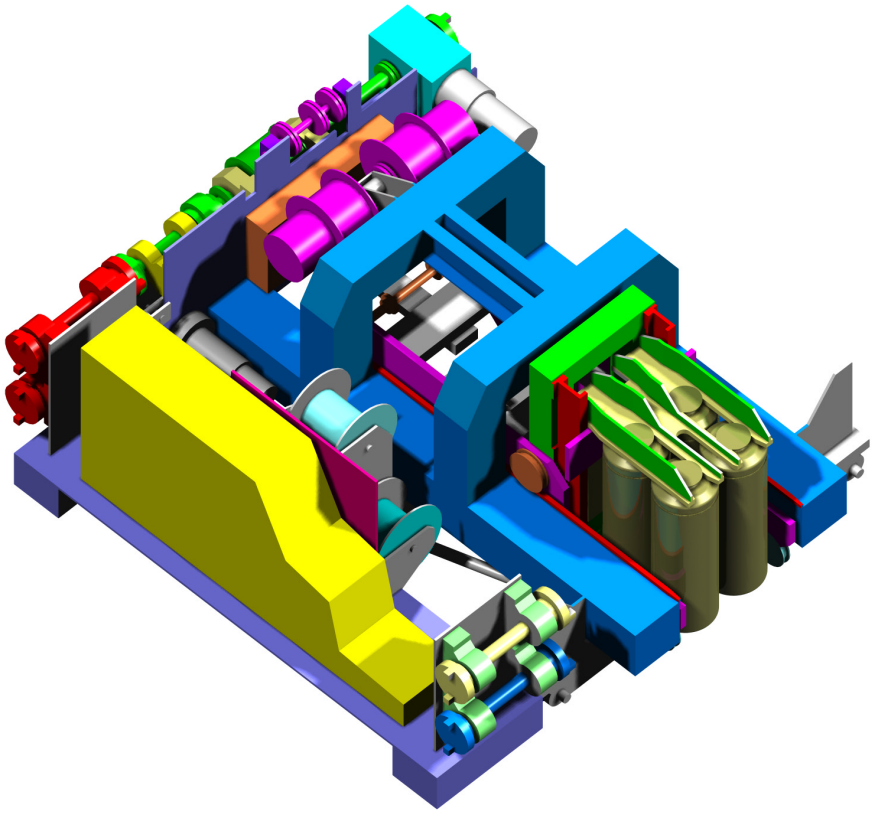

Figure 3 - ECC trolley system

A RELIABLE INTERIM STORAGE FACILITY

The CSDCs for compacted hulls and end pieces are clean and non-contaminated, but they are irradiating canisters (100 Gy/h on contact). The interim storage area is therefore inaccessible.
The trolley system has therefore been designed to ensure the reliability of setting down CSDCs and returning trolleys to the accessible area for maintenance. In order to perform this fallback function, the trolleys have two successive built-in backup systems; an additional trolley is also provided as an emergency system. A comprehensive study, taking into account the contribution of mechanical subsystems, instrumentation and control failure rates to overall reliability, has shown that the specified target is reached.

A SAFE INTERIM STORAGE FACILITY

The conclusions of load drop accident risk analysis have been taken into account and preventive measures, such as high-reliability handling equipment and mitigating features, including shock-absorbing devices, have been designed.
Even in the event of earthquakes, CSDCs remain sheltered inside the ECC building. The regular, balanced and optimized cell structure of the civil works contributes to its seismic resistance.

CSDCs can be stored at floor level, with no support structure, while remaining stable in the event of earthquakes, with the following three major advantages:

- costs are kept to a minimum;
- large amounts of low-level waste represented by support structures are avoided;
- the building can accommodate different types of canister (general storage facility).

The forced convection ventilation system cools CSDCs, trolleys and the ECC civil works at an appropriate operating temperature. The external electrical power grid is backed up by diesel generators on the La Hague site.

In addition, in loss of forced convection accident situations, the ventilation systems design (particularly, the stack height), allows the canisters to be safely cooled by natural convection. A special mockup has been used to determine and optimize the effect of the wind on inlet and outlet pressures. Modelling has been performed to take these results into account for the demonstration of these safety cases.

OPTIMIZED OPERATING CONDITIONS

The transfer shuttles currently used for glass canisters can also be used for the compacted waste CSDCs between the ACC compacting facility and the ECC interim storage facility .
The experience of COGEMA operators has been taken into account by the SGN engineering team, particularly for the design of high activity mechanical units automated and optimized for operation. Personnel safety has been a constant concern for maintenance procedures definition.

FAST-TRACK CONSTRUCTION

Construction of the ECC facility began in 1999. The facility is expected to be completed and ready for operation by 2001, less than three years later.

CONCLUSION

The ECC facility provides an ideal solution to meet the needs expressed by COGEMA and its customers for an interim storage facility that ensures stored canister integrity and for a safe, available facility for receiving, storing and dispatching compacted hulls, end pieces and technological waste canisters. The ECC concept adopted by SGN and COGEMA is cost-effective and allows a facility to be built in less than three years.