Dem & Melt: An innovative In-can vitrification process

In-can Vitrification Process for the conditioning of High and Intermediate Level Waste.

THE CHALLENGE

The nuclear industrial, research and D&D activities lead to a wide variety of medium to high level waste for which long-term management poses significant challenges. The great versatility of waste, in terms of shape and composition, poses difficulties to find an appropriate and economical management channel; some waste even does not have any routes.

The level of activity and lifetime of those waste often require a durable containment of the radionuclides as well as a chemical stabilization of the waste in order to meet the acceptance criteria for the long term disposal facility. In addition, the volume reduction is also a determining factor considering the technical and economic aspects of a geological disposal.

THE SOLUTION

The DEM&MELT process is an innovative vitrification tool developed and designed to match the requirements and constraints of wastes streams from remediation or decommissioning and dismantling operations with no exit routes and for which handling, transportation and adapted conditioning matrix within the existing regulations have been identified as an issue.

The aim of this process is to provide a robust, simple and flexible in-can vitrification process to treat a diverse array of nuclear waste and materials ranging from intermediate to high level waste with different compositions and forms such as sludge, deposits, zeolites, liquids or solid wastes.

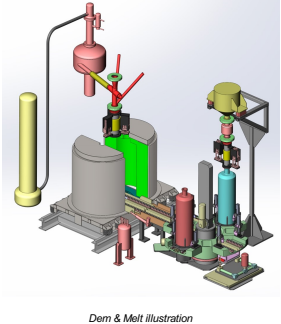
DEM&MELT is flexible to accommodate uncertainties in waste composition and is compact enough to be implemented in a decommissioned cell or close to the waste to be treated. The process allows a significant volume reduction in addition to safe radionuclides containment, and limited quantity of secondary waste. This in-can vitrification process has been also developed under a modular design in order to be adapted regarding to the nuclear operators needs minimizing investments and operating costs.

KEY FEATURES

A robuste, simple and versatile vitrification process

A Modular design

An integrated solution



Dem & Melt illustration

EXPERTISE & EXPERIENCE

DEM&MELT design benefits from mature and proven technologies (including both the upstream and downstream process steps) and over 40 years of Orano experience in high activity operations at La Hague and Marcoule.

As of today, DEM&MELT process is in application on some major projects such as:

- Scale 1 pilot qualification for the treatment of highly active deposits in the fission products tanks of the UP1 reprocessing plant in the CEA Marcoule, currently under decommissioning phase with a view to developing a future unit to treat those waste on a CEA or Orano site. To this end, a major milestone has been achieved with a successful first test campaign in February 2021, with very promising results and the production of a canister of around 300 kg of glass with a 60 wt% waste incorporation rate demonstrating the capacity of the process to provide significant volume reduction ;
- Fukushima Daiichi water treatment secondary waste (zeolites, sludge…) under demonstration.

YOUR BENEFITS AT A GLANCE

DEM&MELT offers several benefits for the operators such as:

- A simple, robust, flexible and competitive solution for treating intermediate and high level waste arising from remediation and D&D ;
- A solution compatible with and designed for a wide range of waste (liquids, zeolites, sludge, solids) ;
- Flexibility to accommodate uncertainties in waste composition ;
- A significant volume reduction, the safe containment of radionuclides and the stabilization of the waste ;
- A limited volume of secondary waste ;
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- A limited volume of secondary waste;
- A compact solution allowing to be implemented in a decommissioned cell or close to the waste to be treated;
- A modular design in order to be adapted regarding to nuclear operators needs minimizing investments and operating costs;
- An integrated solution ranging from scenarios studies and matrix design definition to industrial operations.

A modular vitrification process

For the treatment of HL/IL legacy & D&D waste

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