

# Cementation

## Background

If radioactive liquid or solid waste needs to be converted into a product suitable for final storage, cementation is one of the methods commonly used. Cement is readily available and inexpensive for use in solidifying liquid or wet solid waste, and also for encapsulating solid waste generated during operation of a power plant as decontamination and decommissioning waste and legacy waste. Using cement for immobilizing radioactive waste offers a wide range of possibilities for optimizing the properties of the final end product. Recipes for the end product can be tailor-made to suit particular waste streams – from the highest possible compression strength to the maximum amount of waste at a certain level strength – combined with low leachability.

Westinghouse provides a variety of options for cementation systems. One method using an in-drum mixer is a proven solidification process for radioactive wastes used throughout the world in the nuclear industry. Westinghouse has engineered this process to new levels, resulting in fast and easy-to-clean components that reduce preparation time and increase operational efficiencies.

Another proven system is cementation with a reusable blade. Thereby, no additional waste and consumables are needed. Westinghouse also has innovated a solution to increase the cleaning efficiency of the mixer blades. A mobile solution is also possible based upon the proven Westinghouse-owned mobile solidification system (MOSS) design and our experience in cementation technology from recent multiple cementation facilities.

## Description

In the cementation process, the waste, water and additives are dosed from a tank into the drum at the waste loading station. Then, the waste-loaded drum is transferred to the in-drum mixer, where cement is added and mixed with the waste. By adding cement to the filled drum, low water/cement ratios (less than 0.35) are possible.

The cementation process using the in-drum mixer takes approximately 60 minutes (excluding drum handling). Because mixing is done in-drum, there is no chance of a lost stirrer. Dosing of the liquid and solid components is separate and a special mixer coating provides for better cleaning.

With cementation the waste activity is halved due to the volume increase. Average waste loads for a 400 liter (L) drum to achieve a compression strength greater than 15 MPa are:

- 100 kg of dewatered spent resins (highly borated)
- 220 kg of evaporator concentrate

A 200 L drum also can be used. An optional cement supply system and an optional heating system are available.



Cemented drum

## Benefits

The advantages of Westinghouse cementation options include:

- Cement is available worldwide.
- Waste cementation is relatively inexpensive and accepted worldwide.
- Westinghouse has the know-how for various waste stream treatment including: spent resins, boric acid waste, sulphate waste, nitrate wastes, phosphate wastes and sludges.
- We designed and built several mobile and fixed installed cementation facilities.
- Westinghouse did cementation as a stand-alone process and integrated it into larger treatment facilities.
- Westinghouse can provide recipes for resin and liquid solidification.
- Westinghouse built designed cementation systems into new buildings and also into already existing building structures.
- We provide a fully automated system, compatible with 200 L drums and other drum sizes and their respective transport systems.



In-drum mixer

## Experience

Since 2006 Westinghouse has been working with customers in China on cementation facilities. Our experience includes 10 cementation facilities at nuclear power plant sites. Support for five of these sites' facilities is ongoing.

The Westinghouse MOSS operates worldwide.