

Radioactive Waste Management

High Level Waste (HLW)

Sellafield Ltd has a commitment to manage risks to the environment from historic liabilities by reducing the hazard from accumulated radioactive waste stocks and identifying and managing areas of contaminated land.



We continue to strive to minimise the quantities of both radioactive and non-radioactive waste we generate, and to ensure that we manage and dispose of the waste properly. The waste forms, classified according to their level of activity, are low, intermediate and high-level.

At Sellafield processes have been developed for the processing of high active wastes, including high active liquors (HAL), a result of reprocessing irradiated nuclear fuel.

The HAL contains 97% of the radioactivity from the used nuclear fuel and is maintained in a safe state under suitably controlled storage conditions with cooling, agitation and monitoring. At the Sellafield site HAL has been safely stored for more than 50 years. A vitrification technology has been developed where the liquid waste is converted to a stable, solid state suitable for transport and long-term storage.

Processes

Vitrification of the radiologically hazardous HAL is one of the most technologically advanced waste treatment processes in operation, using a detailed understanding of the behaviour of the waste stream.

The main technologies are:

- evaporation to reduce the amount of HAL to 1% of its original volume;
- storage of the concentrated HAL in stainless steel tanks;
- the remote transfer of HAL between the various process stages;
- calcination and incorporation of HAL into a glass matrix;
- storage of the vitrified product.

Applications

Design, construction and operation of reduced pressure evaporators to concentrate the highly active waste stream from Sellafield reprocessing operations prior to interim storage.

A series of high integrity stainless steel tanks have been designed and constructed for the safe interim storage of HAL at Sellafield.

The Waste Vitrification Plant (WVP) has produced approximately 4500 containers to date of vitrified highly active waste. A second vitrification plant has been built incorporating operating experience from the existing plant, to give sufficient capacity to reduce HAL stocks at Sellafield to the lowest practical levels.

A Vitrified Product Store (VPS) with a capacity of 8000 product containers is located at the vitrification plants. The VPS incorporates an export facility to eventually transport the vitrified waste off site.

Sellafield Ltd offers fully integrated processes and technologies for the safe and cost-effective handling, treatment and storage of highly active waste.

Fifty years experience in the evaporation of highly active liquor (HAL) includes:

- use of reduced pressure evaporation to extend plant life;
- maintenance free systems.

Interim storage of concentrated HAL in high integrity stainless steel tanks.

Detailed understanding of the process for the vitrification of HAL includes:

- capability to develop glass formulations for given waste streams;
- understanding of the long-term properties of the vitrified product.

Sellafield Ltd has the complementary capability to design and construct transport flasks to international requirements which can be used to return vitrified waste to customers. Designs have been developed which employ natural cooling of the vitrified waste and have demonstrated impact protection and containment.

Sellafield Ltd has built and is operating a full scale inactive vitrification test rig facility. This rig has been, and will continue to be used to develop flowsheets for different feed streams and operating regimes.



Continuous Vitrification Process

