

What is reprocessing?

There are two nuclear fuel reprocessing plants at Sellafield site. One deals with Magnox fuel from Britain's early nuclear reactors, like the ones which were used at Calder Hall power station at Sellafield, which is now closed down. The other fuel reprocessing plant at Sellafield site is the Thermal Oxide Reprocessing Plant, or Thorp, as it is known. Thorp deals with fuel from British Advanced Gas Cooled fuel and Light Water Reactor fuel from around the world.



Flask arriving at Sellafield

When the used fuel is removed from a nuclear reactor it is still emitting radiation and heat. It is put into large ponds or pools of water near the reactor where it can sit to allow it to cool and allow the radiation levels to decrease. After this cooling period, the fuel is loaded into specially constructed secure containers called 'flasks'. These flasks are transported to Sellafield site either by road, rail or from some overseas customers by sea in purpose built ships.

In over 40 years of operations we have successfully transported over 2,000 casks of nuclear material

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The flasks can weigh up to 110 tonnes. Various tests have been carried out on the flasks to ensure the 'spent fuel' is safe and secure at all times. In one test, a flask was placed on a railway line and a 140 tonne train was deliberately crashed into it at 100 miles per hour. The train was written off, but the flask remained intact!

When the used or 'spent' fuel arrives at Sellafield site it is removed from the flasks and placed into a storage pond which looks like a large swimming pool.

Depending on the type of fuel it can stay in the ponds for up to five years to allow the radiation and heat levels to decrease even further to levels where the fuel can be sent for reprocessing.

When the spent (used) fuel is removed from a nuclear reactor it is still emitting radiation and heat



Thorp Feed Pond

Before any fuel can be reprocessed it has to be monitored to make sure it is ready to be treated. The reprocessing involves dissolving the used fuel in acid, then the uranium, plutonium and waste are separated from each other using chemical processes.

The highly radioactive waste is further purified before being incorporated into solid glass blocks using a process called vitrification. The liquid is evaporated into granules which are mixed with small pieces of glass and heated inside a melter to over 1150°C.

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This mixture is then poured into stainless steel containers and allowed to cool. The containers are then lidded, washed and monitored before being placed into a specially designed store at Sellafield. This process reduces the volume of highly active waste to one third of its original volume.

Wastes from reprocessing are categorised as high, intermediate and low-level, according to the amount of radiation they emit.

Radioactive material loses its radioactivity naturally. The time it takes for a radioactive substance to halve its level of radioactivity is called its half-life. Iodine 137 is radioactive but its half-life is only 24 seconds. Uranium 238 on the other hand has a half-life of 4,500 million years.



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