Urenco's core business is enriching uranium to provide sustainable energy for the world. Enriched uranium is an integral component in civil nuclear power generation.

The responsible management of the by-product of the enrichment process, known as tails, is crucial to Urenco's commitment to sustainability. Tails are converted to uranium oxide, which is stable and allows long term storage prior to either further enrichment or safe disposal of the residual uranium. To enable the conversion, Urenco invested in the Tails Management Facility (TMF), which is operated by a subsidiary Urenco ChemPlants.

Urenco and Urenco ChemPlants are very proud of the safety record during the construction of the TMF. More than 7 million hours of safe working were achieved making the TMF one of the safest construction sites in the UK.

Urenco ChemPlants's activities are scrutinised and regulated by the Office of Nuclear Regulation, Environment Agency and the Health and Safety Executive.

Vapourisation of depleted uranium hexafluoride (UF_6) in the autoclaves

Cylinders are loaded into each autoclave.

A reservoir of water inside is electrically heated to produce steam.

This converts the solid UF_6 directly to a gas, without going through a liquid phase, in a process called sublimation.

The gaseous UF_6 is fed into a kiln.

Once the cylinder's contents have been vapourised, it is removed, weighed and temporarily stored within the cylinder handling facility.

Deconversion Kiln

Deconversion of UF_6 is achieved by reacting gaseous UF_6 with steam to produce uranyl fluoride (UO_2F_2).

The UO_2F_2 is further reacted with steam and hydrogen (H_2) to produce uranium oxide powder (U_3O_8) and hydrogen fluoride (HF) vapour.

All the reactions take place within specially designed kilns.

The initial deconversion of UF_6 into UO_2F_2 takes place in a 'hydrolysis chamber' where gaseous UF_6, supplied from vapourisation autoclaves, is fed through by an injection pipe together with steam and nitrogen which have been heated under pressure (superheated).

The hydrolysis reaction is exothermic (gives out heat) and takes place at approximately 500 °C. By injecting hydrogen gas, further energy is released raising the temperature in the reaction zone to above 750 °C.

The resultant powder U_3O_8 is packed into special containers for long term storage. The gaseous HF is cooled and liquefied as a saleable product.

Hydrofluoric Acid Facility

Hydrofluoric Acid (HF) processing:

HF is collected from the deconversion kilns and transferred as a liquid to a number of storage tanks.

HF storage:

The HF is stored here prior to loading into road tankers for shipment to customer.

Loading of the road tankers is performed in a sealed tanker loading bay that ensures the tanker is connected safely and prevents over filling.

HF neutralisation:

The remaining HF which cannot be sold is neutralised, separated into solids and liquids and appropriately disposed of in a environmentally responsible manner.

Uranium Oxide Store

The Uranium Oxide Store (UOS) provides a radiologically shielded facility for the long term safe storage of U_3O_8 that has been processed and deconverted at the TMF.

All material stored in the UOS is electronically tracked in line with nuclear safeguards.

The tracking system interfaces with the overhead crane system and drives it remotely to locations within the facility.

Cylinder Handling Facility

The facility prepares the cylinders for processing in our TMF.

Each full UF_6 cylinder can weigh up to 15 tonnes.

Cylinders are individually identifiable, automatically tracked and are radiologically monitored.

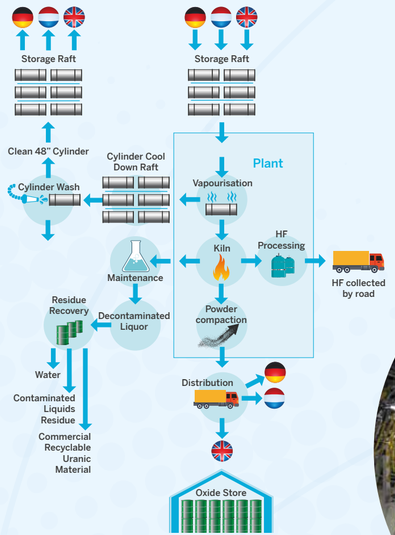
Cylinders are moved within the facility using a 16.5 tonne semi automatically operated crane.

The crane is usually operated remotely from a control room, assisted by CCTV.

Once the cylinders have been processed and emptied in the TMF they are reused in the uranium enrichment process.

urenco
ChemPlants

Process



www.urenco.com

Cylinder Wash Facility

The cylinders, are tested and certified every five years.

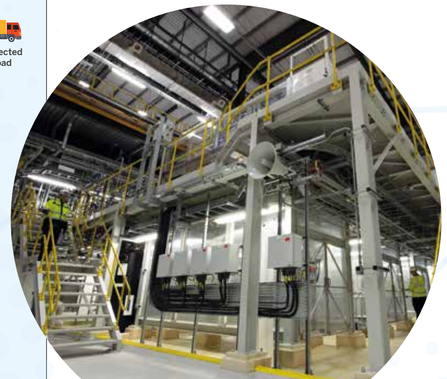
Before testing can be carried out any residual uranic material must be removed.

Any gas is removed from the cylinders and then the uranic residues are washed out using water and chemicals.

When clean, the cylinder is internally pressure tested with water, checked by an external inspector and then dried.

Any new fittings are installed and tested, vacuum pressure is applied to the cylinder, it is sealed and then accurately weighed.

The cylinder is then re-certified and reused in the enrichment process.



Central Control Room

The Central Control Room (CCR) provides an operational control hub for all the plant processes and systems associated with the TMF.

Operated on continuous shift pattern, the CCR technicians control and monitor the plant processes using a Supervisory Control and Data Acquisition (SCADA) control system.

The SCADA automatically measures and controls the TMF processes to pre-defined operating parameters and process variables to ensure the safe and efficient operation, start up and shutdown of the facility.

All the CCR technicians are trained to operate the system utilising an on-site SCADA plant simulator.

Residue Recovery Facility

The TMF generates liquids and solids some of which will contain uranic residue. These are received, treated and processed by the Residue Recovery Facility.

The processes separate recyclable uranic material suitable for storage and possible reuse by:

- pH adjustment / Precipitation
- Separation
- Drying
- Containment in drums

The residual contaminated liquids are cemented into drums for disposal.

Water is also recovered for reuse in the TMF processes through:

- Evaporation
- Reverse osmosis
- Storage

Decontamination Maintenance Facility

The facility is dedicated to the TMF to provide radiological and chemical decontamination of plant items that may need maintenance, inspection or disposal.

The Decontamination Maintenance Facility (DMF) covers all decontamination from large pieces of plant equipment to small nuts and bolts.

The DMF is responsible for:

- Dismantling of equipment and parts.
- Wet and dry decontamination of components using a vacuum system, jet washing and industrial washing.
- Chemical decontamination, acid washing and rinsing.
- Equipment drying.
- Maintenance and testing of plant equipment and components.
- Receipt, storage and distribution of bulk chemicals used.
- Management and processing of radiological and non radiological plant waste.

urenco
ChemPlants