NUCLEAR SOLUTIONS

MAETP (Modular Active Effluent Treatment Plant)

Magnox Sites, UK

VEOLIA

| The Challenge

The decommissioning of Magnox nuclear plants in the UK generated a need to treat radioactive effluent generated at the sites. Under an agreement signed in 2017, Veolia Nuclear Solutions was contracted by Magnox Ltd. to provide four MAETP systems for deployment at Chapelcross, Hinkley Point A, Oldbury, and Dungeness A, though the unit destined for Oldbury was later canceled at the request of the customer. Chapelcross required both filtration and ion exchange modules whilst Dungeness and Hinkley Point only required a filtration module.

Veolia Nuclear Solutions has taken a mobile and modular approach for the design of these liquid effluent treatment systems. Designs for individual modules capable of specific functions (such as ion exchange, filtration, and system control) have been developed.

| Veolia's Solution

The Magnox MAETP systems included the following criteria:

- Flow rate of between 4 and 6 m3/hr
- Effective solids separation and/or soluble activity removal
- Modular design, allowing only specific operations (e.g. filtration, ion exchange) to be operated if required
- Processed wastes compatible with site disposal routes and processes
- Good reliability, resulting in high availability
- Able to treat effluents within a pH range of 6 to 12 and conductivity ranges from 30 – 3000 µS/cm

Magnox, UK

Contract Facts:

PROJECT: Modular Active Effluent Treatment Plant)

DURATION: 36 months

CLIENT: Magnox

Flow rate of between 4 and 6 m3/hr

Treat effluents within a pH range of 6 to 12

Effective solids separation and/or soluble activity removal

| Process description

A conceptual model of the modular system developed for Magnox (image below). The system contains the following elements:

- A reception tank where waste is introduced via a bowser or pipeline
- A filtration module for oil and particulates removal
- An ion exchange module containing shielded vessels for targeted soluble radionuclide removal
- A discharge tank where treated water is stored prior to analysis and discharge
- An influent and discharge module used to reroute incoming liquid to the reception tank or to recirculate, sample, and pump out the discharge tank.

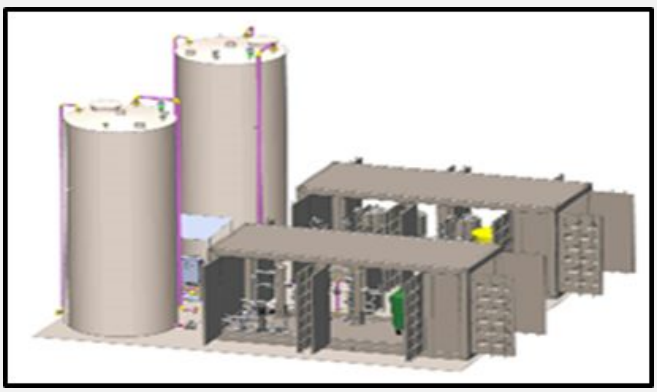
| Client Benefits

The solution is an adaptation of the technologies and approach used in modular effluent treatment systems deployed in Japan and in-process for the United States. The Modular Active Effluent Treatment Plant (MAETP) comprises a limited number of individual components: Receipt Tank, Influent and Discharge Module, Filtration Module, Ion Exchange Module, Discharge Tank and Discharge Pump Skid.

- **Common Design:** The tanks are sized at $30m^3$ to allow for common design at all four sites. Recirculation lines provided to allow for single size pumps to serve all four sites.
- **Compact Footprint:** Area required for all tanks and modules is 10m x 10m. For the two sites that do not require an IX Module, the footprint can be reduced to 13m x 7m.
- **Flexibility:** Double-walled tanks, double contained hoses, and quick connect power and instrumentation cabling simplify installation and enable multiple site configurations with only hose and cable length changes.
- **Ease of Installation:** System to be installed by crane. This enables placement into spaces which may not be accessible by forklift.
- **Commercial Practice:** Non-metal piping and piping components are utilized within the Filtration and IX Modules to provide a cost-effective solution that meets liquid containment requirements.
- **Ease of Operation:** The system is operated from a Local Control Panel. Once manual valve alignments are verified, operation requires activation of the main process pump from a visual HMI program, which shows real time system status.
- **Reduced Work Exposure:** Filtration units selected to increase time between filter cartridge changes. IX media and shielding selected to extend vessel life for a reasonable shield thickness.

ACTIVITY TYPES

- **Mechanical Engineering**
- **Electrical Engineering**
- **I&C**
- **HVAC**
- **Process Engineering**
- **Automated Control Systems**
- **Leak Detection Equipment**
- **Fabrication**
- **FAT**
- **Column Replacement**
- **Media Replacement**



VNS EXPERTISE:

- Water Treatment
- IX Media
- IX Column Design
- HVAC
- Filtration
- Pressure Vessel Fabrication