

# Drum Assay Systems

**Client:** Canberra - UK Site DSRL

## Aims and objectives

Aquila won the contract to design, manufacture, factory test, install and commission, two assay handling systems to be integrated into a waste retrieval and conditioning process at Dounreay Site Restoration Limited (DSRL). A design requirement was that the systems had to complement the Canberra UK designed assay systems and maximise their effectiveness.



**Shielded Facilities**

Cyclife EDF Group - Subsidiaries



# 01

## The client

Dounreay Site Restoration Limited (DSRL) is the site-licensed company responsible for the clean-up and demolition of Britain's former centre of test reactor research and development.

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Aquila integrated all the requirements in the design and managed the manufacture, factory and site installations.

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# 02

## Project overview

Aquila began the contract with a feasibility study on methods available to manipulate the drum during assaying. A scheme design was developed employing Commercial Off-The-Shelf (COTS) items, where possible, and avoiding novel solutions in line with DSRL Technical Readiness Level (TRL) guidelines. Aquila had considerable restrictions to address, with a design life of 10 years and limited or no access for equipment maintenance. Canberra UK conducted extensive system modelling to determine the arrangement and sensitivity of the assay systems and finalised the shielding and system geometry requirements.

Aquila integrated all the requirements in the design and managed the manufacture, factory and site installations. Canberra UK and Aquila held face-to-face project and design review meetings every month, maintaining excellent communications, ensuring expectations were clear and all actions addressed.

Once Aquila had commissioned the complete handling system in the Canberra UK facility at Harwell, Oxfordshire, it handed the plant over for Canberra UK to conduct an extensive programme of active testing and calibration, prior to the plant being installed for the final time in a new facility at DSRL.



# 03

## Sub systems

### Upper Containment

The Upper Containment assembly sits at the top of the plant and provides a contained boundary around the drum lift and slewing drives, while enabling maintenance access through glove ports to the drive components. The assembly comprises the following main features:

- Stainless steel containment - Cell and the Assay Cell.
- Containment windows and glove ports
- Glove guards
- Tenting flanges on two opposing windows.
- Sealed interfaces
- Hoist support
- Internal lights
- Gland plate
- Ventilation Port

### Lower Containment

The Lower Containment assembly provides a containment boundary between the drum and the assay equipment. It comprises the following main features:

- Stainless steel containment
- Encast Plate
- Lead support
- Carriage guide support
- Handling features

### Lead Shielding

The Lead Shielding assembly provides attenuation for the assay instrumentation. The assembly is built around the Lower Containment assembly and comprises the following main features:

- 4" thick lead
- Upper Containment tube penetrations
- HRGS instrument penetration
- G64 instrument penetration
- Add-A-Source penetration
- Cadmium column
- Neutron generator sleeve

### Plastic Shielding

The Plastic Shielding assembly provides neutron moderation for the assay instrumentation and includes a 4" graphite layer on the roof to reflect neutrons back towards the instrument assay. The assembly is built around the Lead Shielding assembly and comprises the following main features:

- 300mm HDPE instrument shielding
- HDPE Add-A-Source shielding.
- 4" thick graphite (roof only)
- Steel support structure
- Fire resistant stainless steel cladding

### High Resolution Gamma Spectroscopy (HRGS)

The High Resolution Gamma Spectroscopy (HRGS) assembly consists of a cryostat mounted behind a variety of attenuation blocks to provide attenuation of the activity being measured into a range suitable for the instrument. It includes the following design features:

- Lead column
- Attenuation mechanism
- Slide-mounted cryostat
- Support frame

### Drum Lifting

The Drum Lifting assembly comprises the lift and slewing drives for the Assay Handling Equipment. Design features that have been included are:

- Load cell
- Hoist interface
- 1000kg SWL Hoist system
- Chain linkage
- Rotation system
- Containment mounted drives
- Fabricated Drum Carriage Assembly
- Vertical Driveshaft
- 1000 kg SWL Drum Grab

# 04 Sumamry

Aquila provided the 3D design solution for the mechanical and electrical system together with Canberra for the radiometrics during the bid process. This is the normal approach adopted by Aquila when tendering to a functional specification. This approach enables and allows for:

- Accuracy in design and manufacturing pricing
- Accuracy in selection and pricing of major bought out items
- Confidence with our clients being able to see the 3D concept together with a full technical description.
- Validation and gap analysis of functional specification and solution offered.

The plant is situated on top of a concrete shielded Process Cell,

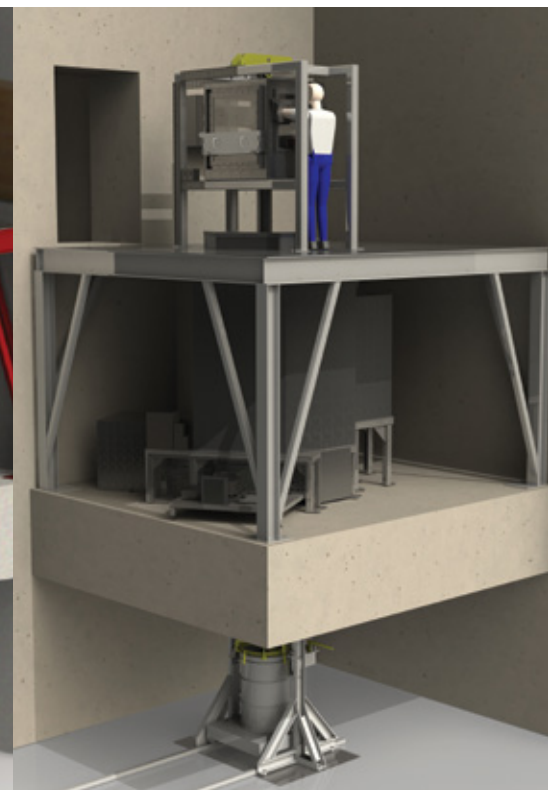
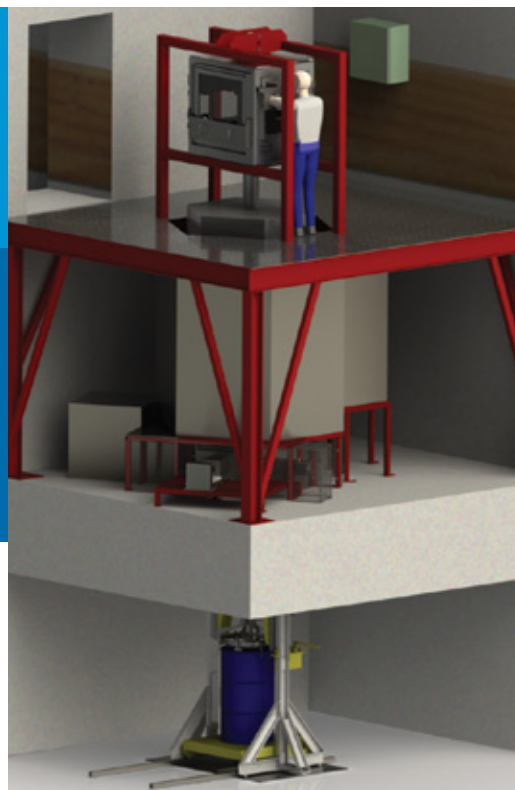
where the waste undergoes sorting and processing before being loaded into drums. When ready for collection by the Assay Handling Equipment, a drum grab is lowered through an aperture in the floor. The drum is lifted through the aperture into a stainless steel containment where the assaying routines take place, involving various raise, lower and rotate operations.

The Lower Containment is shielded on all walls and the roof with 4” of lead. 300mm of HDPE shielding is included around the lead for neutron moderation and for housing the instrumentation used for the assaying.

An additional 100mm layer of graphite is included on the roof, to reflect neutrons back into the chamber.

The drum is collected using a self-actuating mechanical drum grab and lifted into the Lower Containment. The drum carriage runs on rails to guide the position, reacting to any forces resulting from offset drum loading, and to resist the drum-slewing torque generated when the drum is rotated during assaying.

All raising and lowering is undertaken using an electric chain hoist suspended in a glove box (Upper Containment), positioned on top of the Lower Containment. The Upper Containment also houses the slewing drive mechanism. Access to the Upper Containment is via the Support Platform, which also allows for removal of the assaying instrumentation from within the HDPE shielding assembly



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