Case Study: Measurement of 1800 ILW/PCM drums at LLWR for Drum Recategorisation

ANTECH was contracted to carry out measurement services to measure 1800 drums sentenced as ILW at the Low Level Waste Repository with the aim of recategorisation through a high accuracy assay of the drums. For this ANTECH deployed the Universal Drum Assay and Segregation System (UDASS), in partnership with NSG Environmental Ltd for on-site measurements.

Scope

- 1800 drums of historical waste from decommissioning operations, previously classified as Plutonium Contaminated Material (PCM)
- ANTECH provided assay, measurement analysis and reporting on the drum results. Providing consignment recommendations to LLWR.
- Work collaboratively in partnership with NSG Environmental to form a cohesive team to support the LLWR site team.
- Provide installation, commissioning and removal of the system from the site during the mobilisation and de-mobilisation stages. Also maintain and service the system throughout the campaign.

Performance Objectives

- Provide accurate consignments with minimal, accurate uncertainties in report form for use in final consignment.
- Meet project objectives in delivering an efficient measurement service. Monitor and manage delivery targets and schedules.
- Carry out drum assays, averaging >6 drums per day and provide regular reporting to maintain throughput and project schedule.
- Operate on site in compliance with site requirements and training objectives.
- Provide suitable confidence and support to end user subject matter experts in their efforts for reconsignment.

ANTECH Solution

For the measurement services, ANTECH deployed its latest assay instrument; the Universal Drum Assay & Segregation System (UDASS). This is a high accuracy, precision system for the accurate measurement of waste in both 220L and 340L drums. The UDASS incorporates enhanced versions of both the Open Detector and Segmented Gamma Scanner (SGS) assay methodologies, with a pre-scan providing a differentiation for each drum, and using the most accurate scanning technique for each drum. A further TGS mode allows for object identification and activity correction. Through this, the UDASS achieves a high level of accuracy and minimised uncertainties, allowing for accurate final consignment.

UDASS Specification

Sample Sizes	220L drum, 340L drum
Sample Weight	0 - 1300kg, ±0.5kg
Detector Type	HPGe, >70% relative efficiency
Scan Techniques	DOD, WR-SGS, TGS
Measurement Time	30mins (typical)
Transmission Source	370MBq (10mCi) Eu-152
Shielding	2 inch (50mm) lead
Filters	30mm tungsten filter for high activity

Both main scan types of Open Detector and SGS are enhanced by ANTECH's experience in the design, development and use of assay instruments into the 'Dynamic Open Detector' (DOD) and 'Wide Range Segmented Gamma Scanner' (WR-SGS). The use of a high activity transmission source for enhanced density correction and variable aperture collimator for refined scanning techniques improve both techniques to result in the highest accuracy system available on the market. In combination with a >70% efficiency High Purity Germanium (HPGe) detector ensures accuracy and

To ensure conformity and accuracy, the UDASS features a number of quality control measures as part of the measurement process, so each measurement has a validity check. This allows the operators to monitor any drifting or degradation in performance of either detector or hardware and provides assurance for the end user.

ANTECH installed the UDASS onto the LLWR site in June 2021 and has been carrying out operations since, and submitting results. As a result of using the UDASS, the campaign has had a high rate of reconsignment,

Results

- At the current rate of over 75% of drums measured and reported, over 99% of the drums have been recommended for reclassification from ILW to the lower LLW category of waste, with the majority assessed to be below VLLW.
- The service has currently realised savings in excess of £9million for the lifetime cost of managing the waste drums, including transportation, storage etc. This value is assessed by the end user LLWR.
- Peak daily throughput of 10 drums regularly met.
- Learning from experience and system improvements have been taken from the campaign.

Benefits

- Forecast savings of almost £11million for the whole campaign, based on the current trend of reclassification.
- UK Taxpayer savings through savings for the Nuclear Decommissioning Authority and site budgets
- Site radioactive inventory and radiological hazard level has been significantly reduced through accurate reconsignment.
- Reduced requirement on radioactive secure transportation equipment, reducing the burden on the NDA estate.