

Project Case Study

Intermediate Level Waste (ILW) Analytical Support



Challenges

- Working with ILW levels
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- Response on turnaround requested
- Employing analytical techniques to reflect decontamination techniques to be used on site.



Key Features

- Working safely with the higher level of radiation and potential contamination risk
- Managing relationship with and expectations of the client
- Where appropriate adjusting our methods to reflect the decontamination techniques to be used and recommending alternatives where appropriate.



Project Summary

AMEC were contracted by a licensed nuclear site to provide radiochemical analysis support to the investigation of appropriate waste disposal routes. This involved the analysis of fuel element debris (FED), pond skip coupons, filter sand, resin, sludge, and FED slurry.

AMEC provided appropriate Type A packaging and dangerous goods safety advisor support for the transport of the samples.

AMEC worked in partnership with the client to ensure the end results would meet their project requirements. We carried out radiochemical fingerprinting on all matrices. Standard methods were adapted following pre-agreement with the client, to suit the unusual matrices and to meet client's special requirements. Physical testing was also carried out on various samples. Interim results were reported at each stage and then further analysis commenced only following further discussion with the client. In addition to the standard report, results were reported in the client's preferred format, and professional consultancy was available to assist in interpretation of the results.



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Typical examples were decontamination experiments and fingerprinting of the pond skip coupons for Magnox South Sites

Each site had a different approach; however, for Hinkley, samples of metal skip coupons were received, which were analysed for high-resolution gamma spectrometry and for strontium-90 analysis. The samples were then leached and the bulk leachates were analysed for plutonium, americium and uranium isotopes. Other selected coupons were also analysed by gamma spectrometry following the acid leach step to determine residual Co-60 and Cs-137 activities. Gamma spectrometry was also performed on the bulked leachate as a confirmation that the bulked sample activity was consistent with the individually determined activities.

Another approach was to take surface swab samples of the slime covering the skips and analyse for gamma spectrometry as received. Samples of metal skip coupons were also received for gamma spectrometry measurement as received, on the leachate, and on the coupons post-leaching. One of the coupons was selected for strontium-90, plutonium/americium/curium/uranium isotopes, samarium-151/promethium-147, gross alpha/beta, iron-55, nickel-63, tritium and carbon-14 analyses

Fingerprinting of Fuel Element Debris (FED)

FED samples were received for a full fingerprint determination, which included gamma, gross alpha/beta, uranium/plutonium/thorium/ americium/curium/californium isotopes, strontium-90, samarium-151/promethium-147, iron-55, Tc-99, chlorine-36, iodine-129, nickel-63, radium-226, tritium and carbon-14 analyses. The difficulty with some of these samples was to homogenise them without losing the volatile determinands. This involved a significant amount of work in partnership with the client to achieve representative results.

For the higher active samples, swabs were used to fingerprint the FED.

Samples were also received and characterised from the wet vault for both radiochemical and chemical determinands.

Carbon-14 determination was also carried out on FED dust.

Filter sands

A graphite based BCD? Write in full filter dust sample was received for radiochemical fingerprinting to include gamma, gross alpha/beta, uranium/plutonium/thorium/ americium/curium/californium isotopes, strontium-90, samarium-151/ promethium-147, iron-55, chlorine-36, iodine-129, nickel-63, radium-226, tritium and carbon-14 analyses.

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Desiccant samples

Desiccant samples were received for radiochemical fingerprinting to include gamma, gross alpha/beta, uranium/plutonium/thorium/ameridium/curium/californium isotopes, strontium-90, samarium-151/promethium-147, iron-55, chlorine-36, iodine-129, nickel-63, radium-226, tritium and carbon-14 analyses.

Pond Sludge analysis

Sludge samples were received for physical testing, radiochemical fingerprinting and chemical analysis.

Sand and resins

A sand and resin sample was received for radiochemical fingerprinting and waste acceptance criteria analysis to determine an appropriate waste route

FED slurry

FED slurry samples were received for:

- Radiochemical determinands including gamma, gross alpha/beta, uranium/plutonium/thorium/ ameridium/curium/californium isotopes, strontium-90, samarium-151/promethium-147, iron-55, Tc-99, chlorine-36, iodine-129, nickel-63, radium-226, tritium and carbon-14.
- Chemical analysis to determine the bulk chemical make up, organic and inorganic carbon content, and volatile organic content.
- Physical testing such as particle size distribution, pH, wet and dry weight, weight loss on ashing, and settling experiments.