

THE RAYMON - IT'S WORTH ITS WEIGHT IN GOLD

The RayMon, a Radiation Protection Manager (RPM) and a Nuclear power plant. It's a match made in heaven!

Summary

The Radiation Protection Manager for Entergy recruited the RayMon to complete a CRUD analysis to understand the radioisotopes present in radioactive deposits accumulating in the pipes, and their associated dose. The device was successful in quickly determining the identity of these isotopes and their individual dose contributions, informing dose reduction strategies to help minimise workers' exposure to radiation.

Using Kromek's RayMon and MultiSpect Analysis Gamma Spectroscopy Software

The RPM team received a quick tutorial on how to use the 'calibration', 'measurement acquisition', 'analysis' and 'isotope identification' features of the [RayMon handheld gamma spectrometer](#). The detector was placed against the pipe wall and left to acquire for 120 seconds. The data was initially analysed on the RayMon, then later transferred onto a computer and analysed with [MultiSpect Analysis](#).



From the measured spectrum, the fluence across the spectrum at every energy was calculated. Binning was then used to calculate the dose contribution from each isotope.

Results

By aggregating the energy bins of the various photo peaks of interest, the dose contribution by isotope was determined for each of the primary isotopes of interest: Cs-134, Cs-137, Co-58, and Co-60. The initial testing by Entergy at ANO has proven that isotopic concentration can be measured and calculated using the Kromek RayMon portable survey instrument.

CRUD analysis is essential to determining which dose reduction strategy to pursue, using the RayMon proved that initial surveys can be used to provide this information. Over time, repeating these surveys will provide more visibility in the CRUD content and changes over time. The RayMon has proven without a doubt to provide Entergy accurate data to make decisions for workforce dose reduction strategies. Comparing of isotopic ratios over time will equip the Entergy team with the tools to not only take the correct action to reduce the dose but to also evaluate the long-term effectiveness of the dose reducing activities with the outcome of saving money.

THE RAYMON - IT'S WORTH ITS WEIGHT IN GOLD

“The RayMon has proven without a doubt to provide Entergy accurate data to make decisions for workforce dose reduction strategies.”



CRUD Analysis - Radioactive Isotope Analysis in the Field

[Entergy](#) is an American energy company. They operate over 40 plants that turn nuclear, natural gas, coal, oil and hydroelectric power into electricity. Prior to remediation work in certain parts of their nuclear power plants, it is understood that radioactive deposits within pipework can significantly elevate ambient dose rates. Following the ionizing radiation regulation principle As Low As Reasonably Possible (ALARP), it is necessary to implement methods to reduce radiation exposure of the workforce.



The Radiation Protection Manager (RPM) for Entergy, is primarily interested in lowering source term inside pipes and having a method to determine the success of remediation processes. To do this, the RPM and his team need to know which isotopes are present and the relative contribution to dose for each isotope.

Challenges faced by Entergy

Within the laminate film layer in process pipes, a build-up of radioactive metals takes place. These are referred to as Chalk River Unidentified Deposits (CRUD). While radiochemistry is an effective tool for analysing the CRUD layer, the Entergy team need to know the composition of the CRUD layer as this relates directly to dose contribution.

Having the facility to characterize the CRUD layer, the RPM and his team can put in dose reduction measures specific to the heavy isotope(s) identified. For example by adding depleted zinc, which penetrates the laminate film and blocks Co-60 from bonding to the pipe wall. It should be noted that without a good understanding of the CRUD layer composition, it is impossible to determine the long term effectiveness of the removal process and therefore no guarantee that there will be a lasting result. Nuclide Identification enables accurate targeting and leads to ensure that the correct and most cost-effective removal methods are used.