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Novel technology developments for waste Condition Monitoring & Inspection by Sellafield Ltd through collaboration with the supply chain

The safe storage of chemically reactive radioactive waste, under water cover within a robustly engineered system, for a prolonged period requires understanding of its history and the ability to predict future behaviour. Condition Monitoring and Inspection (CM&I) is seen as the final step in the hierarchy of controls used to demonstrate the longevity of interim stored waste. Such monitoring and inspection will provide evidence that the waste packages continue to be compliant with the safety case requirements and that Sellafield Ltd. (SL) is complying with the Site Licence Conditions through confirmation that evolution is progressing as expected throughout interim storage whilst remaining compliant with the Radioactive Waste Management Ltd disposal requirements.

CM&I takes account of the technical risks, potential waste evolution and performance requirements of both store and waste container. It should be proportionate to the levels of concern (residual risk) associated with each of the waste types. This provides reassurance that the overall performance of the storage system is protective of people and the wider environment.

A number of technologies are being developed to support monitoring of packages in the stores (in-situ) or for more detailed examination on packages retrieved from the stores (ex-situ). This presentation describes the novel technologies developed by Sellafield Ltd through collaboration with the supply chain to meet our CM&I requirements - specifically:

• Muon Tomography, for viewing inside the packages for waste expansion, water consumption, corrosion/deformation of package internals.

• Range-resolved Hydrogen Detection (raman spectroscopy at distance). The rate of hydrogen gas release is a useful indicator of reactions taking place, however it is very difficult to measure in a real system constrained by space, access, remote operations, competing ventilation flows, and low hydrogen release rates.

• Acoustically detecting and locating deflagrations (not expecting any but cannot be dismissed),

• Real-time image enhancement for existing camera systems (currently installed store cameras were not intended for CM&I),

and a summary of others being evaluated such as High Energy X-Ray, filter performance monitoring, thermal imaging, LiDAR, and structured light scanning.

The presentation will also address deployment challenges in remote handled vault stores and how engineering, operational and maintenance requirements can be considered in early stage technology development.

Affiliation

Sellafield Ltd

Speaker's title

Mr

Do you wish to participate as a Young Professional?

No

Do you wish to be considered for a Young Professional grant?

No

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