European collaboration to improve radioactivity measurement in waste materials

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As part of the European Metrology Research Programme (EMRP), the National Physical Laboratory (NPL) is working to improve the radioactivity measurements needed to ensure safety at nuclear power plants and waste repositories throughout their operation and decommissioning.

The project 'Metrology for Radioactive Waste Management' began in 2011, is led by CMI, the Czech Metrology Institute, and involves the national measurement institutes from 12 European countries.

One of NPL's roles in the project is to develop automatic gas analysis devices for tritium (a radioactive isotope of hydrogen) and carbon-14 species produced as nuclear waste decomposes over time. Monitoring for these gases is required to ensure worker safety and compliance with environmental monitoring legislation.

A prototype 'NPL Automated Repository Monitoring System' is being assembled for active testing later in 2013 with low level gas standards similar to the levels of gases expected to be present in a nuclear waste repository. This device will collect gases and prepare samples for subsequent analysis using a technique called liquid scintillation counting. This technique uses a liquid to convert the kinetic energy from nuclear emissions into light energy (photons) which are then detected by the counting equipment. The final device will be fully automated and have the ability to transfer data to a remote computer for result analysis.

As part of the same project, scientists at NPL are also working to validate and develop a commercial device that can increase the speed and safety of radioactivity measurements on samples. NPL is one of only two laboratories in Europe in possession of a NorthStar Automated Radiochemistry System, the other being PTB, the national measurement institute of Germany.

Currently, the device can separate five products of a sample (isotopes of uranium, plutonium, americium, technetium and strontium) in under one hour, whereas traditional methods could take several days. As it does not use any corrosive/carcinogenic chemicals, or concentrated acids, and generates relatively small waste volumes, the system is also safer and better for the environment. NPL is working closely with NorthStar to improve the system and the control software.

This work is providing an important input to the EMRP project and demonstrates the benefits of collaborative research in measurement science across Europe. It also shows how NPL is working to both develop new techniques and refine existing ones to help ensure the safety of the people working in the nuclear industry.

The final Call for EMRP joint research projects is now underway and the proposed successor programme, 'European Metrology Programme for Innovation and Research' (EMPIR), is currently being developed.

Provided by National Physical Laboratory