

TECHNOLOGY@ROCKY FLATS

Demonstration & Deployment Summary

New Alpha Detection Instrumentation Developed for Characterizing SCO Waste

Summary

During decontamination and decommissioning of Building 779 in the late 1990s, Rocky Flats cleanup managers capitalized on a newly created Department of Transportation shipping classification called Surface-contaminated Object (SCO) to transport low-level radioactive waste. The ability to characterize, package and ship waste as SCO has had an extremely positive cost, schedule and safety impact on the cleanup and closure of Rocky Flats. When SCO criteria are achieved, size-reduction is minimized because larger containers can be used for disposal. Characterization rework is minimized because the characterization and package inventory calculations are completed prior to sealing the container. Cost of characterization is significantly lower (more than \$500 per cubic meter less than baseline estimates) because measurements are performed by technicians using inexpensive instruments in the field instead of at centralized counting facilities. Combined with new decontamination techniques, use of the SCO criteria has resulted in a dramatic reduction in the amount of waste that would otherwise have been shipped to WIPP.

To improve the ability of site radiation control technicians to perform SCO characterization, new radiation detection instrumentation was needed. The Ludlum Measurements Company, working closely with Rocky Flats, developed the High-Range Alpha Ion Chamber.

The Need

Characterizing waste as SCO required a new type of radiation detection equipment than what is normally used at Rocky Flats. The upper detection limit for standard alpha detection instruments is 2 million disintegrations per minute (dpm) per 100 square centimeters. SCO characterization



The Ludlum High-Range Alpha Ion Chamber

requires upper detection limits of 500 million dpm per 100 square centimeters.

SCO instrumentation would often become contaminated when used in the field to take measurements in a contaminated environment such as a glovebox undergoing D&D. Contaminated instruments could not be removed from a contamination area for routine

A Surface-Contaminated Object

is a solid object which is itself not radioactive, but which has fixed and/or removable radioactive contamination distributed on any of its surfaces. Examples of SCOs that are being disposed as low-level radioactive waste during Rocky Flats

Environmental Technology Site closure activities include: tools, desks, cabinets, computers, laboratory cabinets, bench tops, fume hoods, ducting, safes, bakeout ovens, vacuum cleaners and air movers with filter media removed, sinks, sheet metal, metal bar stock, piping, rigid plastics, wallboard, flooring, plastic sheeting, cardboard, light fixtures and glovebox components.

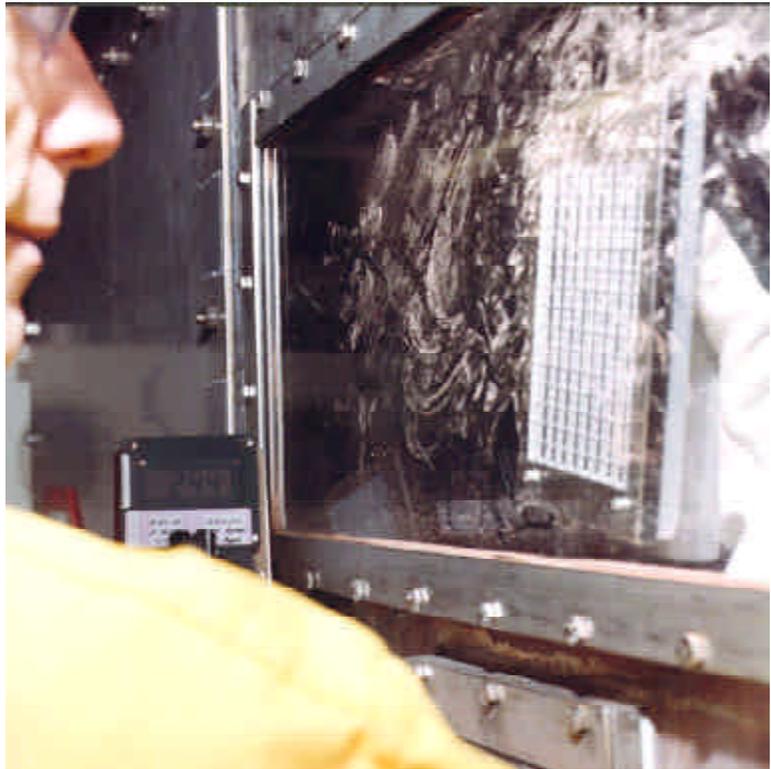
calibration and performance testing. Calibration is performed at a central location using a radioactive source that emits a known value of radiation.

Developing the Technology

With the support of Kaiser-Hill, Safe Sites of Colorado, The Alpha Group and DOE's Science and Technology office (EM-50), vendors were asked to develop and demonstrate technologies to meet the new Rocky Flats characterization needs.

A sodium iodide detector that could take readings through glovebox walls, eliminating the potential for instrument contamination, was developed. It did not meet SCO characterization requirements but showed potential for characterizing contamination within building ventilation systems.

Developmental work continued with additional funding from the Rocky Flats Building 371/374 Project and EM-50. The Alpha Group, Rocky Flats' radiological instrumentation, calibration and maintenance contractor, worked with the Ludlum Company to develop and refine the Ludlum High-Range Alpha Ion Chamber to measure extremely high levels of surface contamination. The Ludlum instrument consists of the Model 43-132 Ion Chamber Probe and the Model 195 Readout Unit. It is a newly developed instrument designed for conditions that exist at Rocky Flats. The design incorporates an electronic performance test that can be done in the field, even after the detector itself has become highly contaminated, improving the quality assurance of the measurement. Because National Institute of Standards and Technology (NIST) traceable alpha contamination standards are not available above a few million dpm, a new calibration technique had to be developed to establish NIST traceability.



The Ludlum instrument is used to characterize a plutonium-contaminated glovebox.

Results and Benefits

The Ludlum instrument was tested for expected conditions. Test results demonstrated that the instrument could measure alpha contamination levels from 10,000 to 1 billion dpm per 100 square centimeters, exceeding instrument requirements. It had no significantly interfering response to beta, gamma or neutron radiation at levels likely to be found at Rocky Flats. Other important characteristics such as linearity, temperature response, response to radio frequency interference, ability to calibrate, field maintenance, price, availability and human interface equalled or exceeded characteristics of normal survey instruments. Learning curve for using the new instrument was negligible. For more information concerning characterization of SCO at Rocky Flats, contact Robert Morris, The Alpha Group, at (303) 966-6468



Technology Supporting the Path to Closure

For more information about Technology at Rocky Flats, contact David Maloney, Kaiser-Hill Company, (303) 966-7566, or Gary Huffman, DOE, Rocky Flats Field Office, (303) 966-7490

