

TECHNOLOGY@ROCKY FLATS

Demonstration & Deployment Summary

Mobile High Performance Lung Counter Protects Workers

Summary

Lung counting is used at Rocky Flats as part of the routine and special bioassay programs to detect and quantify intakes of radioactive material in workers, and is part of the Radiation Protection Program implemented to meet requirements of 10 CFR 835, Occupational Radiation Protection. The medical building that houses the current lung counting system (Building 122) is scheduled for demolition as part of the Site closure.

There is no other lung counting facility in the Denver metro area to replace those of Building 122. The Site explored the possibility of outfitting a shielded room owned by the Colorado Department of Public Health and Environment (CDPHE) for lung counting. However, that room is currently utilized by CDPHE for other purposes, so even if it were to be outfitted with equipment meeting Rocky Flats requirements, it would not be available full time for Rocky Flats use. In addition to the scheduling conflicts, the facility is located several miles away from Site, which would present a further delay for the workers to travel to an from that facility. Lack of a dedicated site facility would impact the closure schedule due to the lost productivity and work availability. Without this system employees will have to be flown to another state where adequate counting capabilities are available, again significantly impacting project costs and schedules.

The Need

Beginning operations in 1964, the Building 122 lung counting system has been successfully used at Rocky Flats for many years. The system includes three shielded rooms (~9'x9'x9') consisting of a graded shield of 6" low background steel lined with 1/8" lead and a thin layer of tin and zinc. Two rooms are used for lung counting and the third is

used for special counts of wounds or other organs. The counting system uses high purity germanium detectors connected to electronics and a computer to analyze the spectrum from the counts. The system that evolved at the Rocky Flats medical facility meets the exacting specifications of the site but is literally built-in in such a way that it can not be moved without destroying its function. An alternate system had to be located nearby, or a replacement system developed.

The Technology Solution

When no suitable existing counters were identified nearby, a decision was made to construct a Mobile Lung Counting Trailer that would allow the Site to maintain a lung counting capability onsite until lung counting is no longer required. The system had to combine the required performance in terms of instrumentation, analytics and shielding materials/configuration with a platform that is mobile (to conform with the site's building demolition schedule).



Inside view of the mobile platform

The Project

Steve Baker, the Project Manager, and his team, with support from the Kaiser-Hill/DOE Technology Solutions Program, proposed, developed and built a mobile Lung Counter System that includes new

TECHNOLOGY ROCKY FLATS

state-of-the-art, high purity germanium detectors installed in a mobile lung counting trailer owned by the Carlsbad Environmental Monitoring & Research Center (CEMRC) at New Mexico State University. The trailer with the detectors was assembled and moved to Rocky Flats to allow both routine and special lung counts of Site workers on an as-needed basis (note that the system can also perform whole body counts). This provides rapid assessments needed to monitor and maintain worker health, and minimize potential health uncertainties. This makes the clean-up work safer and more efficient at the same time, thus avoiding what otherwise would be significant impacts to the closure schedule. The mobile counter has the following features:

- 1 graded shield room (~4'x4'x8' x4") mounted in 57' enclosed trailer
- Trailer equipped with air conditioning and heat
- Array of 2 Canberra broad energy germanium (BEGe) detectors
- Crystals 80 mm diameter (5,026 mm²) x 20 mm thick
- Uses existing RF electronics
- NIM bins, high voltage power supplies, analog to digital converters, AIM modules
- Uses existing computer and software
- DEC Alpha 300/3000 and ABACOS+ (GENIE/VMS) software
- MDA for ²⁴¹Am similar to Building 122 (~ 0.2 nCi)

The Results and Benefits

Following initial start-up and testing, the following results were revealed:

- Detector resolution is equivalent to or better than B122
- Efficiency calibration is similar to but slightly less than B122
- Calibration verification counts equivalent to B122
- Background counts with door closed ~1/2 of B122 background

- Background counts with door open ~4 1/2 times B122 background
- DOELAP Am counts within 5% of B122
- DOELAP U235 counts within 0.3%, U 238 within 1.8%
- MDA for Am-241 ~17% lower than B122 with door closed
- MDA with door open 2x B122 MDA with door closed
- Counts of "Known Cold" people consistent with B122
- Counts of "Known Positive" people consistent with B122



View of the shielded room and counter

The new germanium detectors in combination with this shielded mobile platform offer capabilities comparable to the existing system in use at Rocky Flats. This assures onsite lung counting is used to help meet the requirements of 10 CFR 835 to ensure doses are correctly assessed and tracked for Rocky Flats workers and to meet closure schedules safely.

The system as designed will be returned to the CEMRC upon completion of Rocky Flats Closure so it can be re-deployed at other DOE closure sites.

Technology Supporting Paths to Closure



For more information about Technology at Rocky Flats, contact Dave Maloney, Kaiser-Hill Company, (303) 966-7566, or Dave Hicks, DOE, Rocky Flats Project Office, (303) 966-3122

