MIRION TECHNOLOGIES

Radiation Safety. **Amplified.**

Modular Gamma Box and Container Counter

Nuclear | Healthcare | Homeland Security & Defense | Labs and Education | Industrial and Manufacturing

KEY FEATURES

- Performs full gamma spectroscopy and accurately characterizes containers of waste
- Saves time and labor by assaying waste in a large container or its shipping container
- Modular design can be configured for samples from B-25 (1 x 1 x 3 m^3) boxes through ISO shipping containers
- Fully assays a B-25 box in 30 min. and an ISO container in 2-3 hours
- 0.01 Bq/g (0.3 pCi/g) typical detection limit for a B-25 box
- Available with manual, powered, or automatic conveyor systems for sample handling
- Multiple Germanium detectors (typically four) featuring:
  - Adjustable detector height to match sample size
  - Adjustable detector-to-sample distance to handle low or high activity samples
  - Computer controlled lateral motion to count the entire container
  - ICB-NIM electronics for remote system control
  - Network access for remote interrogation and management
  - Utilizes a wide range of data correction tools for accurate results

DESCRIPTION

The Modular Gamma Box Counter reduces the time and labor required to process waste by giving you the ability to assay it in shipping containers too large to be handled by traditional waste assay systems. Standard B-25 boxes (typically 4 x 4 x 6 ft) can be assayed to a detection limit of 0.3 pCi/g (typical for nuclides >300 keV and 100% yield) in as little as 30 minutes, and a full sized ISO shipping container (typically 8.5 x 8 x 20 ft) processed in two to three hours. Compared to the alternative of unloading the container and/or counting the contents individually, significant savings in handling time and labor can be readily achieved. And, since a very large fraction of the container is analyzed (much larger than traditional sampling techniques), a more accurate result is commonly obtained for those samples with non-uniformly distributed radioactivity.

MODULAR DESIGN FOR FLEXIBILITY

The counter utilizes a modular design, allowing it to be easily adjusted to handle a wide range of sample sizes and shapes in the optimum configuration.

MOVABLE DETECTOR ASSEMBLIES

Movable Detector Stands, adjustable for both sample height and size, are the key to the counter's flexibility. Position them on either side of a sample stand or optional conveyor, and you have a system configured for processing boxes. Or, use one – with all four detectors on it – at one side of a covered loading platform, drive up a truck with a shipping container, and the exact same system can be used for assaying full sized ISO shipping containers.

CANBERRA

The standard design detector stands can be adjusted manually for detector height and sample:detector separation. One of two scanning options is available to best suit the facility's material handling needs. The counter can move the detectors laterally along the entire length of the sample or the counter can be supplied with amaterial handling system to scan the sample in front of the detectors. The individual measurements along the sample length and height are also used to determine sample non-uniformity.

For lowest cost, a simple manual stand is also available. This can be used with just one detector, with the necessary sample segmentation provided by moving the sample manually.

Germanium detectors are used because they are much less sensitive than NaI(Tl) detectors to changes in the ambient environment. In addition, the superior resolution of germanium detectors is a major benefit in handling the complex multi-nuclide spectra often found in waste material.

Each detector is housed in a shielded and collimated module to minimize the interference from environmental and plant background. Shadow shields can also be provided if interference from nearby sample containers is a problem.

Each detector stand can hold two detector modules, with four detectors per system being the most typical configuration.

When very accurate matrix corrections are required, transmission sources, shields, and shutters can be provided (as an option) opposite the detector stands to allow transmission measurements to be made.

VERSATILE SAMPLE HANDLING

The modular design of the system gives it an extremely versatile sample handling capability.

For low volume box counting, a simple sample stand or just a fork lift to position the box may be all that is required. For greater throughput, both manual and powered conveyors are available. Automatic powered conveyors that can load each new sample and remove the one just counted are also available. Manual or automated weighing systems can also be supplied to provide the input data for matrix correction routines and for the calculation of the results in concentration levels as well as activity.

When the system is configured for large shipping containers, a truck is normally used to move the container into position for counting. Multiple lateral segments are automatically measured as the system repositions the detector tower along the length of the container.

COMPUTER CONTROLLED ELECTRONICS

The Box Counter modularity is also carried over into its signal processing electronics. ICB-NIM is used throughout, giving you the ability to manage all of the system's electronics remotely from the Host PC.

POWERFUL SOFTWARE BASE

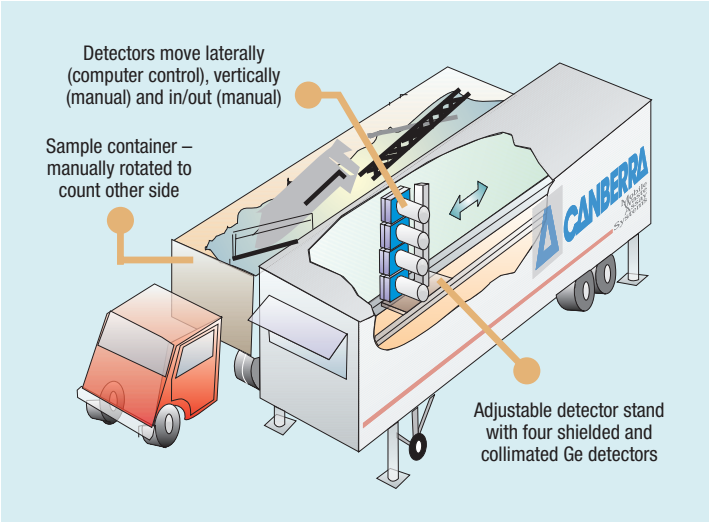
The software in the Host PC is built upon the powerful OS/2 based Genie™ 2000 basic spectroscopy package. Using the REXX programming language and the Genie 2000 Graphical Batch Tools, this base was then extended into an easy-to-use menu-driven application tailored to the job.

For manual systems, operator prompts are used for any needed geometry changes during an assay. Systems with an automatic sample handling mechanism automatically perform the needed movement controls.

PROVEN ANALYSIS ALGORITHMS

In addition to the basic gamma spectroscopy capabilities associated with Genie 2000, the final package also features CANBERRA's field-proven waste assay software functions, including:

- Monte Carlo techniques for system calibration.
- Differential peak absorption.
- Transmission matrix absorption.
- Matrix density correction.
- Random summing and live time correction.
- Bilateral counting geometric averaging.
- Non-homogeneity identification from segment countrate data.



Typical installation to assay large waste containers

PERFORMANCE

The performance varies with the details of the system configuration (number and size of detectors), ambient background, sample matrix, nuclide, and counting time. The following description gives an outline of the conditions that can be expected and the results that can be obtained from a typical system installation.

ASSUMPTIONS AND TYPICAL CONDITIONS

- Detector(s) properly shielded and collimated.
- 0.1 µSv/h (0.01 mR/h) ambient background.
- Gamma energies from 300-1500 keV.
- 100% gamma abundance for the measured nuclides.
- 30 minute processing time for a B-25 box.

ENVIRONMENTAL CONDITIONS

- 5-35 °C, non-condensing humidity.
- Free from dust or other potential radioactive contaminants.

TYPICAL SENSITIVITY VALUES (LLD)

FOUR DETECTOR SYSTEM

- Low density samples (0.3 g/cc): 0.01 Bq/g (0.3 pCi/g).
- High density samples (1.8 g/cc): 0.001 Bq/g (0.03 pCi/g).

SINGLE DETECTOR SYSTEM

Since only a single detector is used, much greater sample handling is required to count all segments. This increases the sample handling costs. Also for a fixed total sample counting time, it reduces the counting time available for each segment, and raises the detection limits significantly.

- Low density samples (0.3 g/cc): 0.05 Bq/g (1.3 pCi/g).
- High density samples (1.8 g/cc): 0.007 Bq/g (0.2 pCi/g).

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