Case Study

CANBERRA

Advisor™

Expertise for Challenging Measurements

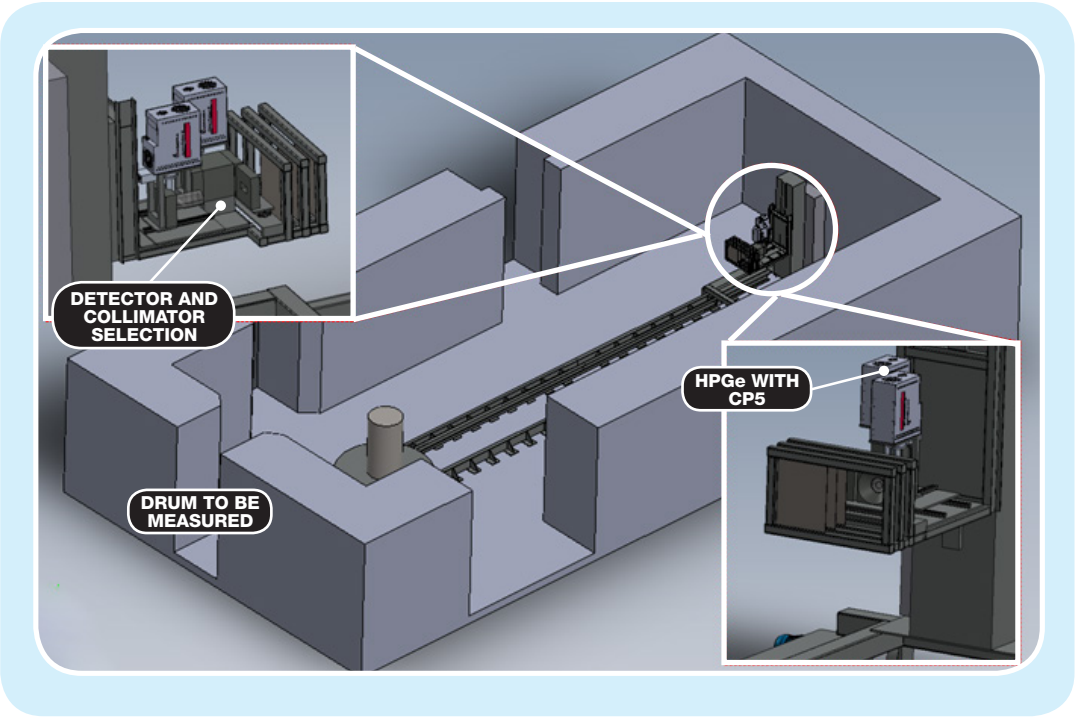
Feasibility Study: Gamma Spectrometry of High Activity Waste drums

Scope:

- The future “CIGEO” facility, managed by the French Nuclear Waste Agency, is designed for long-life medium and high activity waste final disposal.
- Once built, nuclear waste from all of French industry will be shipped to this facility.
- Some drums will go through a full characterization process, for various quality and safety checks.
- Around 150 types of drums containing about 200 different radionuclides are expected.

Key Drivers:

- Need to precisely assess the footprint required for spectrometry measurements.
  - Large concrete walls are mandatory for radiological protection, making civil work a significant cost for the future facility.
  - Space optimization and forecast is key in this project.
- Measurement range: from Intermediate Level Waste (ILW) to High Level Waste (HLW), up to 10^{15} Bq at ^{137}Cs, without detector saturation.
  - Ensure that the waste activity level remains in the range allowed by the license of the storage facility.
  - Declare the activity to the National Agency of Radioactive Waste for costs and scenario forecasts.
- Final study report to be delivered within two months.



Visit our Measurement and Expertise (M&E) page.

MIRION TECHNOLOGIES

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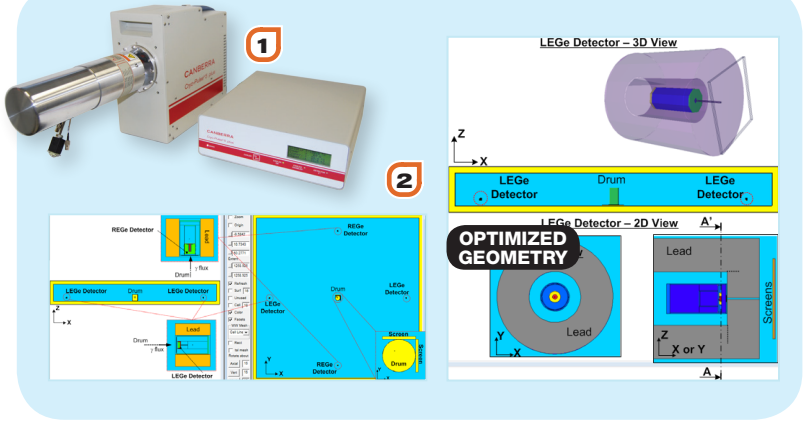
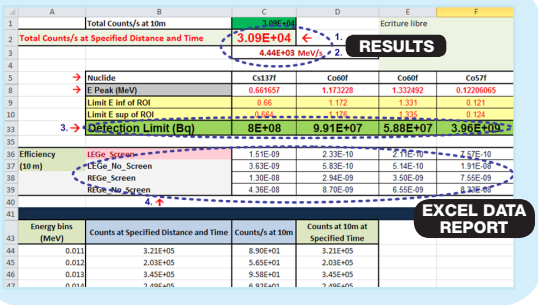
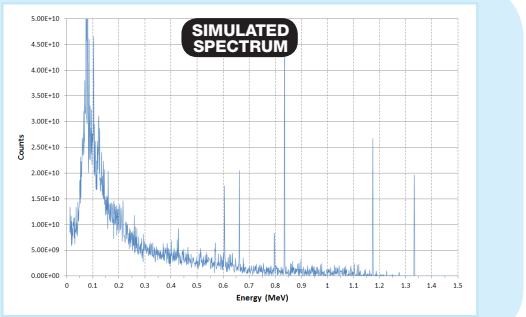
Instruments & Techniques Used:

1. HPGe Cryo-Pulse® 5 Plus detectors
2. MCNP calculation code







CANBERRA Solution:

- From the list of around 150 types of drums, 12 "bounding" geometries have been defined, taking into account variety in terms of:
  - Composition and density.
  - Shielding.
  - Internal volume and shape.
- Parametric studies using MCNP calculation code have been performed.
  - For each bounding geometry, one calculation is performed per emitter radionuclide.
  - Automation of the calculations allowed about 600 calculations to be performed in less than one month.
  - Studying up to four measurement configurations in one model made efficient use of the allowed calculation time.
  - This approach allowed a large flexibility in the analysis.
- A specific Excel sheet has been delivered for analysis of results which allows the customer to "build" the detector response of the desired drum, with clear display of the results.
- The measurement configuration has been optimized for the most penalizing drum to be measured using advanced MCNP calculation techniques to allow convergence with highly collimated detectors.

ACHIEVEMENTS

- Complexity problem reduction achieved by CANBERRA M&E Team for planning and cost optimization.
- Definition of an adaptive measurement system with guarantee of measurement ability for every expected drum.
- Excel sheet reports can be re-used by the customer for further analysis in the next stages of the project without additional cost.
- Civil work cost assessment can be performed based on reliable information.
- On Time Delivery of the final report in spite of the tight schedule thanks to responsiveness of CANBERRA's M&E Experts from various countries.