Case Study

CANBERRA

Advisor™

Expertise for Challenging Measurements

Underwater measurement of activated wastes with the SMOPY Probe

Scope:

The objective of this measurement campaign was to characterize spent control rods from decommissioning nuclear plants before they are packaged, shipped and stored as intermediate-level radioactive waste. The waste would ultimately be sent to a final repository site.

The SMOPY probe has been used for underwater measurement of activated waste:

- Assessment of the amount/ activity and localization of gamma and neutron emitters

Measurement campaign performed in March 2014:

- Measurement of ^{60}Co, ^{110m}Ag and ^{108m}Ag in casks filled with about 200 spent AgInCd (AIC) control rods
- Total activity calculation and activity profile along the 4 meter high casks
- Checking for the absence of neutron emitters/fissile materials

Key Drivers:

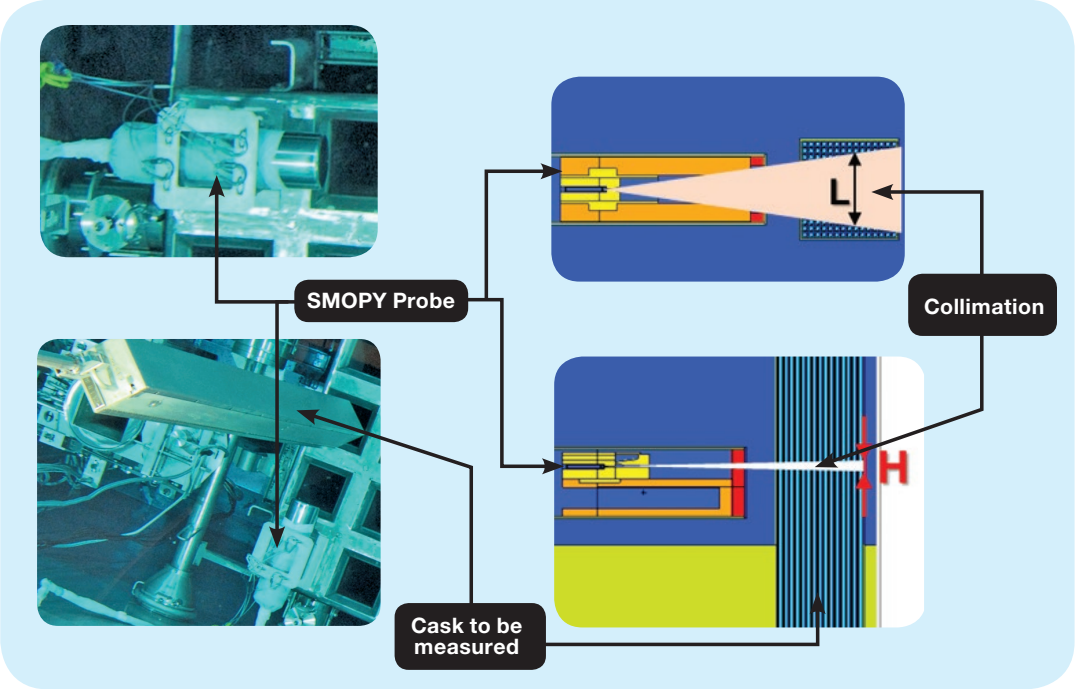
Need to make space in cooling ponds by removing waste.

Need to assess the activity in the waste in order to:

- Control cost and risks for the shipment of the waste to the temporary storage facility
- Ensure that the waste activity level remains in the range allowed by the design of the storage facility
- Declare the activity to Authorities and to the National Agency of Radioactive Wastes for costs and scenario forecasts for future final storage

With SMOPY measurement, safety margins can be determined accurately to significantly decrease all costs.

Measurements need to be performed underwater for radiological protection.



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

MIRION TECHNOLOGIES

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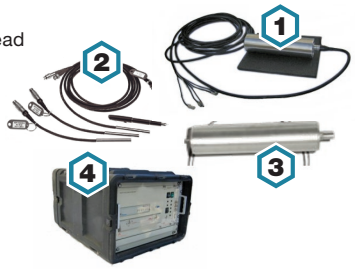
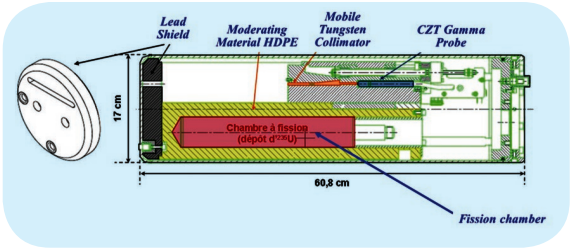
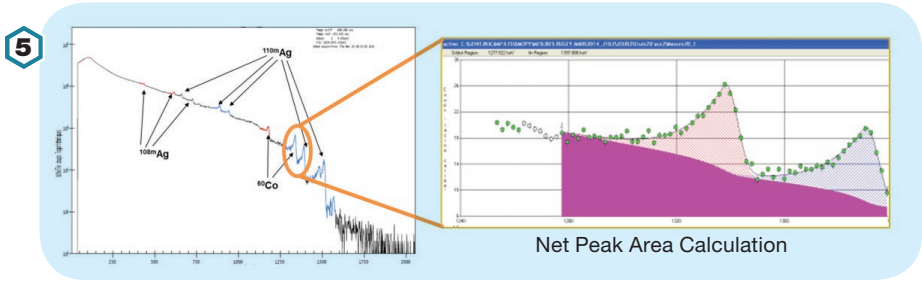
Instruments & Techniques Used:

1. Waterproof SMOPY measurement head
2. CZT spectrometry detector
3. Fission chamber
4. Electronic cabinet
5. Genie 2000 Spectroscopy SW







Net Peak Area Calculation

CANBERRA Solution:

- SMOPY includes a gamma spectrometry detector and neutron probe
- Spectrometry measurement with a collimated CZT probe (5 mm^3, 20 mm^3 or 60 mm^3)
  - Measurement of a layer of the waste cask (see figures)
  - Linear Total Activity Range from approximately 1E+08 Bq/cm up to 1E+13 Bq/cm
  - Combination between fixed spectrometry measurements and scanning measurements (waste moved at constant speed) with time registration
    - This allows an optimization between accuracy and time constraints
- Neutron measurement with a fission chamber in a moderating material (HDPE)
  - Linear Neutron Emission rate from approximately 5E+04 $n.s^{-1}.cm^{-1}$ up to 1E+09 $n.s^{-1}.cm^{-1}$
- SMOPY measurement head waterproof up to 20 m deep (relative pressure ≤2 bar)
- Compact electronics cabinet driven by a rugged tablet suitable for nuclear area
- The whole package fits in a regular family car

ACHIEVEMENTS

- Results consistency checks proved the validity of the techniques and will enable reliable characterization of waste under water before shipment
- 7 casks – about 1200 activated AIC (Silver “Ag” – Indium “In” – Carbon “C”) control rods – fully characterized
- Results will be used as a reference point by nuclear plants before waste disposal
- Characterizing waste under water will save nuclear plants a lot of time, money and dose