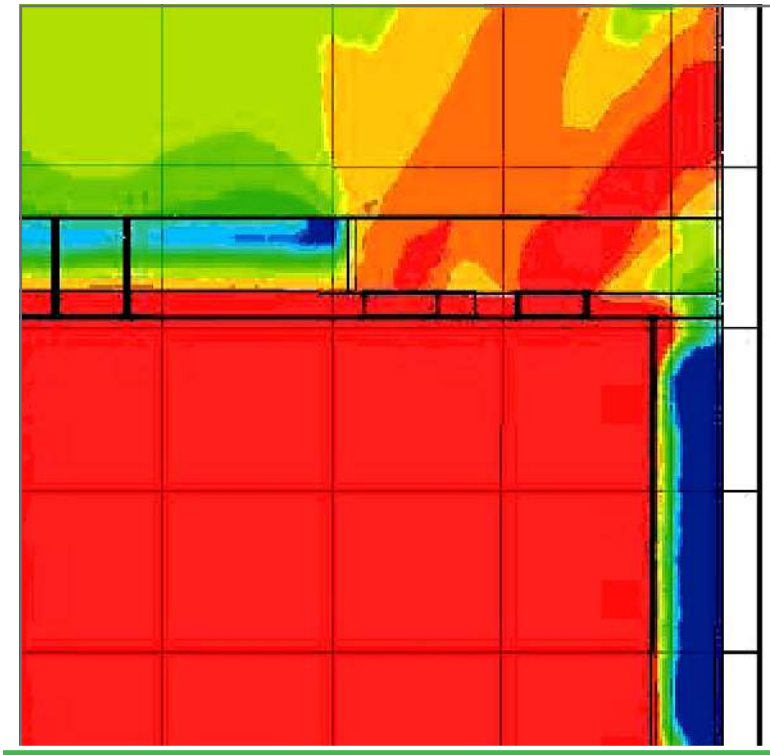
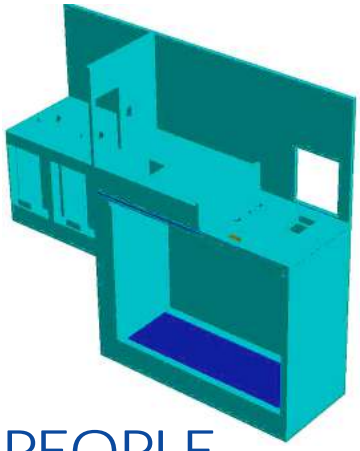
cavendish nuclear



Gamma Dose Rate Mapping Image showing location of hotspots.



PEOPLE WHO DELIVER

PRODUCTS AND SERVICES:

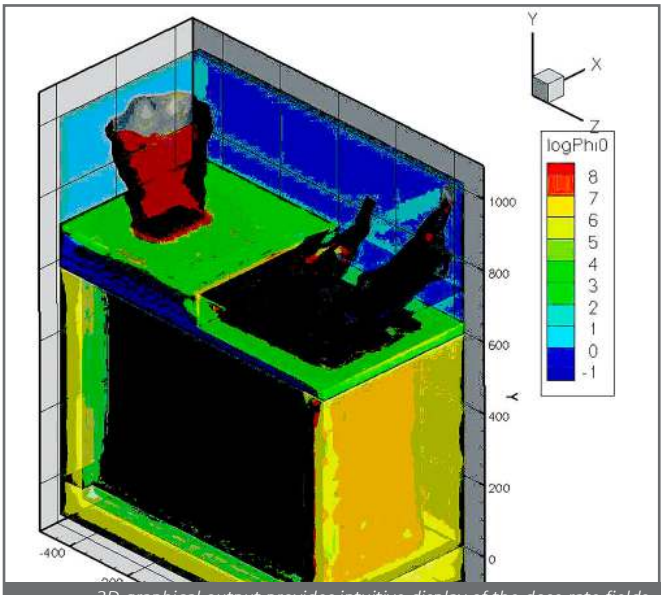
3D Gamma Dose Rate Mapping

OVERVIEW

Cavendish Nuclear has a proven ability to generate 3D gamma dose rate maps in high dose rate nuclear environments to support operations and decommissioning planning, minimising operator dose uptake. This technique involves combining radiometric measurements with the plant geometry in a computer model.

SUMMARY

- Cost effective tool for optimising decommissioning strategies
- Use of data from gamma imaging and gamma ray spectrometry
- Choice of radiation transport codes
- Demonstrated ALARP
- Turnkey solution providing radiometric characterisation
- Flexible approach to data collection and analysis



3D graphical output provides intuitive display of the dose rate fields.

OUR PRODUCT IN DETAIL

Our Approach

Cavendish Nuclear's 3D dose rate mapping technique combines radiometric measurements with plant geometry. The input radiometric data can take the form of gamma-ray images, dose rate measurements or spectroscopy measurements. Geometrical information about the plant can be taken from existing drawings, laser surveys or the best knowledge available. The resultant 3D dose map is an invaluable aid for planning operations in high dose rate plants.

Features and Benefits

- Direct measurement of the main sources of radiation using our wide range of measurement tools and techniques.
- 3D graphical output provides intuitive display of the dose rate fields.
- The flexibility of the modelling allows for different options to be modelled.
  - additional shielding
  - clean-up of particular hotspots
  - moving a hotspot from one location to another
  - removal of shielding or insertion of holes into existing infrastructure
- The effect of any changes can be easily modelled.
- The dose burdens for jobs can be calculated .
- Options for reducing the dose rates can be investigated.

Advantages of the Cavendish Nuclear

We use in-house and proprietary tools and techniques to provide the optimum solution

- The measurements are optimised to meet the particular challenges of the plant considering parameters such as access, time, and dose rates.
- A collimated gamma-ray imaging survey provides the best information for dose mapping, pinpointing all of the significant sources of radiation within an environment.
- Gamma-ray spectroscopy measures the energies of gamma-rays that are present in the environment.
- Uncollimated dose rate readings provide reassurance that the results of the modelling are correct.
- The dose modelling is performed using industry standard and benchmarked analysis codes such as RANKERN and Attila.
- The technique can be applied to a wide variety of environments:
  - scenes with a small number of intense sources
  - environments with a lot of scattered radiation
  - plants where there is widespread contamination
  - scenes with a mix of radionuclides
  - from small rooms to large ponds

In addition to generating dose rates, waste inventories can be determined. The activity or specific activity of individual items can be determined. This can help identify the waste category of an item or the total inventory present.

Methodology

The first phase of this service is to identify the most suitable radiometric measurement technique and to undertake a series of measurements. Cavendish Nuclear has a wide variety of techniques, covering a wide range of dose rates and deployment options.

For some situations a series of gamma-ray imaging measurements using either our RadScan® system, a service DISPIM® system for the measurement of plutonium or a HRGS, LRGS or dose detection system will provide complete coverage of the area in question. In other situations the use of collimated spectroscopy detectors may be used.

The approach selected aims to locate and quantify the radioactivity present with the support of existing plant data, for example, for the identification of the radionuclides.

The second phase is to gather and model plant geometric data. This can come from drawings, CAD models, or if necessary, measured using in-situ scanning devices. When necessary, geometrical information can be extracted or augmented by the range data collected from RadScan®.

Production of Dose Maps

A computer model of the plant is constructed containing the geometrical and radiometric data that has been collected.

Advanced radiation transport codes such as Attila, RANKERN or Mercurad are then used to determine the dose rates present within the environment. The model also includes information about the shielding properties of the plant structures, and can be easily modified to demonstrate the effect of adding or removing shielding, or of reducing or moving any of the source terms.

Service Scope

The measurement and modelling regime selected will depend on the plant environment, the data required and the time and budgets available.

A complete service could include:

- Initial assessment to identify and agree the most appropriate and cost effective solution
- Preparation of task specification confirming the scope of work and the anticipated costs
- Setting up, testing and calibration of the equipment
- Data collection
- Data retrieval and interpretation with appropriate peer review and checking

Cavendish Nuclear works with clients to understand the best radiometric measurement technique to use. The optimum choice will depend upon access, dose rates and whether there is a good understanding of the radionuclides present in the environment.

Similarly we will work with clients to understand the existing geometrical data and determine what additional data, if any, is required. Having ascertained the measurements that need to be taken, we can offer a turnkey solution for both the radiometric and geometric acquisitions, including design of jigs, deployment and system operation.

Once the data has been collected Cavendish Nuclear's experts will analyse the data, generate the necessary computer models and produce dose rate plots. We can then work with customers to model the effect of various dose reduction options, producing the additional dose rate plots and geometrical models that this requires.

cavendish nuclear

FOR MORE INFORMATION, CONTACT:

Jonathan Britton - Product & Services Manager, Cavendish Nuclear,
106 Dalton Avenue, Birchwood, Warrington, Cheshire WA3 6YD
+44 (0)1925 377800 *instrumentservices@cavendishnuclear.com*