MIRION
TECHNOLOGIES

SOLUTIONS FOR

Challenging D&D Projects

We Understand Your Challenges

Every D&D Project has Different Requirements and Characteristics

In 2016 Mirion and Canberra joined forces becoming a leading supplier of radiation measurement and imaging solutions to the nuclear industry, with the focus of supporting customers involved with Decontamination and Decommissioning (D&D) projects. Our world-class team of experts combines application know-how with a broad range of Mirion products and systems to deliver solutions that help customers address the complex challenges faced during all stages of the D&D project life cycle.

We develop advanced and innovative equipment, tools and methodologies that meet or exceed your needs, focusing directly on the success criteria of your D&D project. Whether it's acceleration of site clean-up, minimization of waste volumes or reduction in waste costs, we can help you achieve your objectives.

Our flexible offer ranges from the supply of off-the-shelf equipment, to customized equipment and support services, to dedicated on-site scientific and technical resources.

Measurements and Expertise Solutions

Partnerships For More Efficient and Cost-Effective Nuclear Measurements

Expert Support for Complex Systems

Technical and feasibility studies to assist in waste management and D&D strategies, audit preparation and assistance, NDA system upgrade, system training.

Method Development

Best approach and methodology to achieve the customer's objectives, best practice approach.

On site Measurement Services and Characterization Reports

Large range of on site services from dose rate and gamma imaging surveys to complex gamma spectroscopy and neutron measurements. Some of our instruments and systems are available for lease.

Measurement Procedures

Operating instructions, documentation and training to provide QA approved methods for operators.

Assistance to System Operations

Enhancing the operation of your NDA systems with the support of our Experts, providing assay systems for measurement campaign.

Expert Data Review

Expert physics review of assay system results with QA and fingerprint reviews.

System Calibration Service

Initial or Annual calibration for installed systems, system qualification and certification.

MIRION TECHNOLOGIES

Examples of Our D&D Solutions

Decontamination and Decommissioning (D&D) is a major effort worldwide, covering everything from early R&D facilities to first generation nuclear power plants, weapons and fuel fabrication facilities and research reactors.

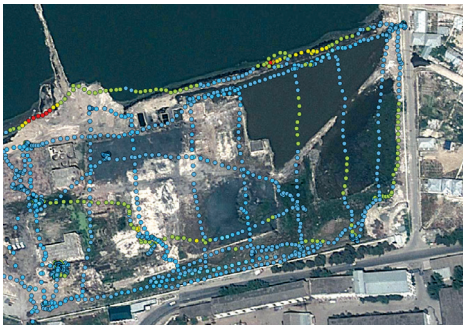
		Site Characterization				Operations Support			Environment	Worker Protection
		LARGE OUTDOOR AREA SURVEYS	UNDERWATER MEASUREMENTS	CONCRETE WALLS AND FLOORS	SYSTEMS, STRUCTURES AND COMPONENTS	SOIL SORTING	LABORATORIES	WASTE CHARACTERIZATION	ENVIRONMENT MONITORING	CONTAMINATION MONITORING
Products & Systems	Imaging Cameras		✓	✓	✓					✓
	iPIX™ Gamma Imager	✓		✓	✓					
	Aegis™ Spectrometer	✓		✓	✓			✓		
	ISOCS™ In Situ Object Counting System	✓	✓	✓	✓	✓		✓		
	NDA Systems & Clearance Monitors				✓	✓		✓		
	Lab Gamma Spec			✓			✓			
	Low Background Alpha/Beta			✓			✓			
	Lab Alpha Spec						✓			
	Hand Held Dose Rate & Contamination	✓		✓	✓			✓		✓
	Personnel Contamination Monitors									✓
	Alpha Beta & Gamma Air Monitoring	✓		✓					✓	✓
Measurement & Expertise	Expert Support for Complex Systems	✓	✓	✓	✓	✓		✓		
	Method Development	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Measurement Procedures	✓	✓	✓	✓	✓		✓	✓	✓
	Onsite Measurement Services	✓	✓	✓	✓	✓	✓	✓		
	Assistance to System Operations	✓	✓	✓	✓	✓	✓		✓	
	Expert Data Review	✓	✓	✓	✓	✓				
	System Calibration Service	✓	✓	✓	✓	✓				✓

Site Characterization

Large Outdoor Area Surveys

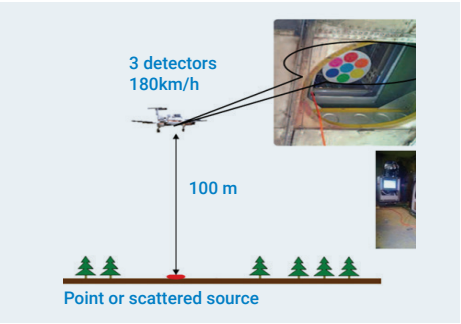
Mirion has developed solutions to survey large areas using GPS technology for mapping outdoor areas in real time. These solutions include high-efficiency clusters of HPGe capsules in helicopters, various gamma assay systems with ISOCS (In Situ Object Counting System) technology and handheld dose rate meters mounted in a mobile lab.

DOSE RATE MAPPING



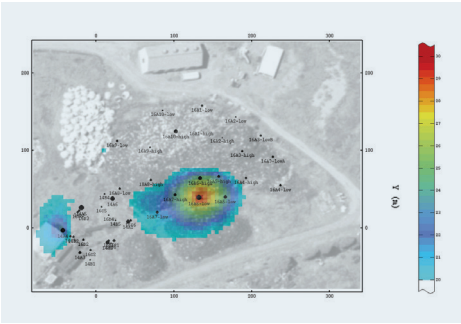
Dose rate data with Colibri® and Kartotrak® software by Geovariances

AERIAL SURVEY



Air survey mapping with segmented HPGe detectors

IN FIELD SPECTROMETRY

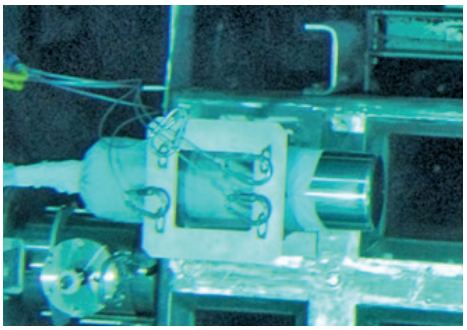


Mapping of ^{235}U contaminated area

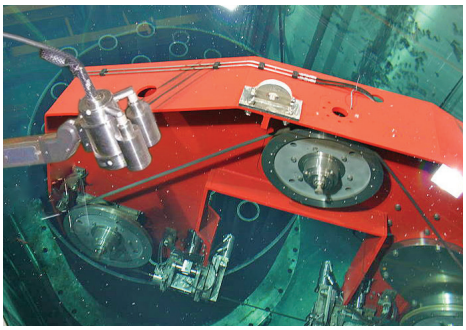
Underwater Measurements

To obtain accurate quantitative results, our sealed, electrically cooled HPGe detector can be used in ponds and rivers, whereas in fuel pools, our SMOPY Services Team can provide characterization for fuel rods as well. Our detectors come with the ability to be easily mounted in a Remotely Operated Vehicle (ROV) to survey large underwater areas.

SOLUTIONS CAN BE DEPLOYED FOR UNDERWATER NUCLEAR MEASUREMENTS



Underwater measurement of activated waste with the SMOPY Probe



Radiation tolerant cameras used to monitor underwater cutting & dismantling of Reactor components

Sealed HPGe in water tank (25 m cable)

Surfaces and Floors

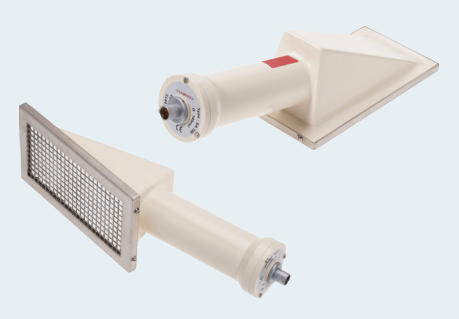
Basic radiological detection is performed by gamma dose rate instrumentation, as well as surface contamination monitors.

Typical alpha beta measurements on surfaces and floors are executed by means of contamination monitors, whereby levels of 0.04 Bq/cm² (240 DPM/100 cm²) alpha and 0.4 Bq/cm² (2400 DPM/100 cm²) beta are applicable survey limits for discrimination (either averaged over 100 cm² or site specific limits can apply).

Mirion can supply the user with a range of instruments from swipe/smear testers to handheld detectors or larger floor contamination monitors with varying sizes of detectors, but where full discrimination between the alpha and beta (gamma) channels can be obtained.

DOSE RATE AND ALPHA – BETA/GAMMA AREA CONTAMINATION MONITORS

Dose rate detection by RDS-30™, RDS-32™, Radiagem™, Colibri series for ambient to medium levels



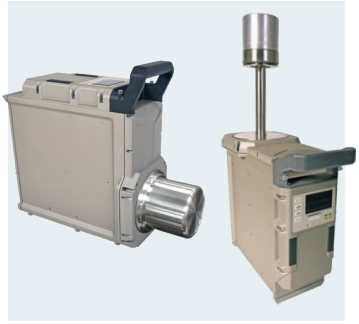
α-β contamination probes SAB(G)-100 (100 cm²)

External and Tele-STTC™ dose rate probes for high range levels

SWIPE TESTERS AND LARGE AREA CONTAMINATION MONITORS

iSolo® α/β Swipe/Filter Counter with NORM rejection

Easy-Count™ CSP™ α/β Portable Smear Counter



Aegis™ Transportable HPGe Spectrometer

SABS-579™ α β (579 cm²) Floor Monitor

Site Characterization

Bore Holes and Concrete Walls

Where (beta) gamma contaminants are expected, surface and in-depth profiling of walls and floors are required to accurately evaluate the contaminated areas before dismantling operations commence. Once contaminated areas are identified a plan for waste segregation and contamination removal can be evaluated.

Mirion offers a broad array of products and turn-key solutions with support from our Measurement and Expertise Team, from on core sampling methods, to HPGe or CZT detectors inserted in drilled holes, and innovative gamma imaging coupled to spectroscopic detectors.

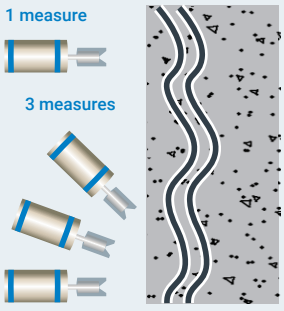
Non-invasive solutions are available using our ISOCS calibrations with HPGe or CZT detectors. Results can be processed using ISOCS software, or with specialist support from Mirion using the Advanced In-Situ Gamma Spectrometry Services.

SPECTROMETRY BASED MEASUREMENTS FOR DEPTH PROFILING

In-core spectrometry for Bq/g determination using single sealed LN_2-free HPGe

GR1™ compact CZT detector with optional shielding and collimator set

Non-invasive in-situ measurement using ISOCS software, also using several ISOCS positions.



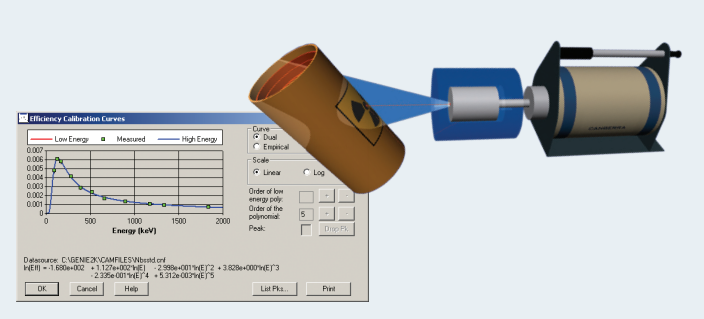
Wall or surface determination in Bq/cm² and in-depth profile detection using ISOCS HPGe

In-situ Measurement of Depth Tagged Dust Samples (TruPro® Technology)

Systems, Structures and Components

Mirion has decades of experience characterizing contamination of nuclear components using ISOCS software. Waste or in process components such as pipes, tubes, scrap, ventilation systems, and small irregular objects can be characterized using this approach. ISOCS software is an excellent tool to evaluate the activity of these components for continued waste storage or disposal, without the need for radionuclide calibration sources. ISOCS software can be deployed along with the iPIX Gamma Imager to locate a hot spot in real time.

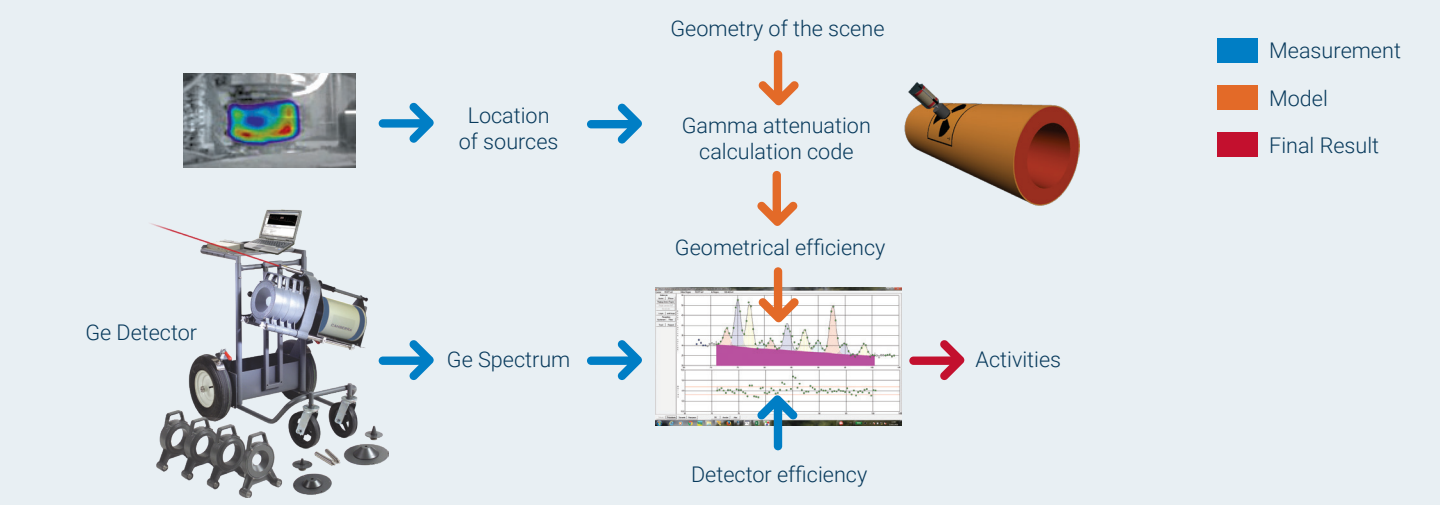
ISOCS CALIBRATION SOFTWARE



Flexible geometrical models for efficiency determination using ISOCS software

Characterization of heat exchangers for free release

SCHEME OF ACTIVITY CALCULATION



ISOCS Uncertainties Estimator and multi-Geometry Calculator enables the testing of the sensitivity of model's parameters, such as geometry, material, shapes, etc.

Site Characterization

ADVANCED SERVICES WITH IPIX GAMMA IMAGER

PASSIVE NEUTRON COINCIDENCE MONITORS FOR NEUTRON CHARACTERIZATION OF SPECIAL NUCLEAR MATERIAL (SNM) IN FUEL CYCLE OPERATIONS OR D&D

For Fuel Cycle facilities, Mirion offers neutron slab counter solutions for inventory and D&D purposes.

WM3400 Passive Neutron Slab Counter

WM3500 Curved Slab Passive Neutron Counters

Imaging

Nuclear Inspection and Surveillance Systems – Cameras Hardened Against the Effects of Radiation

CCTV monitoring of nuclear generating, reprocessing, waste management and research facilities is of vital importance during the decommissioning and dismantling phases. Mirion radiation tolerant inspection and surveillance systems, whether permanently located within the plant or used in portable or temporary configuration are designed to survive the hostile environments frequently encountered.

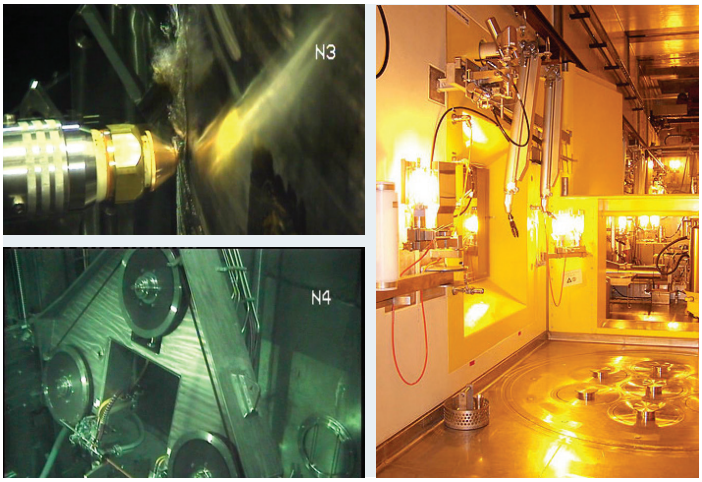
D&D APPLICATIONS

- Pre-shutdown surveys
- Fuel removal and handling
- Visual monitoring of inaccessible areas
- In situ monitoring of D&D activities
- Fuel storage ponds
- Drum identification (machine vision)
- Waste retrieval and handling
- Robotics and remote tooling
- Welding and cutting
- Corrosion evaluation
- Waste encapsulation and vitrification
- Safeguards

These CCTV cameras can be equipped with a selection of lens and lighting attachments, allowing operators to carry out a variety of inspection tasks for both low and high radiation environments with a total gamma dose between 100 Gy – 1 MGy.

Major project experience with D&D programs and an in-depth knowledge of the latest CCTV technology are crucial in our ability to meet the rigorous specifications that the nuclear industry demands. We employ professionally qualified System Design Engineers and Project Managers experienced in configuring and managing CCTV projects from initial concept to final on-site commissioning.

We have the ability to re-package our imaging systems to fit through legacy penetrations and cell/tank access paths not previously used for cameras to support your D&D needs while leveraging the latest IP technologies for data storage and remote/wireless viewing.



CAMERAS AND IMAGING SYSTEMS

RC-913™ Mini-PTZ Camera

RC720™ HD-RAD Camera

C983™ System Camera

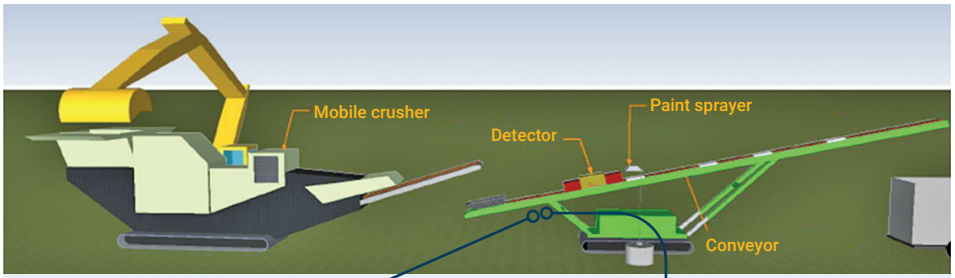
RC911™ Dotcam-HR Camera

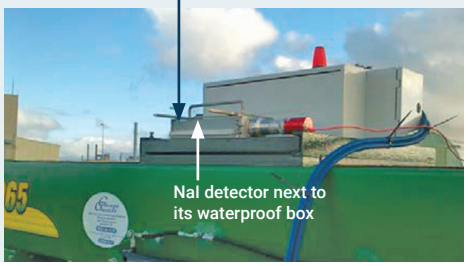
Operations Support

Soil Sorting and Bulk Materials Characterization

The large volume of soil and sludge incurred in a D&D project requires an efficient and fast segregation of contaminated waste from the waste that can be free released. Mirion has designed and operated soil sorters to respond to these challenges in some major D&D sites around the world.

A VARIETY OF CONFIGURATIONS ARE AVAILABLE TO MEET YOUR UNIQUE NEEDS



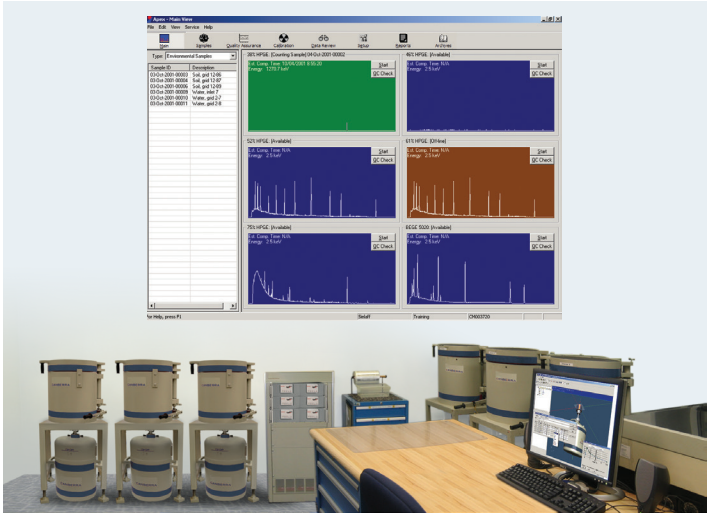


Laboratories

Samples are typically analyzed in radiochemistry laboratories with quantification of alpha, beta and gamma emitting nuclides using our cost effective and easy-to-use solutions.

MAXIMIZE PRODUCTIVITY IN YOUR LABORATORIES AND COUNT ROOMS

Alpha Analyst™ for alpha spectrometry



Apex-Gamma™ Spectroscopy

iMatic™ Gasless Automatic Alpha/Beta Counter

Waste Characterization

Mirion has significant experience and expertise in non-destructive assays for waste measurement. Gamma assay, neutron assay, and combined gamma/neutron systems are available to measure containers ranging from non-packaged waste to vehicles. We are committed to providing you a full range of measurement solutions to meet your site waste characterization needs. The Measurement and Expertise Team can be deployed on-site to provide a customized solution to fit your specific project.

Free Release Waste (VLLW)

PLASTIC SCINTILLATOR BASED CLEARANCE MONITORS

Cronos®-1/-4/-11 family

CGO/CPO-SMART™ with spectrometry capability and NORM reduction

RTM6xx series for large volume screening

HP GERMANIUM BASED FREE RELEASE MONITORS WITH NUCLIDE IDENTIFICATION

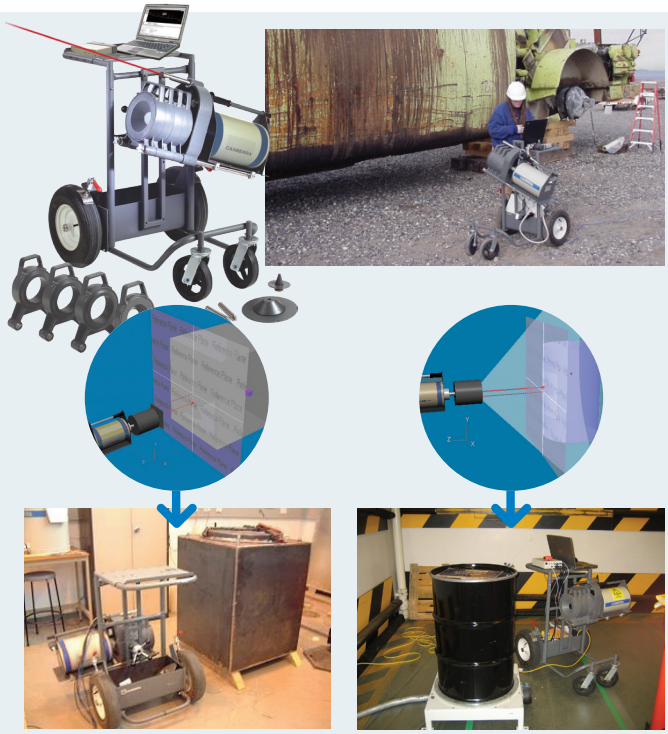
CLEA for 100 liter drums

Q² / AQ² / IQ³ family

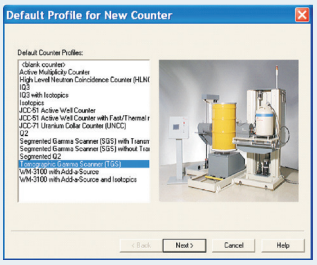
Box counter

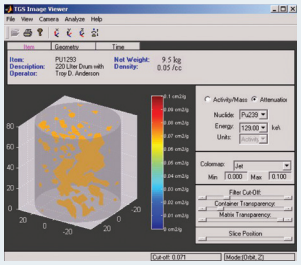
Non-exempt Waste (LLW / ILW)

ISOCS SYSTEM BASED SOLUTIONS FOR IN SITU MEASUREMENTS



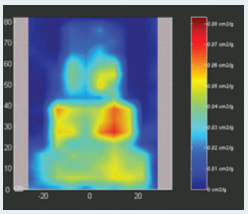
SGS™ / TGS™ DRUM MONITORING SYSTEMS IDENTIFICATION





NDA 2000™ Non-Destructive Assay Software

SGS Segmented Gamma Scanner for Waste Characterization



TGS Tomographic Gamma Scanner for improved accuracy (typically for SNM)

MOBILE WASTE ASSAY SOLUTIONS

MILCC™ Mobile ISOCS Large Container Counter

Environment

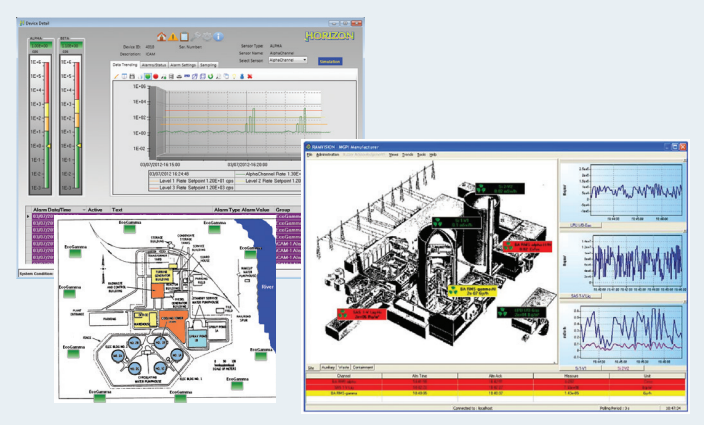
Environmental Monitoring

Routine monitoring is required around and in all nuclear D&D sites to provide early warning and characterization of possible radiation release incidents. To evaluate the real-time contamination in nuclear sites, it is important to continuously measure releases of radioactive material in the environment strongly affected by wind direction and speed. Our solutions can be deployed on complex D&D sites using wireless secured connections in any situation.

EcoGamma™-g is an advanced, dual detector environmental gamma radiation monitor designed to operate in the most extreme conditions with unsurpassed accuracy, range and stability.

ABPM 203M™ Mobile Alpha/Beta Particulate Monitor. This monitor, with its small and lightweight extendable sensor, functions locally next to the respiratory tract of workers. It is perfectly adapted for the measurement of particulates in environments with high rates of radon.

Environmentally enclosed iCAM™ Continuous air monitor capability for D&D applications requiring remote monitoring of the D&D facility. Environmentally enclosed iCAM monitors can be placed around your D&D facility to monitor for any airborne release of radioactivity.



Horizon® Supervisory Software represents a real-time data acquisition and control system that provides supervisory oversight of your radiological instruments. It combines Mirion's radiological monitoring expertise with industry-leading technology for SCADA (Supervisory Control and Data Acquisition) applications.

Workers Protection

Dosimetry and Contamination Monitoring

A proactive and comprehensive health and safety program is essential to safeguard the health of workers, to maintain compliance with ALARA principles and to avoid preventable and costly accidents in D&D operations. Mirion supplies a variety of instrumentation and equipment used to monitor worker health and assure that the working environment is safe.

DOSIMETRY

Beta Module

DMC 3000

Telemetry Module

Neutron Module

PRD Module

DMC 3000™ family of dosimeters with optional beta, neutron or gamma sensitive PRD modules

HANDHELD DOSE RATE AND CONTAMINATION MONITORS

The Radiagem and Colibri family can accommodate a family of CSP-Smart probes for enhanced detection of gamma dose rate and α-β (γ) contamination monitoring

HAND AND FOOT MONITORING

Sirius™-5 (gas or gasless) and H&F Fibre (gasless) for α-β contamination monitoring purposes

Worker Protection

Personal Contamination Monitors

α-β CONTAMINATION MONITORS

Argos™-3/-5 series for gas and gasless α-β and optional Zeus™ gamma detection

TSE-II Two step exit monitors for gasless operation

GAMMA ENTRY/EXIT PORTALS

Based on PVT plastic scintillation detectors

GEM™-5 gamma portal monitor

PGS (normal background) and PGH (high background) and FastTrack-Fibre™ gamma portal monitors

IN-VIVO COUNTERS

Spectrometry based advanced nuclide specific monitoring

FASTSCAN™ NaI Whole Body Counter

ACCUSCAN™ II: Scanning HPGe Whole Body Counter

Vital Protection. Transformative Potential.™

MIRION IS A GLOBAL LEADER IN RADIATION SAFETY, SCIENCE AND MEDICINE.

We offer a diverse portfolio of products and services that protects people and the planet from the harmful effects of ionizing radiation and accelerates innovation across a diversity of end markets.

The Mirion Technologies group provides proven radiation safety technologies that operate with the highest levels of precision – from R&D labs, to critical nuclear facilities, and on the front lines. In collaboration with our customers, Mirion empowers innovations that deliver vital protection and harness the transformative potential of ionizing radiation to shape our future world.

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Protect What's Next™

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