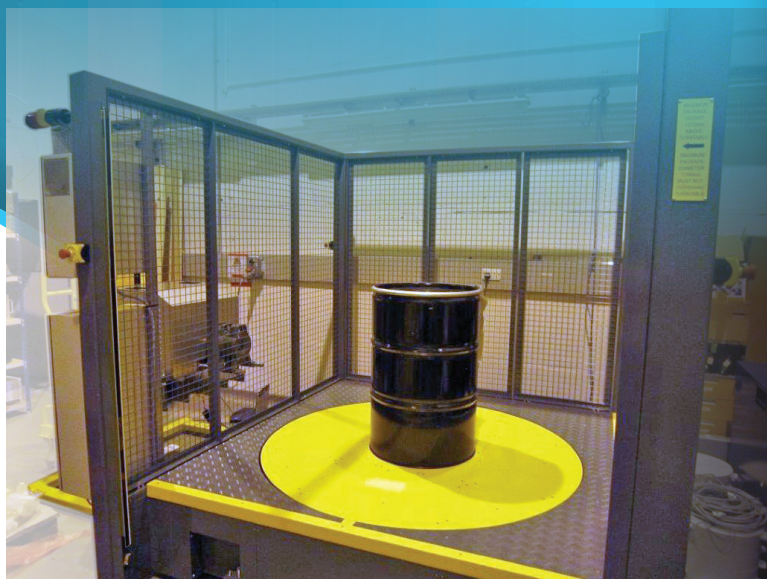
MIRION TECHNOLOGIES



WASTE CHARACTERIZATION

WM2600

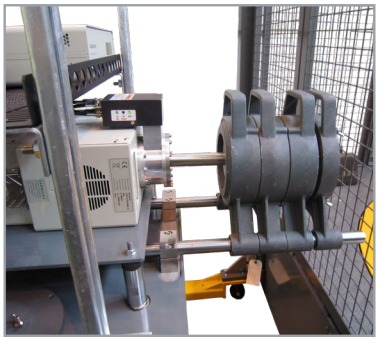
On-Site Assay System (OSAS)

BENEFITS

- In-situ characterization for a wide range of containers and items.
- Easily installed at site location or mounted on trailer for mobile measurements.
- Full setup by Mirion team and options for full-service measurements, or operation by customer teams.
- Immediate reporting of results in plant-specified formats.
- Suitable for Low Level Waste and Free-Release, or “Out Of Scope” waste.
- Easily and quickly reconfigurable as operational conditions change for different waste types, using industry-standard ISOCS software.
- Calibration without sources.
- Modular hardware and software, allowing cost-effective upgrades from existing equipment.
- Options for manual and automatic operation.
- Flexible operation, allowing high-accuracy measurements using advanced innovative ISOCS-based tools.
- Full integration with standard NDA2000 and Genie2000 software for operator familiarity and ease of training.

OVERVIEW

Mirion’s On-Site Assay System (OSAS) is a modular system suitable for characterization of wastes in a wide range of containers and with a range of contents both homogeneous and non-uniform.



The system is controlled manually with options for automated control of the turntable through a PLC. This allows a high degree of flexibility in the operation to suit all plant conditions and levels of operator expertise. Additionally, service measurements can be conducted by Mirion or other staff, allowing for full operations on site. With such a “full service” model, your local plant staff are required to provide support only to make waste containers available for assay and loading onto the turntable, and to provide quality control check sources where possible to minimize shipment burden.

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OVERVIEW (cont'd)

OSAS comprises an ISOCS-characterized collimated High Purity Germanium Detector (or optional NaI detector, or other detector choice for specific applications) mounted on a lift mechanism to scan an item or waste container. The waste item is mounted on a turntable and is typically rotated continuously for uniform wastes in cylindrical containers, to provide good spatial averaging and minimize uncertainties. Optionally, the item can be rotated to fixed positions to perform multiple measurements, for example 4 steps of 90 degrees for boxes.

Waste characterization and sentencing are the core applications for OSAS. Comprehensive nuclide inventory reporting is provided, broken down to individual nuclides and including robust measurement uncertainty treatment. This allows sentencing of waste containers into the most appropriate and cost-effective waste category, with a high degree of confidence. Standard Mirion software and calibration modelling tools (based on industry standard ISOCS software) are used. This also provides access to Mirion's latest generation advanced innovative software and physics expertise including Advanced In-Situ Gamma Spectrometry (AIGS) service, special variants of the standard ISOCS software and application-specific modelling using MCNP. For specially defined projects, these allow OSAS to be used to access specialist calibration by modelling of complex objects not normally amenable to modelling by regular ISOCS, and comparison of multiple datasets (for example examination of different gamma emissions and measurement results from different angles) to reduce the measurement uncertainty.

SETUP & OPERATION

Typically a new system is configured by Mirion specialists at Mirion premises, prior to site acceptance testing and commissioning. This involves establishing calibration files for the range of waste containers to be measured (container types, fill—heights, physical materials, and weights) based on ISOCS modelling. Where similar projects have been carried out before, existing valid calibration files will be re-used where possible to save costs. These are then used to populate the system computer so the operator can select a suitable calibration from a drop-down menu, for each real container measured, for example "200 litre drum, 80% full, combustible waste, 40 kg". This modelling also normally includes assessment of total measurement uncertainties considering non-uniform activity and other defined factors, propagating the results into the final Total Measurement Uncertainty (TMU) reported by the application software. Acceptance testing will include validation tests where known sources are measured inside simulated waste-filled containers, and the measured activity is compared with the known activity.

Once commissioned, the system can be easily reconfigured as your requirements change, for example allowing the system to be re-deployed in another plant or building where different waste containers are used. In such conditions there is no need for the system to be returned to Mirion premises. Instead, new ISOCS calibrations can be carried out either by your in-house team, or remotely by Mirion physicists. Mirion is available to provide a full support service to ensure that you obtain maximum benefit from the system with minimal interruption to normal operations.

Alternatively, OSAS is available for full mobile deployment by Mirion on a "full service" basis. With this approach, the system is configured for campaigns of measurements, and operated by Mirion teams or your own operators, depending on your exact needs, preferences and operator skill levels. With such projects, full documentation is proposed to provide the highest possible confidence in the validity of the results. This typically includes calibration documentation and operations procedures. Details of service packages available, are given at the end of this specification sheet.

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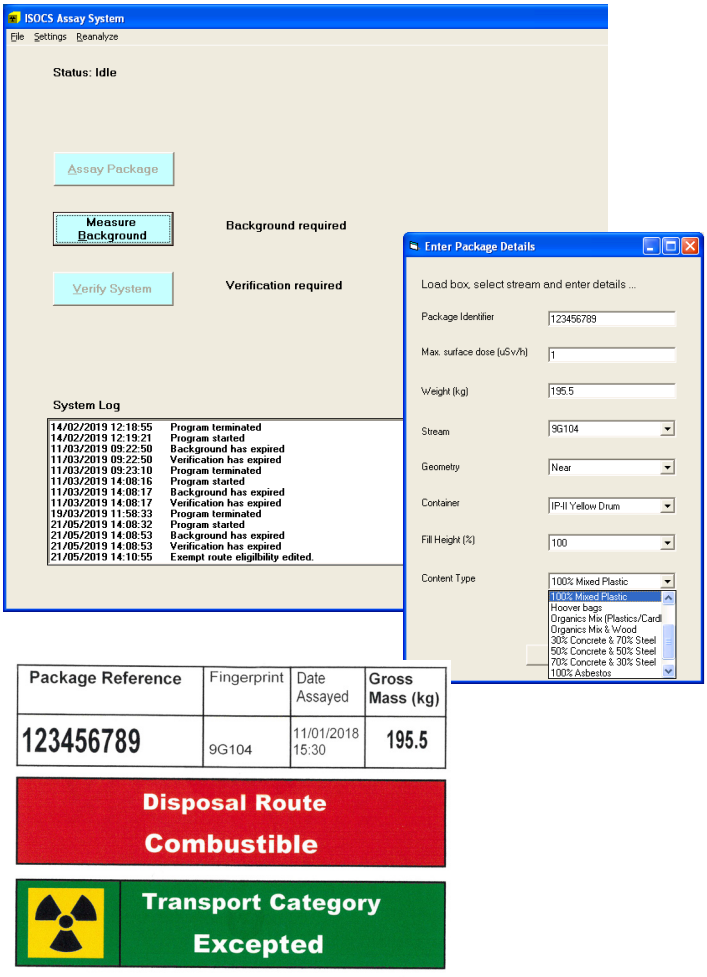
APPLICATION SOFTWARE

The measurement is controlled by a customized user interface software application, underpinned by Genie2000 for spectrum analysis, and NDA2000 for analysis and quality control functions. This software provides access to key operator and supervisor functions such as background, sample count, quality control count and setup functions. Advanced operations such as data trending and adjustment of analysis algorithms, can be performed in NDA2000. The customized user interface software provides real-time data reporting with reporting of individual nuclide activities and Minimum Detectable Activities (MDAs). In addition, pre-defined fingerprints can be used to infer activities of non-measurable nuclides, and allow reporting of the waste category to allow sentencing with optional labels printed. The example screenshots below show the user interface, sample entry screen and results label report.



KEY FEATURES

- Standard system with turntable allowing up to 770 litre wheeled bins, Dolav boxes or smaller items such as 200 litre drums or PACTEC bags.
- Maximum container weight 1500kg (smaller or larger capacity turntable on request).
- Detector mounted on lift for measurements at variable heights to scan objects.
- Modular construction allowing separate use of detector lift and turntable, allows upgrade paths, minimizing costs by re-using existing components.
- Standard 90 degrees collimator allowing background reduction and high throughput measurements.
- HPGe detector, normally electrically cooled; optional liquid-nitrogen cooled.
- Optional use of NaI detectors.
- Instrument cubicle for control of mechanical systems.
- Safety interlock using physical cage and an optional “light curtain” shuts down the turntable if beam is interrupted (e.g. by inadvertent operator entry).
- Complete system can be moved using a fork-lift for ease of transport and mounting on trailer for mobile service campaigns.
- Push-button control of turntable and measurement computer, with optional PLC for automated sample rotation.
- Rotation either continuously or in fixed steps for non-cylindrical objects such as boxes.
- Computer running Microsoft Windows for data acquisition, analysis and reporting.
- Based on Mirion standard and proven Genie2000 and NDA2000 software. Compatibility with latest version (6.1) of NDA2000 allows access to all latest features such as spectral analysis algorithm and drivers for latest-generation MCAs, detector types and ISOCS software updates, for future-proofing.
- Application--specific user interface-software allows bespoke applications for reporting of measurement results, inferred nuclide activities and segregation for example ILW / LLW, LLW / VLLW or VLLW / “Out Of Scope”.
- Optional software for waste consignment management, integrates with plant databases for container inventory records.
- Standard ISOCS software for source-less calibration using standard templates. Calibration and setup performed by your local teams or Mirion specialists as a full-service.

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COMPONENTS

1. Suitable HPGe detector, typically P-Type Co-axial GC3018 with electrically cooled CP5+ Cryostat and a 4-inch remote detector chamber. Other detector options are available upon request, to suit each application, including different types and crystal sizes, liquid nitrogen-cooling and other detectors such as NaI.
2. DSA-LX multi-channel analyser.
3. S520C Genie2000.
4. S529 NDA2000 v6.1 (Windows 7 or 10 64-bit). Please consult Miron for NDA2000 version if other operating system is used.
5. SEP1500 (or similar) Un-interruptible Power Supply.
6. Turntable assembly. Please consult factory for options required including cage, light curtain, weigh-cell.
7. Detector lift system.
8. ISOCS collimator (normally 90 degrees field of view).
9. Optional PLC.

REFERENCES

- Validation of in situ object counting system (ISOCS) mathematical efficiency calibration software.

  R Venkataraman et al, Nuclear Instruments and Methods in Physics Research A 422 (1999) 450-454.
- Canberra, “Detector Specification and Performance Data Certificate of Conformity for GC3018 high purity germanium detector”.
- Use of an ISOCS-based Waste Assay System for Decommissioning Waste at Trawsfynydd.

  Proceedings of the Waste Management Symposium, 2019, Tucson, Arizona, March 3-7 2019.

TYPICAL PROJECT DELIVERABLES

Please confirm detailed requirements upon request of quotation. These typically include:

1. Operational and Maintenance Manual.
2. Calibration document.
3. Calibration validation document.
4. Operations training.
5. Specific training in NDA2000, Genie2000 and ISOCS, as required.
6. Method Statement for on-site deployment with full-service option.
7. Risk Assessment for transport, setup and operation of equipment for full-service option.
8. Operations procedure.
9. Acceptance Test Schedule.
10. Optional measurement reports containing results and commentary of batches of items measured.

Other documentation can also be provided, to suit individual site or project requirements.

HOW TO ORDER

Please contact Mirion via the Sales email address:

UKSales@Mirion.com

A team member will discuss your requirements and develop a proposal that best meets your goals.

OPS-1110– 06/2019

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