Recycling Radioactive Metals: Why and How

22nd November 2013

Craig Ashton BSc (Hons) MSc MIEMA CEnv
Head of Waste Service Delivery
LLW Repository Ltd
Where is LLW generated?

- Activities generating LLW:
  - Nuclear power
  - Reprocessing
  - Fuel fabrication
  - Defence
  - Decommissioning activities
  - Oil and gas extraction
  - Hospitals
  - Pharmaceutical production
  - Factories
  - Universities/schools
UK’s Low Level Waste Capacity – March 2011
The Capacity Challenge

The Solution – Site capacity extended by over 100 years

Unmitigated volume designated for LLWR (2009 Low Level Waste Inventory)

Volume of Low Level Waste remaining after volume reduction and enhanced packaging solutions

LLWR Lifetime Extended and Full Inventory Accommodated

The Problem – Repository full by 2023

Vault Capacity filled in 2023 against the current inventory

Best services delivered by the best people

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National Strategy Implementation

Why Low Level Waste should be managed…

What should be done…

How it can be done…

26 March 2007

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Key Themes of the Strategy

Application of the waste management hierarchy to the management of LLW

Make best use of existing assets

Opening and exploitation of new routes
Waste Services – Contract Model

Best services delivered by the best people

OJEU Framework
Agreements with Multiple Suppliers

Waste Services Contract

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Ministry of Defence

EDF ENERGY

GE Healthcare

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Metallic Waste Treatment Service

• Three Service Providers:
  – Energy Solutions:
    • Bear Creek (Oak Ridge, Tennessee, USA)
    • Inutec (Winfirth, UK)
    • Siempelkamp GmbH (Krefeld, Germany)
  – Nuvia:
    • Socodei (Centraco, France)
  – Studsvik:
    • Studsvik Metal Recycling Facility (Workington, UK)
    • Studsvik AB (Nyköping, Sweden)
Radioactive Waste Life-cycle

Waste Generation and Packaging

Transport

Treatment

Transport

Final Disposition

Waste Characterisation Form

Waste Consignment Information Form
Typical Radioactive Metals Processing

- Sorting
- Size reduction
- Decontamination
- Melting (if required)
- Activity assessment
- Recycling
  - ~95% recycled
  - ~5% residues are disposed

Process for Containerised Scrap

Exempt Release > 95%

UK Capability
Waste Acceptance Criteria

- Each facility has Waste Acceptance Criteria (WAC) for metal; specifying:
  - Acceptable materials
  - Acceptable physical properties - size, weight etc.
  - Acceptable chemical properties
  - What the facility cannot receive
  - Radiological / contamination specification of waste
- Facility will complete a treatability assessment prior to confirming acceptance of waste for treatment; to understand:
  - If the waste meets WAC
  - If the waste can be treated within the facilities normal operating parameters.
  - If the generated secondary waste can be disposed of to LLWR / LA-LLW
  - If waste will impact on permit
  - If waste can be treated safely by equipment within the facility
  - Radiological conditions likely to be generated by treatment.
Waste Exemption Process

- In-Situ Object Counting Software (ISOCS) is typically used for waste that has undergone surface decontamination.
- Sampling and analysis of pucks are typically used for waste that has been melted.
- ISOCS is a High Resolution Gamma Spectrometry (HRGS) system.
- Mounted on a trolley, which allows simple positioning of the detector through 360°.
ISOC’s Process

- ISOCs calibration
- Items placed on a turntable with integrated weigh scale.
- The items mass will be entered into the software along with an identifying code, waste type (drum, box, puck etc.) and waste fingerprint.
- A drum will be continually rotated whilst assaying.
- The system will calculate the activity of any gamma emitting radionuclides detected.
- Using a pessimistic fingerprint the system will calculate the total activity of the package.