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Radiological Protection Challenges of Retrieval of Legacy ILW at the Solid Waste Plant B462 RSRL Harwell

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1 Overview

- Nuclear licensed site @ Harwell and solid waste plant B462
  - Waste over last 60 years of R+D into nuclear energy
  - Facilities included research and material testing reactors
  - Now focus is POCO and decommissioning wastes

- Legacy Intermediate Level Wastes (ILW)
  - why a challenge ?

- Retrieval of legacy ILW from storage tubes – key project
  - Achieve passive state
  - contamination challenges
  - single waste storage tubes
  - multiple waste storage tubes

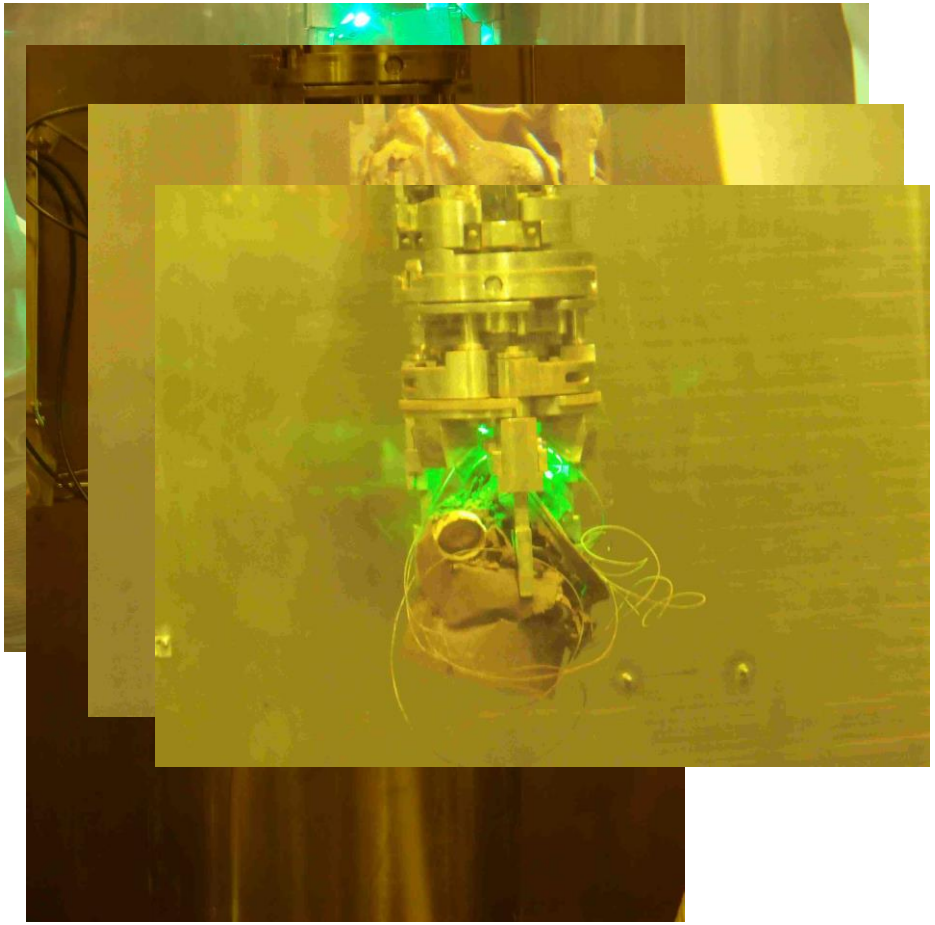
2 ILW Waste stores

- Originally contained >7000 mild steel cans
- Heterogeneous wastes
  - Damp swabs, activated metals, reactor wastes, industrial sources
- Vertical storage tubes (steel lined in concrete)
- Variety of tube sizes / spacing / arrays

- 75mm steel cover keep dose rates <5 µSv/h
  - >100 µSv/h if plates removed to facilitate wastes retrievals

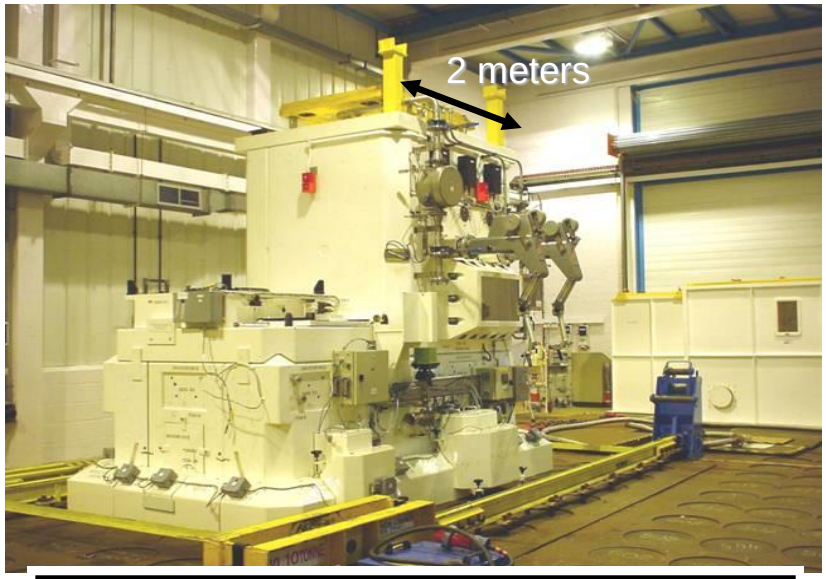
3 Waste characteristics

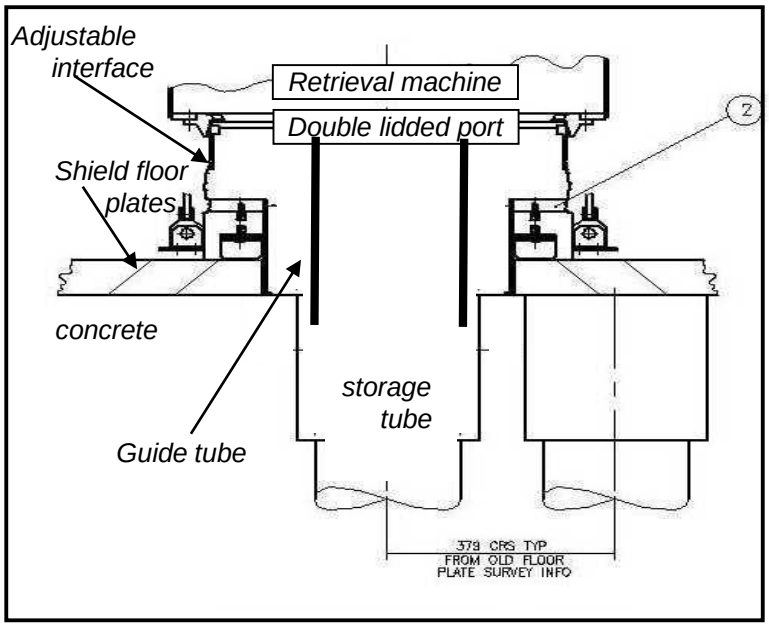
- Mild steel cans as thought of as temporary storage
- Corrosion / failure of cans an issue
- Condition of cans unknown prior to retrieval
  - Intact – purely external dose issue
  - Corroded – not a problem unless fall apart during recovery
  - Can disintegrated/ debris – different grabs, slower recovery, more contam
    - damp + IR + plastics deterioration
    - 5 – 10 % corroded
- Individual cans varied inventory
  - >1 TBq down to <<1GBq actinide equivalent
  - 100 Gy/h down to <1 mSv/h



4 Single tube interfacing (RM1)

- Over 1000 cans retrieved to date from 300 tubes
- Substantial shielding + ventilated containment + single tube access
- Machine dismantled (“split”) to move from tube to tube
- Top of machine, bottom of machine and top of adjustable storage tube interface linked by double lidded (DL) ports
- DL ports need help if significant debris/contam
  - DL port protectors
- No DL port to storage tube, also needs assistance for contamination control
  - guide tube @ tube interface





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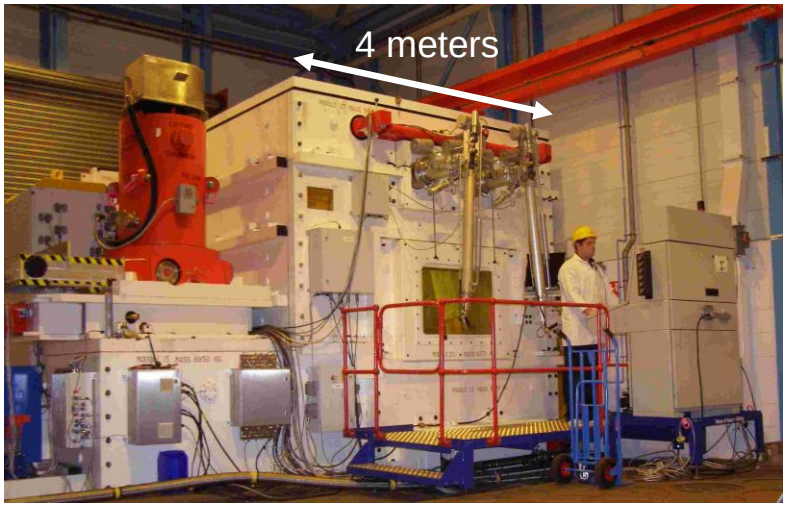
5 Single tube access – contam challenges

- DL Ports (normally) cleaned by simple RPE + damp wipes
- Internal of adjustable storage tube interface - decontam within containment unit
  - Up to few 100 Bq/cm^2 β, little/no α
- Occasionally wastes have provided additional challenges during retrieval
  - Protection failure and/or fine high activity dust
  - > 10,000 Bq/cm^2 β, few mSv/h γ, > 50 mSv/h β/γ at “split”
  - Re-assemble + undertake remote decontam
  - Sacrificial β/γ monitor check prior to split – confirmed success of remote cleaning – now routine for debris
  - Non-residue tape – improved decontam of floor

6 Multiple tube access (RM2)

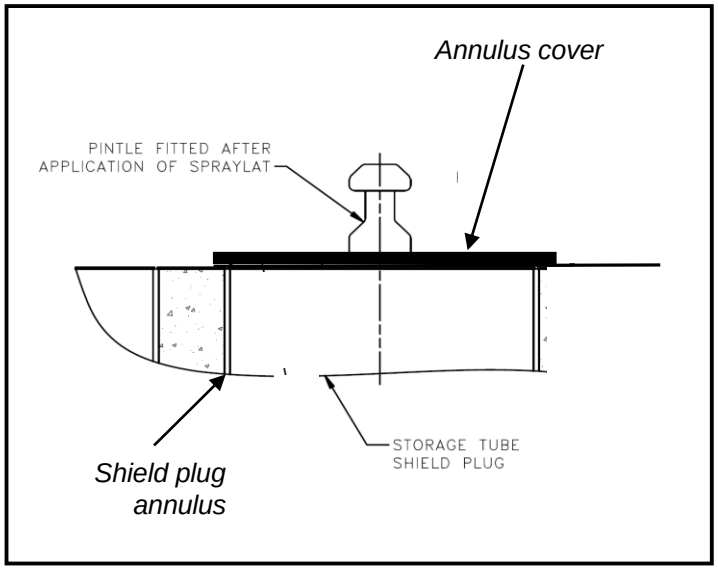
- Shielded containment with improvements on RM1:
  - Access to 20 tubes per build
    - 64 arrays, 6500 cans
  - Grabs + tools held in-box
- Contam control improvements:
  - Peelable floor seal
  - Vortex debris removal
    - ventilated “guide tube”
  - No waste traverse on grab
  - In-box monitoring equipment (dose rate and smear monitors)

- 9 arrays completed to date – none without debris



7 Multiple tube contam challenges

- End of each array still requires in-box decontam (vacuum, tacky rags, damp wipes) using MSMs
- modular containment + RPE to remove peelable layer and decontaminate floor.
  - Normally few 100 Bq/cm^2 β, little/no α
- Ongoing improvements
  - MSM decontamination techniques
  - Plastic covers for shield plug annulus
    - Contam being pushed into gaps - 10s mSv/h β/γ
    - Not identifiable by in-box smears and rad checks



8 Summary

- Corroded ILW wastes provides a varied radiological challenge
- Large shielded retrieval machines + ventilated containment boxes, adequately deal with ‘big’ exposures
- Simple controls applied to maintain doses ALARP + maintain operational efficiency
  - Use of simple plastic covers for double lidded ports
  - “Gaffa” tape to protect difficult surfaces to decontaminate (such as bare concrete)
  - Plastic discs to protect gaps around a shield plug

- Thank you for your attention, any questions?