Decontamination and Dismantling techniques

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Agenda

- Why decontaminate
- Factors which influence selection of methods
- Techniques for metal
- Techniques for concrete
- Practical experience
- Possible options for PRR-1
- Video
- Questions

Why Decontaminate

- Reduce radiation exposure
- Reduce volume of active waste
- Salvage equipment
- Reduce overall waste disposal costs
  - Free release waste disposal $100/ M^3
  - Low Level waste disposal $5000/ M^3
  - Intermediate level waste$1 000 000/ M^3

Factors which Influence Methods

- **Safety**
  - **Method should not increase radiation hazard to worker, external / internal dose**
- **Efficiency**
  - **Method should be able to remove activity to enable reduction in waste disposal category**
- **Cost Effectiveness**
  - **Will the reduction in waste disposal costs be greater than the cost of decontamination**
- **Waste Minimisation**
  - **There's no point in generating 10m^3 of secondary waste to decontaminate 1m^3 metal**

Techniques for metal

- **Chemical decontamination**
  - **Concentrated or diluted chemical reagents**
  - **Effective for complex geometry**
  - **Requires efficient recycling of the chemical**
  - **Unless the site has a process for either solidifying liquid waste or processing it, avoid liquid decontamination methods**
  - **They produce large volumes of secondary wastes**
  - **Equally so electrochemical methods**

Techniques for metal

- **Abrasive- blasting techniques**
  - **Wet techniques**
  - **Dry techniques**
  - **Provided secondary wastes are controlled can be efficient.**
    - **Waste disposal fuel transfer cask SURR**
- **Melting**
  - **Cannot envisage a suitable application on a research reactor site.**

Techniques for metal

- **Considerations for pipe-work.**
  - **How do you clean it**
  - **How do you monitor it (particularly if the contamination is alpha)**
  - **How much secondary waste do you generate to clean a pipe/ m length**
- **Cost Benefit analysis will more often than not suggest minimise volume but dispose of as active waste, (LLW)**

Techniques for Concrete

- **Activated concrete removal**
  - **Pneumatic breaker**
  - **Diamond drill**
  - **Expanding grout**
  - **Subject to depth scabbling/ shaving.**

Activated concrete will contain Tritium, general principal avoid wet methods, otherwise spread secondary contamination

Activated Concrete

- Depth will generally preclude scabbling or shaving
- Most efficient hydraulic crusher, if all surfaces accessible, however maximum thickness 0.5m
- Usually driven to pneumatic breaker
  - Can achieve up to 5 m^3 /hr

Techniques for Concrete

- **Free release concrete removal**
  - **Pneumatic breaker**
  - **Diamond drill/ burst**
  - **Expanding grout**
  - **Hydraulic crusher**
  - **Diamond Wire**
- **Diamond wire maximum removal rates**
  - **Subject to cranage facilities, configuration of bioshield.**

Techniques for Concrete

- **Contaminated concrete**
  - **Scabble**
  - **Shave**
  - **Breakout**
- **All methods worthy of consideration.**
- **Consider minimisation of airborne contamination.**

Developing a strategy

- **Compile in inventory of all material in the reactor Building**
  - **Define characteristics**
    - **Material; volume; mass**
    - **Estimated activity- fingerprint (which radionuclides)**
    - **Estimated dose rate if any**
  - **Select an appropriate waste disposal strategy**

Video

Scottish Universities Research Reactor Decommissioning Project