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Case Study Decommissioning

Training Package on Occupational Radiation Protection in Uranium Mining and Processing Industry

Decommissioning Description

- Every uranium operation will eventually stop production and need decommissioning.
- Often the decommissioning is a long time after the finish of production. The knowledge of the operation may be poor.
- Sometimes decommissioning is undertaken progressively whilst the majority of the plant is still in operation.
- Where there is insufficient knowledge, a site radiation survey can be used to identify areas with the potential for higher exposures.

Some Aspects of Decommissioning

- Plant demolition and disposal
- Bulk material movements
- Stabilisation of surface structures
- Rehabilitation of surface structures
- Isolation of underground facilities
- Groundwater remediation (particularly for ISR)

Build your own Decommissioned Facility

- **Choose the areas to be decommissioned?** (*Process plant, tailings area, in-situ leach wellfield, waste rock dumps, miscellaneous contaminated waste, evaporation ponds*)
- **Choose your disposal method?** (*on or off site, on surface with cover, shallow disposal, in pit disposal, underground disposa*l)
- **Is the decommissioning during operations, just after closure or a long time after closure**?

Model Answer Decommissioned Facility

- ISR Wellfield with a processing facility (ion exchange and calciner) and storage/settling ponds
- All wastes including plant not able to be decontaminated to be disposed of in an on site shallow pit (30m) specially built for the decommissioning
- The operation closed 15 years prior to decommissioning

Determine the Exposure Pathways for your Plant

- For each stage assign a relative level for the importance of the exposure pathway
  - VH-very high, H-high, M-medium, L-low, VL-very low

- Special is for unusual cases such as maintenance

Exposure Pathways for your Decontamination Facility

Stage/Pathway	Gamma	Radon	LLRD	Special
Wellfield				
Plant decontamination				
Plant disposal				
Disposal operation				
Storage pond remediation				

Model Answer: Exposure Pathways for your Decontamination Facility

Stage/Pathway	Gamma	Radon	LLRD	Special
Wellfield	L(*H)	VL	L(*M)	*potential for Ra226 Scales
Plant decontamination	L(*H)	L/(*M)	L(*H)	*potential for Ra226 Scales and final product
Plant demolition	L	VL	L(*H)	*potential for Ra226 Scales and final product
Disposal operation	L	L	L	
Storage pond remediation	L	L	M	

What are the potential critical areas for radiation protection

?

Model Answer Critical Areas

- Delay since closure means there is no operational knowledge of the site and where high radiation areas may be
- Potential for high activity scales and uranium residues
- Material all dry so decontamination and demolition (cutting and moving) may generate high activity dust
- Thin layer of solids from the liquor storage may have high activity (radionuclide will not be in equilibrium and may contain other radionuclides as well as ^{238}U, ^{234}U, ^{230}Th) and be very prone to dusting

What Monitoring is Required

- **Gamma** – which groups need personal monitoring, can monitoring be optimised?
- **LLRD** – breakdown what radionuclides in what areas, how to determine activity measurement?
- **Radon** – where and when to monitor?
- **Contamination** – what is the critical areas and do you need biological monitoring (Uranium in urine)?

Model Answer Monitoring

- **Gamma** – For workers involved in areas with potential ^{226}Ra scale and bulk scrapping of material use personal dosimeters otherwise use SEG average
- **Radon progeny** – No personal monitoring and some alpha track detectors for area monitoring
- **LLRD** – Occasional personal area sampling as a low priority with the exception of demolition activities and the scraping of the ponds
- **Contamination monitoring** not performed as not expected to be a significant pathway. Urine analysis only considered if there is a accident with the potential for direct ingestion or injection

What are Some of the Critical Controls

?

Model Answer: Critical Controls

- Conduct a site gamma survey to detect any areas of enhanced exposure due to ^{226}Ra scales.
- Density gauges may still be on the plant and highlighted during survey.
- Dusting during demolition and scrapping should be minimised.
- Use of wet cutting, remote cutters or respiratory protection when cutting through process infrastructure.

Dose Assessment

- How to determine total dose?

Model Answer Dose Assessment

- For gamma, use personal TLD results or workgroup average
- Assume radon is not significant unless alpha track detectors show enhanced levels
- Calculate LLRD dose using the time the workers are on site, the workgroup average airborne activity and a dose conversion factor based on equilibrium and an AMAD of 5μm

Key Messages

- For decommissioning, the biggest risk is the potential lack of knowledge about what are the potential exposure areas.
- A pre-decommissioning survey can help plan and manage radiation exposure.
- Particular care is needed for areas where radionuclides may have concentrated;
  - Scales
  - Solids remaining from evaporated liquids
  - Final product areas
  - Potentially old density gauges which are not recorded

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Thank you!