Management of Spent Desiccant from Vapour Recovery Dryers

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Purpose of Presentation

• Request information from members of the tritium handling community

• Specifically, practices associated with handling and disposal of tritiated molecular sieves

• Use of molecular sieves to trap tritiated water is a familiar technology in the tritium handling community

• Significant literature exists on the performance characteristics and on tritium “memory” effects

• Focus of request is more on the disposal of spent molecular sieves
Drivers for RFI

- CANDU heavy water reactor community is interested in employing best practices when disposing of its spent molecular sieve desiccant.

- A state of the report is being prepared to capture industry experience and practices.
In CANDU plants tritium is a major contributor to worker dose and environmental emissions.

Tritiated heavy water leaks from the major systems: moderator and heat transport (major contributor).

- Heat transport water tritium activity typically in the low Curies/kg.
- Water leakage results in a tritiated vapour environment which if not captured leads to worker dose and emissions to the environment.
**Tritium Control using Molecular Sieves**

- Vapour Recovery Dryers containing molecular sieve desiccant are routinely used to: collect heavy water leaking from systems, control airborne tritium concentrations and reduce tritium emissions to the environment.

- VRDs are large air drying systems using thousands of kg of molecular sieve per dryers.

- Thermal swing is used to regenerate the dryers.

- Desiccant is changed either on a regular maintenance cycle or if VRD performance degrades.

Dual Tower D2O Vapour Recovery Dryer CANDU-6
Spent Molecular Sieve

- Typical practice prior to extraction is to regenerate the desiccant prior to opening the dryer.

- Once the dryer is opened the molecular sieve is vacuumed into 200 L drums.

- The molecular sieve is now a radioactive waste stream.

- Long term storage requires meeting waste acceptance criteria of disposal site – dependent on country and accessibility to a waste disposal site.
Options for Disposal

Options for the disposal of tritiated molecular sieves are:

- Storage in drums – potential for tritium release upon exposure to air or liquid
- Detritiation to unconditional release levels – resultant tritiated water needs disposal
- Immobilize in concrete to reduce tritium leaching
- ?
Objective of State of the Art Review

Review and document current practices for spent molecular sieve management at various NPPs and tritium handling facilities. Specifically,

- When to replace
- Residual tritium in spent molecular sieves – impact on disposal options
- Hazards in the handling of tritiated molecular sieves
- Conditioning/treatment requirements to meet waste acceptance criteria of storage site (tritium leach rate requirements, tritium specific activity, storage media, etc.)
- Solutions for detritiation of molecular sieves (is it cost effective or possible to detritiate to unconditional clearance levels, what to do with the tritiated water produced)
Conclusion

Interested in obtaining information from tritium handling facilities on their management of spent molecular sieves and its ultimate disposal.

THANK-YOU😊