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

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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

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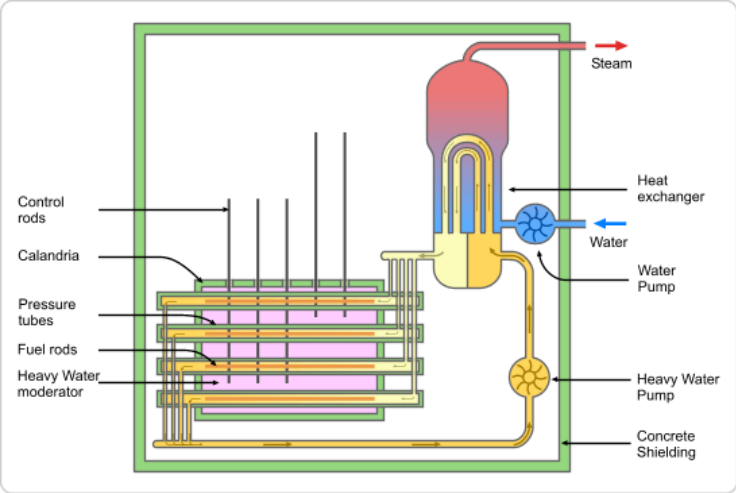
Molecular Sieves Usage in CANDU Reactors



- 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

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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

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Spent Molecular Sieve

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- 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

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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
- ?

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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)

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Conclusion

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

THANK-YOU☺

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