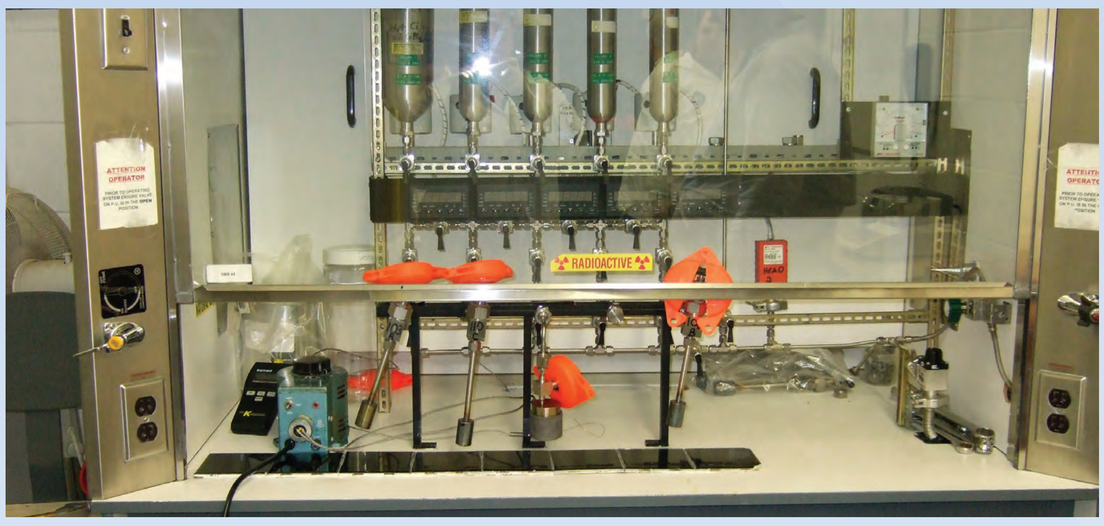
Evaluation of Facilities Handling Tritium

Overview

The evaluation of Canadian facilities included six licensees that produce or process tritium, or manage tritium wastes:

- Darlington Tritium Removal Facility (largest tritium-handling facility in Canada)
- Atomic Energy of Canada Limited Chalk River Tritium Laboratory (dispenses tritium for Ontario Power Generation tritium customers)
- SRB Technologies (gaseous tritium light source manufacturer)
- Shield Source Inc. (gaseous tritium light source manufacturer)
- Kinectrics Inc. (engineering design company doing tritium development work)
- GE Hitachi Nuclear Energy Canada Inc. (designing a tritium removal facility)



Bulk splitter
A bulk splitter dispenses tritium from the commonly used Amersham container onto smaller getter beds for use throughout the facility.

Three facilities were also visited overseas:

- United Kingdom: GE Healthcare Ltd. (tritium separation facility)
- South Africa: NTP Radioisotopes (Pty) Ltd. (gaseous tritium light source facility)
- Switzerland: Mb Microtec AG (gaseous tritium light source manufacturer)

Objectives

- Identify appropriate best practice for the handling and control of tritium in Canada.
- Evaluate the operating performance of Canadian tritium producers, processors and major users.
- Compare the operating practices of the Canadian tritium-processing licensees to industry best practice.

Main Findings

The following are considered best practice:

1. High-performance vacuum equipment for gaseous tritium handling
2. High-quality primary containment, i.e., maintain a nearly leak-proof facility as the most important control feature through the use of reliable, high-quality valves, pipes and pipe connections
3. Uranium getter beds for operational storage of tritium gas
4. Titanium getter beds for the long-term storage of tritium gas
5. Direct adsorption onto getter beds, or inert gas purging and capture onto getter beds during processing operations (intentional release of tritium gas from pipe work and vessels is not good practice)
6. Oil-free scroll pumps wherever possible
7. Removal of tritium gas and HTO (molecule of hydrogen + tritium + oxygen) from vacuum pump exhaust, provided there is a treatment or disposal route for the abated tritium
8. Reduction of chronic releases through additional secondary containment of getter beds, particularly for beds that are used at elevated temperatures over prolonged periods of time
9. Abatement technology at the point of generation of the release
10. Appropriately designed release points (stacks) for ventilation systems to achieve good dispersion of tritium gas and tritiated water vapour

Tritium recovery rig
In a tritium recovery rig, glass GTLS tubes are placed into a stainless steel vessel containing stainless steel rods. This vessel acts as a rotary mill. The glass tubes are crushed and the tritium is recovered. The amount of recovered tritium varies considerably; where measurements have been done, the recovery rates ranged from 95% to 98%.

Conclusion

The overall conclusion is that current Canadian practice is comparable to that in overseas facilities. Effective management of tritium is being achieved through a wide variety of mechanisms—and includes many custom-designed strategies that provide good levels of tritium control. While Canadian facilities operate using many of the best practices listed in the report, adoption of additional proven methods could further minimize the releases of tritium to the environment.