

Tritium Measurement in Soft Waste

Model: 7019-SWTM-001

Application

Tritium laboratories accumulate large quantities of Low Level Waste from items such as paper, Kim-wipes, plastics, cloths, gloves which are used in daily activities of operators and maintenance personnel. The personnel will have worked in potentially active areas and so it is assumed that their waste is contaminated with tritium even though it may not be. During the course of a year considerable waste in this category may have accumulated, some of which could be of a low enough level that it could be discharged into regular land fill, but because its activity level is not positively established it must be stored indefinitely in a low level waste facility with the costs and potential public objection that entails. Tyne has designed equipment to assess the activity of each bag of potentially tritiated waste.

The equipment is based on measuring tritium outgassing rate by capturing it in a bubbler subsequently monitored in a scintillation counter. In the case of waste activity being lower than approved levels for disposal, the bag can be sent to regular landfill. This may represent significant saving. The equipment can also be used to characterize tritium contaminated waste such that personnel will become aware of which kind of waste is potentially more active and should be bagged together. This will result in increased inactive waste accumulation, and reduced amounts sent into long term storage.

Features

- Cuts expenses by reducing long term waste
- Can monitor many bags tritium contaminated waste simultaneously
- Automatically timed operation with minimal operator involvement.



Description

The system is simple in principle. It comprises several closed and sealed stainless steel drums, into which laboratory soft waste bags have been placed. Bags may be plastic or paper. A sharpened wand comprising an inner and outer tube to deliver and return air to and from the bags is inserted into the bags before the drum door is closed.

Circulating air, delivered by a coiled tubing assembly connected to the wand and located inside the drum, sucks outgassed tritium and transports it to a bubbler. There is one bubbler per bag, and one spare for measuring room background. The bubbler removes all tritium (which is in oxide form) in the gas stream. Gas flow and duration are controlled and measured and hence it is possible to calculate the quantity of tritium picked up from the individual bags. Bags of acceptably low activity level can be discarded into unprotected landfill.

Multi Drum Arrangement

The basis for the design of this tritium in soft waste equipment is a formula arrived at experimentally by Ontario Hydro Technologies. The formula equates the tritium content of bagged waste to the measured rate of out-gassing. It is known that in most laboratories where tritium is handled, much of the soft waste may be clean and could be discarded if the activity level was known for certain. This equipment provides that opportunity.

The Soft Waste Tritium Monitor Assembly comprises a number of parallel systems controlled by a timer and operating simultaneously but independently. Operation is initiated automatically when the presence of a waste bag is detected inside a drum by an optical sensor, activated by the closing of the drum lid.



Close up of bubbler and controls

The equipment records the cycle times of each drum operation, thereby determining the amount of air used to purge the bags. Since the air flow is according to a predetermined rate established by a mass flow controller The total quantity of air transported through each bag is known.

A fifth bubbler is provided which takes room air alone, monitors it for tritium without going through the bags and provides a background base line measurement. This is a twice daily measurement, and does not need to be carried out more frequently than once every 12 hours. It provides a number to which bag measurements are compared in case tritium is present in the lab atmosphere.

When the monitoring operating is complete the drum will be put into purging mode to make sure that no tritium from a previous bag remains. The phase of operation of the system is displayed by coloured lights on the control panel.

Flow through the drums is provided by a wobble pump chosen for its quiet performance while delivering continuous reliable flow.

The glass bubblers are easily removed from their sealed aluminum mounting brackets for conveyance to the scintillation counter. The results of the scintillation counter can be printed on the waste bag for easy subsequent recognition.



Drum shown with bag and wand inserted

Specifications

Number of Bubblers	2 or more (including one reference bubbler)
Drum Size	460 mm dia x 590 mm deep
Unit dimensions	Height 1762 mm high Width 1200 mm wide Depth 735 mm deep Weight 458 Kg (crated for shipment)
Number of waste bags accommodated	1 or more (paper or plastic Large)
AC Power	280 W 240V/110V
DC Power	135 W/ 24 V
Flow through each bag	5 l/min
Bubbler size	1 liter
Controls	Timer controlled
Safety Lights	Red, White, Green, Yellow, sequenced to show operating phase
Records	Permanent records of scintillation count of bubblers may be kept.
Calibration	Mass Flow Controllers are all calibrated in air.