

Secondary Enclosure Cleanup (SEC) System



❖ Features & Benefits

Controlled Environment: Closed loop, continuously conditioned Helium atmosphere

Three Bed System: Conditions Helium for water vapor, oxygen and Tritium

Robust System: Few moving parts for very low maintenance

Hands Free Operation: automated Helium makeup and alarm/notification system

Pressure Vessel: All beds are registered to ASME Section VIII Div 1

❖ Typical Uses

- Glovebox Cleanup Systems
- Helium gas conditioning system

❖ Overview

The secondary enclosure cleanup system (SEC) is far superior to a standard purged enclosure for high activity processes. When significant levels of tritium activity are expected to permeate from the process into the secondary enclosure it is preferred to capture the activity rather than purge and release up the stack.

The SEC is a closed loop system that is attached to a helium atmosphere glove box for the purpose of capturing all tritium in the vapor and elemental form to reduce stack emissions. The continuous closed loop operation provides a constant cleaning of the helium atmosphere to both provide maximum detritiation and minimize helium usage. The SEC system is designed to handle water vapor, oxygen and hydrogen (Tritium) contaminants in the helium atmosphere.

The SEC system is an ideal solution for any helium atmosphere glove box cleanup system. With only one pump, passive cleanup beds, and a variety of instrumentation the SEC is a simple, robust, and well monitored system that provides very long run times with low maintenance.

❖ Theory of Operation

Helium is pulled from the glove box by a very robust Metal Bellows pump through a 1 Liter ionization chamber tritium monitor. The helium is then sent through three beds to deal with contaminants in the gas stream. The first bed is a 6kg 5A molecular sieve that removes all water vapor down to a dew point of -30 °C. A dew point monitor after the bed is provided to notify the user when the bed needs to be replaced. The next bed is a 1 kg Nickel Bed which is used to recombine any trace oxygen in the gas stream. The final bed is a 6kg Zirc-iron bed used to capture any hydrogen isotopes in the gas stream. The fully cleaned helium is then cooled and directed through a tritium monitor back into the glove box. A helium makeup circuit is provided to maintain the helium glove box pressure.

❖ Specifications

Operating Conditions	
Helium Cleanup Flow Rate	5 SLPM
Helium Pressure	5" of water
Helium Temperature	21 C
Water Vapor Cleanup Bed	
Bed Type	5A Molecular Sieve
Bed Weight	6 kg
Bed Effluent Alarm	Dew Point Sensor
Oxygen Cleanup Bed	
Bed Type	Nickel
Bed Weight	1.5 kg
Hydrogen Isotope Cleanup Bed	
Bed Type	Zirc-Iron
Bed Weight	6 kg
Bed Effluent Alarm	1 L ionization chamber Tritium Monitor
Physical	
Dimensions	39" wide x 27" depth x 68" height (As shown) Dimension designed per customer request
Isolation Valves	Bellows sealed, manual, copper stem tip
Wetted Materials	Molecular Sieve, Nickel alloy, Zr-Fe alloy, 316L Stainless Steel, Copper
Leak Tightness	1×10^{-9} cc/sec helium with 1 atm helium upstream
Pressure Vessels	ASME Section VIII Div 1
Electrical	
Bellows Pump	120 VAC, 1.4A
Nickel Bed Heaters	400 W – 2 heaters, 120 VAC, 3.33 A ea, 6.66A total
ZrFe Heaters	400 W – 2 heaters, 120 VAC, 3.33 A ea, 6.66A total
Instrumentation	120 VAC – delta Pressure sensor, solenoid valves 24 VDC dew point sensor
Tritium Monitors	Power over Ethernet (48 VDC, 100mA)

Drawings

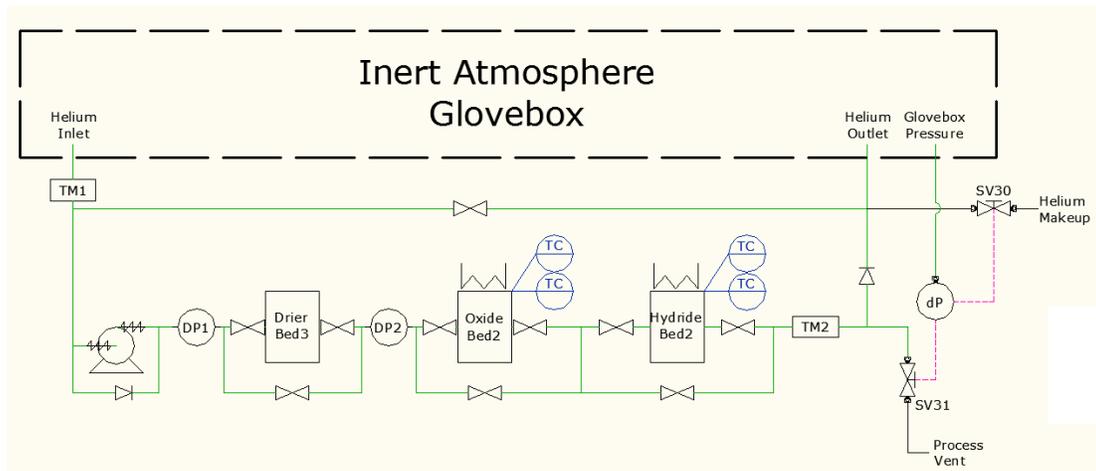


Figure 1: Secondary Enclosure Cleanup System Sample Process Flow Diagram