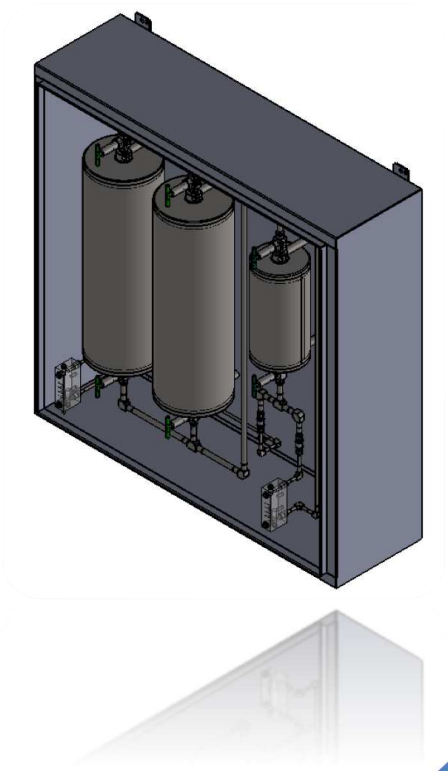
Torion Plasma Corporation

6006-S1-02

Tritium Effluent Recovery System (TERS)



Features & Benefits

H_2 Isotope Capture:	Oxidize and capture all hydrogen isotopes from inert gas streams
Inherently Safe:	No ignition source, reaction is catalyzed
No Emissions:	Less then 100 ppm water vapor
Self-Contained:	Industrial enclosure of all components, indicators and alarms
Robust and Simple:	Manual operation with integrated safety systems and dry contact relay alarm indication

Typical Uses

- Low activity elemental tritium in hydrogen capture system
- Low activity tritium gas in inert gas capture system

Overview

The Tritium effluent recovery system (TERS) is capable of capturing trace amounts of tritium (< 100 µCi/m^3) from a low flow (< 10 sccm) of hydrogen isotope effluent streams. The effluent stream is co-injected with dry air into a low temperature oxidizer bed where the hydrogen isotopes are oxidized to water vapour. The water vapour is adsorbed on a molecular sieve (MS) drier which will maintain a better than -40 ˚C dew point on the outlet thereby capturing all activity. A dew point on the outlet of the drier indicates when the bed is fully loaded and needs to be removed and sent for reconditioning. A second parallel drier is valved in when the first drier is removed to provide continuous system operation while the first drier is being processed.

The TERS is a simple system with a hydrogen flow indicator, air flow indicator and alarm, oxidizer bed temperature controller, outlet temperature limit alarm and a dew point indicator and alarm. The oxidizer bed is protected by an automatic bypass valve should the oxidation reaction generate too much heat for some unknown reason. The whole system provides a visual alarm and dry contract relay indication for an oxidizer bed off-normal temperature conditions and/or for a high dew point condition in the effluent.

Design Benefits

The TERS is a compact, fully integrated, self-contained unit with manual operation and visual indicators and alarms. The NEMA 12 industry enclosure contains all electronics, components and process piping required. The end user only supplies dry compressed air, the hydrogen isotope effluent stream to be treated, connection to vent and a 10A, 120VAC power connection. A dry contract relay is provided for indication of an alarm event in the end user's control system.

Specifications

Operating Conditions	
Hydrogen Isotope Effluent Gas Flow	1 to 10 sccm with flow indication
Air Gas Flow	0 to 1 SLPM flow indication and needle valve 0.5 SLPM alarm setpoint
Oxidizer Bed Operating Temperature	120 ˚C
Maximum Drier Bed Outlet Dew Point	-20 ˚C dewpoint
Effluent gas composition	Hydrogen isotopes, inert gases containing elemental or oxidized hydrogen NOT recommended for streams containing sulfur or potassium bearing compounds, volatile organic compounds
Services Requirements	
Dry air - Humidity - pressure range - temperature range - maximum flow - connection	 Dew point < 0 ºC at 1 atm 30 – 150 psig 15 – 25 ºC 1 SLPM ¼” OD Tube with female Swagelok fitting
Hydrogen Isotope Effluent - maximum pressure - temperature range - maximum flow - connection	 15 psig 15 – 25 ºC 10 sccm ¼” OD Tube with female Swagelok fitting
Vent - connection	 ½” OD Tube with female Swagelok fitting
Electrical	120 VAC, 60 Hz, 10 A
Physical	
Dimensions	42” L x 42” W x 12” D
Access	Double door with handle
Panel Indicators	Air flow indicator, Effluent flow indicator Temperature controller, Temperature Limit Dew Point indicator
Alarm	Visual indicator on top of enclosure Dry contract relay for end user use

Drawings

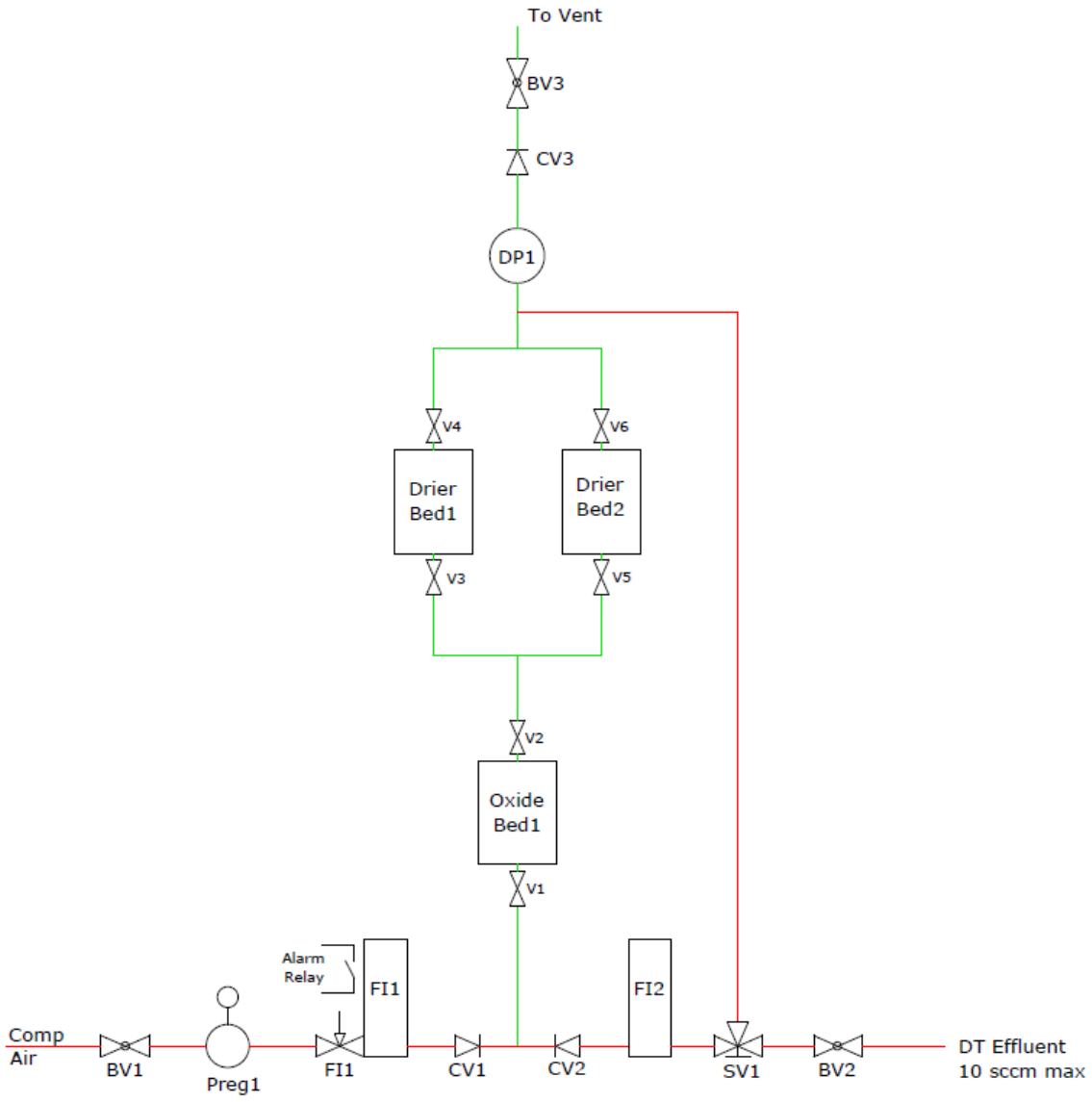


Figure 1: Process Flow Diagram

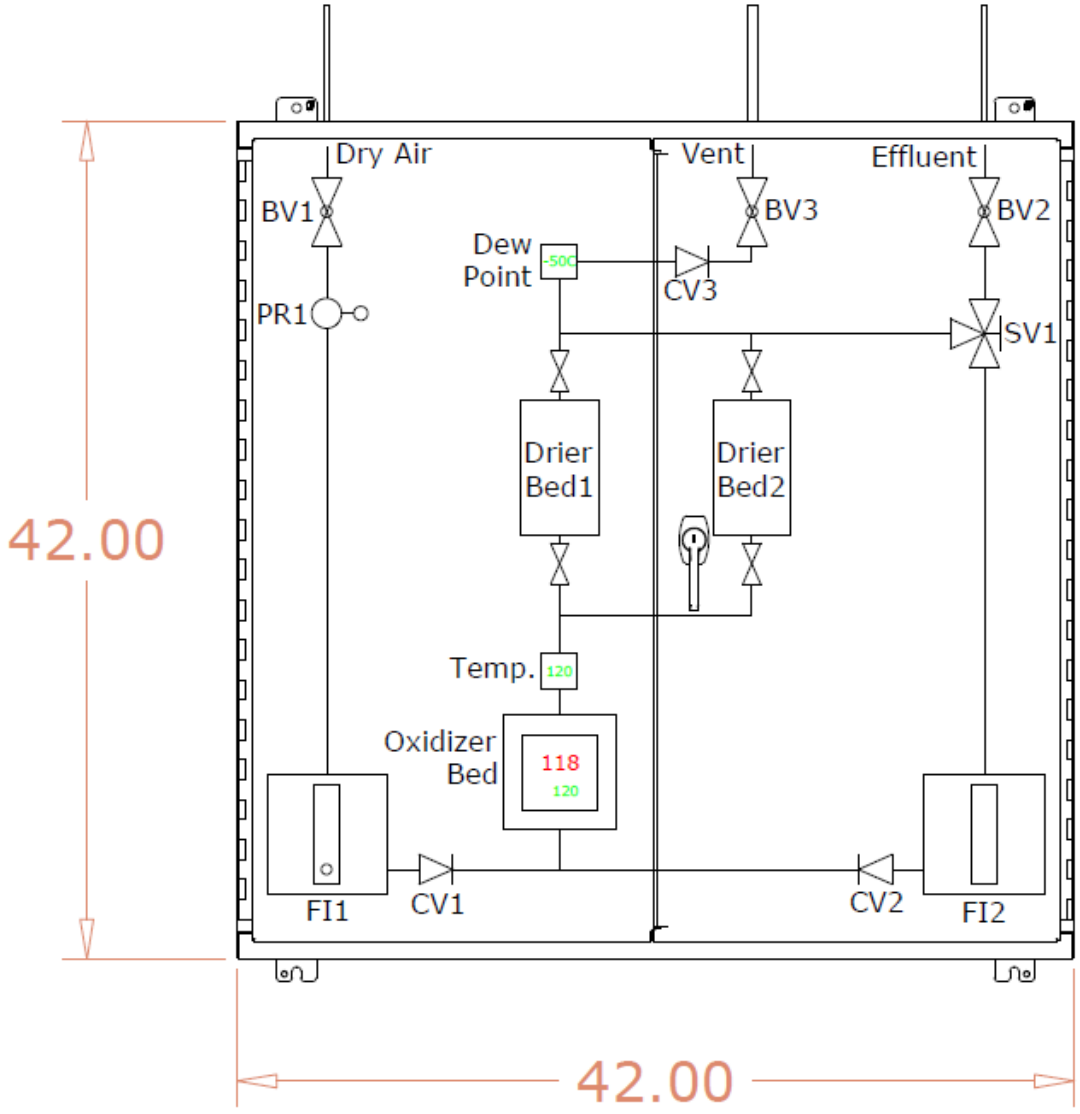


Figure 2: Front Panel Graphical Layout

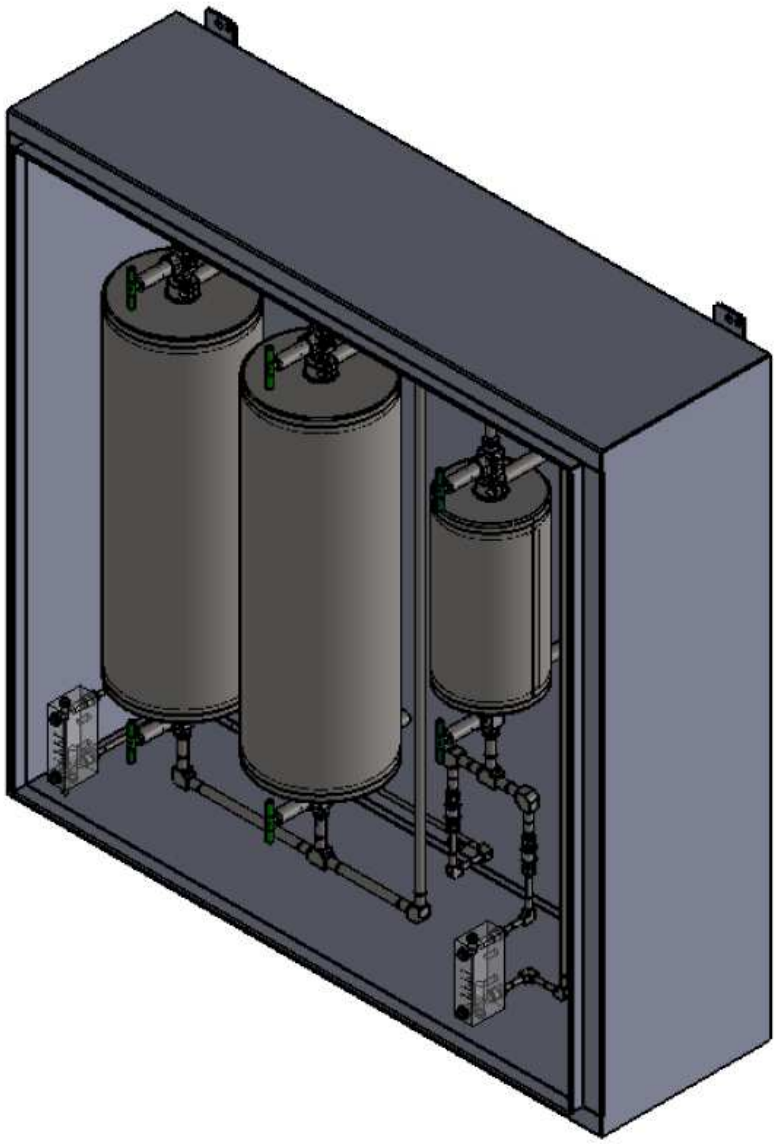


Figure 3: Internal 3D Layout