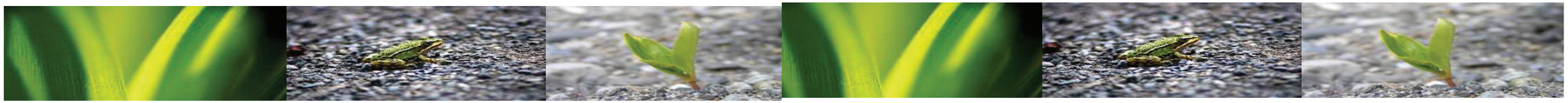
CS CLEAN SYSTEMS



Gas Abatement Solutions
"Make the Right Choice"

- **Direct Exhaust to Atmosphere**
- **Dilution (into general exhaust system)**
- **Central Wet/Thermal System**
- **Activated Charcoal Unit**
- **Dry Abatement (NOVASAFE)**

NOVASAFE® Features and Benefits

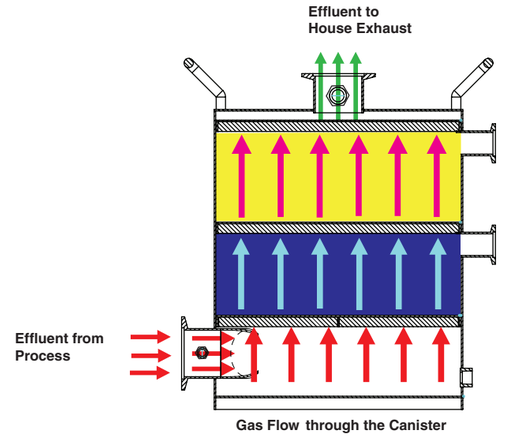
Features	Advantages	Customer Benefits
Dry chemical scrubber comprising a 10L can	Guarantees no out gassing of hazardous materials	• Spent canister is completely disposable by landfill or incineration • No liquid waste stream • Safety of personnel and facility • Canister sized to align with vaccum pump maintenance
Zero footprint	Small size allows for installation in or on top of any vacuum pump	• Low cost of ownership • No additional floor space required
Limited facilities requirements	• No power required • No nitrogen required • Nominal flow (<<1 sim) CDA required	• Low cost of ownership • Low facilitization cost
Scrubs to <TLV levels	No process gases or byproducts above TLV are detected at the outlet until canister breakthrough	Zero emissions – compliance with EH&S standards
No moving parts	• High reliability • Zero maintenance	• No unscheduled downtime due to scrubber failure/malfunction
Simple breakthrough indication	Simple indicator will indicate replacement time	• Low cost of ownership • Paper indicators for acid and hydride gases
Pressure and breakthrough monitoring port	• Provides indication of canister consumption and/or accumulation of solid by-products • Provides point of measurement for additional breakthrough sensor	Ensures no impact to pump or process tool due to back pressure

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NOVASAFE®
Dry Bed Abatement Technology





Applications

- Ion Implant
- Vent Gas
- Lab Instruments
- ETCH
- Acid & Hydride Gases
- ALD
- CVD
- III-V Compounds
- Chamber Clean
- MOCVD

Note: Low flow R&D and Laboratory applications

Advantages

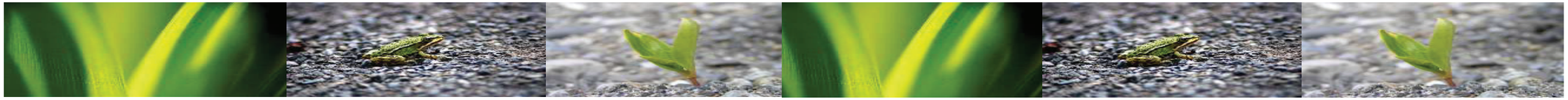
- Chemisorption of all hazardous species
- Each canister connected to one pump
- Continuous passive operation
- In-situ controlled air oxidation of process by-products and spent granulate
- Low operating cost
- Process selectable granulate mix

NOVASAFE combines high efficiency and high capacity in a compact, in-situ solution providing compliance with appropriate exhaust gas regulations and protocol

NOVASAFE is a passive abatement solution for semiconductor, vent gas, R&D and Lab instruments application. As a zero footprint scrubber, the NOVASAFE can be easily integrated with your vacuum pump system

Effluents are abated with the NOVASAFE to sub-TLV levels from roughing pumps and cryopumps. There are no moving parts. Change-outs are accomplished easily and have minimal impact on operations. With its compact and low impact design, the NOVASAFE is the ultimate uptime and economical abatement solution.

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Introduction

Air pollution regulations, employee health concerns, and growing awareness of toxic agents from semiconductor processes demand increased improvements in exhaust gas conditioning.

The NOVASAFE® Dry Scrubber reduces the hazards associated with flammable, toxic or corrosive gases and vapors.

NOVASAFE® effluent gas scrubbers offer an extremely safe and efficient way to treat toxic and corrosive gases resulting from hazard processes. This scrubber is a technologically advanced dry chemical scrubber containing approximately 2.5 gallons (9.5 liters) of scrubbing media. The scrubber is suitable for use in production and general laboratory environments. Operating passively at ambient temperature, chemical resins in the canister react on contact with process gases and by-products, converting them to non-volatile inorganic solids.

NOVASAFE® Overview

- Designed for Semiconductor, R&D and Laboratory Applications
- For Use On Low Flow Etch, Ion Implant, ALD, EPI, MOCVD, and CVD Applications
- Endorsed by Major Tool Manufacturers
- No Utilities Required Power or Water
- 24 Months Minimum Canister Lifetime
- Optional Pressure Gauge
- Optional Colour Change End Point
- Direct Mounting to Vacuum Pump Exhaust
- Broad Applications for Vent Gases
- Used by Major R&D and Laboratories

NOVASAFE® Application Chart

Application	Process Gases	Gas Capacity (minimum)
Acid Gas (HBr, HCl, HF)	HBr, HCl; HF	1500-Liters (Acids)
Hydride Gas (No H2)	AsH3, PH3, SiH4	1500-Liters (Hydrides)
Hydride Gas (with H2)	H2, AsH3, PH3 (No SiH4)	1500-Liters (Hydrides)
Etch (Except Metal Etch)	Cl2, HBr, HCl; HF; NF3 & F2 (from PFC: CF4, C2F6, etc)	750-Liters (Acids) 250-Liters (Halogen)
Metal Etch (w/ Upstrean Trap)	BCl3; Cl2; HCl; F2 (CF4)	750-Liters (Acids) 250-Liters (Halogen)
High-K ALD	NH3 & Rare Earth Precursor	250-Liters (Ammonia) 250-Liters (Precursor)
LPCVD	SiH4 & Dopants (AsH3, PH3, etc.)	1500-Liters (Hydrides)
PECVD	NH3, SiH4	250-Liters (Ammonia) 750-Liters (Silane)
WCVD	SiH4; WF6	750-Liters (Silane) 250-Liters (WF6)
HDP-CVD	SiH4 & NF3/F2	750-Liters (Acids) 750-Liters (Silane)
NF3/F2 Chamber Clean	NF3/F2	2500-Liters (F2)
Ion Implant	AsH3; BF3 & PH3	750-Liters (Acids) 750-Liters (Hydrides)
3-5 Compounds / MOCVD	AsH3; PH3 & MO-Precursors	750-Liters (Hydrides) 250-Liters (Precursor)

Application Considerations

A cost effective, safe, and simple solution to “point of use” select gas abatement. Very favourable “cost of ownership.”

Environmental Safety and Health (EHS) number of new laws has increased average 18% per year since 2006 globally.

Advanced semiconductor Research and Process Recipes (i.e. III-V) -- require use of dangerous and hazardous gases.

Heighten awareness and control of water usage and pollution. -- Wet scrubbers do not solve the problem, they move the problem.