

BUILDING A WORLD OF DIFFERENCE®



BLACK & VEATCH



VAPOR-PHASE ODOR CONTROL FOR COLLECTION SYSTEMS

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BLACK & VEATCH

Agenda

- Why Is Odor Escaping From My System
- Where Is The Odor Escaping
- Odor Control Technologies

Why Is There Odor Escaping from My System?

- Sewer drag
- Pressurization of sewers
- Change in barometric pressure
- Relative density of sewer and outside air

Where Are Odors Escaping

- Lift station wet wells
- Force main discharge manholes
- Siphons
- Vents
- Manholes
- Areas of high turbulence
 - Junction structures
 - Drop structures

Vapor-phase Technologies

- Wet scrubbers
- Activated carbon systems
- Other dry media systems
- Biofilters
- Biotrickling filters
- Technologies in need of further study
 - Air ionization (Bentax™)
 - Hydroxyl ion fogger (Vapex™)

Wet Scrubbers for Collection Systems

- Small footprint
- Height restrictions
- Operation and maintenance
- Chemical delivery issues
 - Truck traffic in neighborhoods
 - Truck accessibility at sites

Package Wet Scrubber Systems



L-Series Odor Control Systems



RJ Environmental Lo-pro System

Package Wet Scrubber Systems

Duall Division



Activated Carbon for Collection Systems

- Small footprint
- Contaminant loading limitations
- Grease and moisture elimination
- Operation and maintenance
- Media monitoring
- Accessibility for media replacement
- Media selection

Activated Carbon Media Types

- Virgin – Good VOC removal, low H₂S capacity
- Caustic impregnated – High H₂S, low VOC removal
- Water washable – Good H₂S, moderate VOC removal
 - Centaur™ by Calgon
- High capacity carbon – Good H₂S and VOC removal
 - Midas™ by US Filter
 - Sulphasorb XL™ by Pure Air Filtration
 - Minotaur™ by Calgon

Activated Carbon System Types

Carbon Systems come in a wide range of shapes and sizes including:

- Manhole inserts
- Drum systems
- Skid mounted systems
- Vertical bed systems
- Phoenix™ by Calgon

Manhole Inserts - Comparison



Comparison Information Provided by Wolverine

Name/mfg	Price	1 year warranty	Carbon LBS.	Replacement
Wolverine Manhole insert	\$425 all sizes	Yes	20 LBS	\$100
Manhole OC unit/ Bay Products	\$650	?	20 LBS	?
Calgon Street Sweet	740	Yes	20 LBS	\$400
Nodpor advanced carbon systems	\$400	Yes	27 LBS	\$150
Manhole bio filters/RJM inc.	\$1000	?	?	?
Manhole odor insert/PEC	Starts @ \$375	Yes	Dioxide Pellets	\$250
Peacemaker Syneco Systems	Starts at \$300	?	Oxidizing pellets at \$150 per bucket	?

Drum and Skid Mounted Systems

Bay Products, Inc



HDPE Drum System



Fiberglass Skid Mounted System

Vertical Bed Carbon System

PureAir Filtration

VTS - Vertical Airflow System

The PureAir VTS system is a complete self contained, vertical airflow unit.

For air streams ranging in volume from 6,000 to 40,000 CFM in a compact design.

The systems come in either blow-through or draw-through configurations.



Calgon Phoenix™ System in Westhaven, CT



Westhaven Pump Station

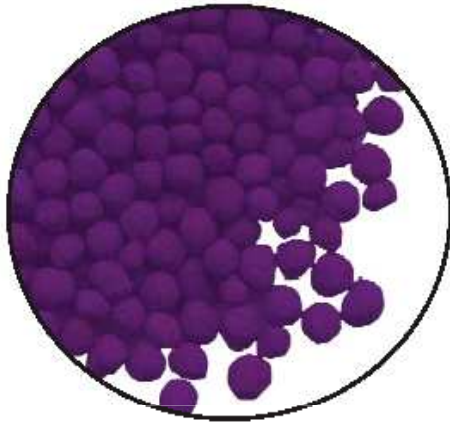


Calgon Phoenix™ Interior Installation

Other Dry Media Systems

- Dry Chemical Media
 - Purafil™
 - Peacemaker™
- Iron Sponge
 - Marcab™
 - Varec™
- Granular Iron Media
 - SulfaTreat™
 - Sulfa-bind™

Purafil™ Dry Scrubbing Media



Purafil Odoroxidant SP™ Media is activated alumina pellets impregnated with sodium permanganate



Purafil Odorcarb II™ is activated alumina pellets impregnated with caustic chemicals

Purafil™ Dry Scrubbing Systems



MOLE Manhole Scrubber

Controls street-level sewer odors.
Odors flow through 2 passes of
Purafil ESD Odormix SP media.
Scrubber collar fits any manhole

Drum Scrubber

Quiet control of odors at pump stations
in residential communities. Odors are
drawn upwards through multiple layers
of Purafil media. System is weatherproof
and requires little maintenance. Sized fo
airflows from 0 to 1,000 cfm.



Purafil™ Dry Scrubbing Systems



Tub Scrubber

For small headworks, large pump stations, in screening rooms, and at the discharge of biofilters. Features a 3 ft (0.9 m) media bed for increased residence time. Sized for airflows from 500 to 6,000 cfm.

Deep Bed Scrubber

For multiple contaminant challenges. Horizontal bulk-fill system has up to four media stages. Use at small headworks, large pump stations, in screening rooms, and at the discharge of biofilters. Sized for airflows from 500 to 8,000 cfm.



Syneco™ Dry Scrubbing Systems

PERSNICKETY® OXIDIZING & POLISHING MEDIA

- Oxidation is accomplished with chlorine dioxide media
- Polishing is done with Countervailant™ media which has polymeric adsorption and electrostatic bonding

PEACEMAKER® MANHOLE INSERTS



Syneco™ Dry Scrubbing Systems

PEACEMAKER® Dry Air Scrubbers



Iron Sponge Systems

MAR CAB COMPANY, INC.



Marcab™ iron sponge systems in residential settings

Iron Sponge Systems



Iron sponge system on JEA collection system near mall

Iron Sponge Systems

OdorKnocker™

The ODORKNOCKER™ MODEL RX



SS Tub Side View



Top View
Shows Gas Vents



Screen
Prevents Media Loss



OdorKnocker™ Media

Non-Hazardous!

A hydrated iron compound mixed with wood chips and shavings is supplied for use with our insert and above ground units for H₂S removal. The chips and shavings are carefully selected to give a range of particle sizes which give as much contact with the gas as possible to maximize removal. OdorKnocker™ Media weighs between 48-52 lbs per cubic foot. IT IS NON-HAZARDOUS in both the new and spent state. (MSDS furnished on request.) The media converts the H₂S into iron pyrite, or fools gold. One cubic foot of media will convert 15 lbs of H₂S. It will also remove mercaptans, but the amount and type vary, and testing is recommended for predicting results.

SulfaTreat® Media Systems



Granular iron impregnated media treats high H₂S, and mercaptans, but not other odorous VOCs



Force main air release manhole application in Johnson County, Kansas

SulfaTreat® Media Systems

Sierra Environmental has used a combination of SulfaTreat® and carbon to provide more complete removal of VOCs and odor



SIERRA
ENVIRONMENTAL
TECHNOLOGIES, LLC.

SWEET-AIRE®
ODOR CONTROL SYSTEMS
HYDROGEN SULFIDE AND MERCAPTAN REMOVAL

Biofilters For Collection Systems

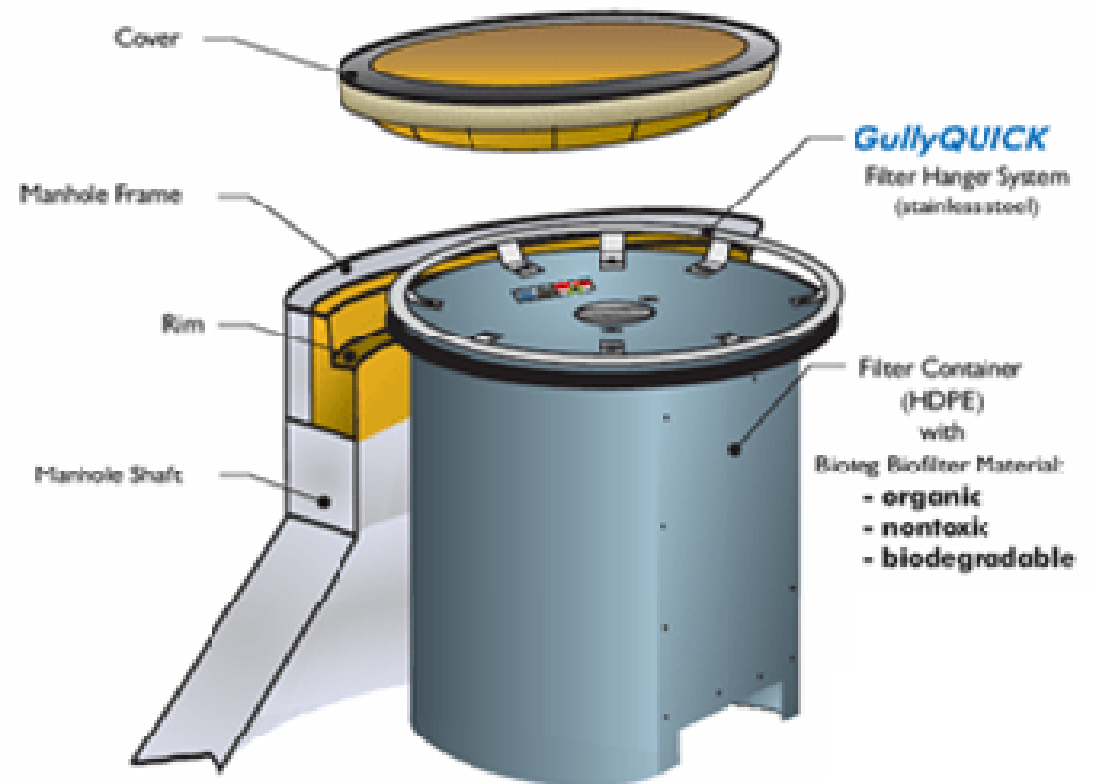
- Small footprint
- Contaminant loading limitations
- Moisture considerations
- Enclosed system with stack
- Accessibility for media replacement
- Organic or inorganic media

Biofilter System Types

Biofilters come in a wide range of shapes and sizes including:

- Manhole inserts
- Force main air release valve units
- Modular biofilters

Biofilter Manhole Insert

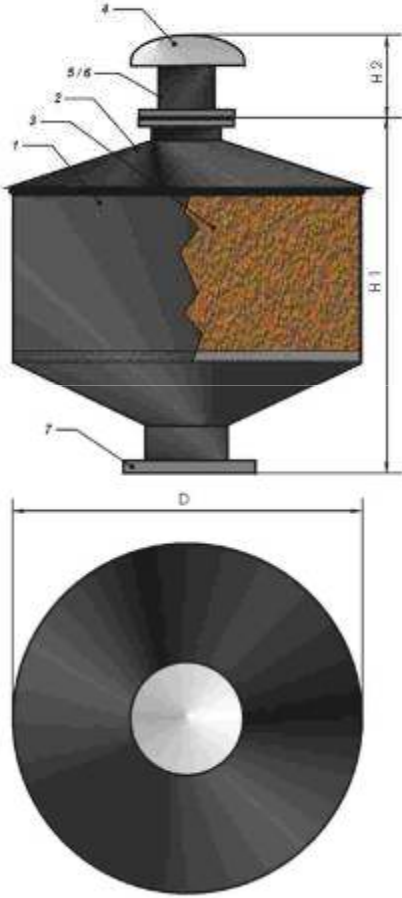


MBF-Series: Manhole Biofilter

Biofilter For Force Main Air Release Valve



Bioteg Force Main Biofilter **DEBF-Series**



Application

The Force Main Biofilters have been specially designed to reduce sewage odors emitting from force main air release valves. The filter is mounted, above or belowground, to the connecting piece of a force main ventilation pipe. They can be run as inexpensive passive biofilters with a vent stack, or can be equipped with a ventilator. The Bioteg Force Main Biofilters can be networked to adapt to greater inflow rates. Depending on the environmental conditions, the biofilter material may last up to 7 years. The replacement of the filter material is an easy and inexpensive process. The used biofilter material can then be readily composted.

Technical Data and Measurements

Surfaces in contact with the contaminating media:
 HDPE, PPs, PVC, stainless steel
 Biofilter Material: bioteg bpc-BT50

Type	Weight* ca (lbs)	Waste Air Stream (cfm)	D1 (in)	H1 (in)	H2** ca. (in)
DEBF-15	440	15	31	35	29
DEBF-30	770	30	39	41	to
DEBF-45	1,090	45	47	43	60

* Weight: humidified and ready to use
 ** Vent stack (H2) according to requirements
 Special sizes upon request

June 2000

Key

- 1) Filter Container (a=HDPE, b= stainless steel)
- 2) Detachable Cover (a=HDPE, b= stainless steel)
- 3) Filter Material
- 4) Ventilator Cover (a=HDPE, b= stainless steel)
- 5) Vent Stack (Stack length according to requirements)
- 6) Ventilator (a= with explosion protection, b= without explosion protection)
- 7) Flange ring for mounting on ventilation pipe

a is the standard version
 Number 2 and 6 are optional extras
 Client may chose between 5 or 6

Different materials and design upon request

DEBF-Series: Force Main Biofilter

Modular Biofilters

Treats airflow rates in a range of 300 cfm to 7,000 cfm.

Double walled filter containers with painted steel outer wall and inner surfaces coated with 3 mm heavy-duty polyethylene



MCBF-Series: Modular Container Biofilter

Modular Biofilters

Envirogen



McMillan Street Pump Station in Jacksonville, FL (JEA)

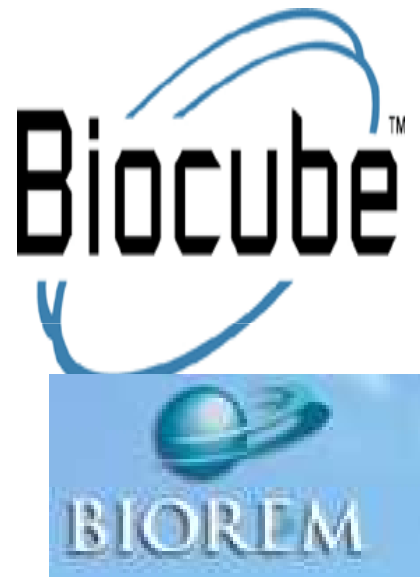
Modular Biofilters

SIEMENS (USFILTER) ZABOCS BIOFILTER

- Airflow rates from 350 cfm to 1500 cfm
- Vinylester FRP



Modular Biofilters



Abess Road Pump Station in Jacksonville, FL (JEA)

Modular Biofilters



BIOREM BASYS™ is an integrated modular biofilter using engineered media and suitable for treating air flows of 1,000 cfm to 5,000 cfm.



BASYS™ unit at Zanesville, Ohio



**City of La Malbaie in Quebec, Canada,
BASYS™ 12 unit treating 1,770 cfm**

Biotrickling Filters For Collection Systems

- Small footprint
- High H₂S loads
- Residual outlet odor may require polishing
- Nutrient requirements with potable water
- Accessibility for media replacement
- Various systems now available

Biotrickling Filters



Bioway Zerochem® units in HDPE and fiberglass



Bioway Eliminator® unit with integral carbon media core

Biotrickling Filters

Biotrickling Filters at Lift Stations on JEA collection system



**Fiberglass Bioway Zerochem®
units at Lennox Avenue Lift Station**



**HDPE Bioway Zerochem® unit at
Renne Drive Lift Station**

Biotrickling Filters

Biotrickling Filters at Lift Stations on JEA collection system



AroBIOS® by MetPro/Dual



Mixed Flow Exhauster™ (MFE)

Biotrickling Filters

Biotrickling Filters at Lift Stations on JEA collection system



Siemens (US Filter) Zabocs®



Envirogen RenovAIR®

Biotrickling Filters

BIOREM Mytilus™ biotrickling filter



**BIOREM System showing
“Popcorn” media**



**BIOREM installation in
Lakeland, FL**

Biotrickling Filter + Biofilter (SAM-M1)



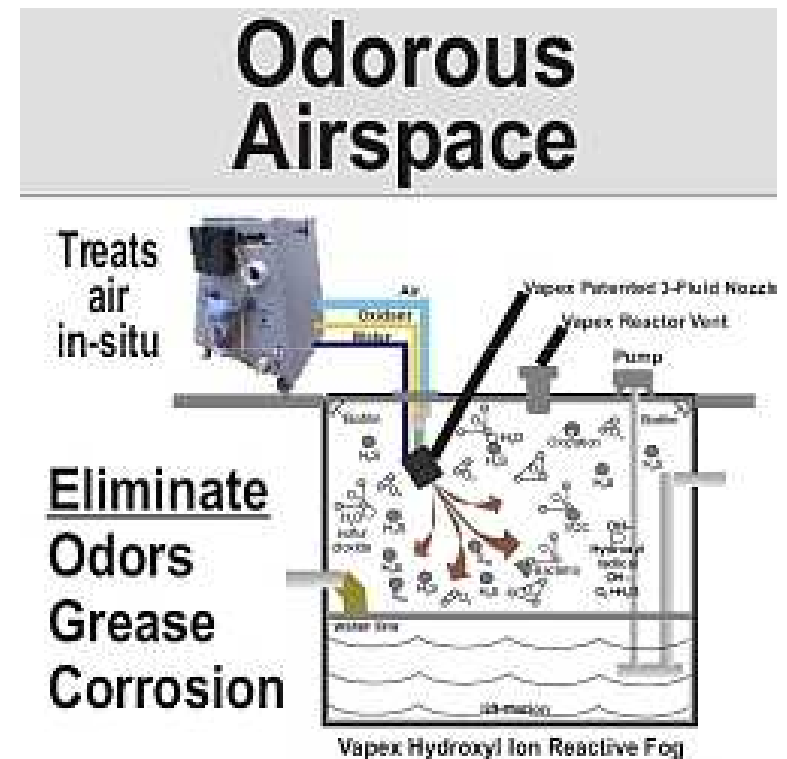
- A combination of biotrickling filter and biofilter technologies.
- Applications where total odor removal is required.
- The first stage consists of a biotrickling filter customizable to 2 – 30 seconds EBRT and used as a roughing scrubber to remove elevated hydrogen sulfide concentrations, allowing the second stage biofilter to concentrate on the more recalcitrant organic sulfides and VOCs.

Technologies In Need Of Further Study

Vapex - Hydroxyl Ion Fog

Supplier Information:

- For collection systems controls odor, grease, and corrosion.
- For scrubber pretreatment removes 98%-100% H₂S.
- The fog is applied in a scrubber duct, wet well, holding tank or any vessel containing foul air as the reaction chamber, needing no removal of foul air.
- The footprint is only 30"x31"x38". Installation is simple; connect power, water and insert the fogging nozzle.
- No chemicals are purchased, stored or handled.
- Provides significant savings over other odor control methods. Annual O&M is less than \$1,850/yr.



Technologies In Need Of Further Study Vapex - Hydroxyl Ion Fog



Measurements Fury Drive lift station at JEA showed incomplete treatment with high residual H₂S in wet well application



Pilot study at Yakima, WA showed zero reduction of 4 to 5 ppm H₂S in ductwork ahead of wet scrubber

Technologies In Need Of Further Study

Air Ionization



Wet well applications are reported by system supplier to be highly effective at reducing H₂S and odor. However.....



enclosed belt press testing at Lemay WWTP in St. Louis showed no reduction of H₂S at concentrations from 2 to 20 ppm

Questions?

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