FINAL ENGINEERING DESIGN REPORT
SOIL GAS VAPOR
and AIR SPARGING SYSTEM
INSTALLED AT
MERRICK CLEANERS
5640 MERRICK ROAD
EAST MASSAPEQUA, NEW YORK

Prepared for:

MERRICK CLEANERS
5640 MERRICK ROAD
EAST MASSAPEQUA, NEW YORK

Prepared by:

EEA, *Inc.*
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Garden City, New York 11530
(516) 746-4400
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JANUARY 2002
Revised
MARCH 2002

ALLEN SERPER, P.E.

Project: 01802

CERTIFICATION

The Soil Gas Vapor and Air Sparing System installed
at the Merrick Cleaners was constructed in accordance
with the approved Remedial Design Report
dated August 2001 and the construction
complies with all requirements of the Record of Decision.

Allen Serper, P.E.

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AS-BUILD DESIGN SOIL GAS VAPOR AND AIR SPARGING SYSTEM INSTALLED AT MERRICK CLEANERS 5640 MERRICK ROAD EAST MASSAPEQUA, NEW YORK AND OPERATIONS & MAINTENANCE MANUAL

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AS-BUILD DESIGN SOIL GAS VAPOR AND AIR SPARGING SYSTEM INSTALLED AT MERRICK CLEANERS 5640 MERRICK ROAD EAST MASSAPEQUA, NEW YORK AND OPERATIONS & MAINTENANCE MANUAL

INTRODUCTION

The following presents the as-built design of the system installed at Merrick Cleaners (formerly Minuteman Cleaners), 5640 Merrick Road, East Massapequa, New York. Also included is the Operation & Maintenance Manual (O&M).

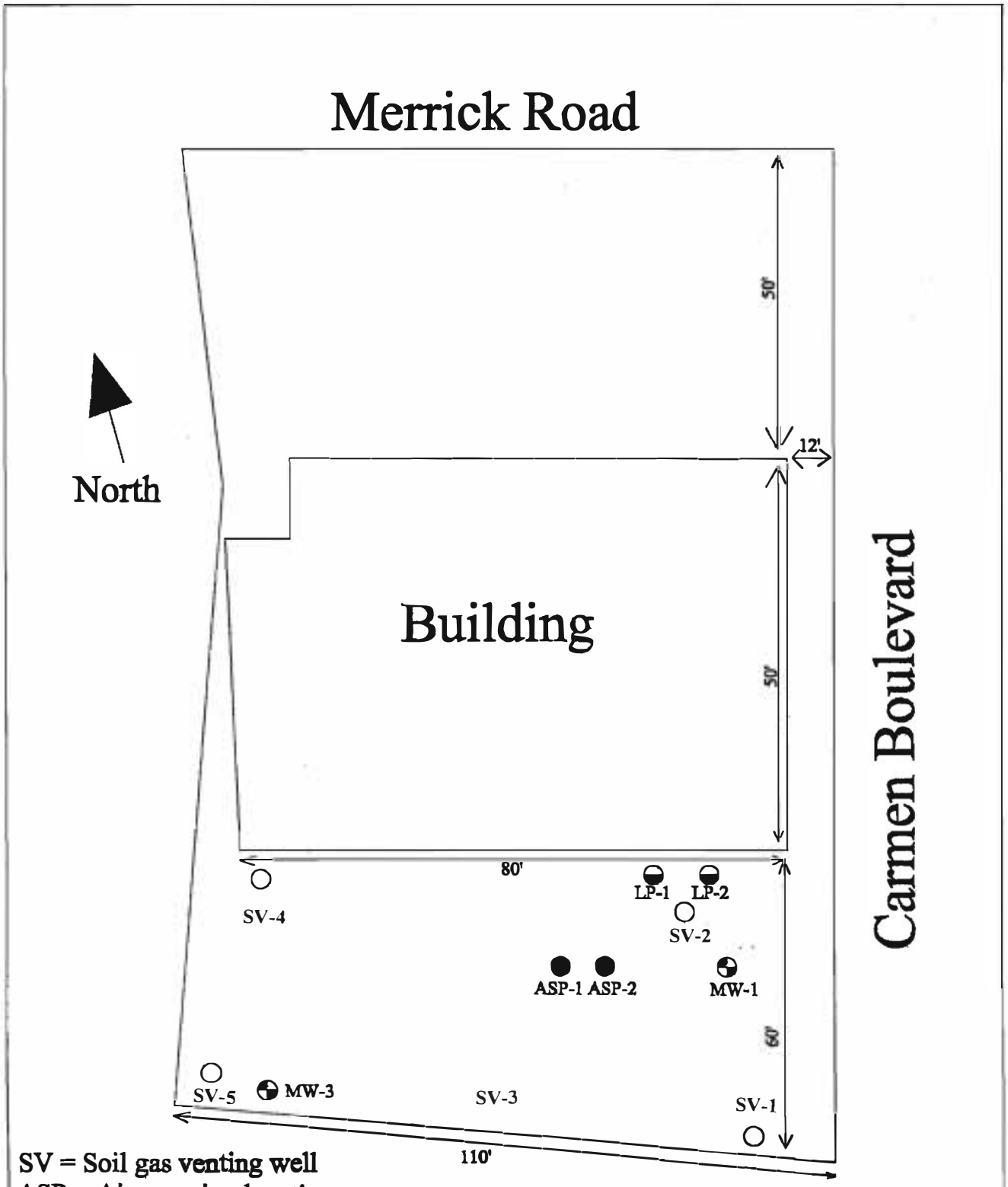
The system consists of a soil vapor extraction system that works in conjunction with an air sparging system. The design for the system is presented in the Remedial Design Report prepared by EEA in August 2001. The information in this document is prepared to supplement the design report.

SYSTEM DESCRIPTION

The construction of the wells is presented in the design report. The soil gas venting system and air sparging system are depicted schematically in Figures 1, 2, and 3 which show the SVE components on the site. The system consists of four soil gas wells located as shown in Figure 1. SV-1 is located between the two leaching pools. This well is the primary cleanup well. SV-2, SV-3, and SV-4 were constructed in a similar manner; however, the primary purpose of these wells is to provide a vacuum around the site that will prevent any migration of volatile organic compounds. The actual as-built piping diagram is presented in Figure 2. All piping is buried belowgrade.

a. Soil Gas Venting System

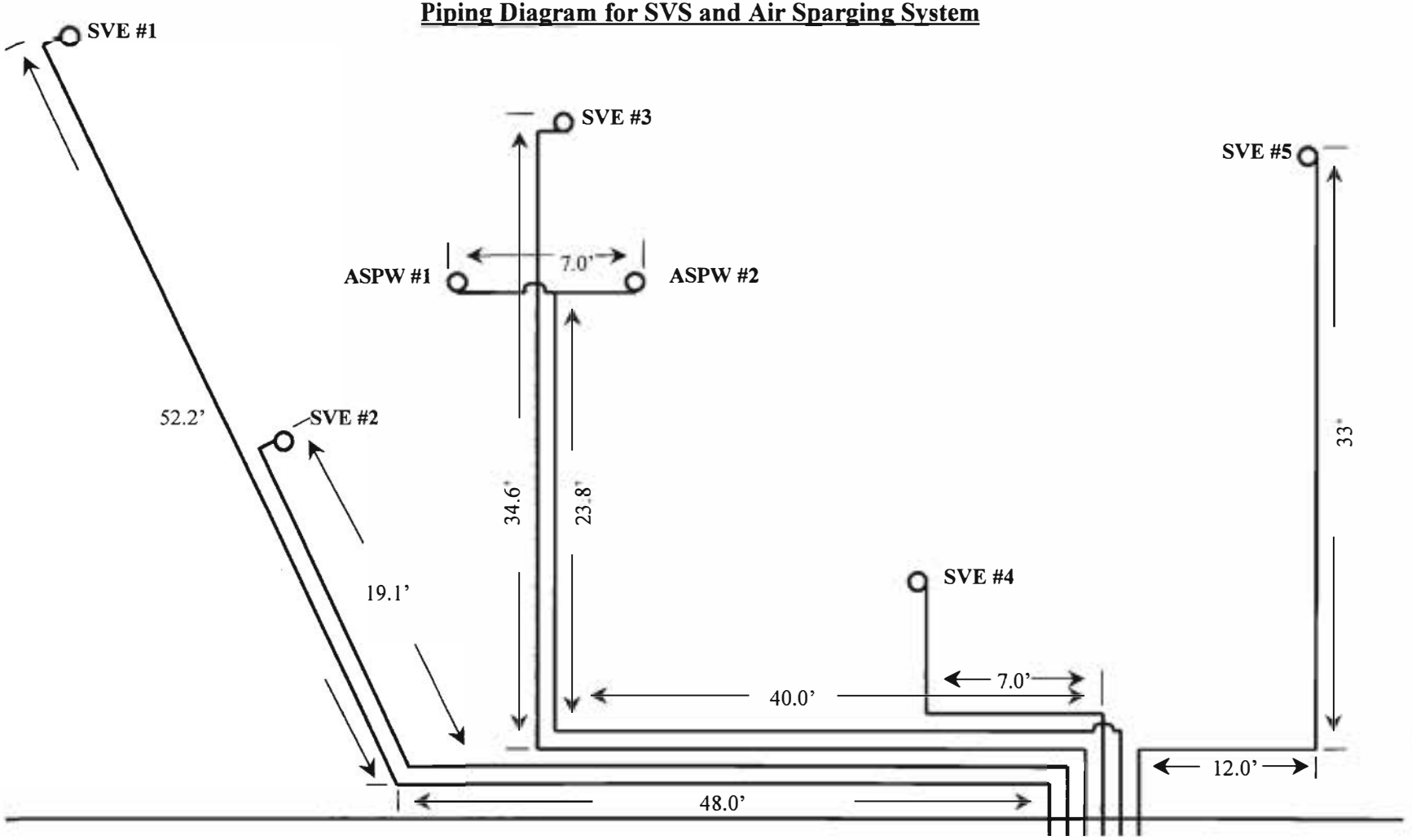
The system is capable of achieving a flow of 150 cfm at 55 inch water vacuum (at blower). The blower is a regenerative blower direct drive unit (Rotron EN6F5L). The motor is a 5 hp explosion-proof unit. The package includes a vacuum relief valve, inlet filter, an air dilution valve, and discharging muffler. The unit is equipped with temperature and vacuum pressure gauges. A 30-gallon air/water separator is installed on the air inlet line immediately before the blower to remove any liquid entrained in the vapor stream. The separator is equipped with a liquid level sight tube, a manual drain, and a high liquid level shut down that will automatically shut down the VES blower if a high water level develops in the separator. This will prevent water from entering into the regenerative blower. The control for the system is installed in a NEMA 4 box and mounted on the skid. A carbon filter is located after the blower exit. It is anticipated that the unit will operate at 40 to 50 cfm for the main extraction well SV-1, and 10 to 20 cfm at SV-2, SV-3, and SV-4. (The vents to control the migration.) System drawings and specifications are shown in Appendix A.



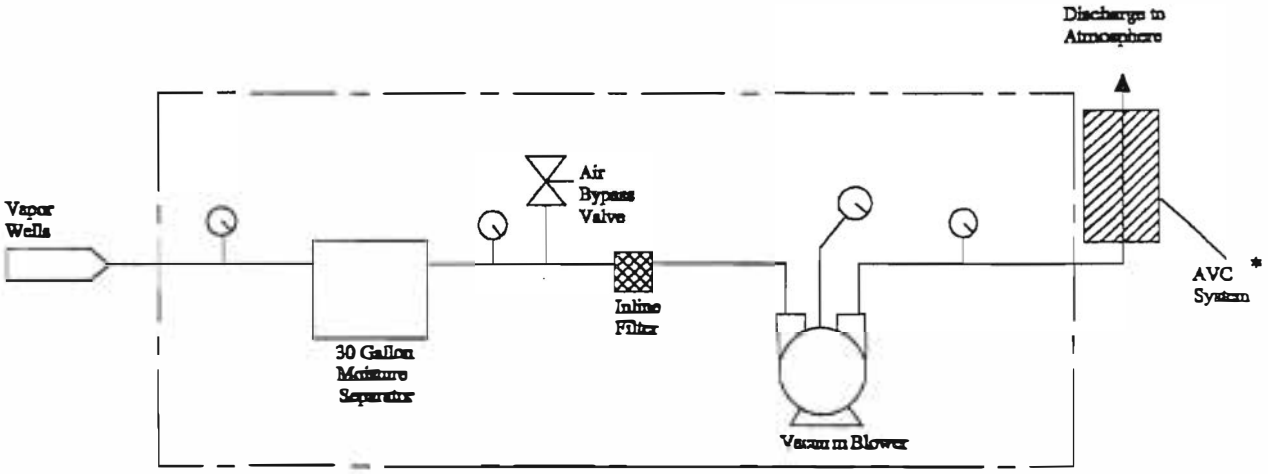
SV = Soil gas venting well
ASP = Air sparging location
LP = Leaching pool
MW = Monitoring well
M.P. = Monitoring point

EEA, Inc. 55 Hilton Ave. Garden City, NY, 11530	Merrick Cleaners East Massapequa	Site Layout Figure 1 Not to Scale

Piping Diagram for SVS and Air Sparging System



scale: 1" = 10'
2" PVC piping
SVE = soil gas vent
ASPW = air sparging well



Soil Gas Venting System

* = Activated Carbon System

Not to Scale

EEA, Inc. 55 Hilton Ave. Garden City, NY, 11530 (516) 746-4400	Merrick Cleaners East Massapequa	Soil Gas Venting System Figure 3

The drawings for the individual components are also shown in the Operations & Maintenance Manual (O&M).

b. Air Sparging System

An air compressor is employed to introduce the pressurized air to the air sparging wells. A Model 2067/2567 Gast Compressor is utilized. This compressor can provide 20 psi air at a maximum flow of 21 cfm (open flow). The system is designed to deliver 6 to 8 cfm at a pressure of 8 to 9 psig. The over pressure is calculated to be 14 psig. The unit is mounted on a skid and includes an inlet air filter, a pressure relief valve, pressure gauge, flow indicator, and flow control valve (see Appendix A).

c. Interconnecting Piping

The interconnecting piping and fitting from the well head to the blower is 2-inch PVC pipe generally utilized for water supply, irrigation systems, sprinkler systems. EEA has utilized PVC tubing when installing high vacuum methane control systems at municipal solid waste landfills.

Manifold piping connects the extraction wells to the skid-mounted SVE and air sparging system. Piping and fittings are 2-inch diameter, Schedule 40, Industrial Grade, PVC manufactured from Type 1, Grade 1 conforming to ASTM D-1784. All pipe fittings, including valves, unions and flanges will be pressure rated at 300 psi conforming to ASTM D-1875, ASTM D-2464 and ASTM D-2467.

Each extraction and air sparging well is individually piped, valved, and connected to a manifold location upstream of the SVE system. A flow gage, vacuum gage and air flow control valve are installed on each pipe at the extraction well. Piping is sloped toward the extraction well so that the condensate or entrained groundwater flows back toward the well. Photographs of the installation of the system piping are presented in Appendix A.

d. Control Panel (control for air sparging and soil gas venting system)

The control panel for both SVE system and air sparging system is mounted on the wall adjacent to the SVE system. Each system has its own individual controls and lights. However, the two systems are interconnected. If the SVE system shuts down, the air sparging system will also shut down. However, if the air sparging system shuts down, the SVE system will not shut down. The wiring diagram is presented in the O&M Manual.

e. Carbon Adsorption Bed

A carbon adsorption unit is utilized to remove the contaminants prior to discharge to the stack on the roof. The carbon consists of two large vapor phase drum adsorbers in series. Each drum contains approximately 500 pounds of activated carbon. The design report contains the calculations for the life of the activated carbon were previously presented in the Design Report.

SUMMARY OF SYSTEM SPECIFICATIONS

SOIL VAPOR EXTRACTION SYSTEM:

- Rotron EN6F5L Regenerative Blower
- 5 HP, 230 V, 1 Phase, TEXP Motor
- 55-Gallon, Carbon Steel, Liquid Entrainment Cylinder
  - Liquid Level Site Tube
  - Manual drain
  - High Level Shutdown integrated into the Central Control Panel
- 3" Stoddard Inline Filter (particulate filter)
- Universal U5-4 Discharge Silencer
- Pre- and Post Vacuum/Pressure Gauges
- All piping and wiring completed to applicable NEC standards
- Complete system test process in simulated field conditions

SOIL SPARGING SYSTEM:

- Gast Model 2567-P132 Rotary Vane Compressor
- 2.0 Hp, 230 V, 1 Phase, TEFC motor
- Slide Base with OSHA certified V-belt guard
- Inlet Coalescing Type Air Filter
- Pressure Relief Valve
- Discharge Silencer
- Complete Gauge Package including Pressure and Temperature Gauges
- All piping and wiring completed to applicable standards
- Complete system test process in simulated field conditions

NEMA 4 CENTRAL CONTROL PANEL:

Hoffman NEMA 4 Metal Enclosure including:

- Two (2) Motor Starters
  - 5.0 Hp VES
  - 2.0 Hp Soil Sparge
- Individual On/OFF/AUTO Switches for each motor
- Individual Green Operating Lights
- Individual red Fault Lights
- SVE and Sparge System Interlocked
- The Control Panel is mounted on the wall adjacent to the SVE System.

SKID/MOUNTING:

Each system is mounted individually on steel framed skids.

Appendix A

SVE System Description
Air Sparging System Description
Activated Carbon Systems
Photographs

SVE System Description

EN 6 & CP 6
Explosion-Proof Regenerative Blower

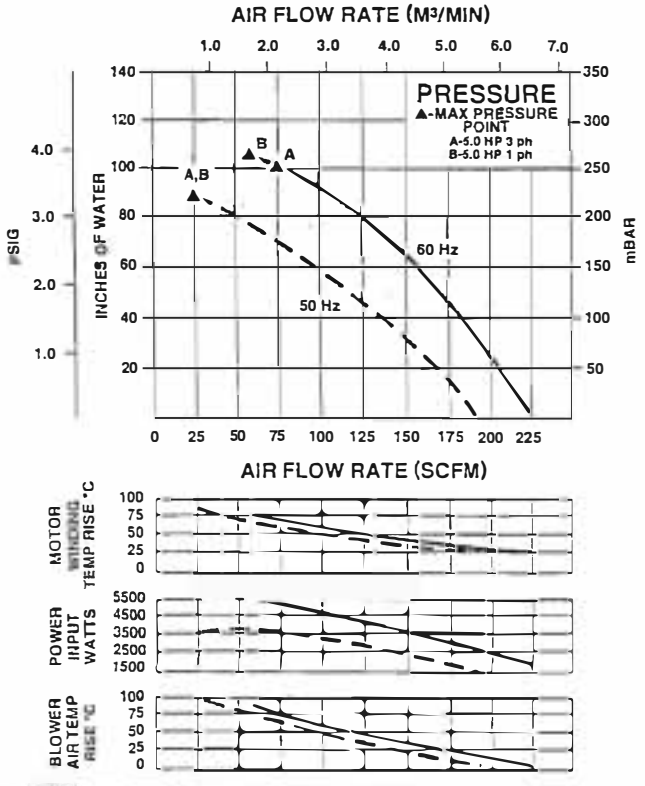
FEATURES
- Manufactured in the USA – ISO 9001 compliant
- Maximum flow: 225 SCFM
- Maximum pressure: 104 IWG
- Maximum vacuum: 85 IWG
- Standard motor: 5.0 HP, explosion-proof
- Cast aluminum blower housing, cover, impeller & manifold; cast iron flanges (threaded); teflon lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

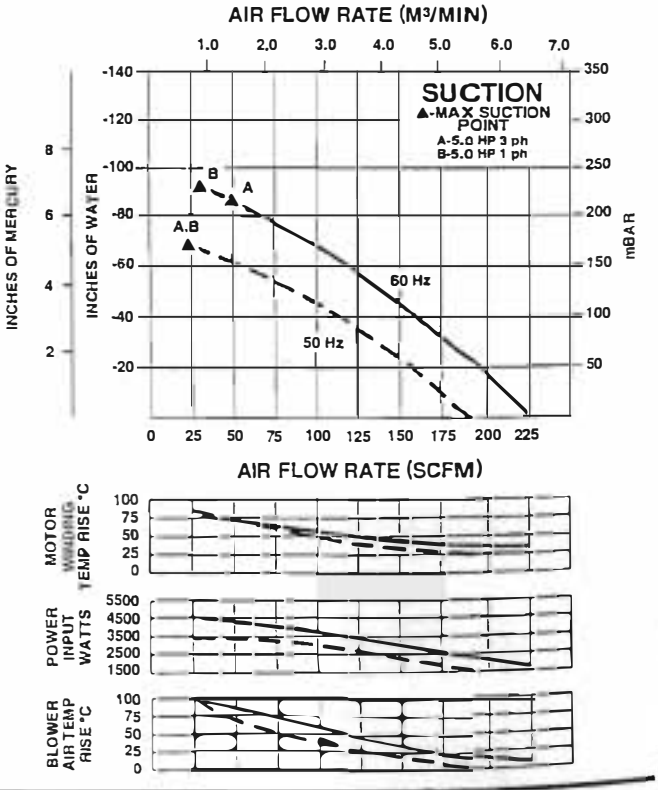
MOTOR OPTIONS
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

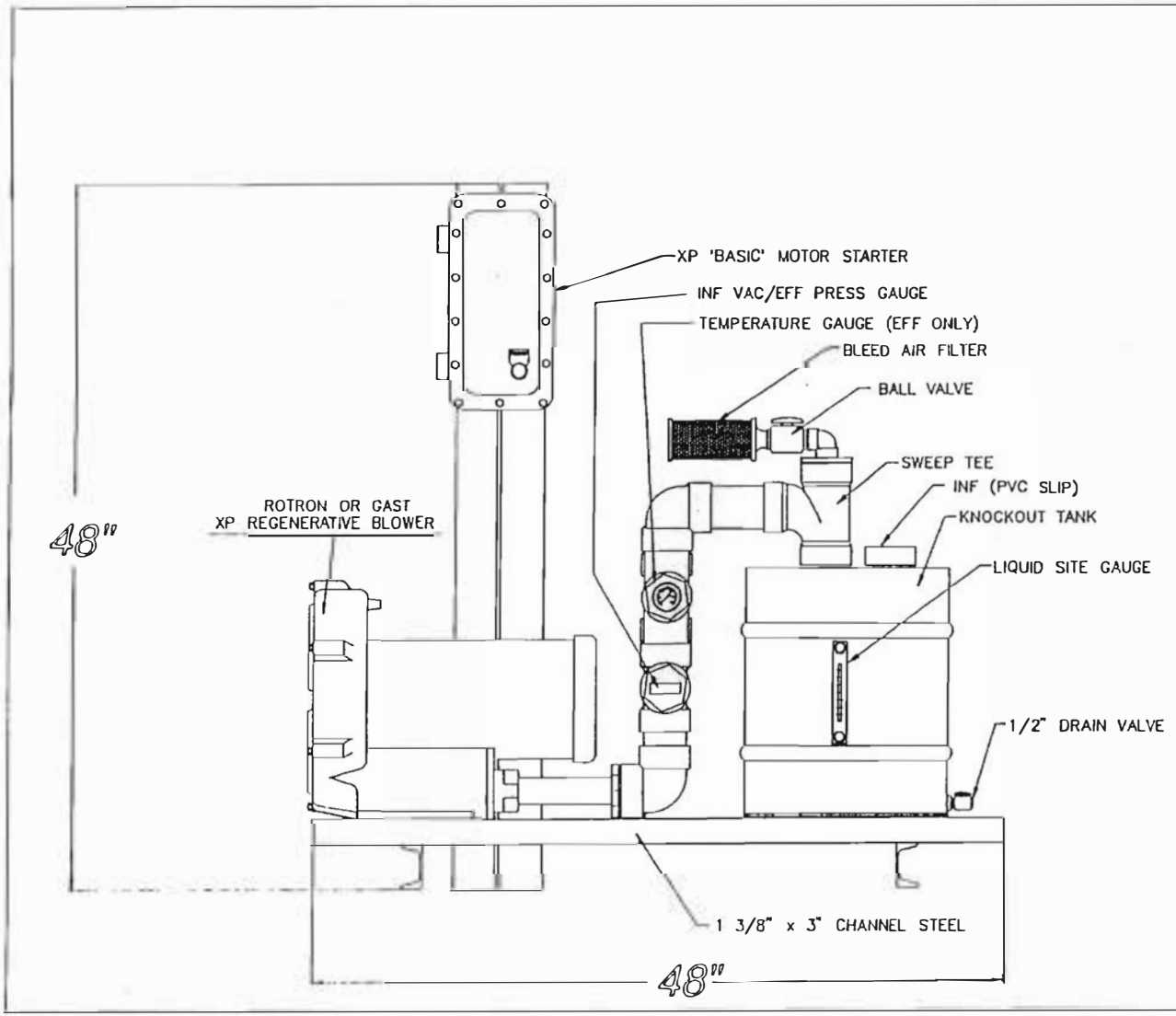
ACCESSORIES (See Catalog Accessory Section)
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges & relief valves
- Switches – air flow, pressure, vacuum or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

BLOWER PERFORMANCE AT STANDARD CONDITIONS





AMETEK ROTRON TMD, SAUGERTIES, NY 12477 • e mail: info@ametek.com • internet: www.rotrontmd.com



NOT FOR CONSTRUCTION

GROUNDWATER RECOVERY SYSTEMS, INC.

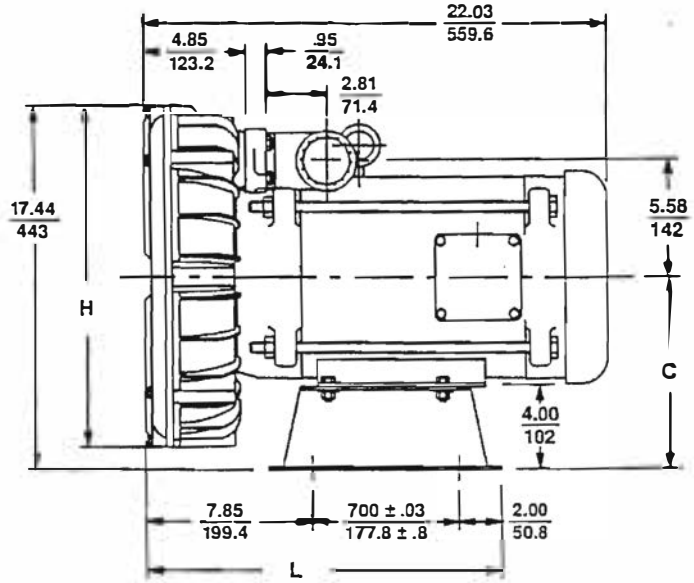
BASIC SOIL VENT SYSTEM

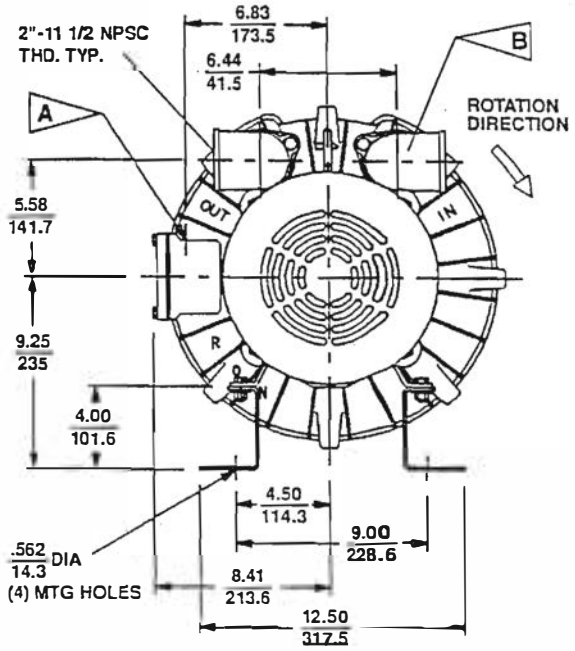
1/31/94

VES

EN 6 & CP 6
Explosion-Proof Regenerative Blower

Scale CAD drawing available upon request





DIMENSIONS: IN / MM
TOLERANCES: .XX ± .12 / 3
(UNLESS OTHERWISE NOTED)

MODEL	L (IN/MM)	C (IN/MM)	H (IN/MM)
EN/CP6F72L	20.37/517	8.5/216	16.7/424
EN/CP6F5L	22.0/560	10.21/259	17.5/443

A — 0.75" NPT CONDUIT CONNECTION AT 12 O'CLOCK POSITION

B — 90° ELBOW SUPPLIED ON 1 PHASE MODEL ONLY

SPECIFICATIONS

ALL PRODUCTS LISTED INCLUDE MUFFLER PN522948

MODEL	EN6F5L	EN6F72L		EN6F86L	CP6FW5LR	CP6FW72LR
Part No.	038361	038180		038438	–	038978
Motor Enclosure – Shaft Material	Explosion-proof – CS	Explosion-proof – CS		Explosion-proof – CS	Chem XP – SS	Chem XP – SS
Horsepower	5.0	5.0		5.0	Same as EN6F5L – 038361 except add Chemical Processing (CP) features from catalog inside front cover	Same as EN6F72L – 038180 except add Chemical Processing (CP) features from catalog inside front cover
Phase – Frequency [1]	Single - 60 Hz	Three - 60 Hz		Three - 60 Hz		
Voltage [1]	230	230	460	575		
Motor Nameplate Amps	19.5	14	7	5.7		
Max. Blower Amps [3]	22.8	15.8	7.9	6.3		
Inrush Amps	175	152	76	38		
Starter Size	2	1	0	0		
Service Factor	1.0	1.0		1.0		
Thermal Protection [2]	Class B - Pilot Duty	Class B - Pilot Duty		Class B - Pilot Duty		
XP Motor Class – Group	I-D	I-D, II-F&G		I-D, II-F&G		
Shipping Weight	232 lb (105 kg)	160 lb (73 kg)		160 lb (73 kg)		

[1] Rotron motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz.** Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz.** All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

[2] Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

[3] *Maximum blower* amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates.

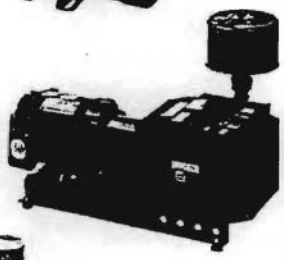
Air Sparging System Description

Special Purpose Units – Compressors for Soil Sparging *up to 112 cfm*

GAST

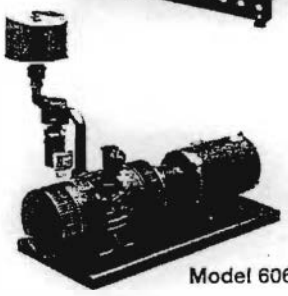
Model 0823

Units are supplied with special, high capacity filtration plus motors that allow up to 30% more pressure than the standard model counterpart.

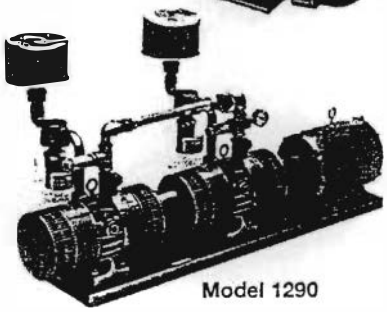


Model 2080/3080

Model 2067/2567



Model 6066



Model 1290

Oilless 0823, 2080/3080, 2067/2567, 6066 and 1290 Series

MODEL 0823
10 PSI MAX. CONTINUOUS PRESSURE
8 CFM OPEN FLOW

MODELS 2080/3080
15 PSI MAX. PRESSURE
25-35 CFM OPEN FLOW

MODELS 2067/2567
20 PSI MAX. PRESSURE
17-21 CFM OPEN FLOW

MODELS 6066
20 PSI MAX. PRESSURE
37-55 CFM OPEN FLOW

MODELS 1290
20 PSI MAX. PRESSURE
112 CFM OPEN FLOW

PRODUCT FEATURES

- Oilless operation
- Rugged construction/low maintenance
- Heavy-duty filters

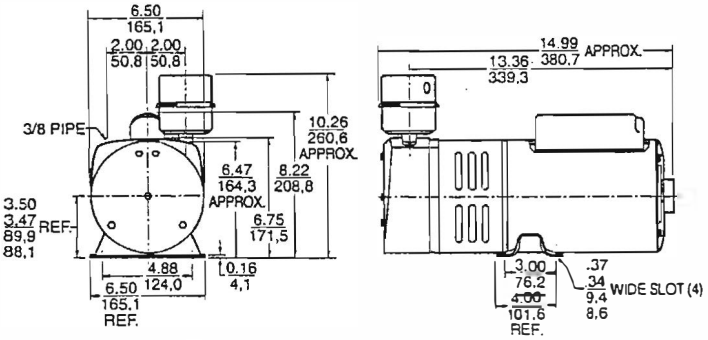
RECOMMENDED ACCESSORIES

- Pressure gauge AA644B
- Relief valves:
  AA600 (0823)
  AN225 (2080, 3080)
  AA307 (2067, 2567, 6066, 1290)
- Repair kits:
  K479A (0823)
  K546 (2080, 3080)
  K585 (filter/muffler kit for 2080)
  K584 (filter/muffler kit for 3080)
  K357 (2067, 2567)
  K503 (6066, 1290 – use 2)

Product Dimensions (mm, inches)

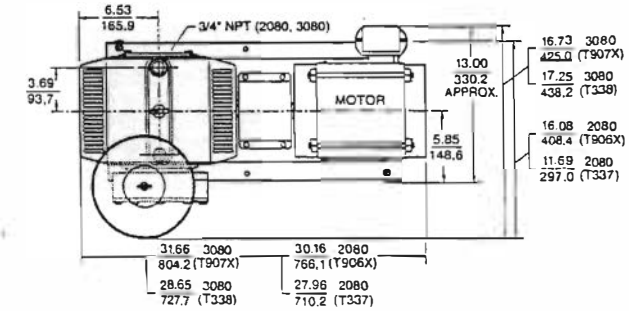
Dimensions are for reference only.

Model 0823

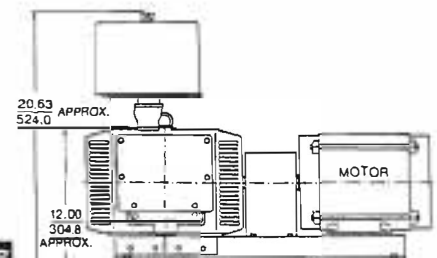


Models 2080/3080

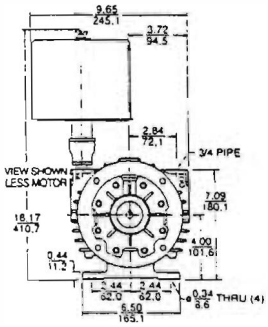
Top View

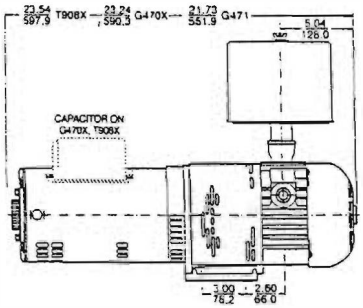


Side View



Models 2067/2567





Product Specifications

Note: All models are compressors.

Model Number	Motor	RPM 60 cycle	RPM 50 cycle	HP	kW	Net Wt. lbs.	Net Wt. kg
0823-P155-G608X*	100-110/220-240-50-1 110-115/208-230-60-1	1725	1425	3/4	0.56	50	22.5
2080-P124-T337†	230/460-60-3	1725	—	2	1.5	135	60.8
2080-P124-T906X†	115/230-60-1	1725	—	3	2.2	135	60.8
3080-P124-T338†	208-230/460-60-3	1725	—	3	2.2	160	72.0
3080-P124-T907X†	208-230-60-1	1725	—	5	3.7	160	72.0
2067-P118-G470X†	115/230-60-1	1725	—	1 1/2	1.1	84	37.8
2067-P118-G471*†	220/380-415-50-3 208-230/460-60-3	1725	1425	1 1 1/2	0.75 1.1	84	37.8
2567-P132-G475†	230/460-60-3	1725	—	2	1.5	85	38.3
2567-P132-T908X†	115/230-60-1	1725	—	2	1.5	85	38.3
6066-P122-T339*†**	208-230/460-60-3	1725	—	5	3.7	205	92.3
6066-P122A-T905†**	208-230/460-60-3	1725	—	5	3.7	205	92.3
6066-P122A-T909†	208-230/460-60-3	1725	—	7 1/2	5.6	205	92.3
1290-P110-T904*†**	208-230/460-60-3	1725	—	10	7.5	430	193.5
1290-P110A-T910†	208-230/460-60-3	1725	—	15	11.1	440	198.0

*For 50 Hz performance, reduce air flow on grid by approximately 17%.

**6 pole motor; 1140 RPM.

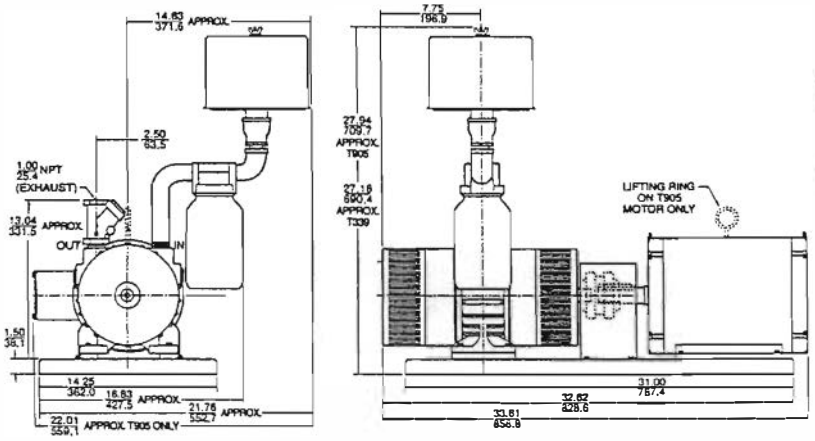
***These models are capable of 15 psi max. performance, reference performance grid below.

†Also available as separate drive, less the motor. To order as a separate drive version, specify the first two sets of digits only of this model number. Consult factory or distributor for the correct Nema frame size motor to use. Customer supplied motor must have minimum service factor of 1.15.

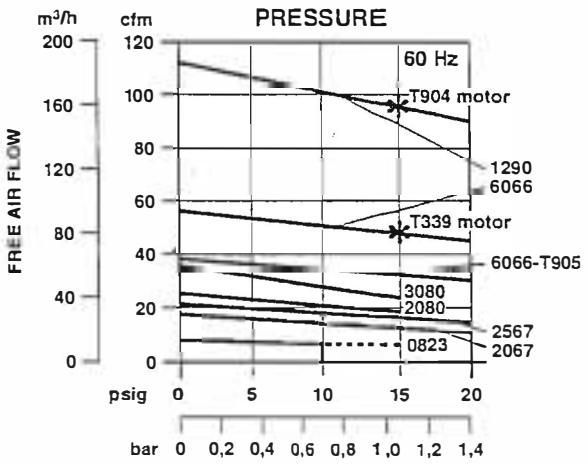
Product Dimensions (mm, inches)

Dimensions are for reference only.

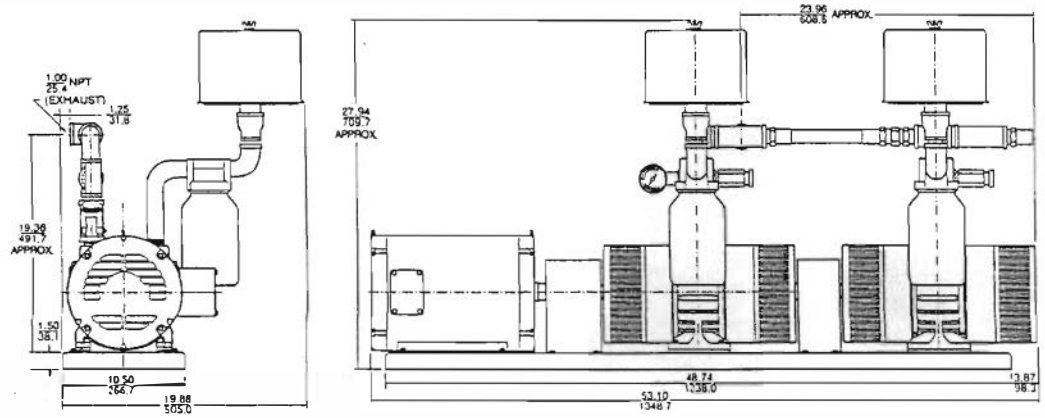
Models 6066



Product Performance (Metric, U.S.)



Models 1290



Activated Carbon Systems

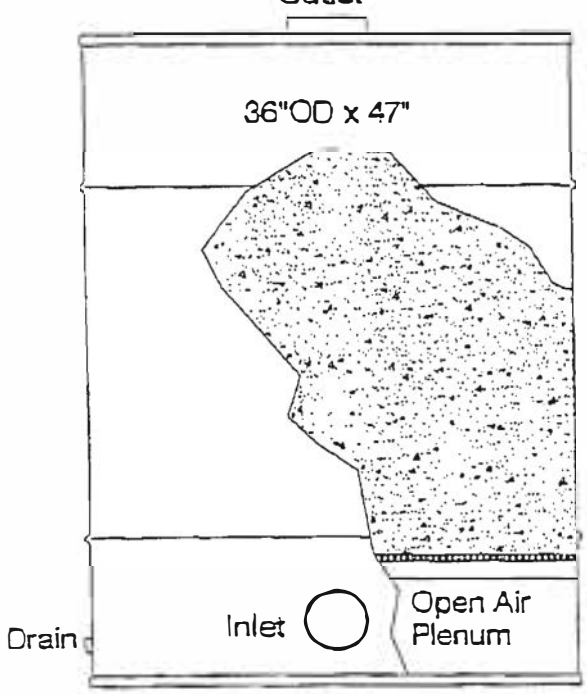
WATERLINK
Barnebey Sutcliffe

PROTECT™ MX-500-V
Vapor Phase Drum Adsorbers

Barnebey Sutcliffe Corporation offers the **PROTECT™ MX-500-V** drum adsorber for applications that are operating at low flow rates where larger vessels are not feasible or needed.

The **MX-500-V** drum adsorber is designed as a low cost portable solution that can be easily be put in service.

The **MX-500-V** drum adsorber has a maximum flow rate of 450-cfm and operating pressure of 7-psi, or 5" of vacuum, and a max. operating temperature of 150°F. Each **PROTECT™ MX-500-V** contains 450-lbs. of activated carbon and has an estimated shipping weight of 580-lbs.



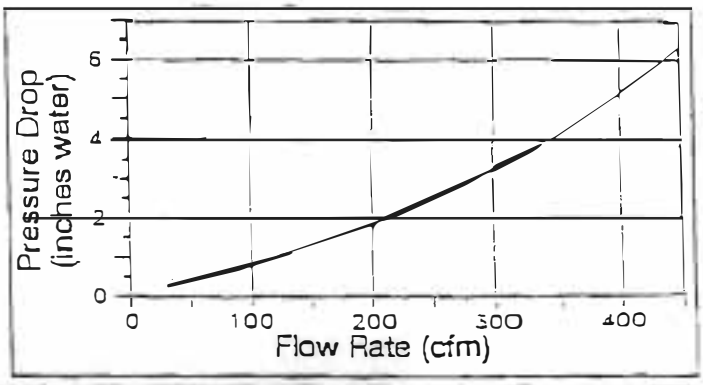
Important Features

- UN 31A1 rated multi trip drum.
- 4" threaded influent/effluent connections.
- ¾" threaded plug located on the lid for optional Carbon Saturation Indicator.
- ½" threaded drain plug.
- 16 gauge carbon steel construction
- Internal epoxy phenolic lining and external baked enamel coating.
- Upper and lower plenums are designed to provide maximum carbon utilization.
- Reusable by replacing spent media with fresh media.
- Can be filled with any of Barnebey's reactivated or virgin activated carbons.
- Shipped with carbon and ready for service.

Available Options

- Multi Drum Skid Mounted Systems
- Pressure Gauge/Sample Point Assemblies
- Hose Connection Assemblies in a Variety of Materials
- Call for Your Custom Configuration

For More Information and Pricing Call
1-800-886-2272
and Talk to One of Our Knowledgeable Technical Support Personnel
or Visit Our Web Site at
http://www.bscarbons.com



Volume and weight based on vapor phase bituminous carbon @ 30-lbs/ft³.

Estimated pressure drop based on virgin 4x10 carbon.

Design and specifications subject to change without notice.

Warning: Some compounds and/or high concentrations can lead to heat buildup in GAC and potential bed fire. Contact BSC for information.

P.O. Box 2526 • Columbus, OH 43216 • 1-800-886-2272 • 614-258-9501 • Fax 614-258-3464 • E-Mail: activated_carbon@waterlink.com
Rocky Mountain Office • Reno, NV • 775-355-7770 • Fax 775-355-7785 / Western Regional Office • Los Angeles, CA • 562-802-3400 • Fax 562-802-3460
Gulf Coast Regional Office • 337-527-0084 • Fax 337-527-0087

WATERLINK®
Barnebey Sutcliffe

6

PROTECT™ V410

Vapor Phase Granular Activated Carbon

PROTECT™ V410 is a virgin granular activated carbon made from selected bituminous coal thermally activated in a rotary kiln with a steam atmosphere. This product is specifically developed for vapor phase applications where it provides superior performance for adsorbing vapor phase contaminants and odors from the air streams and industrial gases. This carbon product has characteristically high hardness suitable for solvent recovery applications.

Properties and Specifications

PROPERTIES	VALUE	TESTING METHOD
Carbon Tetrachloride No. (min.)	60%	ASTM D-3467
Hardness	95%	ASTM D-3802
Moisture as Packed (max.)	2%	ASTM D-2867
Apparent Density	0.50 g/cm^3	ASTM D-2854
Particle Size	4x10	ASTM D-2862
greater than 8 mesh (max.)	5%	
less than 30 mesh (max.)	3%	
Surface Area (typical)	1150 m^2/g	BET N2
Ash Content (max.)	12%	ASTM D-2866
Pore Volume	0.70	
pH Water Extract	9.5	

CAUTION, avoid inhalation of excessive carbon dust. No problems are known to be associated in handling this material, however dust may contain greater than 1.0% silica (quartz). Long term inhalation of high dust concentration can lead to respiratory impairment. Use forced ventilation or a dust mask when necessary for protection against airborne dust exposure. Wet activated carbon preferentially adsorbs oxygen from air. Use appropriate work and safety practices for low oxygen environments when entering vessels and confined areas.

For More Information and Pricing Call **1-800-886-2272**
or visit our web site at **http://www.bscarbons.com**

P.O. Box 2526 • Columbus, OH 43216 • 1-800-886-2272 • 614-258-9501 • Fax 614-258-3464 • E-Mail: activated_carbon@waterlink.com
Rocky Mountain Office • Reno, NV • 775-355-7770 • Fax 775-355-7785 / Western Regional Office • Los Angeles, CA • 562-802-3400 • Fax 562-802-3480
Gulf Coast Regional Office • 337-527-0084 • Fax 337-527-0087

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PROTECT™ VR

Vapor Phase Granular Reactivated Carbon

PROTECT™ VR is a regenerated granular activated carbon. This product is designed for vapor phase applications where a virgin granular activated carbon is not required. This carbon provides good adsorptive performance at a lower cost relative to virgin products.

Properties and Specifications

PROPERTIES	VALUE	TESTING METHOD
Carbon Tetrachloride No. (min.)	58%	ASTM D-3467
Moisture as Packed (max.)	3-5%	ASTM D-2867
Apparent Density	0.47 g/cm^3	ASTM D-2854
Particle Size	4x16	ASTM D-2862
Surface Area (typical)	950 m^2/g	BET N2
Ash Content (max.)	12%	ASTM D-2866

CAUTION, avoid inhalation of excessive carbon dust. No problems are known to be associated in handling this material, however dust may contain greater than 1.0% silica (quartz). Long term inhalation of high dust concentration can lead to respiratory impairment. Use forced ventilation or a dust mask when necessary for protection against airborne dust exposure. Wet activated carbon preferentially adsorbs oxygen from air. Use appropriate work and safety practices for low oxygen environments when entering vessels and confined areas.

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