LOTT Clean Water Alliance
Lacey • Olympia • Tumwater • Thurston County

Submittal Transmittal

Reference Specification Section 01 33 00

Date: 1/8/2024	Spec Section: 44 31 00	Submittal No. 010
Submittal Description: Carbon Media Odor Control System		
Submittal Type: Shop Dwgs: ☑ Manufacturer Info: ☑ Testing Info: ☐ Material Sample: ☐ O&M: ☐ Other: ☐		
Project: Centrate Building Rehabilitation		Project No: BI1601
Contractor: Rognlin's Inc.		Contract No: 544-03-08

Contractor Comments:

Submittal Contents:

Item	Spec Section	Description	Review Action	Review Comments Attached	Reviewer Initials	Date
1	44 31 00	Carbon Media Odor Control System				
2						
3						
4						
5						

NET = No Exception Taken MCN = Make Corrections Noted A&R = Amend & Resubmit R = Rejected
RA = Receipt Acknowledged RI = Reviewed for Information Only

☐ **Submit Specified Item:** (a resubmittal is needed under a separate cover)

Owner Comments:

Contractor Certification:

☑ We have certified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work specified (no exceptions).

☑ We have certified that the material or equipment contained in this submittal meets all the requirements specified **except** for the deviations noted below.

Certified By: Craig Espedal

Contractor Requested Deviation:

Item	Deviation

SUBMITTAL INFORMATION

PROJECT:

LOTT Centrate Building Rehabilitation

(4) SAH12-707-3-BLR

Description:

PureAir Filtration is providing (4)SAH12-707-3-BLR designed to treat 11,000 CFM of air and meet all performance requirements for eliminating odors. The system will provide numerous benefits as described in the specification section.

Rev 0

January 3, 2024

LETTER OF TRANSMITTAL

PUREAIR FILTRATION
6050 PEACHTREE PKWY
SUITE 240-187
NORCROSS, GA 30092
678-935-1431

From: John Beckman To: Craig Espedal
Title: Project Engineer
Date: 1/3/2024

Project Name: LOTT Centrate Building Rehabilitation

Related Document:

Rev. #: 0

We are submitting the following document(s):

☒ Project Submittal ☐ I, O, & M ☐ Component Substitution

Under Separate Cover via the following:

☐ Drawings ☐ Specifications ☐ Letter ☐ Component Data Sheet

# of Copies	Date	Description
1	1/3/2024	Submittal

Transmitted as checked below:

☒ For Approval ☐ For Reference Only ☐ Final Revision

☐ For Approval as Revised ☐ For Review ☐ Other:

Remarks:

Signed: *John Beckman* Date: 1/3/2024

TABLE OF CONTENTS

TAB 1 GENERAL
1. SPECIFICATION COMPLIANCE
2. SCOPE OF SUPPLY
3. PART/COMPONENT SUBSTITUTION
4. WARRANTY
5. SYSTEM INSTALLATION LIST

TAB 2 DRAWINGS
1. SYSTEM LAYOUT

TAB 3 ADSORBANT MEDIA INFORMATION
1. SULPHASORB XL MEDIA DATA SHEET & MSDS
2. CPS12 MEDIA DATA SHEET & MSDS
3. MATRIX MEDIA DATA SHEET & MSDS

TAB 4 COMPONENT INFORMATION
1. BLOWER & MOTOR
2. PRESSURE GUAGE
3. MIST AND GREASE FILTER
4. EBMv2

TAB 5 CALCULATIONS

1. AIRFLOW AND MEDIA LIFE CALCULATIONS

TAB 1

GENERAL

SPECIFICATION COMPLIANCE

SECTION 44 31 00

CARBON MEDIA ODOR CONTROL SYSTEM

PART 1 GENERAL

1.01 SCOPE

The work specified in this Section consists of furnishing all material, equipment, and incidentals required to install odor control system for the control of foul air at levels as specified herein. The odor control equipment supplier shall provide the carbon vessel, carbon media, the fan, connectors, balancing dampers, and mist eliminator. The odor control fan shall be supplied with a vibration isolation system meeting the requirements of Section 43 20 10. The Contractor shall secure services necessary to complete all balancing and testing work for the odor control system specified herein. The odor control fan motors and related electrical equipment shall be electrically classified to be operated in a Class 1 Division II environment.

The entire system shall be a packaged system consisting of the following major components:

A. Equipment housing

B. Air exhaust fan

C. Dry chemical media filter modules

D. Media life analyzer

E. High efficiency mist & grease filter

1.02 RELATED WORK SPECIFIED ELSEWHERE

Section	Item
01 33 00	Submittals
09 90 10	Steel and Piping Surface Preparation and Painting
23 00 00	Heating, Ventilation, and Air Conditioning
Division 26	Electrical
40 23 00	Piping Systems
43 20 00	Equipment General Provisions
43 20 10	Vibration and Critical Speed Limitation

1.03 SUBMITTALS

The following submittals shall be provided in accordance with Section 01 33 00:

A. Complete specifications, descriptive drawings, catalog cuts, and descriptive literature, which shall include make, model, dimensions, weight of equipment, and electrical schematics. Complete dimensional drawings of the fan, inlet box, and balancing damper(s).

B. Complete performance data for the fan and associated components that will indicate full compliance with the specifications; all fans shall have sound power level data at the design operating point; ratings shall be based on an AMCA Standard 210-85 IP AP AMCP approved laboratory.

C. Recommend procedures for protection and handling of equipment and materials prior to installation.

D. Motor data as specified herein and Division 26.

E. Operating and Maintenance Manuals for the equipment specified herein. Provide preliminary manuals for review with equipment submittals. Provide final manuals with testing documentation after startup and testing is complete.

F. List of recommended spare parts for equipment and materials specified.

G. Written verification of calibration of testing and balancing equipment.

H. Copies of balance logs following completion of system adjustments, including test results and adjustments or rebalancing procedures.

I. Qualifications and experience record of air balancing and test agency, at least 20 days prior to start of testing.

Outside PAF scope of supply.

1.04 QUALITY ASSURANCE

All systems shall be supplied by a single manufacturer who has been building said equipment for a minimum of 10 years.

In order to ensure unity of responsibility, skid, fan, enclosure, dry media, and other miscellaneous system appurtenances shall be furnished by a single manufacturer.

Media manufacturer shall be responsible for free media sampling analysis once per quarter. Media samples shall be shipped to a reputable approved laboratory for analysis. Third party media analysis shall be by others.

The Contractor shall be responsible for having the odor control system installed and balanced. Services of the independent air balancing and testing agency shall have a proven record on similar projects and be certified by a national balancing association. The agency shall have no vested interest in the Project such as sales of equipment or services, and shall not be a party to or wholly owned subsidiary of any interested party, Contractor, or subcontractor.

Outside PAF scope of supply.

1.05 DELIVERY, STORAGE, AND HANDLING

All equipment shall be completely factory assembled, skid mounted, crated, and delivered to protect against damage during shipment.

All exposed flanges shall be covered and sealed with shrink-wrap to prevent the entrance of moisture. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

PART 2 PRODUCTS

2.01 GENERAL

Odor control units shall be a packaged system complete with exhaust fan, replaceable dry chemical media cartridges, and other accessories as described herein. Odor control units shall be designed to remove hydrogen sulfide (H_2S) and miscellaneous sewage gases, and odor constituents associated with municipal wastewater and meets the performance requirements described herein. Odor control units shall be Side Access Housing as manufactured by PureAir Filtration., or approved equal.

The structural, mechanical, and electrical designs shown on the Plans are based on the equipment manufactured by PureAir Filtration. Any modifications to the mechanical, structural, electrical, instrumentation and control, and other portions of the work that may be required to adapt the general layout and details shown on the Plans to the equipment actually furnished shall be at no additional cost to the Owner. All necessary design revisions shall be made at the Contractor's sole expense. All redesign information prepared by the Contractor shall be submitted for review prior to incorporating the redesign into the work.

2.02 PERFORMANCE:

Carbon media odor control units shall be designed for the following operating conditions:

- Air Flow (cfm): 11,000 cfm @ 5.8 in. S.P. (min. 44,000 cfm for entire building)
- Facial Velocity (fpm): up to 250 fpm
- Unit Approximate Dimensions: 90" High x 88" Width x 155" Length

The carbon media odor control units shall demonstrate the following performance which operating under the specified design conditions above:

- H_2S Removal: 99% removal from 10 PPM H_2S inlet

2.03 MATERIALS

A. EQUIPMENT HOUSINGS

1. The housings shall be constructed from aluminum.

2. The housings shall be provided with side access doors for servicing components and replacing media cartridges. Doors shall be on both sides and shall be hinged with stainless steel hinges and pins and permanently attached positive locking door latches. Closed-cell neoprene gaskets shall be provided to prevent air leakage around doors and between doors and filters.

3. The housings shall be powder coated internally and externally.

4. The housings shall be suitable for installation and operation outdoors.

5. Aluminum filter tracks to accept carbon media cartridges shall be attached to vertical formed channel supports at 24 inch intervals. Filter tracks shall be an integral seal to reduce filter bypass.

6. The housings shall be provided with connection flanges to accept ductwork as shown on the Plans.

B. PREFILTER SECTIONS

1. Units shall include prefilter sections with 4-inch deep stainless steel and poly fiber mesh designed to capture mist and particulates. Filters shall be washable type. One spare set of filters shall be provided.

Recommended M&G velocity is 400fpm

2. Filter face velocities shall not exceed 300 fpm.

3. Access doors to the filters shall be with quick release latches.

4. Prefilter sections shall be monitored by magnehelic differential pressure gauge.

C. CHEMICAL MEDIA SECTIONS

1. The units shall include three chemical media banks designed to accommodate 12-inch deep chemical adsorbent media filter cartridges utilizing filter tracks.

2. Modular media containment devices (cartridges) shall have a nominal size of 24-inch wide by 12-inch high by 12-inch deep in

direction of airflow with a V-bank medium bed depth of 3-inch. Cartridges shall be recyclable and constructed of black, high impact polystyrene.

3. Pressure drop through each chemical media section shall not exceed 1.3-inch wg. Maximum airflow through chemical media section shall be 250 fpm.

4. The chemical media in the cartridges shall be PureAir Filtration Sulphasorb XL, or equal, in the first two filter banks. The chemical media in the cartridges shall be PureAir Filtration CPS12 Blend, or equal, in the third bank.

5. Media data sheets, MSDS information, and samples are to be provided by the manufacturer.

6. The chemical media sections shall include an array of H_2S sensor which shall be located prior to the first bank, between each bank, and after the final bank. The sensor shall be connector to a PLC which will use the data to indicate the predictive life of the adsorbent media. The PLC shall have an HMI and 4-20 mA signal which indicates the remaining life of the adsorbent media in percentage. The HMI shall also provide a predictive date of media replacement based on sensor data.

D. EXHAUST FANS

1. The units shall include fan motors and wheels.

2. The fans shall be centrifugal, backward inclined plenum type and be capable of exhausting the design volume at the design external static pressure. Fans shall be statically and dynamically balanced and be AMCA rated.

3. The fans shall be constructed of corrosion resistant material.

4. The fans shall be direct drive type. Motors shall be explosion-proof, inverter duty, and suitable for 460 V, three phase, 60 Hz power. Coordinate with VFD submittal per Division 26 herein.

E. SPARE PARTS

Manufacturers spare parts shall be provided in labeled, wood boxes, with moisture protection and contents labeled for each system component. Provide manufacturers recommended spare parts including one spare filter set as specified above.

PART 3 EXECUTION

3.01 INSTALLATION

All equipment, carbon media and ductwork shall be installed per the manufacturer's recommendations, as shown on the Plans and specified herein to provide complete and operational carbon media odor control system.

Anchor bolts are excluded, otherwise OK.

All anchor bolts and bolts, nuts and washers for equipment and ductwork shall be stainless steel and shall be furnished by the manufacturer, unless noted otherwise.

Outside PAF scope of supply.

Proper clothing, gloves, safety goggles and respirator should be worn while loading carbon media into the carbon filter unit. The Contractor shall pay close attention to the manufacturer's procedures and safety precautions while handling the carbon media. Carbon media shall not be loaded until fan has been checked and proven to be operational.

Once the carbon media has been loaded into the carbon filter unit and the Owner the has been allowed to receive new centrate flow into the basins, the filter unit fan must run uninterrupted for a minimum commissioning period of 20 days.

CAUTION: Contact of impregnated activated carbon media with strong oxidizing agents such as liquid oxygen, chlorine, ozone, or permanganates, or with high concentrations of combustible matter, may result in fire. Fresh impregnated activated carbon media may react exothermically in air. The carbon media loading shall be the last order of work and the Contractor shall insure the carbon filter unit fan is operating properly before loading the carbon media. In normal operation, the cooling action of the design air flow through the carbon filter unit will control this slow initial release of heat. However, if the fresh impregnated carbon media is exposed to air under static conditions, (i.e., without air movement through the media) its temperature may continue to rise until it ignites. Therefore, when impregnated carbon media is loaded into its vessel, the manufacturer's startup instructions should be rigorously followed and the design air flow should be started when the loading is completed. If there is an unavoidable interruption in air flow through a loaded vessel, the temperature of the bed should be monitored when the bed is static and for several hours after the air flow is restarted. If the temperature continues to rise and an ignition starts, the oxidation may be quenched by a water spray.

Manufacturer to provide warning labels on the media fill manway lids which address the potential exothermic reaction with fresh impregnated carbon and potential oxygen depletion hazard inside vessel.

As described below, a representative of the carbon filter units manufacturer shall be provided to inspect the installation and make any field adjustments necessary to insure proper operation. Manufacturer's services for this work shall include minimum 2 days at the site (two visit) and shall be included in the bid price.

Outside PAF scope?

3.02 AIR BALANCING

Adjust air volumes on supply and exhaust ducts to the quantity specified herein with allowable variation of +10/-5 percent.

In each system at least one air path from fan to final branch duct termination shall have all dampers fully open. Achieve final air quantities by adjusting fan speed.

PAF's blower selection shall achieve this requirement.

Adjust fan speeds and motor drives after media installation for the required air volumes, with allowable variation of +10/-5 percent.

After final adjustments, do not operate motor above nameplate amperage on any phase.

Perform airflow test readings under simulated or actual conditions for the specified flows.

Furnish and make drive and belt changes on motors or fans as required to adjust equipment to specified conditions. Provide written notice to the air handling unit manufacturer if any drive or belt changes were made.

Eliminate drafts and noises where possible.

A. FINAL ADJUSTMENTS

1. Mark final positions of all balancing dampers with red felt pen.

2. Recommend to Owner any dampers that must be added or replaced in order to obtain proper air control. Contractor shall install the approved dampers at no additional cost.

3. When adjustments are made to a portion of any fan system, reread all other portions of that same system to determine the effects imposed by the adjustments.

4. After balancing an air system, lock dampers in their final balanced position.

3.03 FIELD TESTING

A. After completion of the installation, equipment and systems shall be tested for satisfactory operation without excess noise, vibration, and overheating. Equipment must be adjusted and checked for misalignment, clearances, supports, and adherence to safety standards by the Contractor.

B. A qualified manufacturer's field engineer shall be provided for a period of not less than one day to inspect and adjust the equipment furnished

under this Specification to ensure that the system is in proper operation and in accordance with the performance specifications. A second inspection shall be provided after foul air has been treated for 20 day commissioning period to perform the odor removal testing.

C. After the system is judged to be in satisfactory compliance, furnish the services of a qualified manufacturer's representative to instruct the owner's personnel on the system operation. Training shall be performed in a minimum of two 1/2 day long sessions and as specified in Section 01 91 00.

Submit operating and maintenance manuals for the carbon absorber system with the shipment of the vessel, per Section 01 33 00 and 01 78 23.00.

D. ACCEPTANCE CRITERIA AND TOLERANCES:

Odor control systems shall remove a minimum of 99 percent of the influent H_2S, as measured in ppm, at peak air flow and inlet concentrations.

E. TESTING REPORT

A full testing report shall be submitted to the Owner and the Engineer for review. Manufacturer shall include expected media life calculations based on the testing.

***** END OF SECTION *****

SCOPE OF SUPPLY

SCOPE OF SUPPLY

Note: 4x units provided, quantities listed below are for each unit.

1) SAH12 Housing
   a) (1)- 707 size unit with aluminum construction.
   b) (1)- Inlet per drawing
   c) (1)- Outlet per drawing
   d) (1)- Access Doors per drawing
   e) (4)- Anchor Lugs
   f) (4)- Lifting Lugs
   g) (1)- Mist & Grease filter per drawing
      i) Mist & Grease pads included.
   h) (1)- Metal graph nameplate
   i) (1)- Stickers for - PureAir, Airflow, Media, Other Labeling
   j) (1)- Dwyer Magnehelic Differential Pressure Gauge, 0-2in for Mist & Grease Filter
   k) (1)- Dwyer Magnehelic Differential Pressure Gauge, 0-10in for Media
   l) (5)- Electric Media Bed Rod Sensors
   m) (1)- Electric Media Bed Rod Panel
2) Motor & Blower
   a) (1)- MTR- 20hp 3ph/460V/60Hz TEXP.
   b) (1)- Blower rated for 12,100 CFM @ 7 IWC
   c) (1)-Vibration Isolation Dampers for Blower Mounting
   d) (1)- Discharge stack
3) Spare Parts
   a) (1)- Complete set of spare media for each unit.

Supply Notes:

1. *All mechanical construction / erection is by others.*
2. *All electrical material & installation is by others.*
3. *All media loading is by others.*
4. *All air balancing is by others.*

Not Included:

1. *Installation of any of the above equipment*
2. *Duct, duct hangers, or duct supports*
3. *Electrical and control panel installation*
4. *Anchor bolts for securing the units to concrete pad*
5. *Concrete slab*

PART/COMPONENT SUBSTITUTION

Part/Component Substitution

Information for various parts and components shown within the submittal is for reference only. PureAir Filtration reserves the right to substitute one brand for another of any component given **equal component specification**. Exceptions to this are when a brand is specifically named within the specification or exceptions page within the submittal.

Particular items for substitution are motors. Motor information is provided for reference. PureAir reserves the right to substitute brand of motor with another brand of the same frame size which meets the project specification.

In the event of a substitution, PureAir Filtration shall notify the CONTRACTOR of needed (or recommended) substitution if required.

WARRANTY

LIMITED WARRANTY

LENGTH OF COVERAGE

PureAir Filtration LLC. warrants PureAir Filtration products and parts to be free from defects in workmanship and material under normal use and service to the first user for:

12 months after system start up OR **18 months after delivery**

(*whichever comes first*)

HOW TO OBTAIN OUR SERVICES

Our obligation under this warranty is limited to repairing or replacing, at our option, any defective part or parts, if they are returned to PureAir within the warranty period with transportation charges prepaid and are found by our own examination to have been defective.

Installation of replacement parts is not covered under this warranty and is the responsibility of the Contractor and/or System Owner to remove defective equipment in these circumstances.

Any request for repair or replacement should be directed to:

Pure Air Filtration LLC
6050 Peachtree Pkwy
Suite 240-187
Norcross, Georgia 30092

Phone: (678)935-1431 or 1-866-543-7479
Fax: (678) 935-0648
Email: info@pureairfiltration.com

LIMIT OF WARRANTY AND LIABILITY

Warranties shall not apply to any defect, failure, or damage caused by improper use, improper or inadequate maintenance and care. PureAir Filtration shall not be obligated under these warranties:

a) Missing components must be noted within (30) days after delivery for replacement parts to be covered by PureAir Filtration.

b) It is the duty of the CONTRACTOR/CUSTOMER receiving the equipment to report, within (36) hours, to PureAir Filtration of any damages that may have occurred during shipping.

c) Any changes, repairs, and/or alterations made to a PureAir supplied system will void system warranty if changes, repairs, and/or alterations are made prior to written consent of PureAir Corporate Office.

d) Adsorbent media that has been improperly stored and/or handled after shipment (refer to IO&M manual) affects media performance – PureAir is not responsible to the performance issues and will not cover the replacement of the damaged media.

e) Any instance requiring PureAir's' consultation of system performance issues with PureAir Filtration scope of supply that is not directly caused by PureAir's' equipment can result in additional fees. Such fee's will be determined based on time, labor, travel, shipping and/or any other expenses accrued from such instance.

f) Blowers & Motors – Failure to keep regular maintenance log will void warranty on blower. Owner/Contractor must strictly follow PureAir Filtrations IO&M manual for proper maintenance and bearing lubrication intervals.

g) Failure to properly maintain PureAir systems as based on supplied IO&M manual will void system warranty. Any maintenance to PureAir system performed by CUSTOMER/CONTRACTOR must be documented at time of performed maintenance and shown to PureAir Filtration if filing a warranty claim. PureAir Filtration will solicit this document if not provided.

h) Deviations made after submittal approval can result in additional change order fees. Change order fee's will be determined by PureAir Filtration and presented to customer before proceeding with new provisions.

i) It is the ENGINEER / CONTRACTOR's responsibility to clearly state and reference significant drawings and/or P&ID's that directly affect PureAir system's assembly and layout. Furthermore, it is the Contractors responsibility to notify PureAir Filtration of updates to specifications, addendums, mechanical drawings and P&ID's, and other significant documentation prior to release of manufacturing.

j) Absorbent media is a consumable product and its life duration is not covered by this warranty.

SYSTEM INSTALLATION LIST

6050 PEACHTREE PKWY, SUITE 240-187 ATLANTA, GA 30092
Ph: 678-935-1431, Fax: 678-935-0648

U.S. Municipal Scrubber (High Airflow) References
for Pure Air Filtration, LLC

The following customers are available for reference in regard to PureAir odor control systems :

Rockaway Valley Sewerage Authority Tomar Construction 732-238-0700 Units: Vortex 8 Radial Flow & Vortex 6 Radial Flow Airflows: 6000 CFM & 4100 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Installed: 2/2007 Status: In service	**North Dorchester Bay CSO** Walsh 781-793-9988 Units: Vortex 8 Radial Flow & Vortex 6 Radial Flow Airflows: 7200 CFM & 5000 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Installed: 2/2011 Status: In service	**Big Creek WRF** Engineer: Gresham, Smith & Partners 770-754-0755 Units: Vortex 14 Radial Flow & Vortex 6 Radial Flow Airflows: 25000 CFM & 3500 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Status: In submittal
Lower Bird Creek Kevin Boyle (contractor) 785-539-7513 Units: Vortex 14 Radial Flow & Vortex 12 Radial Flow Airflows: 8150 CFM & 5200 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Delivered: 2/2013 Status: Being Installed	**MWRD Westside Primary Settling Tanks & Aerated Grit Facility** Engineer: William Nichols (Greeley Hansen) 312-578-2322 Units: Vortex 8 Radial Flow units Airflows: 7800 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Status: Bidding	**City of Los Angeles, CA Hyperion WWTP Facility** Cyrous Gilani 310-648-6124 Unit: Packed Bed System Adsorbent: Sulphasorb XL Adsorbent: Coconut Shell carbon Adsorbent: PureAir 8 Constituents removed: VOC's Installed: 2/2006 Status: Unit being moved
City of Bemidji, MN Andy Mack 218-759-3583 Unit: Vortex System (VTS) 4000 Airflow: 2400 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Installed: 3/2004 Status: In service	**Blue River WWTP Kansas City, KS** David Schmidt 913-897-3855 Unit: Vortex System (VTS) 14000 Airflow: 8600 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Installed: 3/2005 Status: In service	**Branson WWTP Branson, MO** Jared Rassmussen 417-337-8559 Unit: VTS 20000 Airflow: 10000 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Installed: 10/2009 Status: In service

South Cary WRF **Cary, NC** Jamie Revels 919-462-3836 Airflow: 5000 CFM Adsorbent: PureAir AC-X Constituents removed: H2S, VOC's Installed: 6/2009 Status: In service Engineer: Hazen & Sawyer	**RL Sutton WWTP** **Smyrna, GA** Unit: Vortex System (VTS) 40000 Airflow: 20000 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Status: In submittal	**Fort Smith WWTP** **Sunnymeade, AR** Keith Tatham Unit: VTS 15000 Airflow: 8000 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Installed: 10/2008 Status: In service
Zero Street WWTP **Sunnymeade, AR** Keith Tatham Unit: VTS 15000 Airflow: 8000 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Delivered: 6/2014 Status: In service	**Amersee Lakes Pump Station** **Gwinnett County GA** **Vortex 4** Unit: Vortex 4 Radial flow Airflow: 1100 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S, VOC's Installed: 4/2011 Status: In service	**MWRA North Dorchester CSO** **Pump Station** Walsh 781-793-9988 Unit: Vortex 7 Radial Scrubber Airflow: 10,000 CFM Adsorbant: Sulphasorb XL Constituents removed : H2S VOC's Installed : 2007 Status: in Service
Linwood WRF Improvements Bacle Fowler (678) 725-4031 Unit: PBS-707 FRP Airflow: 2500 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S VOC's Delivered: 4/2020 Status: In service	**CS0 170C** Fred Howell (509)309-1738 fhowell@spokanecity.org Unit: PBS 505 Airflow: 2100 CFM Adsorbent: Sulphasorb XL and Sulphasorb FE Constituents removed: H2s VOC's Delivered: 12/2018 Status: In service	**TJ Meenach CS0 I03 Control Facility** Korie Palmer (509)-363-0414 Unit: (2) PBS-807 Airflow: 5000 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S VOC's Delivered: 10/2017 Status: In service.
Taylorville WTP David Speagle (217) 287-7639 watersupt@etitech.com Unit: EGS-707 Airflorw: 5000 CFM Adsorbent: Safetysorb Constituents removed: Cl VOC's Delivered: 7/2018 Status: In Service	**SCVWA Dry Chlorine Scrubber** Rafael Pulido (661) 513-1243 rpulido@scvwa.org Unit: EGS-707 Airflow: 5000 CFM Adsorbent: Safetysorb Constituents removed: Cl VOC's Delivered: 5/2020 Status: In Service	**Albuquerque Wastewater Utility** Matt Dyer (505)289-3086 mdyer@abcwua.org Units: VBS-608 Airflow: 5000 CFM Adsorbent: SulphasorbXL Constituents removed: H2S VOC's Delivered: 4/2018 Status: In service
Tomahawk Creek WWTP George Cloud (913) 534-4632 George.cloud@jcw.org Unit: Vortex 10 Airflow: 16,200 CFM Adsorbent: Sulphasorb XL Constituents removed: H2S VOC's Delivered: 10/2020 Status: Waiting on Startup	**ROPEC Thickening & Dewatering Building** Sandra Gray (613)580-2424 x 28066 Sandra.gray@ottawa.ca Unit: VTS-15000 Airflow: 7500 Adsorbent: Sulphasorb XL Constituents removed: H2S VOC's Delivered: 10/2018 Status: In Service	**Cumberland CSO Storage Facility** Aaron Grove (304)813-6212 aaron.grove@cumberland.gov Unit: VBS-8 Airflow: 5000 CFM Adsorbent: Sulphasorb RGN Constituents removed: H2S VOC's Delivered: 2/2019 Status: In Service

Highbury Interceptor Air Mgt. Facility Bob Glover (604)986-1400 Bob.glover@olympicsinternational.com Unit: VTS-15000 SS Airflow: 13,000 Constituents Removed: H2S VOC's Delivered: 12/2018 Status: In Service	**Philpott WTP** Justin Pruitt (276)629-3227 jpruitt@co.henry.va.us Unit: EGS-8 FRP Airflow: 5000 CFM Adsorbent: Safetysorb Constituents Removed: Cl VOC's Delivered: 7/2019 Status: In service	**Bayview Steeles** John Round (705)878-5729 allround@i-zoom.net Unit: SAH-606 FRP Airflow: 11,6000 CFM Delivered: 12/2019 Status: In service
Peru SA-SMCV Gabriel Oritz (511)641-3800 x371 goritz@saeg.com Unit: SAH12-806-2-BLR Airflow: 12,000 CFM Adsorbent: PureAir 8 Constituents Removed: H2S VOC's Delivered: 5/2019 Status: In Service	**Gansen** Thoimas Schulze (472)002-3000 Thomas.schulze@progroup.ag Unit: SAH12-606-3-BLR Airflow: 7628 CFM Adsorbent: Sulphasorb Constituents removed: H2S VOC's Delivered: 5/2020 Status: In service	**GWUH Helipad** Stephen Goss (202)306-2797 Stephen@bostfiltrex.com Unit: SAH18-906 Airflow: 27,000 CFM Adsorbent: CPS Blend Constituents: H2S VOC's Delivered 8/2019 Status: In service.

6050 PEACHTREE PKWY, SUITE 240-187 ATLANTA, GA 30092
Ph: 678-935-1431, Fax: 678-935-0648

Various Systems:

Millbrae Water Pollution Control
Unit: Packed Bed System (PBS) 504,1100 CFM
Contact: Mike Galea (650-259-2395)
400 East Millbrae Ave
Millbrae, CA 94030
Owner: City of Millbrae
Engineer: Kennedy Jenks
Contractor: West Bay Buliders
Installed: 4/2011
Status: In service

Burbank WRP, Burbank CA
Unit: Vertical Bed System (VBS-8), 2100 CFM
Contact: Matthew McIntosh (818-972-1118)
740 N. Lake Street
Burbank, CA 91502
Owner: United Water
Engineer: Kennedy Jenks
Contractor: Pacific Hydrotech
Installed: 5/2010
Status: In service

Blue River WWTP
Kansas City, KS
Unit: Vertical Tube System (VTS) 14000, 8600 CFM
Contact: David Schmidt (913-897-3855)
2625 W. 151st Street
Overland Park, KS 66224
Owner: Johnson County Wastewater
Engineer: Black & Veatch
Contractor: Grimm Construction
Installed: 3/2005
Status: In service

Borough of Sewickley, PA
Unit: Packed Bed System (PBS) 706, 2100 CFM
Contact: Mark Brookes (412-589-0934)
601 Thorn Street
Sewickley, PA 15143
Owner: Borough of Sewickley, PA
Engineer:
Contractor:
Installed: 4/2004
Status: In service

Bemidji WWTF, MN
Unit: Vertical Tube System (VTS) 606, 2400 CFM
Contact: Andy Mack (218-759-3583)
400 Midway Drive South
Bemidji, MN 56601
Owner: City of Bemidji
Installed: 3/2004
Status: In service

Lahaina WWTP
Unit: Packed Bed System (PBS) 504, 1310 CFM
Contact: Stephen Long (808-268-5586)
3300 Honoapiilani Hwy
Lahaina,HI 96761
Owner: City of Maui
Engineer: HDR
Contractor: Azzuro
Installed: 12/2008
Status: In service

SBSA Solids Handling
Unit: Packed Bed System (PBS) 403, 800 CFM
Contact: Dennis Reeves (650-832-6232)
1400 Radio Road
Redwood City, CA
Owner: South Bayside System Authority
Engineer: Whitley-Burchett
Contractor: Reliable Air Mechanical System
Installed: 12/2009
Status: In service

Cowskin Creek Pump Station and Forcemain
Unit: Vertical Bed System (VBS) 505, 1800 CFM
Contact: Sid Fleming (316-303-8702)
2727 South Tyler Ave
Wichita, KS 67202
Owner: City of Wichita
Engineer: CDM
Contractor: Grimm Construction
Installed: 12/2009
Status: In service

Sunnymeade Wet Weather Flow Management
Unit: Vertical Transition System (VTS) 20000
Contact: Johnny Keys (479-462-6291)
Fort Smith, AR
Owner: City of Fort Smith
Engineer: Hawkins Weir Engineers
Contractor: Branco Construction
Installed: 12/2009
Status: In service

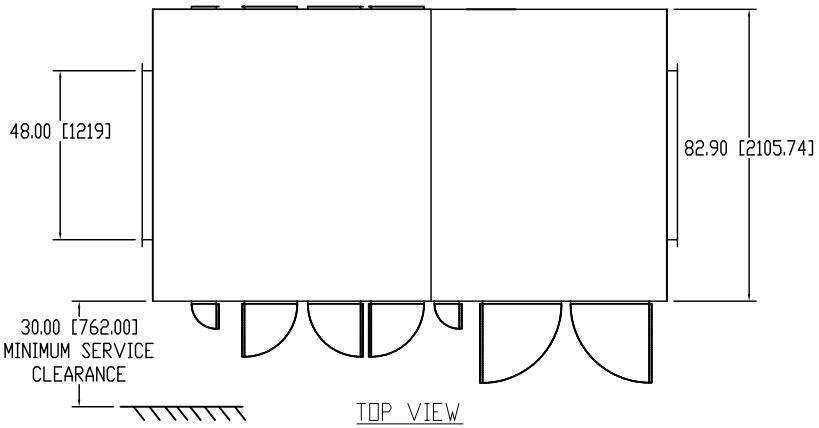
Kingsport WWTP
Unit: Packed Bed System (PBS) 809, 5000 CFM
Contact: Tom Hensley (423-229-9394)
620 Industry Drive
Kingsport, TN
Owner: City of Kingsport, TN
Engineer: CDM
Contractor: CDM Construction
Installed: 12/2009
Status: In service

TAB 2

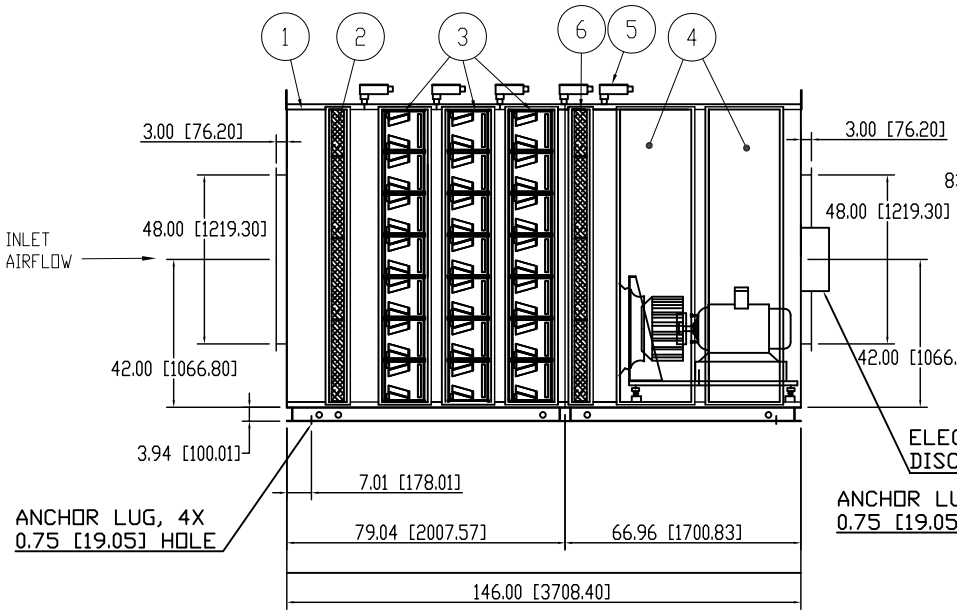
DRAWINGS

SYSTEM LAYOUT

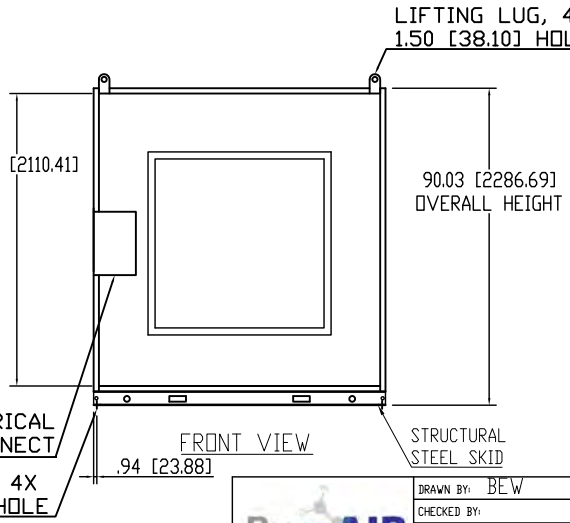
GENERAL NOTES:
- STAGES:
1. INLET PLENUM
2. MIST AND GREASE SECTION
3. 3 PASSES PP12 MODULES
4. BLOWER SECTION
5. EBM SENSORS
6. MATRIX FILTER
- BODY MADE OF POWDERCOATED ALUMINUM
- SKID MADE OF STRUCTURAL STEEL
- ALL DOORS TO BE SEALED WITH CLOSED CELL NEOPRENE
- WILL UNCLUDE ANCHORING AND LIFTING POINTS
- DIMENSIONS ARE APPROXIMATE
- FINAL PRODUCT MAY HAVE COSMETIC DIFFERENCES, BUT GENERAL LAYOUT/ORIENTATION WILL REMAIN THE SAME



TOP VIEW



SIDE VIEW



FRONT VIEW

PureAIR FILTRATION

6050 Peachtree Parkway
Suite 240-187
Norcross, GA 30092
Phone: (678) 935-1431

DRAWN BY: BEW	COMPANY: PUREAIR FILTRATION
CHECKED BY:	CLIENT:
DATE: Thursday, April 27, 2023	DESCRIPTION: LOTT CENTRATE AMMONIA ODOR CONTROL SAH-707 SYSTEM DRAWING
S.O. #:	
PROJECT NAME: LOTT CENTRATE	
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PURE AIR FILTRATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PURE AIR FILTRATION IS PROHIBITED.	DWG. NO:
REV: 0	DO NOT SCALE DRAWING — SHEET 1 OF 1

TAB 3

ADSORBANT MEDIA INFORMATION

Sulphasorb XL™ Adsorbent Media

Basic Information:

- Sulphasorb XL™ was developed to provide our customers with the highest extended life.
- Sulphasorb XL™ has a capacity for capturing hydrogen sulfide (H_2S), which is two to three times higher than other products in the market. PureAir does not impregnate this carbon.
- Sulphasorb XL™ performs exceptionally well not only in PureAir scrubbers, but also as replacement media in scrubbers manufactured by other companies.

General Description

Porous, 4 mm cylindrical pellets of high grade activated carbon. Sulphasorb XL™ is catalytic type engineered carbon that targets hydrogen sulfide.

Product Specifications

- Particle Size: 4mm diameter cylinder
- Density: 480 kg/m^3 (30 lbs/ft^3)
- Surface Area: 1100 m^2/g
- Typical Moisture Content %: 5%
- Crush Test: 97 lbs
- Abrasion Loss %: 3% maximum
- Relative Pressure Drop: See Curve C
- Ignition Temperature: >400° C
- CTC Value: 70%
- Iodine #: 1100 mg/g
- Ash Content: 5% maximum
- Butane Activity: 27% minimum

Removal Capability

- Approximately 66% by weight

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Toll Free: 866.543.7479
www.PureAirFiltration.com
6050 Peachtree Pkwy Suite 240-187. Atlanta, GA 30092 U.S.A.

Sulphasorb XL

Revision Date: *September, 2020*

SAFETY DATA SHEET

1. IDENTIFICATION OF THE PREPARATION AND OF THE COMPANY

Product Identification: Sulphasorb XL

Product Synonyms: Activated Carbon

Use of the preparation: This product is intended for use in gas-phase air filtration

Company Identification:
Pure Air Filtration
6050 Peachtree Parkway
Suite 240-187
Norcross, GA 30092

Company Contact Numbers:
Telephone: (678) 935-1431
Facsimile: (678) 935-0648

2. HAZARD(S) IDENTIFICATION

Irritant, Category 2

GHS Hazard Codes: H315: Causes Skin Irritation

GHS Precaution Codes: P264: Wash hands thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.

GHS Response Codes: P302+352: IF ON SKIN: wash with plenty of soap and water.
P332+313: IF SKIN irritation occurs: Get medical advice/attention.
P362: Take off contaminated clothing and wash before reuse.

GHS Storage Codes: P401: Store in a cool, dry area in enclosed containers.

Most Important Hazards:
-If crushed or handled extensively, dust may evolve and can be irritating to the eyes, skin or respiratory tract.
-Confined space entry. Appropriate safety precautions should be taken when entering any confined space. Entering containers or media vessel/tanks housing activated carbon for inspection, maintenance, etc. may constitute a confined space entry. In confined spaces, activated carbon may remove oxygen from the air causing severe hazards for workers entering such spaces. Before and during the entrance of a confined space all local, state, and federal regulations should be followed.

Adverse Human Health Effects:
—The following medical conditions may be aggravated by exposure to the product: asthma, chronic lung disease, and skin rashes.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name and Synonyms: Activated Carbon
Formula: C
Chemical Family: Activated carbon, Magnesium Oxide
CAS Number: 7740-44-0

Common Chemical Name	Synonyms	CAS#	Wt%	EC #	Harmonization Code
Carbon	activated carbon	7440-44-0	75-100%	231-153-3	380210
Magnesium Oxide		1309-48-4	up to 25%	215-171-9	25199040

4. FIRST-AID MEASURES

First aid measures should be taken as indicated below for the following routes of exposure.

Inhalation: Move to fresh air. If breathing difficulty occurs or persists, seek medical attention.
Skin Contact: Wash area with soap and water. If irritated persists, seek medical attention.
Eye Contact: Flush with large quantities of water for 15 min. Seek medical attention.
Ingestion: Seek medical attention.

Notes to Physician:
Product is expected to be non-toxic and only an eye irritant in the powder form. Treatment is recommended to be symptomatic and supportive.

Other Information:
This media is classified by the manufacturer for health effects according to EU Directive 1999/45/EC with Xi; R36/37/38

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
If involved in a fire, use water spray, dry chemical, alcohol foam, or carbon dioxide.

Specific Hazards:
Wet activated carbon depletes oxygen from the air. Materials allowed to smolder for long periods in enclosed spaces may product amounts of carbon monoxide which may reach the lower explosive limit for carbon monoxide of 12.5% in air.
Contact with strong oxidizers such as ozone or liquid oxygen may cause rapid combustion.

Protection of Firefighters:
Fire fighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:
Protective clothing appropriate for the environment should be worn. Goggles or safety glasses with side shields, NIOSH approved dust masks, rubber or plastic gloves, and full cover clothing covering arms and legs are recommended.

Environmental Precautions:
None known

Methods for Cleaning Up:
Clean up using dry procedures (broom, shovel, etc.); avoid dusting.

Recovery:
Product may be recovered for use if it has not come in contact with liquid, changed color, or been exposed to significant amounts of gaseous contaminants.

Disposal:
See Section **13: DISPOSAL CONSIDERATIONS**

7. HANDLING AND STORAGE

Handling:
Use air conveying (vacuum) for bulk removal. If manual handling is used for transfer (from vessel, slingbags, boxes, or pails), use mechanical ventilation or other measures to remove airborne dust.

Prevention of User Exposure: See section 8

Prevention of Fire and Explosion:
Contact with strong oxidizers may result in fire.

Precautions for Safe Handling:
-Confined space entry. Appropriate safety precautions should be taken when entering any confined space. Entering containers or media vessels/tanks housing active carbon for inspection, maintenance, etc. may constitute a confined space entry. In confined spaces, activated carbon may remove oxygen from the air causing severe hazards for workers entering such spaces. Before and entrance of a confined all local, state, and federal regulations should be followed.
-Avoid crushing the product to keep dusting to a minimum. As described under Handling above, mechanical ventilation or other measures may be needed to remove airborne dust.
-Protect from water exposure to contaminated air (gaseous, particulate, and aerosol contaminated), otherwise the product may be rendered useless.

Storage:
General good storage practices should be followed.

Suitable Conditions:
Store in a cool, dry area and keep in original, closed containers.

Incompatible Products:
-Product should be kept protected from water and exposure to contaminated air (gaseous, Particulate, and aerosol contaminated), otherwise the product may be rendered useless.

-Contact with strong oxidizers such as ozone, liquid oxygen, chlorine, permanganates, peroxides etc. may result in fire.

Recommended Packaging Materials:
-Corrugated boxes of 50 lb, double wall quality, with 4 mm plastic liners.
-Injection molded polystyrene pails and lids including a neoprene seal.

Not Suitable Materials:
Porous materials allowing contact with water, air, and the contaminants contained therein.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values:

Inert or Nuisance Dust	5mg/m3 respirable fraction	OSHA PEL
	15 mg/m3 total dust	OSHA PEL

Exposure Controls:
Minimize eye and skin contact by using appropriate protective equipment. Use local or general room ventilations to control airborne dust that may be generated.

Personal Protective Equipment:
The following recommendations are made for appropriate personal protective equipment for the following.

Respiratory Protection:	NIOSH approved dust mask
Hand Protection:	Rubber or plastic gloves
Eye Protection:	Goggles or safety glasses with side shields

Skin and Body Protection: Full cover clothing covering arms and legs.
Hygiene Measures: Do not inhale dust and avoid contact with eyes.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid
Form: cylindrical pellets approximately 4mm (1/8 in. nominal) in diameter
Color: Black
Odor: No significant odor

Health, Safety, Environmental Information

pH: 6.9-9.0
Flash point: Not applicable
Flammability: Not flammable under normal conditions
Explosive properties: Not explosive
Oxidizing properties: Not an oxidizer
Vapor pressure: 1 @3586C (6487F)
Bulk density: 0.641-0.721 g/cc (40-45lb/ft3)
Solubility: insoluble
Partition coefficient: Not applicable
Viscosity: Not applicable
Vapor density: .04
Evaporation rate: Not applicable
Specific gravity: 1.8-2.1

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions

Materials to Avoid:
Strong oxidizers such as ozone, liquid oxygen, chlorine, permanganate, etc may result in rapid combustion. Avoid contact with strong acids.
Conditions to Avoid:
Incompatibles and protect from water and exposure to contaminated air, otherwise media may be rendered useless.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon dioxide and carbon monoxide.
Intended Use and Foreseeable Misuse:
Intended use is for air purification from gaseous contaminants. The product is not intended to remove dangerous particulates or biological contaminants. The product is not intended to purify water.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity: Expected to be low[2], not tested
Local Effects: See section 3.

HAZARDS IDENTIFICATION, Adverse Human Health Effects.

Sensitization:

Primary skin irritation and corrosivity (rabbits): expected to be non-irritant, not tested
Eye irritation (rabbits): expected to be irritant not tested
Primary Route of Entry: Inhalation, ingestion, skin contact, eye contact

12. ECOLOGICAL INFORMATION

Not determined. See Section 3. "HAZARDS IDENTIFICATION, Environmental Effects".

13. DISPOSAL CONSIDERATIONS

Waste From Residues:
Sulphasorb converts hydrogen sulfide into elemental sulfur, thereby eliminating the acidic aspect. Because of this, Sulphasorb XL does not typicall have restrictions on disposal. Consult your local disposal requirements.

Contaminated Packaging: Not relevant

14. TRANSPORT INFORMATION

International Regulations: The media contains less than 50% (by weight) activated carbon, which is produced by a steam activation process. Because of this the media is not subject to the provisions of the International Dangerous Goods Code (IMGD) or the labeling and packaging requirements of the International Maritime Organization (IMO) Class 4.2.

Proper Shipping Name: NMFC 40560 Activated Carbon, Purifying

15. REGULATORY INFORMATION

Regulations:
This section contains information specifically applicable to the chemical product relative to the following regulations. Local regulations should always be consulted and followed.

SARA Title III (Superfund Amendments and Reauthorization Act)
Section 302 Extremely Hazardous Substances (40CFR355):
Not listed
Section 312 Hazard Categories (40CFR370.2):
Only expected as Acute (eye irritant), see section 11 TOXICOLOGICAL INFORMATION.
Section 313 Reportable Ingredients (40CFR372):
None listed

EU Classifications & Labeling:

Xi – Irritant
Risk Phrases:

R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:

S3: Keep in cool Place.
S8: Keep container dry.
S24/25: Avoid contact with skin and eyes.
S26: In case of contact with, eyes, rinse immediately with plenty of water and seek medical advice
S28: After contact with skin, wash immediately with plenty of soap and water.
S62: If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
S63: In case of accident by inhalation: remove casualty to fresh air and keep at rest.

16. OTHER INFORMATION

Ingredient R(isk) Phrase Definitions:

None

Disclaimer:

The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones, which exist. Pure Air Filtration, LLC makes no warrants of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. The user has sole responsibility to determine the suitability of the material for any use and the manner of use contemplated.

CPS12 Blend Adsorbent Media

Basic Information:

CPS12 Blend adsorbent media is a 50/50 percent blend of PureAir 12 sodium permanganate-based media and PureAir AC-X virgin bituminous activated carbon designed for the broadest range removal of corrosive, odorous, or toxic gases.

Note: CPS12 Blend media meets the requirements for UL certification.

General Description

CPS12 Blend has the combined properties and benefits of PureAir 12SP and PureAir Activated Carbon.

PureAir 12SP:
Spherical or cylindrical porous pellets formed from a combination of powdered activated alumina and other binders, suitably impregnated with sodium permanganate to provide optimum adsorption, absorption, and oxidation of a wide variety of gaseous contaminants.

PureAir AC-X:
Porous, cylindrical pellets of high grade bituminous activated carbon.

Product Specifications

- Particle Size: See base products
- Density: 640 kg/m^3 (40 lbs/ft^3)
- Surface Area: See base products
- Typical Moisture Content %: See base products
- Crush Test: See base products
- Abrasion Loss %: See base products
- Relative Pressure Drop: See Curve B
- Permanganate Content: 12% minimum
- CTC Value: See base products
- Iodine #: See base products

Removal Capability

- Hydrogen Sulfide: 12.0% by weight
- Sulfur Dioxide: 10.4% by weight
- Nitric Oxide: 2.5% by weight
- Nitrogen Dioxide: 23.4% by weight
- Formaldehyde: 2.1% by weight

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Toll Free: 866.543.7479
www.PureAirFiltration.com
6050 Peachtree Pkwy, Suite 240-187, Atlanta, GA 30092 U.S.A.

PP Blend, CPS Blend, CP Blend, CPS12 Blend, TriBlend, CPZ Blend, PP12 Blend

Revision Date: *January 2022*

SAFETY DATA SHEET

1. IDENTIFICATION OF THE PREPARATION AND OF THE COMPANY

Product Identification: PP Blend, CPS Blend, CP Blend, CPS12 Blend, TriBlend, CPZ Blend, PP12 Blend

Product Synonyms: Alumina, Activated Carbon

Use of the preparation: This product is intended for use in gas-phase air filtration

Company Identification:
Pure Air Filtration
6050 Peachtree Parkway
Suite 240-187
Atlanta, GA 30092

Company Contact Numbers:
Telephone: (678) 935-1431
Facsimile: (678) 935-0648

2. HAZARD(S) IDENTIFICATION

Irritant, Category 2
Eye Irritation, Category 2

GHS Hazard Codes: H315: Causes Skin Irritation
H319: Causes Serious Eye Irritation

GHS Precaution Codes: P264: Wash hands thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.

GHS Response Codes: P302+352: IF ON SKIN: wash with plenty of soap and water.
P332+313: IF SKIN irritation occurs: Get medical advice/attention.
P362: Take off contaminated clothing and wash before reuse.
P305+P351+P338+P337+P313: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

GHS Storage Codes: P401: Store in a cool, dry area in enclosed containers.

Most Important Hazards:

-If crushed or handled extensively, dust may evolve and can be irritating to the eyes, skin or respiratory tract.
-Confined space entry. Appropriate safety precautions should be taken when entering any confined space. Entering containers or media vessel/tanks housing activated carbon for inspection, maintenance, etc. may constitute a confined space entry. In confined spaces, activated carbon may remove oxygen from the air causing severe hazards for workers entering such spaces. Before and during the entrance of a confined space all local, state, and federal regulations should be followed.

Adverse Human Health Effects:

—The following medical conditions may be aggravated by exposure to the product: asthma, chronic lung disease, and skin rashes.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name and Synonyms: Potassium Permanganate, Alumina, Activated Carbon
Formula: KMnO4 impregnant (0 -12%) on aluminum oxide (50-58%), activated carbon
Proprietary ingredient: less than 10%
Chemical Family: Inorganic Oxidizer
CAS Number: 1344-28-1

Common Chemical Name	Synonyms	CAS#	Wt%	EC #	EU Classification
Aluminum Oxide	alumina	1344-28-1	44-75%		
Potassium Permanganate		7722-64-7	2-12%		
Carbon	activated carbon	7440-44-0	18-48%		
Potassium Hydroxide		1310-58-3	0-4%		

NOTE: The Hazard Classification listed in this section refers to the chemical at a pure concentration. It has been determined that the remaining ingredient(s) of this component/product are NOT CLASSIFIED AS HAZARDOUS CHEMICALS due to their physical and/or chemical nature and/or concentration in solution, in accordance with California and Federal OSHA regulations (Federal Register 29CFR 1910.1200), and The Chemicals (Hazard Information and Packaging for Supply) Regulations (European Community).

4. FIRST-AID MEASURES

First aid measures should be taken as indicated below for the following routes of exposure.

Inhalation: Move to fresh air. If breathing difficulty occurs or persists, seek medical attention.
Skin Contact: Wash area with soap and water. If irritation persists, seek medical attention.
Eye Contact: Flush with large quantities of water for 15 min. Seek medical attention.
Ingestion: Seek medical attention.

Notes to Physician:
Product is expected to be non-toxic and only an eye irritant in the powder form. Treatment is recommended to be symptomatic and supportive.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
All Blends are not flammable.

Specific Hazards:
None.

Protection of Firefighters:
Fire fighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:
Protective clothing appropriate for the environment should be worn. Goggles or safety glasses with side shields, NIOSH approved dust masks, rubber or plastic gloves, and full cover clothing covering arms and legs are recommended.

Environmental Precautions:
None known

Methods for Cleaning Up:
Clean up using dry procedures (broom, shovel, etc.); avoid dusting.

Recovery:
Product may be recovered for use if it has not come in contact with liquid, changed color, or been exposed to significant amounts of gaseous contaminants.

Disposal:
See Section **13: DISPOSAL CONSIDERATIONS**

7. HANDLING AND STORAGE

Handling:
Use air conveying (vacuum) for bulk removal. If manual handling is used for transfer (from vessel, slingbags, boxes, or pails), use mechanical ventilation or other measures to remove airborne dust.

Prevention of User Exposure: See section 8

Prevention of Fire and Explosion:
Contact with strong oxidizers may result in fire.

Precautions for Safe Handling:

- Confined space entry. Appropriate safety precautions should be taken when entering any confined space. Entering containers or media vessels/tanks housing active carbon for inspection, maintenance, etc. may constitute a confined space entry. In confined spaces, activated carbon may remove oxygen from the air causing severe hazards for workers entering such spaces. Before and entrance of a confined all local, state, and federal regulations should be followed.
- Avoid crushing the product to keep dusting to a minimum. As described under Handling above, mechanical ventilation or other measures may be needed to remove airborne dust.
- Protect from water exposure to contaminated air (gaseous, particulate, and aerosol contaminated), otherwise the product may be rendered useless.

Storage:
General good storage practices should be followed.

Suitable Conditions:

- Store in a cool, dry area and keep in original, closed containers.

Incompatible Products:

- Product should be kept protected from water and exposure to contaminated air (gaseous,
- Particulate, and aerosol contaminated), otherwise the product may be rendered useless.
- Contact with strong oxidizers such as ozone, liquid oxygen, chlorine, permanganates, peroxides, etc. may result in fire.

Recommended Packaging Materials:

- Corrugated boxes of 50 lb, double wall quality, with 4 mm plastic liners.
- Injection molded polystyrene pails and lids including a neoprene seal.

Not Suitable Materials:

- Porous materials allowing contact with water, air, and the contaminants contained therein.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values:

Inert or Nuisance Dust	5mg/m3 respirable fraction	OSHA PEL
	15 mg/m3 total dust	OSHA PEL

Exposure Controls:
Minimize eye and skin contact by using appropriate protective equipment. Use local or general room ventilations to control airborne dust that may be generated.

Personal Protective Equipment:
The following recommendations are made for appropriate personal protective equipment for the following.

Respiratory Protection:	NIOSH approved dust mask
Hand Protection:	Rubber or plastic gloves
Eye Protection:	Goggles or safety glasses with side shields
Skin and Body Protection:	Full cover clothing covering arms and legs.
Hygiene Measures:	Do not inhale dust and avoid contact with eyes.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Form:	cylindrical and spherical pellets approximately 4mm (1/8 in. nomimal) in diameter
Color:	Purple and Black
Odor:	No significant odor

Health, Safety, Environmental Information

pH:	Not applicable
Flash point:	Not applicable
Flammability:	Not flammable under normal conditions
Explosive properties:	Not explosive
Oxidizing properties:	Not an oxidizer
Vapor pressure:	Not applicable
Bulk density:	30-50 lb/cu ft
Solubility:	partially soluble
Partition coefficient:	Not applicable
Viscosity:	Not applicable
Vapor density:	Not applicable
Evaporation rate:	Not applicable

10. STABILITY AND REACTIVITY

Stability:
Stable under normal conditions

Materials to Avoid:
None known

Conditions to Avoid:
Protect from water and exposure to contaminated air, otherwise media may be rendered useless.

Hazardous Decomposition Products:
Dilute KMnO4 solution when wetted. Neutralize with 11% ascorbic acid solution

Intended Use and Foreseeable Misuse:
Intended use is for air purification from gaseous contaminants. The product is not intended to remove dangerous particulates or biological contaminants. The product is not intended to purify water.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity: Expected to be low[2], not tested
Local Effects: See section 3. **HAZARDS IDENTIFICATION, Adverse Human Health Effects.**

Sensitization:
Primary skin irritation and corrosivity (rabbits): expected to be non-irritant, not tested
Eye irritation (rabbits): expected to be irritant not tested
Primary Route of Entry: inhalation, ingestion, skin contact, eye contact

12. ECOLOGICAL INFORMATION

Not determined. See Section 3. "HAZARDS IDENTIFICATION, Environmental Effects".

13. DISPOSAL CONSIDERATIONS

Waste From Residues:
Spent media that has removed toxic chemicals should be examined for specific hazards. Local regulations should always be consulted and followed.

Contaminated Packaging: Not relevant

14. TRANSPORT INFORMATION

International Regulations: not applicable

Proper Shipping Name: NMFC 13090 ALUMINA

15. REGULATORY INFORMATION

Regulations:
This section contains information specifically applicable to the chemical product relative to the following regulations. Local regulations should always be consulted and followed.

SARA Title III (Superfund Amendments and Reauthorization Act)
Section 302 Extremely Hazardous Substances (40CFR355):
Not listed
Section 312 Hazard Categories (40CFR370.2):
Only expected as Acute (eye irritant), see section 11 TOXICOLOGICAL INFORMATION.
Section 313 Reportable Ingredients (40CFR372):
None listed

EU Classifications & Labeling:

Xi – Irritant
Risk Phrases:
R36/37/38: Irritating to eyes, respiratory system, and skin
Safety Phrases:

S3:	Keep in cool Place.
S8:	Keep container dry.
S24/25:	Avoid contact with skin and eyes.
S26:	In case of contact with, eyes, rinse immediately with plenty of water and seek medical advice
S28:	After contact with skin, wash immediately with plenty of soap and water.
S62:	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
S63:	In case of accident by inhalation: remove casualty to fresh air and keep at rest.

16. OTHER INFORMATION

Ingredient R(isk) Phrase Definitions:
None

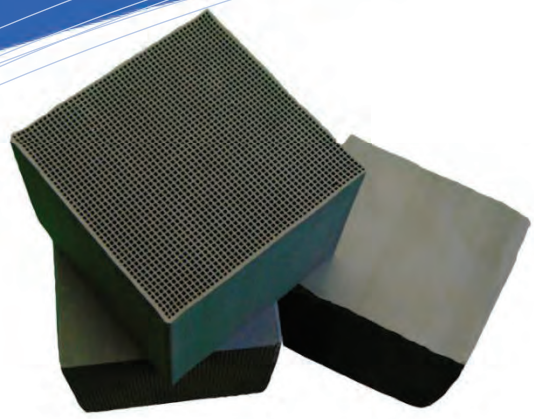
Disclaimer:
The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones, which exist. Pure Air Filtration, LLC makes no warrants of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. The user has sole responsibility to determine the suitability of the material for any use and the manner of use contemplated.

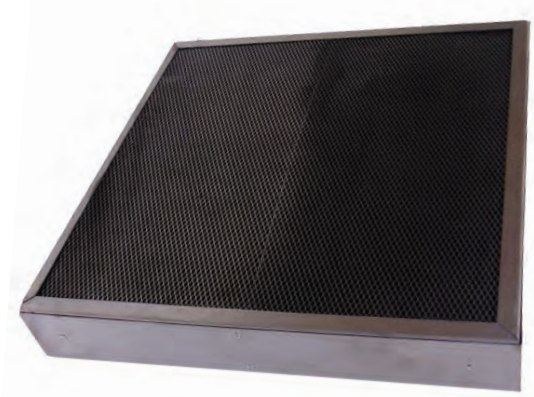
PureAir Filtration

Air Filtration
Matrix

Need a large supply of chemical air filtration, without a large pressure drop?

PureAir's Matrix filter is your gas-phase air filtration solution that will offer energy savings and improved operational performance.





Available in these medias: AC-X, Ammoniasorb, Sulphasorb

Environmentally Friendly

Matrix manufacturing is a closed-loop process and does not produce waste. The PureAir filter uses recycled frame and screen materials with a compressible partition made from 75% recycled post-consumer content. All the PureAir components can be recycled with the exception of the Matrix. However, these may be used as a fuel additive in solid fuel boilers or incinerators, due to a high BTU value, to help reduce operating costs.

Certified

The Matrix has been submitted to an internationally recognized independent research institute to evaluate its superior performance.

Superior Performance

The size and shape of the cells in the Matrix lead to turbulent flow assuring a constant velocity profile in all internal parts of the cells. The exception is the thin layer of gas at the cell wall, in which the flow velocity sharply increases from an almost zero value. As the gas velocity increases, it is in this region where the flow begins to change to turbulent flow. It is this turbulent flow that ensures the Matrix's superior performance. The Matrix monolithic structure- based system is comparable to, and in some cases superior to, traditional packed-bed media systems.

Features and Benefits

Features	Benefits
No Bypass	Total air filtration
Low Pressure Drop	Energy Savings
Turbulent Flow	Cell geometry provides high contact efficiency with contaminant gases
Composite Structure	Full available for adsorption with impregnations for specific gases
Full Utilization of Media	Removal efficiencies and capacities comparable to granular media
Self-Supporting	Structural Stability
Life Testable	Optimal removal test cartridge makes testing easy and fast
No Threat of Media Settling	Efficient and hassle-free

PureAir Filtration
6050 Peachtree Parkway, Suite 240-187, Norcross, GA 30092 U.S.A.
Phone: +1 678-935-1431 (office) / 866-543-7479 (toll free) / 678-935-0648 (fax)
info@pureairfiltration.com / www.pureairfiltration.com

Low pressure-drop, Large results!

the Matrix is a clean, efficient solution for all uses.

Matrix Filters (IP Units)- All filters with galvanized frame material					
Filter Type	**Filter Size (in.)**	**Exact Size(in.)**	**Media Per Filter**	**Airflow**	**Pressure Drop**
Matrix 4”	24W x 24H x 4D	23⅜ W 23⅜H 3⅜D	22.0 lbs	500 fpm/2000 cfm	0.58 i.w.g.
Matrix 4”	20W x 25H x 4D	19½ W 24½H 3⅜D	18.0 lbs	500 fpm/1736 cfm	0.58 i.w.g.
Matrix 4”	20W x 20H x 4D	19½ W 19½H 3⅜D	15.0 lbs	500 fpm/1389 cfm	0.58 i.w.g.
Matrix 4”	16W x 20H x 4D	15½ W 19½H 3⅜D	12.0 lbs	500 fpm/1111 cfm	0.58 i.w.g.
Matrix 4”	12W x 24H x 4D	11⅜ W 23⅜H 3⅜D	11.0 lbs	500 fpm/1000 cfm	0.58 i.w.g.

Matrix Filters (Metric Units)- All units with galvanized frame material					
Filter Type	**Filter Size (mm)**	**Exact Size (mm)**	**Media Per Filter**	**Airflow**	**Pressure Drop**
Matrix 4”	610W x 610H x 102D	594W x 594H x 86D	9.8 kg	2.5 m/s | 3398 m3/h	146 Pa
Matrix 4”	508W x 635H x 102D	495W x 622H x 86D	8.2 kg	2.5 m/s | 2950 m3/h	146 Pa
Matrix 4”	508W x 508H x 102D	495W x 495H x 86D	6.8 kg	2.5 m/s | 2360 m3/h	146 Pa
Matrix 4”	406W x 508H x 102D	394W x 495H x 86D	5.4 kg	2.5 m/s | 1888 m3/h	146 Pa
Matrix 4”	305W x 610H x 102D	289W x 594H x 86D	4.9 kg	2.5 m/s | 1699 m3/h	146 Pa

For more information about using the Matrix in your application or to request a consultation, please contact:

PureAir Filtration
6050 Peachtree Parkway, Suite 240-187, Norcross, GA 30092 U.S.A.
Phone: +1 678-935-1431 (office) / 866-543-7479 (toll free) / 678-935-0648 (fax)
info@pureairfiltration.com / www.pureairfiltration.com

TAB 4

COMPONENT INFORMATION

BLOWER

The New York Blower Company
Fan-to-Size
Fan Selection Detail

Note: Blower at design requirement.

Fan Design

Product:	ECF Plenum
Type:	Backward-Inclined (Unhoused)
Size:	30
Fan Class:	2
Wheel Type:	Backward Inclined (airfoil: ACF/ECF) - ECF-9
Wheel Material:	Carbon Steel
Wheel Weight:	105.0 lb
Wheel WR²:	83 lb-ft2
Percent Width:	60%
Percent Diameter:	100.0%
Outlet Area:	7.53 sq. ft.
Options:	None
Fan 'M':	N/A

Calculation Mode: Find Speed

Drive Type:	Direct
Arrangement:	4
Outlet Velocity:	1461 ft/min
Static Efficiency:	74.40%
Total Efficiency:	76.1%
Operating Temp:	70° F
Maximum Temp:	70° F
Maximum Speed: (1)	1770 RPM
Velocity Pressure:	0.133 in wg
Fan Static Pressure:	6 in wg
Fan Total Pressure:	6.13 in wg
Altitude:	0 ft
NW Delta:	4.5 in

Operating cost is $12514.77 for 8760 hours with a 95% efficient motor when energy unit per kW-hr is $0.13.

Axial thrust load is 410 lbf.

***This configuration is compliant with CEC regulations (suitable for use in California). FEI: 1.4.**

Conditions (Actual Volume; Fan Static Pressure)

	Flow	Pressure	Power	Speed	Speed Limit (2)	Density	Altitude	Inlet Temp.	FEI
	ACFM	in wg (FSP)	bhp	rpm	rpm	lb/ft3	ft	f	
Operating	11000	6	14.0	1626	1770	0.0750	0	70	1.4
Coldstart	11000	6	14.0	1626	1770	0.0750	0	70	1.4
Standard	11000	6	14.0	1626	1770	0.0750	0	70	1.4

(1) Speed Limit at Maximum Temperature (2) Speed Limit at indicated Inlet Temperature

Speed Limit Derates By Temperature

Temperature	Derate	Wheel Limit	Fan Limit
70	1.0000	2285	1770
120	0.9800	2239	1770
250	0.9600	2194	1770

The New York Blower Company certifies that the Plenum Fan is licensed to bear the AMCA Sound & Air Performance Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and 311 and comply with the requirements of the AMCA Certified Ratings program. AMCA Licensed for Sound and Air Performance without Appurtenances (Accessories) or Plenum Effect. Power HP (bhp) excludes drives. The data presented is not certified, and was modified from AMCA licensed performance data. It was modified to account for ** installation, appurtenances, or accessories, etc, Non-standard impeller width **, which were not included in the licensed ratings. This modified performance is not AMCA licensed but is provided to aid in selection and application of the product. Performance certified is for installation type: A - free inlet, free outlet. dBA levels are not licensed by AMCA International.

The New York Blower Company
Fan-to-Size
Fan Selection Detail

Note: Blower at design requirement.

Sound Power Level Ratings

Sound power and sound pressure levels are shown in decibels. (Power levels reference 10-12 watts and pressure levels reference 2x10-7 microbar.) Sound power ratings are calculated per AMCA Standard 301. Ratings do not include the effects of duct end correction. Sound levels do not include motors or drives. Pressure levels are estimated. A-weighing is per ANSI S.1.42-2001 (R2011).

Fan Sound

Center Freq (Hz)	63	125	250	500	1000	2000	4000	8000	Overall
Octave	1	2	3	4	5	6	7	8	
Inlet Total Power, dB	89	91	101	92	93	92	87	81	**103**
A-Weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
Convert To Pressure	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	
Inlet Total Pressure, dBA	51	63	81	77	82	82	77	68	**87**
Outlet Total Power, dB	100	97	106	103	102	100	93	86	**110**
A-Weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
Convert To Pressure	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	
Outlet Total Pressure, dBA	62	69	86	88	91	90	83	73	**95**

Directivity/Reflection is a hemispherical radiation (Q = 2); Distance is 5 ft.
The estimated sound pressure level outside the fan due to inlet noise is 87 dBA at 5 ft.
The estimated sound pressure level outside the fan due to outlet noise is 95 dBA at 5 ft.

The sound power and pressure levels displayed here are estimated values based on tests and ratings conducted in accordance with AMCA standards 300 and 301. AMCA does not certify any of these ratings. The inlet and outlet powers were separately tested.

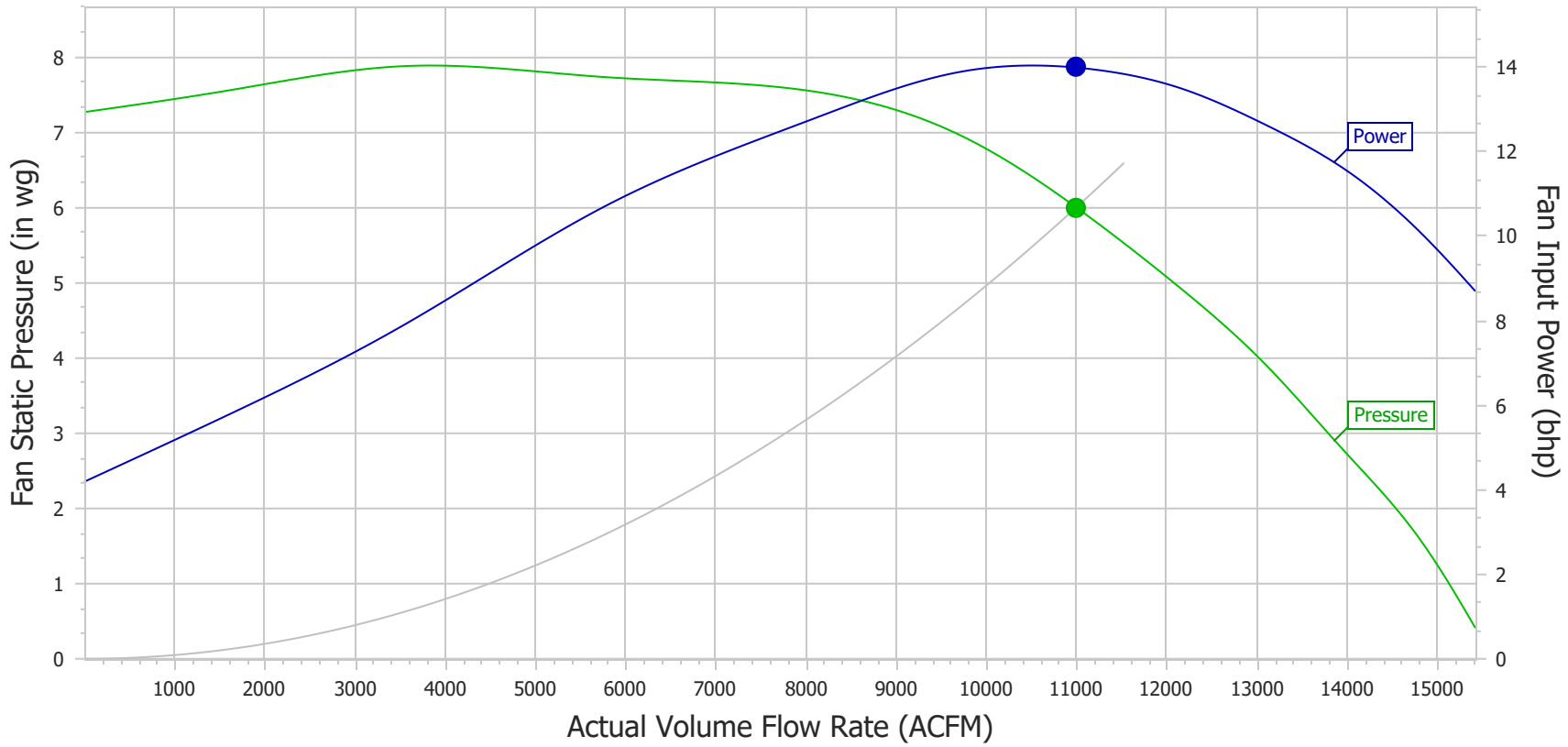
The New York Blower Company
Fan-to-Size
Fan Selection Detail

Note: Blower at design requirement.

Product: ECF Plenum
Material: Carbon Steel
Fan Size: 30, Fan Class: 2
Arrangement: 4
Wheel Type: Backward Inclined (airfoil: ACF/ECF) - ECF-9, Width: 60%
Options: None

Actual Volume Flow Rate: 11000 ACFM
Fan Static Pressure: 6 in wg
Speed: 1626 rpm
Power: 14.0 bhp

Inlet Temperature: 70 °f
Altitude: 0 ft
Density: 0.0750 lb/ft3
Outlet Velocity: 1461 ft/min



*This configuration is compliant with CEC regulations (suitable for use in California). FEI: 1.4.

AMCA Licensed for Sound and Air Performance without Appurtenances (Accessories) or Plenum Effect. Power HP (bhp) excludes drives. The data presented is not certified, and was modified from AMCA licensed performance data. It was modified to account for ** installation, appurtenances, or accessories, etc, Non-standard impeller width **, which were not included in the licensed ratings. This modified performance is not AMCA licensed but is provided to aid in selection and application of the product. Performance certified is for installation type: A - free inlet, free outlet. dBA levels are not licensed by AMCA International.

The New York Blower Company
Fan-to-Size
Fan Selection Detail

Note: Blower at +10%

Fan Design

Product:	ECF Plenum	Drive Type:	Direct
Type:	Backward-Inclined (Unhoused)	Arrangement:	4
Size:	30	Outlet Velocity:	1607 ft/min
Fan Class:	2	Static Efficiency:	74.05%
Wheel Type:	Backward Inclined (airfoil: ACF/ECF) - ECF-9	Total Efficiency:	75.8%
Wheel Material:	Carbon Steel	Operating Temp:	70° F
Wheel Weight:	105.0 lb	Maximum Temp:	70° F
Wheel WR²:	83 lb-ft2	Maximum Speed: (1)	1770 RPM
Percent Width:	60%	Velocity Pressure:	0.161 in wg
Percent Diameter:	100.0%	Fan Static Pressure:	7 in wg
Outlet Area:	7.53 sq. ft.	Fan Total Pressure:	7.16 in wg
Options:	None	Altitude:	0 ft
Fan 'M':	N/A	NW Delta:	4.5 in

Calculation Mode: Find Width (Direct)

Operating cost is $16090.42 for 8760 hours with a 95% efficient motor when energy unit per kW-hr is $0.13.

Axial thrust load is 479.3 lbf.

***This configuration is compliant with CEC regulations (suitable for use in California). FEI: 1.38.**

Conditions (Actual Volume; Fan Static Pressure)

	Flow	Pressure	Power	Speed	Speed Limit (2)	Density	Altitude	Inlet Temp.	FEI
	ACFM	in wg (FSP)	bhp	rpm	rpm	lb/ft3	ft	f	
Operating	12100	7	18	1770	1770	0.0750	0	70	1.38
Coldstart	12100	7	18	1770	1770	0.0750	0	70	1.38
Standard	12100	7	18	1770	1770	0.0750	0	70	1.38

(1) Speed Limit at Maximum Temperature (2) Speed Limit at indicated Inlet Temperature

Speed Limit Derates By Temperature

Temperature	Derate	Wheel Limit	Fan Limit
70	1.0000	2285	1770
120	0.9800	2239	1770
250	0.9600	2194	1770

The New York Blower Company certifies that the Plenum Fan is licensed to bear the AMCA Sound & Air Performance Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and 311 and comply with the requirements of the AMCA Certified Ratings program. AMCA Licensed for Sound and Air Performance without Appurtenances (Accessories) or Plenum Effect. Power HP (bhp) excludes drives. The data presented is not certified, and was modified from AMCA licensed performance data. It was modified to account for ** installation, appurtenances, or accessories, etc, Non-standard impeller width **, which were not included in the licensed ratings. This modified performance is not AMCA licensed but is provided to aid in selection and application of the product. Performance certified is for installation type: A - free inlet, free outlet. dBA levels are not licensed by AMCA International.

The New York Blower Company
Fan-to-Size
Fan Selection Detail

Note: Blower at +10%

Sound Power Level Ratings

Sound power and sound pressure levels are shown in decibels. (Power levels reference 10-12 watts and pressure levels reference 2x10-7 microbar.) Sound power ratings are calculated per AMCA Standard 301. Ratings do not include the effects of duct end correction. Sound levels do not include motors or drives. Pressure levels are estimated. A-weighing is per ANSI S.1.42-2001 (R2011).

Fan Sound

Center Freq (Hz)	63	125	250	500	1000	2000	4000	8000	Overall
Octave	1	2	3	4	5	6	7	8	
Inlet Total Power, dB	92	92	102	94	95	94	90	84	**105**
A-Weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
Convert To Pressure	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	
Inlet Total Pressure, dBA	54	64	82	79	84	84	80	71	**89**
Outlet Total Power, dB	102	98	108	104	104	102	96	89	**112**
A-Weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
Convert To Pressure	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	
Outlet Total Pressure, dBA	64	70	88	89	93	92	86	76	**97**

Directivity/Reflection is a hemispherical radiation (Q = 2); Distance is 5 ft.
The estimated sound pressure level outside the fan due to inlet noise is 89 dBA at 5 ft.
The estimated sound pressure level outside the fan due to outlet noise is 97 dBA at 5 ft.

The sound power and pressure levels displayed here are estimated values based on tests and ratings conducted in accordance with AMCA standards 300 and 301. AMCA does not certify any of these ratings. The inlet and outlet powers were separately tested.

The New York Blower Company

Fan-to-Size

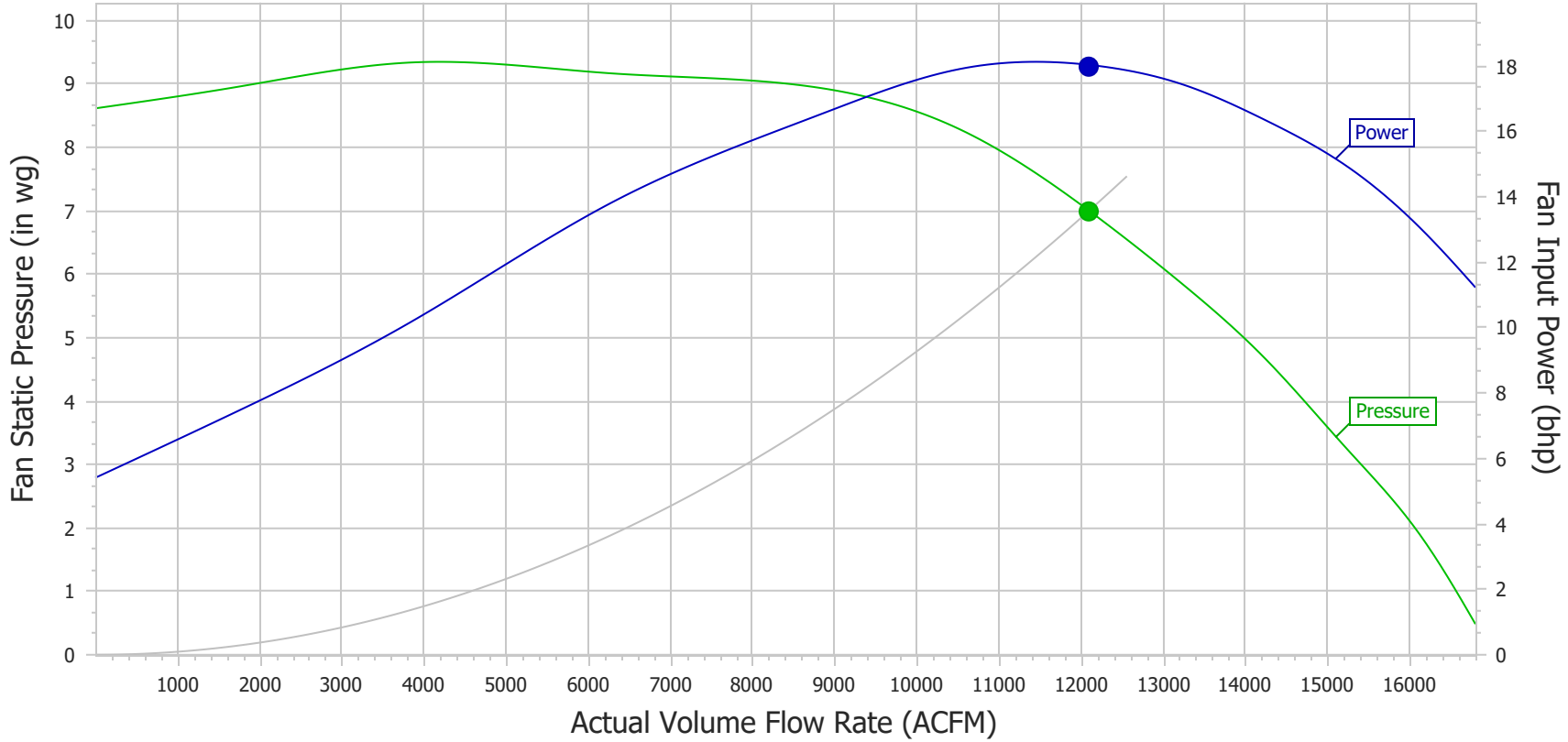
Fan Selection Detail

Note: Blower at +10%

Product: ECF Plenum
Material: Carbon Steel
Fan Size: 30, Fan Class: 2
Arrangement: 4
Wheel Type: Backward Inclined (airfoil: ACF/ECF) - ECF-9, Width: 60%
Options: None

Actual Volume Flow Rate: 12100 ACFM
Fan Static Pressure: 7 in wg
Speed: 1770 rpm
Power: 18 bhp

Inlet Temperature: 70 °f
Altitude: 0 ft
Density: 0.0750 lb/ft3
Outlet Velocity: 1607 ft/min



*This configuration is compliant with CEC regulations (suitable for use in California). FEI: 1.38.

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DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer :

Product line : W21 Explosion Proof NEMA Premium Efficiency Three-Phase

Product code : 14390089

Catalog # : 02018XT3E256T

Frame	: 256T	Locked rotor time	: 36s (cold) 20s (hot)
Output	: 20 HP (15 kW)	Temperature rise	: 80 K
Poles	: 4	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 50.0/25.0 A	Protection degree	: IP55
L. R. Amperes	: 375/188 A	Cooling method	: IC411 - TEFC
LRC	: 7.5x(Code J)	Mounting	: F-1
No load current	: 23.6/11.8 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1770 rpm	Noise level[2]	: 69.0 dB(A)
Slip	: 1.67 %	Starting method	: Direct On Line
Rated torque	: 59.3 ft.lb	Approx. weight[3]	: 373 lb
Locked rotor torque	: 300 %		
Breakdown torque	: 300 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 2.89 sq.ft.lb		
Design	: B		

Output	25%	50%	75%	100%
Efficiency (%)	91.0	91.7	92.4	93.0
Power Factor	0.38	0.63	0.75	0.81

Foundation loads

Max. traction : 707 lb

Max. compression : 1080 lb

		Drive end	Non drive end
Bearing type	:	6309 C3	6209 C3
Sealing	:	Oil Seal	Lip Seal
Lubrication interval	:	20000 h	20000 h
Lubricant amount	:	13 g	9 g
Lubricant type	:	Mobil Polyrex EM	

Notes:
USABLE @208V 55.3A SF 1.15 SFA 63.6A

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	04/01/2024		1 / 5	

Customer :

Thermal protection

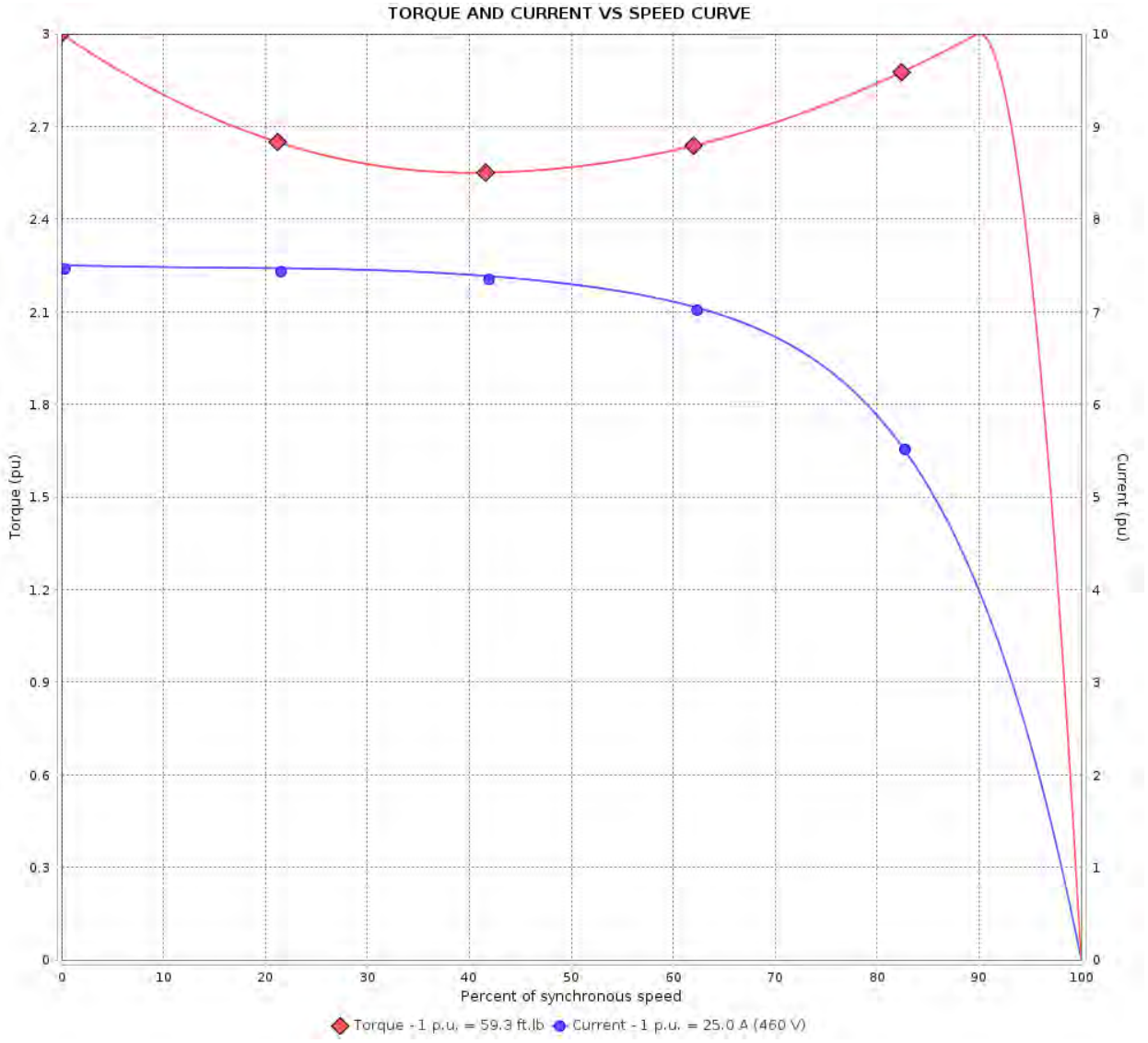
ID	Application	Type	Quantity	Sensing Temperature
1	Winding	Thermostat - 2 wires	1 x Phase	155 ºC

TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer :

Product line	: W21 Explosion Proof NEMA Premium Efficiency Three-Phase	Product code :	14390089
		Catalog # :	02018XT3E256T



Performance	: 230/460 V 60 Hz 4P		
Rated current	: 50.0/25.0 A	Moment of inertia (J)	: 2.89 sq.ft.lb
LRC	: 7.5	Duty cycle	: Cont.(S1)
Rated torque	: 59.3 ft.lb	Insulation class	: F
Locked rotor torque	: 300 %	Service factor	: 1.15
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1770 rpm	Design	: B
Locked rotor time	: 36s (cold) 20s (hot)		

Rev.	Changes Summary	Performed	Checked	Date

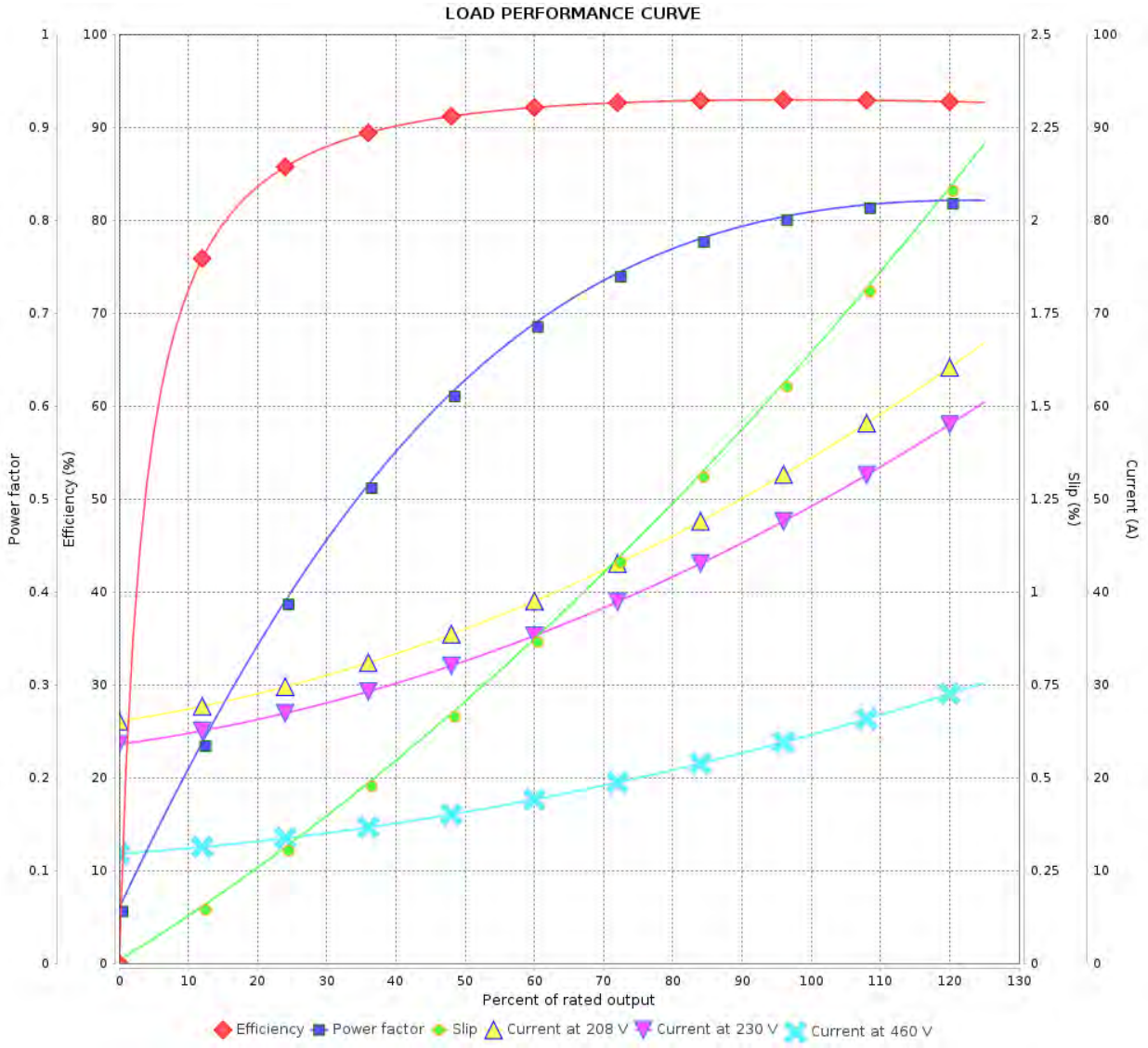
Performed by				
Checked by			Page	Revision
Date	04/01/2024		3 / 5	

LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion Proof NEMA Premium Efficiency Three-Phase	Product code :	14390089
		Catalog # :	02018XT3E256T



Performance	: 230/460 V 60 Hz 4P		
Rated current	: 50.0/25.0 A	Moment of inertia (J)	: 2.89 sq.ft.lb
LRC	: 7.5	Duty cycle	: Cont.(S1)
Rated torque	: 59.3 ft.lb	Insulation class	: F
Locked rotor torque	: 300 %	Service factor	: 1.15
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1770 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	04/01/2024		4 / 5	

VFD OPERATION CURVE

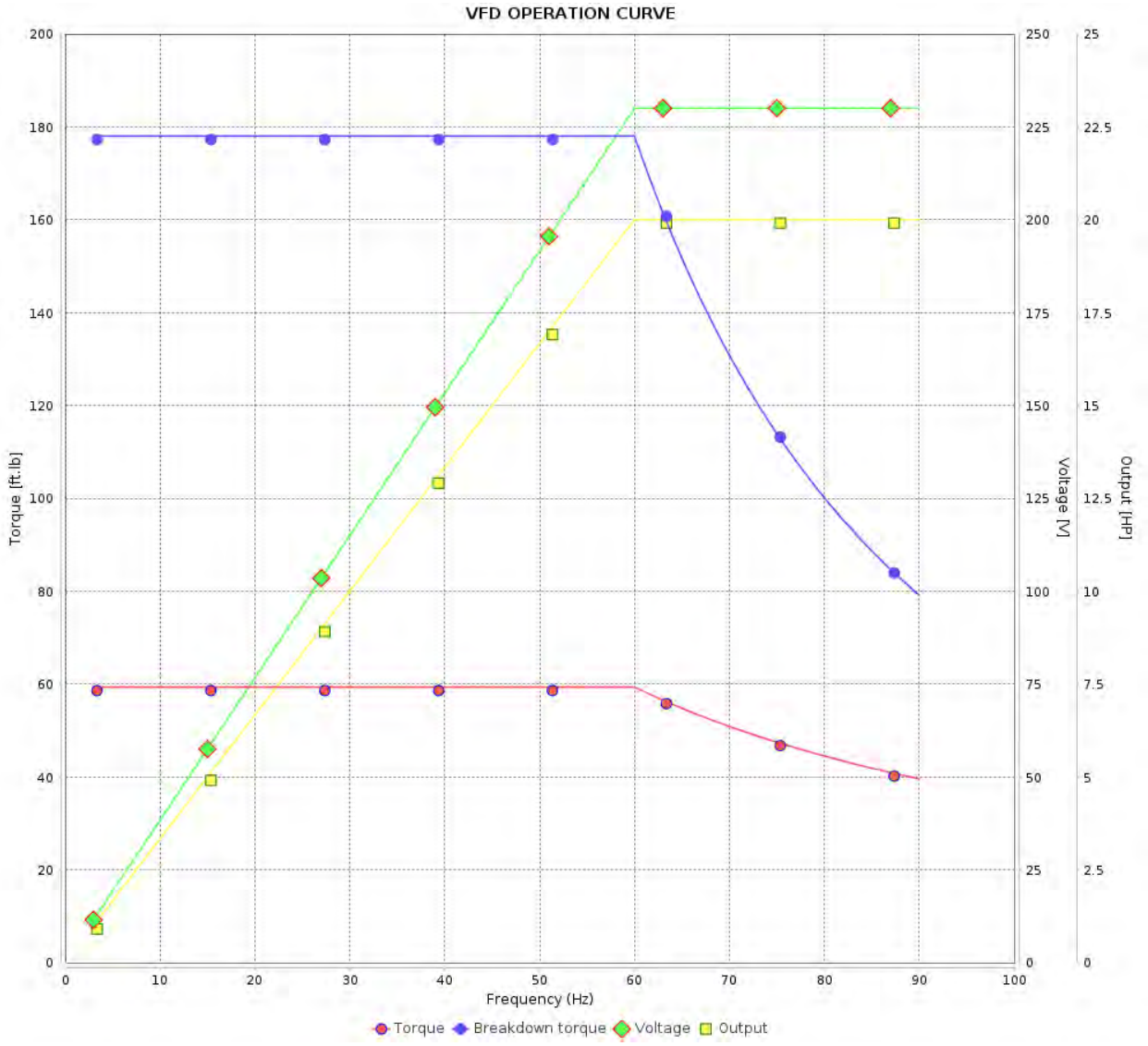
Three Phase Induction Motor - Squirrel Cage

Customer :

Product line : W21 Explosion Proof NEMA Premium Efficiency Three-Phase

Product code : 14390089

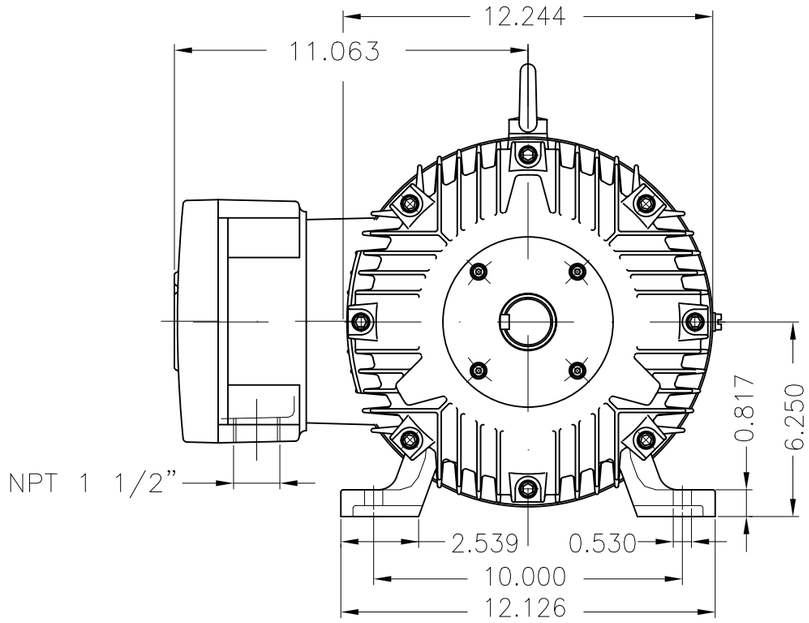
Catalog # : 02018XT3E256T

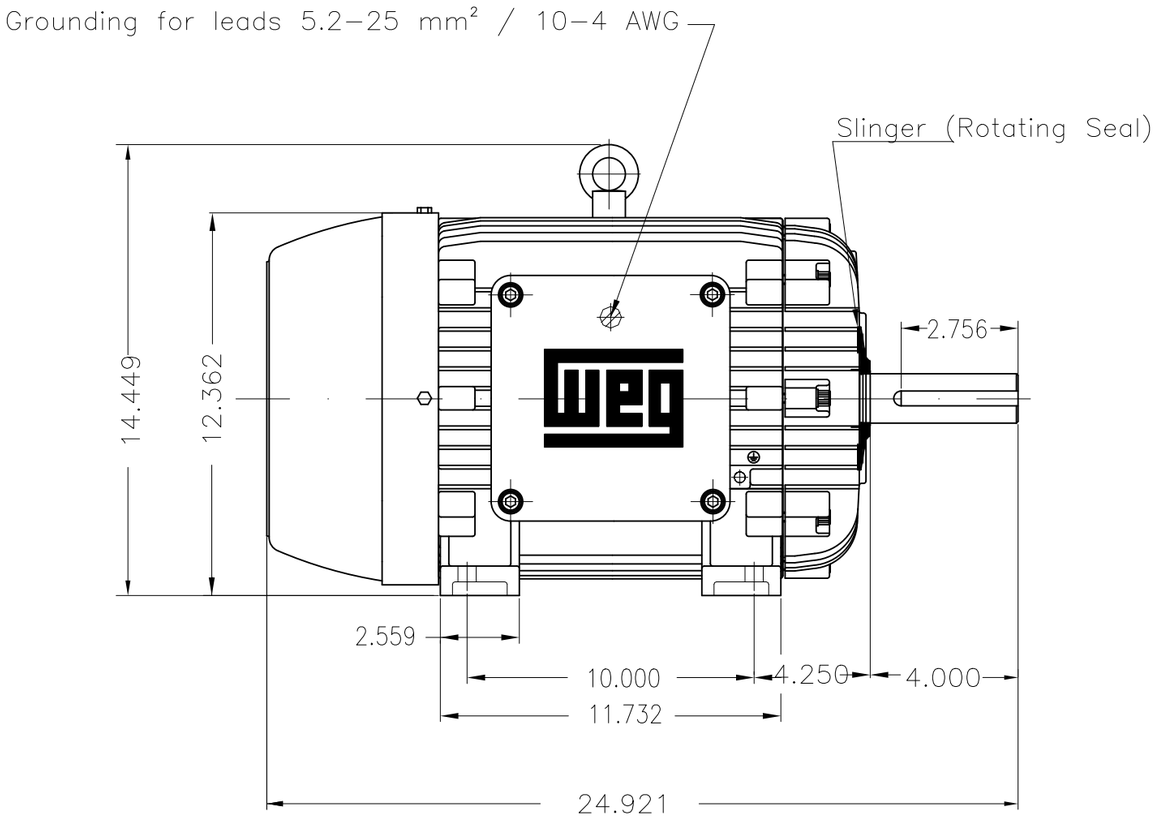


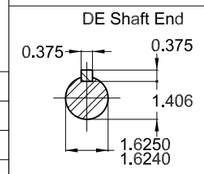
Performance	: 230/460 V 60 Hz 4P		
Rated current	: 50.0/25.0 A	Moment of inertia (J)	: 2.89 sq.ft.lb
LRC	: 7.5	Duty cycle	: Cont.(S1)
Rated torque	: 59.3 ft.lb	Insulation class	: F
Locked rotor torque	: 300 %	Service factor	: 1.15
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1770 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	04/01/2024		5 / 5	







Color RAL 5009
Painting plan 202P
Mounting NEMA F-1
Mounting B3R(D)

20 HP 04 Poles 60 Hz | A

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
			HYBRISUSER				00

EXECUTED	HYBRISUSER	THREE PH. MOTOR EXPLOSION PROOF NEMA PREM. EFF.	PREVIEW
CHECKED		FRAME 256T IP55 TEFC	WDD 00
RELEASED			
REL. DATE		WMO Jaragua do Sul Product Engineering	SHEET 1 / 1

Dimensions in inches
XME A3

MADE IN BRAZIL

W21X NEMA Premium®

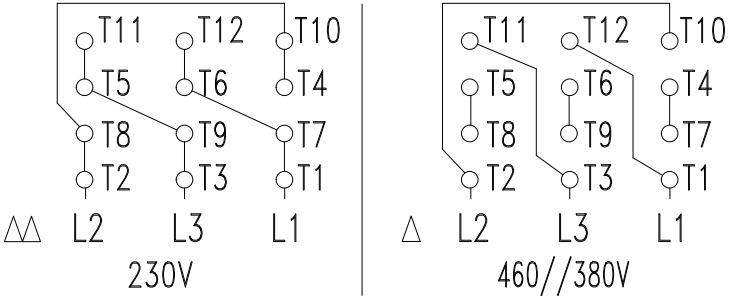
14390089

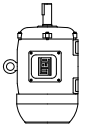
CC029A
Inverter Duty Motor
Severe Duty

LISTED

MODEL 02018XT3E256T

PH 3	FR 256T	
HP(kW) 20.0(15.0)	HZ 60	IP55
V 230/460	A 50.0/25.0	
RPM 1770	NEMA NOM EFF 93.0%	
PF 0.81	SFA 57.5/28.7	DES B
INS CL F ΔT 80 K	SF 1.15	ENCL TEFC
DUTY CONT.	CODE J	ALT 1000 m.a.s.l.
AMB 40°C		
AMB 55°C SF1.0		
20HP 15kW 50Hz 380V 29.8A 1455RPM SF1.00 EFF 91.0% (IE2)		





→ 6309—C3 MOBIL POLYREX EM
→ 6209—C3 13 g 20000 h

373 Lbs

C SA® US
Energy Verified

TEMP CODE T3C
CSA/UL: Class I – Div. 1 – Groups C and D
CSA: Class II – Div. 1 – Groups F and G
CSA: Class I – Zone 1 – IIB
EXPLOSION PROOF MOTOR
FOR USE ON VPWM VFD 1000:1VT, 6:1CT, 1.0SF, T3C, AMB 40°C.

PRESSURE GAUGE

Dwyer

SERIES 2000

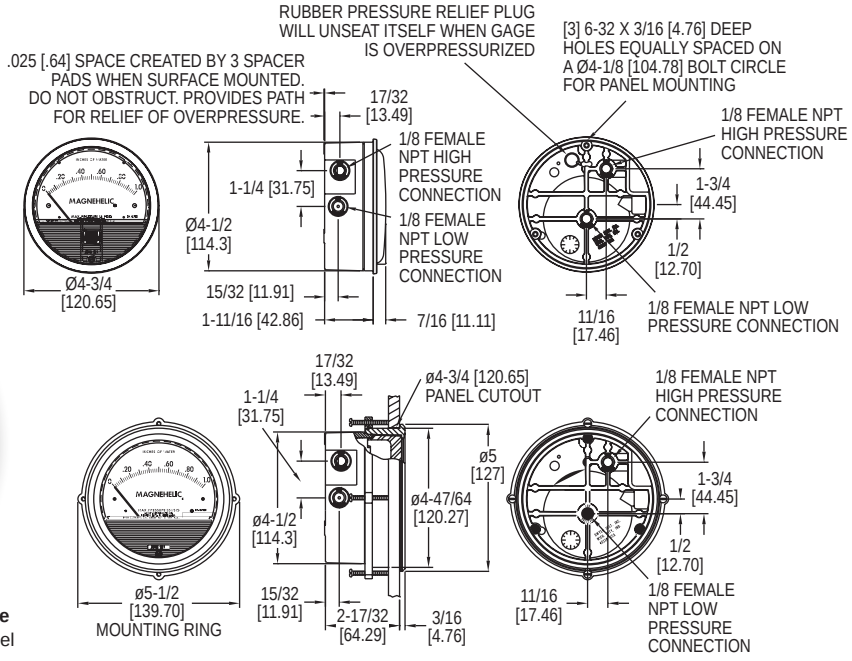
MAGNEHELIC® DIFFERENTIAL PRESSURE GAGES

Indicate Positive, Negative or Differential, Accurate within 1%

5 YEAR LIMITED WARRANTY

Standard Magnehelic® Gage

High Accuracy Magnehelic® Gage
Note: Shown with optional -SS bezel



Select the **SERIES 2000** Magnehelic® Gage for a versatile low differential pressure gage with a wide choice of 81 models and 27 options to choose from. Using Dwyer's simple, frictionless Magnehelic® gage movement, it quickly indicates air or non-corrosive gas pressures--either positive, negative (vacuum) or differential. The design resists shock, vibration, over-pressures and is weatherproof to IP67.
Select the –HA High Accuracy Magnehelic® gage option for an accuracy within 1% of full scale. Also included with the –HA option at no extra cost are a mirrored scale overlay and a 6 point calibration certificate.

FEATURES/BENEFITS

- Easy to read gage through undistorted plastic face permits viewing from far away
- Patented design provides quick response to pressure changes means no delay in assessing critical situations
- Durable and rugged housing and high-quality components combine to provide long-service life and minimized down-time
- High accuracy option is twice as accurate as the standard Magnehelic® gage

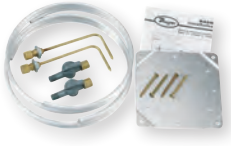
APPLICATIONS

- Filter monitoring
- Air velocity with Dwyer pitot tube
- Blower vacuum monitoring
- Fan pressure indication
- Duct, room or building pressures
- Clean room positive pressure indication

ACCESSORIES	
Model	**Description**
A-432	Portable kit; combine carrying case with any Magnehelic® gage of standard range, except high pressure connection. Includes 9 ft (2.7 m) of 3/16″ ID rubber tubing, standhang bracket and terminal tube with holder
A-605	Air filter gage accessory kit; adapts any standard Magnehelic® gage for use as an air filter gage. Includes aluminum surface mounting bracket with screws, two 5 ft (1.5 m) lengths of 1/4″ aluminum tubing, two static pressure tips and two molded plastic vent valves, integral compression fittings on both tips and valves
A-605B	Air filter gage accessory kit; air filter kit with two plastic open/close valves, two 4″ steel static tips, plastic tubing and mounting flange
A-605C	Air filter gage accessory kit; air filter kit with two plastic open/close valves, two plastic static tips, plastic tubing and mounting flange

SPECIFICATIONS	
Service: Air and non-combustible, compatible gases (natural gas option available). **Note:** May be used with hydrogen. Order a Buna-N diaphragm. Pressures must be less than 35 psi. **Wetted Materials:** Consult factory. **Housing:** Die cast aluminum case and bezel, with acrylic cover. Exterior finish is coated gray to withstand 168 hour salt spray corrosion test. **Accuracy:** ±2% (-HA model ±1) of FS (±3% (-HA ±1.5%) on -0, -100PA, -125PA, -10MM and ±4% (-HA ±2%) on -00, -60PA, -6MM ranges), throughout range at 70°F (21.1°C). **Pressure Limits:** -20 in Hg to 15 psig (-0.677 to 1.034 bar); MP option: 35 psig (2.41 bar); HP option: 80 psig (5.52 bar). **Enclosure Rating:** IP67. **Overpressure:** Relief plug opens at approximately 25 psig (1.72 bar), standard gages only.❶	**Temperature Limits:** 20 to 140°F* (-6.67 to 60°C). -20°F (-28°C) with low temperature option. **Size:** 4″ (101.6 mm) diameter dial face. **Mounting Orientation:** Diaphragm in vertical position. Consult factory for other position orientations. **Process Connections:** 1/8″ female NPT duplicate high and low pressure taps - one pair side and one pair back. **Weight:** 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g). **Standard Accessories:** Two 1/8″ NPT plugs for duplicate pressure taps, two 1/8″ pipe thread to rubber tubing adapter, and three flush mounting adapters with screws. (Mounting and snap ring retainer substituted for three adapters in MP & HP gage accessories.) **Agency Approvals:** Meets the technical requirements of EU Directive 2011/65/EU (RoHS II). **Note:** -SP models not RoHS approved.
Note: For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.	
*Low temperature models available as special options.	

A-432



A-605

❶**Over Protection Note: See page 21 (Series 2000)**

Dwyer

SERIES 2000

MAGNEHELIC® DIFFERENTIAL PRESSURE GAGES

Indicate Positive, Negative or Differential, Accurate within 1%

Bezel provides flange for flush mounting in panel.

Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.

Precision litho-printed scale is accurate and easy to read.

Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.

Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on the helix shaft.

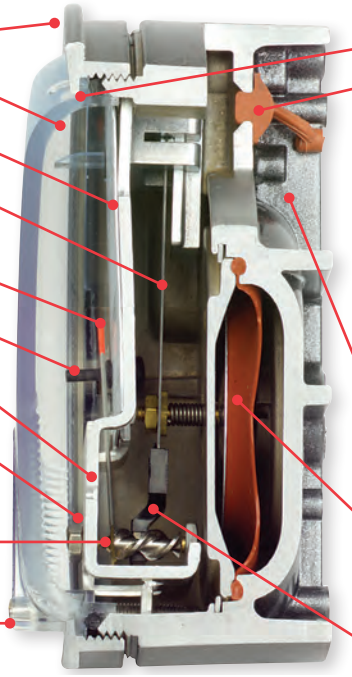
Pointer stops of molded rubber prevent pointer over-travel without damage.

"Wishbone" assembly provides mounting for helix, helix bearings and pointer shaft.

Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.

Helix is precision made from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely, following the magnetic field to move the pointer across the scale.

Zero adjustment screw is conveniently located in the plastic cover, and is accessible without removing cover. O-ring seal provides pressure tightness.



O-ring seal for cover assures pressure integrity of case.

OVERPRESSURE PROTECTION
Blowout plug is comprised of a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches approximately 25 psig (1.7 bar). To provide a free path for pressure relief, there are four spacer pads which maintain 0.023″ clearance when gage is surface mounted. Do not obstruct the gap created by these pads.
The blowout plug is not used on models above 180″ of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.
The blowout plug should not be used as a system overpressure control. High supply pressures may still cause the gage to fail due to over pressurization, resulting in property damage or serious injury. Good engineering practices should be utilized to prevent your system from exceeding the ratings of any component.

Die cast aluminum case is precision made and iridite-dipped to withstand 168 hour salt spray corrosion test. Exterior finished in baked dark gray hammerloid. One case size is used for all standard pressure options, and for both surface and flush mounting.

Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.

Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.

MODEL CHART

Model	Range, Inches of Water
2000-00N†••	.05-0-.2
2000-00†••	0-.25
2000-0†•	0-.50
2001	0-1.0
2002	0-2.0
2003	0-3.0
2004	0-4.0
2005	0-5.0
2006	0-6.0
2008	0-8.0
2010	0-10
2012	0-12
2015	0-15
2020	0-20
2025	0-25
2030	0-30
2040	0-40
2050	0-50
2060	0-60
2080	0-80
2100	0-100
2120	0-120
2150	0-150
2160	0-160
2180*	0-180
2250*	0-250
Zero Center Ranges	
2300-00†••	0.125-0-0.125
2300-0†•	.25-0-.25
2301	.5-0-.5
2302	1-0-1
2304	2-0-2
2310	5-0-5
2320	10-0-10
2330	15-0-15

Model	Range, PSI
2201	0-1
2202	0-2
2203	0-3
2204	0-4
2205	0-5
2210*	0-10
2215*	0-15
2220*	0-20
2230**	0-30

Model	Range, CM of Water
2000-15CM	0-15
2000-20CM	0-20
2000-25CM	0-25
2000-50CM	0-50
2000-80CM	0-80
2000-100CM	0-100
2000-150CM	0-150
2000-200CM	0-200
2000-250CM	0-250
2000-300CM	0-300
Zero Center Ranges	
2300-4CM	2-0-2
2300-10CM	5-0-5
2300-30CM	15-0-15

Model	Range, MM of Water
2000-6MM†••	0-6
2000-10MM†•	0-10
2000-15MM	0-15
2000-25MM	0-25
2000-30MM	0-30
2000-50MM	0-50
2000-80MM	0-80
2000-100MM	0-100
2000-125MM	0-125
2000-150MM	0-150
2000-200MM	0-200
2000-250MM	0-250
2000-300MM	0-300
Zero Center Ranges	
2300-6MM†••	3-0-3
2300-10MM†•	5-0-5
2300-20MM†•	10-0-10
Model	**Range, Pa**
2000-60NPA†••	10-0-50
2000-60PA†••	0-60
2000-100PA†•	0-100
2000-125PA†•	0-125
2000-250PA	0-250
2000-300PA	0-300
2000-500PA	0-500
2000-750PA	0-750
2000-1000PA	0-1000
Zero Center Ranges	
Model	**Range, Pa**
2300-60PA†••	30-0-30
2300-100PA†•	50-0-50
2300-120PA	60-0-60
2300-200PA	100-0-100
2300-250PA	125-0-125
2300-300PA	150-0-150
2300-500PA	250-0-250
2300-1000PA	500-0-500

Model	Range, kPa
2000-0.5KPA	0-0.5
2000-1KPA	0-1
2000-1.5KPA	0-1.5
2000-2KPA	0-2
2000-2.5KPA	0-2.5
2000-3KPA	0-3
2000-4KPA	0-4
2000-5KPA	0-5
2000-8KPA	0-8
2000-10KPA	0-10
2000-15KPA	0-15
2000-20KPA	0-20
2000-25KPA	0-25
2000-30KPA	0-30
Zero Center Ranges	
2300-1KPA	.5-0-.5
2300-2KPA	1-0-1
2300-2.5KPA	1.25-0-1.25
2300-3KPA	1.5-0-1.5

Dual Scale Air Velocity Units
For use with pitot tube

Model	Range, in w.c./ Velocity F.P.M.
2000-00AV†••	0-.25/ 300-2000
2000-0AV†•	0-.50/ 500-2800
2001AV	0-1.0/ 500-4000
2002AV	0-2.0/ 1000-5600
2005AV	0-5.0/ 2000-8800
2010AV	0-10/ 2000-12500

Dual Scale English/Metric Models

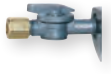
Model	Range, in w.c.	Range, Pa or kPa
2000-00D†••	0-.25	0-62 Pa
2000-0D†•	0-0.5	0-125 Pa
2001D	0-1.0	0-250 Pa
2002D	0-2.0	0-500 Pa
2003D	0-3.0	0-750 Pa
2004D	0-4.0	0-1.0 kPa
2005D	0-5.0	0-1.25 kPa
2006D	0-6.0	0-1.5 kPa
2008D	0-8.0	0-2.0 kPa
2010D	0-10	0-2.5 kPa
2015D	0-15	0-3.7 kPa
2020D	0-20	0-5 kPa
2025D	0-25	0-6.2 kPa
2050D	0-50	0-12.4 kPa
2060D	0-60	0-15 kPa

†These ranges calibrated for vertical scale position • Accuracy ±3% •• Accuracy ±4% *MP option standard **HP option standard

VELOCITY AND VOLUMETRIC FLOW UNITS
Scales are available on the Magnehelic® gage that read in velocity units (FPM, m/s) or volumetric flow units (SCFM, m^3/s, m^3/h). Stocked velocity units with dual range scales in inches w.c. and feet per minute are shown above. For other ranges contact the factory. When ordering volumetric flow scales please specify the maximum flow rate and its corresponding pressure.
Example: 0.5 in w.c. = 16,000 CFM.

ACCESSORIES

Model	Description
A-321	Safety relief valve
A-448	3-piece magnet kit for mounting Magnehelic® gage directly to magnetic surface
A-135	Rubber gasket for panel mounting
A-401	Plastic carry case
A-310A	3-way vent valves. In applications where pressure is continuous and the Magnehelic® gage is connected by metal or plastic tubing which cannot be easily removed, we suggest using Dwyer A-310A vent valves to connect gage. Pressure can then be removed to check or re-zero the gage.



A-310A

MIST AND GREASE FILTER

6050 PEACHTREE PKWY, SUITE 240-187 ATLANTA, GA 30092
Ph: 678-935-1431, Fax: 678-935-0648

MIST & GREASE FILTER INFORMATION

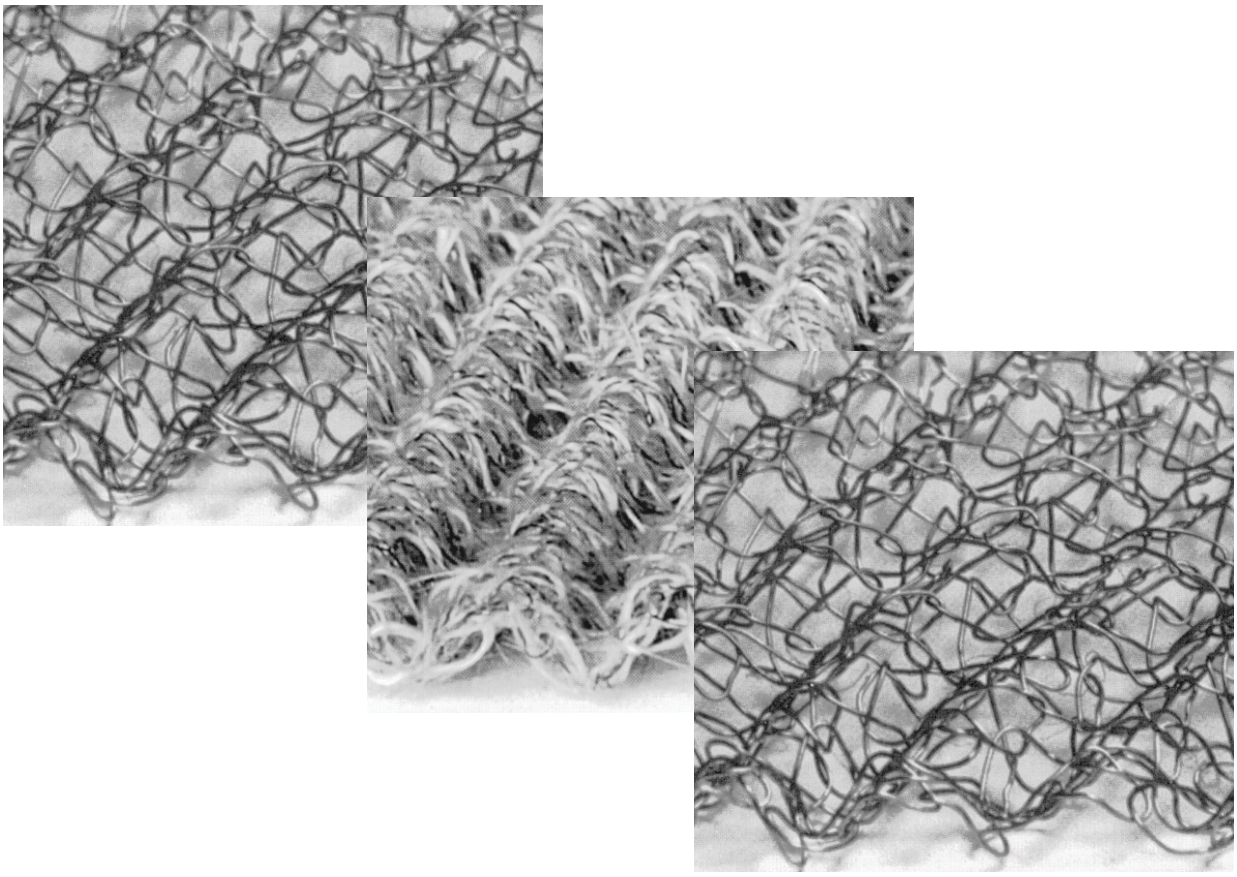
(This mist and grease filter is 99.9% efficient with water droplets 2 microns or greater. The mist and grease filter is constructed of 316L wire mesh and Fiberglass mesh. The style is 3BA/6BE/3BA. Please see the information in this section for further detail. The size of the filter varies but the initial pressure drop through the filter will be .4 iwg.)

MIST and GREASE ELIMINATOR SYSTEM

This magnified view shows the three stages of the Pure Air Filtration ultra high efficiency Mist and Grease eliminator system.

In the direction of airflow the system consists of a section of crimped stainless steel wire mesh, followed by a second section of co-knit stainless steel mesh with fiberglass yarn, and a final section of crimped stainless steel. The crimped stainless steel mesh has a pad surface area of 200ft2/ft3, and the co-knit mesh has a pad surface area in excess of 3648 ft2/ft3 to ensure 99.9% removal down to 2 micron mists in an efficient coalescing manner without flooding or carry over.

Greases and fatty acids are removed in a depth loading manner to achieve huge capacities without significant pressure changes, allowing extended life between cleaning. This is a permanent filter and can be cleaned with solvents, detergents or high pressure streams.



The Engineered Mist Eliminator

Reduce Costs

Increase Capacity

Improve Performance

Debottleneck Equipment

Simplify Installation

Customize Pads

SEPARATIONS & MASS-TRANSFER PRODUCTS

ACS Industries, LP • Houston, Texas • USA

800-231-0077

14211 Industry Road • Houston, TX 77053 • **TEL:** 713-434-0934 • **FAX:** 713-433-6201

eMail: separations@acsind.com • ***Visit our web site*** www.acsseparations.com

Table of Contents

Introduction 1

Droplet Formation and Size Distributions 1

Mechanisms of Droplet Removal 2

Types of Mist Eliminator Mesh & Materials . . .4

Design Equations 6

Predicting Pressure Drop 7

Inlet Diffusers 7

Vessel Configuration 8

Advanced Mist Eliminator Designs 10

Vane-Mesh Assemblies 11

Use of Geometry 11

MultiPocket™ Vanes 11

Case Studies & Examples 12

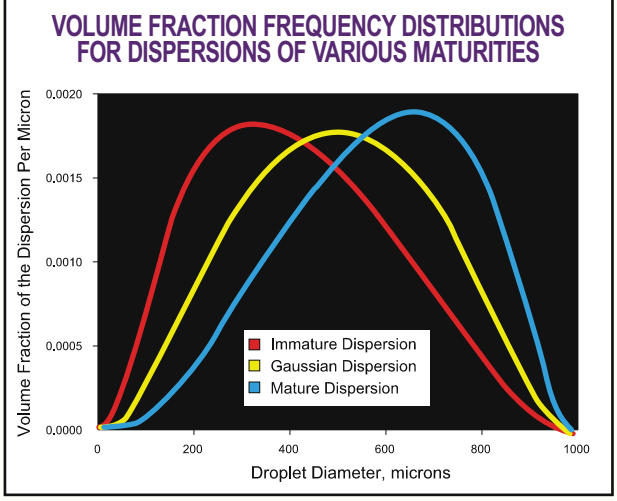
The Engineered Mist Eliminator

Mist elimination, or the removal of entrained liquid droplets from a vapor stream, is one of the most commonly encountered processes regardless of unit operation. Unfortunately, mist eliminators are often considered commodity items and are specified without attention to available technologies and design approaches. The engineered mist eliminator may reduce liquid carryover by a factor of one hundred or more relative to a standard unit, drop head losses by 50% or more, or increase capacity by factors of three or four. This manual summarizes cost effective approaches to reducing solvent losses or emissions, extending equipment life and maintenance cycles using proven and cost effective technologies and techniques.

Droplet Formation and Size Distributions

Entrained liquid does not consist of same-sized droplets, but as a broad range of droplet sizes that may be characterized with a Normal or Bell Distribution centered about some mean or average. The average droplet size depends very much on the mechanism by which they are generated. Sizing equations are expressed in terms of the probability of removing a droplet of a given diameter, and mist eliminator performance is the integration or cumulative sum of individual removal efficiencies. It is therefore critical to know the approximate droplet size distribution in order to properly design a mist elimination system. Figure 1 show some typical size distribution curves from different sources.

FIGURE 1



In practice, designers or engineers do not quantify or measure droplet size distributions, rather they are assumed based on empirical data or experience. Fortunately, an experienced engineer can assume an approximate distribution based on the means or mechanism by which the droplets are generated. Typical examples from common mist sources are given to illustrate these concepts.

Fine droplet distributions, often called *fogs* (<3 µm diameter particles with an average typically in the submicron range), occur in high speed metal stamping in which cycles of extreme frictional heating and shock condensation of lubricating oils form droplets in the submicron range, so-called "blue smoke". This smoke is removed to comply with health and environmental regulations.

Fog is also produced when gas phase reactions form a liquid product as in the case of vapor phase SO_3 and water yielding H_2SO_4. Downstream

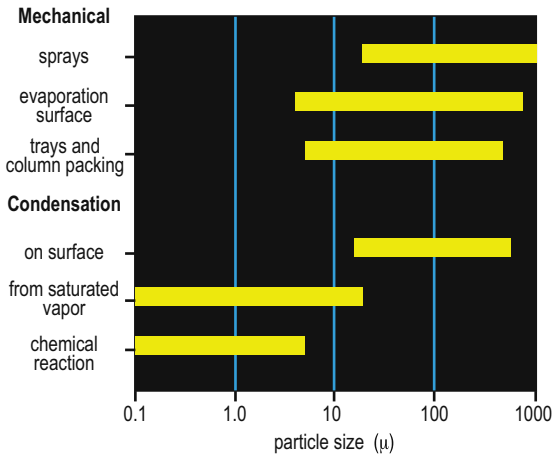
equipment corrodes rapidly without the removal of this liquid. Similar concerns are found in ammonia prill towers, many chlorine applications, as well as phosphoric and nitric acid plants.

A *mist* consists of droplets in the range of 3µm and greater, though distributions with average diameters 20 µm and greater are termed *Sprays*. Mist coming off the top of packing or trays, or generated by surface evaporation, are typically in the broad range of 5-800 µm. In towers used in glycol dehydration and amine sweetening in which mists are a major source of costly solvent losses, removal of droplets down to 5 µm is recommended.

Hydraulic spray nozzles generate particles of diameters greater than 50 µm and pneumatic nozzles greater than 10 µm, with upper limits reaching 1000 µm.

The first step in engineering a mist eliminator is to determine the mechanism by which the droplets are generated and assume an average droplet size. Figure 2 summarizes typical particle size distributions caused by various mechanisms:

FIGURE 2

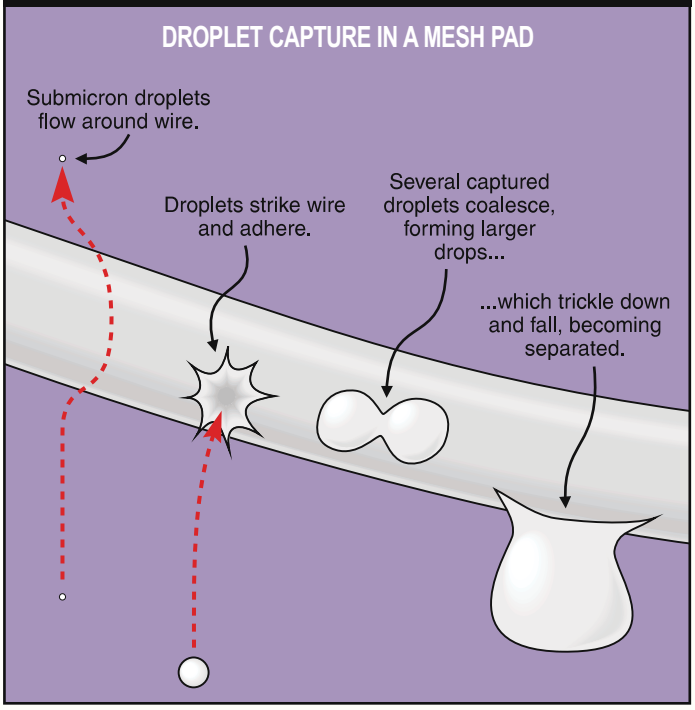


This manual contains basic design concepts used by engineers to remove droplets greater than 3 µm in diameter, so called mists and sprays.

Mechanisms of Droplet Removal

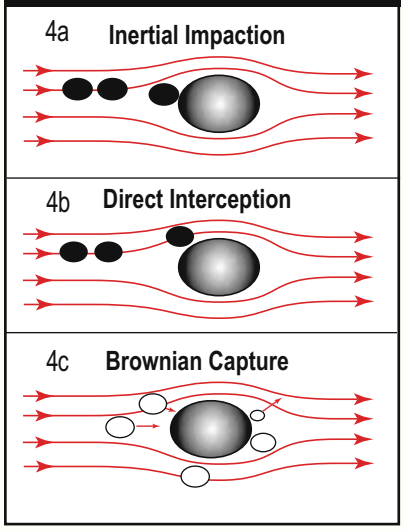
Droplets are removed from a vapor stream through a series of three stages: collision & adherence to a target, coalescence into larger droplets, and drainage from the impingement element. Knowing the size distributions as explained above is important because empirical evidence shows that the target size - important in the first step of removal - must be in the order of magnitude as the particles to be removed. These steps are shown schematically in Figure 3 for mist elimination using a wire mesh mist elimination.

FIGURE 3



For fogs in which the bulk of the droplets are characterized with submicron diameters, the energy to bring about the collision with the target is derived from Brownian Diffusion, the random motion of fine liquid particles as they are pushed about by molecular action as shown in Figure 4c. Fog elimination with so-called fiberbed technology is beyond the scope of this manual.

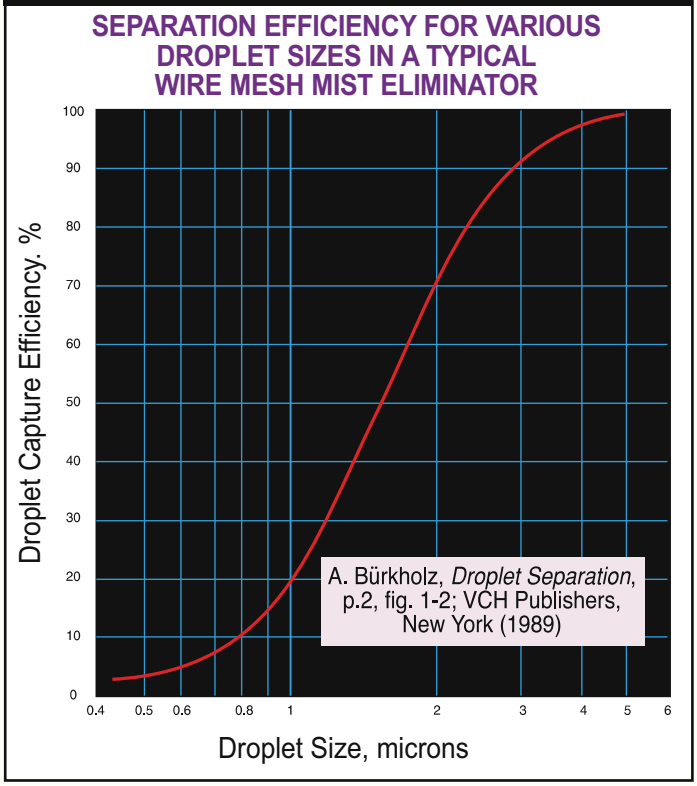
FIGURE 4



For particles in the mist region between 3-20 µm, knitted wire mesh is most common type of mist eliminator used and Interception is the

primary mechanism. Consider a droplet approaching a mesh filament of much larger diameter as shown in Figure 4b. The more dense the droplet relative to the gas, the larger the droplet relative to the filament, and the higher the gas velocity, the more likely it is that the droplet will strike the filament. If the velocity is too low, or the droplet too small or too light compared to the gas, the droplet will simply flow around the filament with the gas. If the velocity is too high, liquid clinging to the filaments will be re-entrained, mostly as larger droplets, and carried away by the gas. Re-entrainment is also promoted by low relative liquid density (making it easier for the gas to pick up a droplet) and low liquid surface tension (as less energy is required to break up a film or droplet). The engineered wire mesh mist eliminator may remove 99.9% of particles 2 µm and greater diameter. Figure 5 shows a typical removal efficiency vs droplet size distribution for a wire mesh mist eliminator.

FIGURE 5



Droplets ~20 µm and greater are primarily collected by means of Inertial Impaction whereby the target is directly in the path of the streamline, as shown in Figure 4a. Figure 6 depicts a profile of the ACS PlatePak™ vane. The entrained droplets, due to their momentum, tend to move in straight lines. By studying this figure, it is easy to understand why in the design equations to follow the removal efficiency is directly proportional to the difference in densities of the liquid droplet and carrying gas. With each change in direction of the gas, some droplets collide with the surface and adhere, eventually coalescing into larger droplets which then drain by gravity. Properly designed vane mist eliminators can remove 99% of particles as low as 10 µm in diameter, especially at lower pressures.

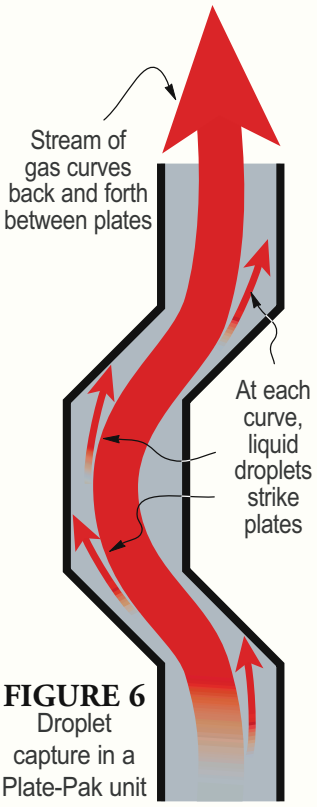


FIGURE 6
Droplet capture in a Plate-Pak unit

Figure 7 illustrates typical wire mesh and PlatePak™ vane mist eliminators, and Figure 8 shows some typical performance curves for both mesh and vane mist eliminators.

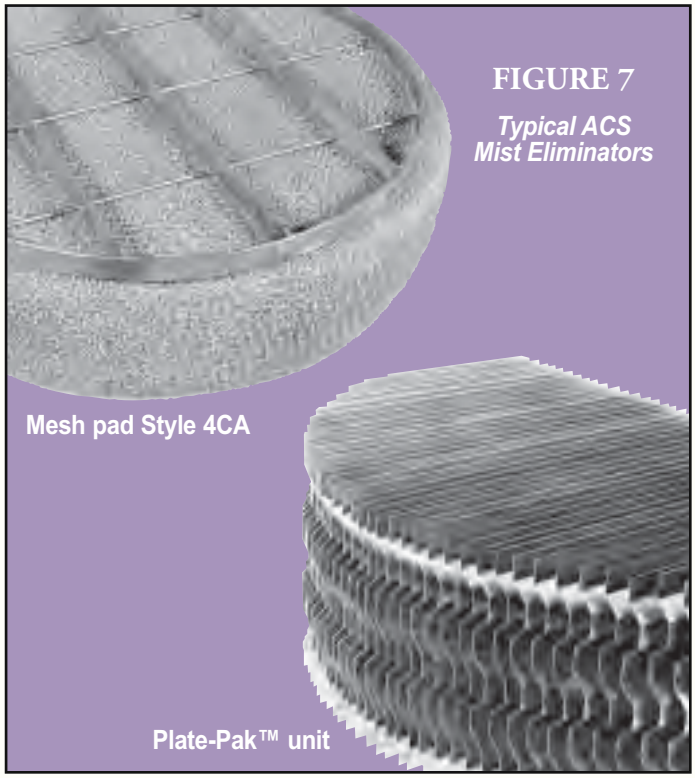
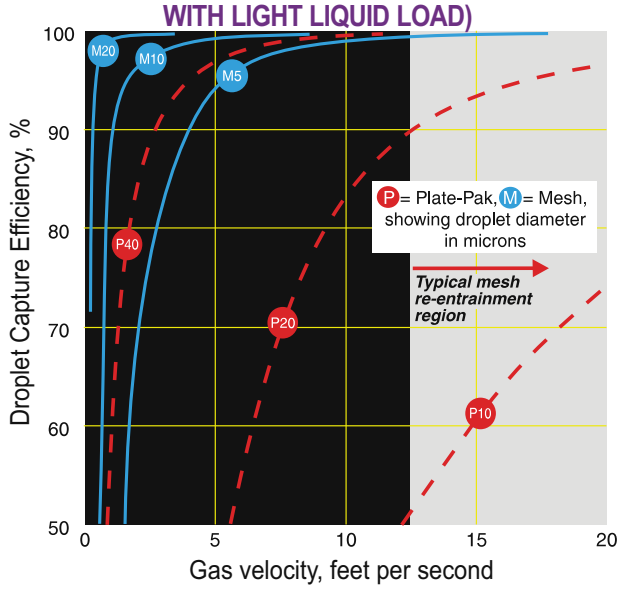


FIGURE 7
Typical ACS Mist Eliminators

FIGURE 8

THEORETICAL EFFICIENCY VS. VELOCITY FOR VARIOUS DROPLET SIZES (WATER IN AIR AT AMBIENT CONDITIONS FOR TYPICAL MESH PADS AND PLATE-PAK™ UNITS WITH LIGHT LIQUID LOAD)



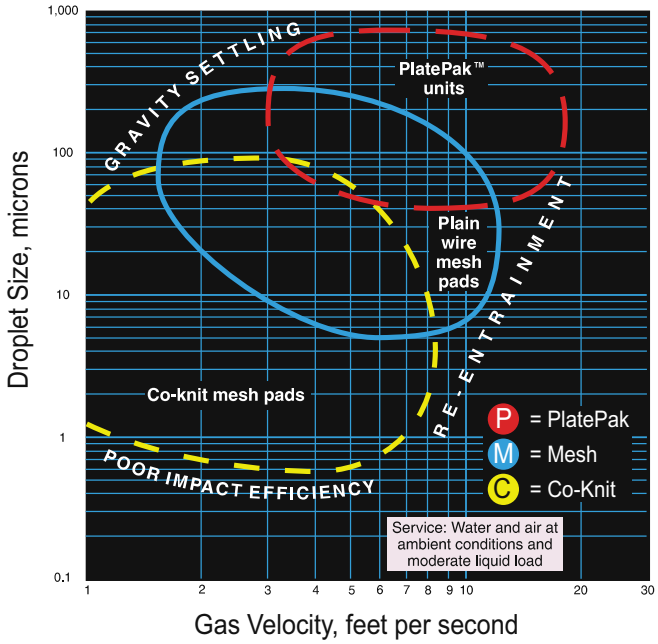
It is worthwhile to discuss Fig. 8 and mist eliminator performance. The dotted curves correspond to different styles of vanes and the solid to wire mesh styles. Note first of all that vanes can be engineered to operate at higher gas velocities and flow rates relative to mesh, but that mesh mist eliminators can approach 100% removal efficiency at smaller droplet sizes. This agrees with the discussions above on Interception and Inertial Impaction removal mechanisms. Note the drastic efficiency drop off at low velocities, in which droplets drift around the filaments or vane blades without striking them. This phenomenon defines the lower operating range of a mist eliminator. The other extreme is when the velocity is too high. In this case, the droplets are captured but the velocity of the gas provides sufficient energy to tear-off and re-entrain droplets. It is in the context of re-entrainment that the design equations which follow show that the removal efficiency is directly proportional to the surface tension of the liquid. As the surface tension increases, so it requires greater kinetic energy (i.e. gas velocity) to break the bond between droplet and target, and the droplets collect and coalesce until drainage by gravity. Re-entrainment defines the upper capacity limit of a mist eliminator.

Operating range is also affected by the liquid loading (proportion of liquid) of the gas. If too great, the mist eliminator becomes choked with liquid, a condition called flooding. Flooding is often noticed by high pressure drops or massive carryover of liquids. Typical wire mesh mist eliminators accommodate liquid loads up to about one US gallon per square foot and vanes twice as much.

The key operating ranges and suitability of mesh and vane mist eliminators is summarized in Figure 9. It emphasizes that vanes are more effective at higher velocities and greater droplet sizes while mesh is more suitable for removing smaller particles at lower velocities. Gravity settling alone is sufficient for very large particles, and co-knit mesh pads, discussed below, for particles in the range of sizes from 2-8 µm. Finally, fiberbed technology is used for submicron fogs.

FIGURE 9

APPROXIMATE OPERATING RANGES OF MIST ELIMINATORS



Types of Mist Eliminator Mesh Styles & Materials

Most designers believe that all wire mesh mist eliminators behave basically the same in terms of capacity and removal efficiency. It is true that for meshes of same filament diameter, the denser mesh offers superior removal efficiency. For meshes with differing filament diameters, a lighter (less dense) mesh may offer considerably better removal efficiency. The key is that the working part of the mesh is the target density, not

the mass density. For example, the most common 9-lb density mesh, ACS style 4CA, exhibits ~85 sq-ft/cu-ft of surface area. Compare this to the co-knit of a metal with fiberglass (ACS style 6BE) which also exhibits 9-lb mass density but exhibits a specific surface area approaching 3,700 sq-ft/cu-ft, some 40X greater targets per unit volume.

Table 1 shows a few of the more common mesh styles available, together with mesh density and void fraction, and most importantly, the diameter and specific surface area (i.e. the target density) of filaments used.

TABLE 1 • *Wire and Plastic Mesh Styles*

Mesh Style	Density lbs/ft³	Diameter D, inches	Surface, S, ft²/ft³	Percent Voids, ε
Metal mesh				
7CA	5.0	0.011	45	99.0
5CA	7.0	0.011	65	98.6
4CA	9.0	0.011	85	98.2
4BA	12.0	0.011	115	97.6
3BF	7.2	0.006	120	98.6
3BA	12.0	0.006	200	97.6
Plastic mesh				
8P	4.0	0.011	130	92.0
8K	4.0	0.011	160	96.3
8T	4.0	0.011	130	97.0

Mesh Style	Density lbs/ft³	Diameter D, inches	Surface, S, ft²/ft³	Percent Voids, ε
Metal mesh				
8D	9	0.0008	485	99.0
8TMW11	12	0.0008	485	99.0
6BE	9	0.00036	3725	99.0
Plastic mesh				
8PP	3	0.001	530	99.0
8TT	5	0.0008	530	99.0

It is the amount of targets per unit volume which influences removal efficiency, not the density of mesh (the greater the number of targets the greater the probability of a successful collision).

In a co-knit such as a metal alloy and fiberglass, the alloy provides a skeleton for structural support and prevents the high specific surface media from collapsing on itself.

As far back as the 1950's researchers (C. LeRoy Carpenter et al) determined that specific surface area and target or filament diameter play a great role in removal efficiency. Target or filament diameter must be on the order of magnitude as the smallest droplets to be removed. Due to limitations in metal wire ductility and corrosion considerations, co-knits provide finer targets and hence remove finer droplets. Figures 8 and 9 are enlarged images of crimped wire mesh and a co-knit with fiberglass respectively.

FIGURE 8

CRIMPED WIRE MESH

FIGURE 9

CO-KNIT MESH WITH FIBERGLASS YARN

In summary, it is important to report mesh styles in terms of the specific surface area - a measure of the target density, and filament diameter -a measure of the smallest droplet size that can be removed with high efficiency. The mass density is only relevant insofar that a metal mesh of density 12-lb exhibits a greater specific surface area than one of density 7-lb provided the wire diameter remains constant.

Selecting the material of mesh style(s) is also important. Corrosion rates as low as 0.005"/year is not serious in vessel walls but will quickly destroy 0.006" or 0.011" wire mesh. Table 2 gives preliminary guidelines, but ACS draws wire and knits mesh with any ductile metal for special applications.

When applying non-metal materials operating temperature limits must be considered.

TABLE 2
Mesh Corrosion & Temp. Considerations

Material	Spec. Grav.	Max. Op. Temp., °F	Typical Surface
304 SS	1.00	---	Petroleum, aqueous
304L	1.00	---	Petroleum, aqueous
316L	1.00	---	Sulfuric acid
410 SS	1.00	---	Mild chemicals
Monel®	1.12	---	Corrosive chemicals
Nickel	1.13	---	Caustic evaporators
Alloy 20	1.00	---	Sulfuric acid
Glass	2.52	---	Mild aqueous chemicals
Hasteloy®	1.14	---	Hydrochloric & other acids
Dacron®	1.38	350	Co-knit applications
Kynar®	1.75	300	Acid, alkali
Polypropylene	0.90	160	Water, acid, alkali
Teflon®	2.15	400	Hot sulfuric acid up tp 300ßF
Tefzel®	1.70	380	Acid, alkali

Design Equations

To determine mist eliminator cross-sectional area (and hence vessel size) and predict performance in terms of removal efficiency, the optimum design gas velocity is determined first. The Souders-Brown equation is used to determine this velocity based on the physical properties of the liquid droplets and carrying vapor:

$$V_d = k(\rho L - \rho G / \rho G)^{1/2} \qquad (1)$$

where V_d = design gas velocity (ft/sec)
k = Capacity Factor (ft/sec)
ρL = Liquid Density
ρG = Vapor Density

The capacity factor is determined through experience and for each application, and is influenced by type and style of mesh or vane targets used, the geometry of the targets (vertical or horizontal relative to the vapor flow), as well as by properties such as operating pressure, fluid viscosities, and liquid surface tension.

The design velocity V_d for a given application is the value that produces the best performance in terms of capturing droplets and avoiding re-entrainment. Referring to Figure 8, this ideal velocity* for a given class of mist eliminators would be somewhere toward the upper end of the range: about 10 fps for plain wire mesh pads, about 8.5 fps for co-knits, and 14 fps for PlatePak™ elements. As discussed, effectiveness drops off at lower velocities as the droplets have sufficiently low momentum to negotiate paths through the targets, and at higher velocities because the vapor carried sufficient kinetic energy to re-entrain droplets. For typical designs, acceptable velocities range between 25% to 125% of the ideal value.

The Capacity Factor may be thought of as an indication of ability of a mist eliminator to drain liquids and avoid re-entrainment under various conditions. See Table 3 for some typical baseline values.

TABLE 3
Standard Souders-Brown Coefficients (k factors) for mesh and Plate-Pak™ Units

	Pad Arrangement	k, ft/sec
1.	Horizontal Style 4CA pad	0.35
2.	Style 4CA MisterMesh® Pad	0.42
3.	Horizontal Plate-Pak™ Unit *With or without MisterMesh below*	0.50
4.	Vertical Plate-Pak™ Unit *With or without Mesh ahead*	0.65

NOTE: Water and air, room temperature, pressure below 100 psia

Note that Souders-Brown equation provides correction for only gas and liquid densities. Should any conditions exist which affects drainage or re-entrainment, the Capacity Factor must be pro-rated as appropriate.

After selecting the appropriate Capacity Factor and calculating the ideal vapor velocity, the cross-sectional area of mist eliminator is readily determined by dividing the volumetric flow rate by the velocity.

Having established this design velocity for the application, you can now predict the efficiency of a mesh pad for droplets of a particular size. This procedure is laborious and therefore well suited for a computer. The ACS MistXpert® software uses the method described below.

First, calculate the inertial parameter K as follows, using consistent units of measurement:

* For Air Water at ambient temperature and atmospheric pressure

$$K = K = [(\rho L - \rho G)Vd^2] / 9\mu D \qquad (2)$$

Where K = dimensionless inertial parameter
V =gas velocity in fps
d =Liquid droplet diameter in ft
μ =Gas viscosity in lb/ft s
D =Wire or filament diameter in ft

Use this calculated K value with Figure 10 to find the corresponding value of the impaction efficiency fraction E. From Table 1, find S, the specific surface area for the mesh style of interest.
And determine SO, of the mist eliminator perpendicular to vapor flow and with a correction factor of 0.67 to remove that portion of the knitted wire not perpendicular to the gas flow:

SO = Specific Surface Area x 1/π x Thickness (ft) x 0.67
Using these values and T, the thickness of the pad, calculate the capture efficiency:

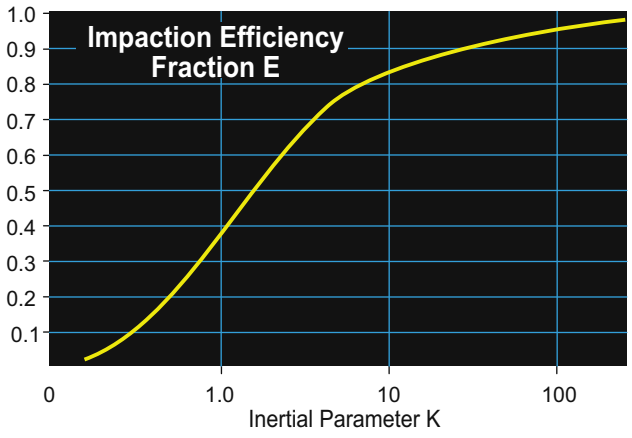
$$\text{Efficiency \%} = 100-(100/e0.213^{ESO})$$

Where S0 = Corrected Pad Specific Surface Area
E = Impaction efficiency fraction

This efficiency is the percent of all incoming droplets of the given diameter which will be captured rather than passing through the mist eliminator. The percentage will be higher for larger droplets and lower for smaller.

FIGURE 10

DETERMINING IMPACTION EFFICIENCY FRACTION E USING INERTIAL PARAMETER K



Predicting Pressure Drop

Although the operating pressure differential across a properly sized mesh pad or vane is never more than a few inches of water, pressure drop is an important design consideration in certain applications, particularly vacuum systems or larger columns requiring the movement of great quantities of gas. It has been shown that each inch of head loss requires some 0.16 hp/scfm. A simple correlation has been developed to describe the pressure drop through a dry mist eliminator (no mist):

$$\Delta P_{dry} = 0.4Vd^2 \rho_G ST/g_c \varepsilon \rho_w \qquad (3)$$

Where gc =gravitational constant
ε =Mesh Void Fraction
ρ_w =Ambient water density

The overall pressure drop is the sum of the head loss incurred as the gas travels through the mesh, as well as that due to the resistance to captured liquids. Liquid accumulates as a pool in the bottom of the mist eliminator. If the liquid loading and velocity are such that a 2" deep pool accumulates in the bottom of the mesh pad, this amount must be added to that calculated using Equation 3. Figure 11 summarizes pressure drop and velocity test data collected on the ACS pilot plant for light and medium liquid loading.

With due consideration given to the mist eliminator itself, the flow of fluid to and from it requires the same attention.

Inlet Diffusers

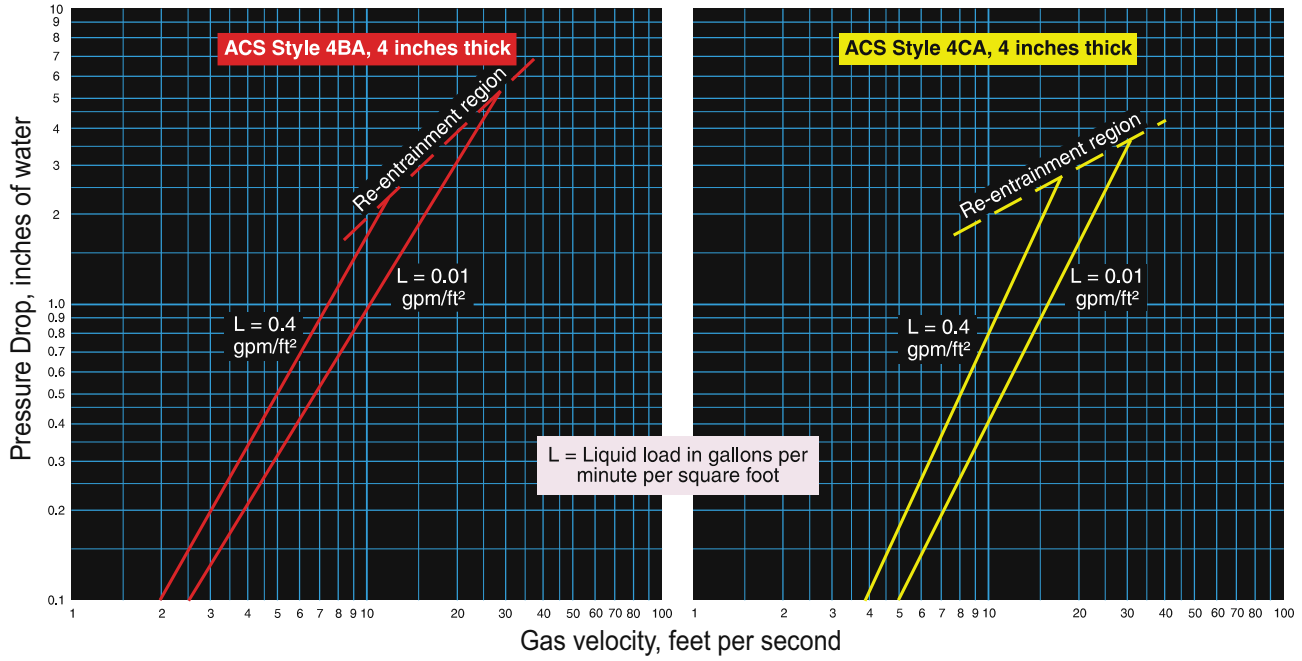
At high flow rates, primary removal of bulk liquids upstream of the mist eliminator is very important to prevent flooding. This is typically done in a cost effective manner by using a simple inlet diverter as shown in Fig. 12.

With this design, liquids impinge upon the diverters, the flow is forced to flow laterally to allow bulk liquids to escape by gravity and eliminate the countercurrent momentum of the gas.

The *Force of Inertia*, expressed as ρv^2, is typically used to quantify the flow entering a vessel to determine whether a simple baffle will suffice ACS recommends inlet diverters to a Force of Inertia up to 2,500 lb/ft s^2. Above this, more sophisticated distributors are recommended.

FIGURE 11

ACTUAL PRESSURE DROP VERSUS VELOCITY FOR TYPICAL ACS MESH PADS AT LIGHT AND MEDIUM LOADS



Decades ago, Dutch Shell Chemical Company introduced Schoepentoeter® style bladed designs (Fig. 12). As the fluid flows axially towards the shell opposite of the inlet nozzle, liquids are captured by specially placed blades. This design is superior because it allows the escape of liquids over a much greater region of the vessel. A simple inlet diverter (Fig. 13) would simply shear bulk liquids into smaller droplets at great flow rates:

FIGURE 12

ACS AccuFlow™ Inlet Diffuser (Fig. 14) is an adaption of the bladed designs in which the body of the diffuser maintains its shape, the restriction of flow which allows the escape of liquids over the diameter of the vessel is accomplished using internal blades of concentric and decreasing cross-sectional areas.

FIGURE 13

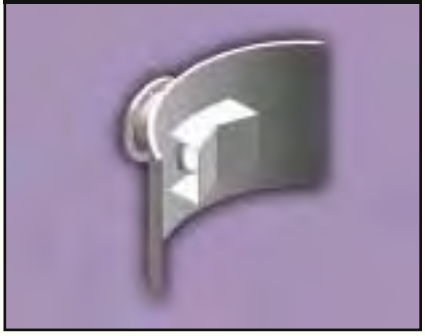


FIGURE 14

Vessel Configuration

Several factors must be considered when deciding on the configuration of vessel internals. The first step is to determine the cross-sectional area needed. Then a tentative geometry and shape appropriate for both the vessel and plant location is selected. Figure 15 shows the most typical, but by no means complete, configurations. Mist eliminators can be of virtually any size or shape to accommodate all factors.

The performance of the mist eliminator depends strongly on an even velocity distribution over the cross-sectional area. As a general rule, a distance of either half the vessel diameter is sufficient spacing both upstream and downstream of the element. Representations for specific cases are illustrated in Figure 16.

ELECTRIC MEDIA BED ROD

Electronic Bed Monitor (EBMv2)

PureAir's Electronic Media Bed Monitor (EBM), a first-to-market electronic monitor for measuring actual media consumption in real time, has been upgraded to the EBMv2. Through continuous monitoring and an electronic notification system, this monitor makes unit maintenance predictable and plannable.

The EBMv2, now features six externally wired and mounted sensors to detect changes in the life of the adsorbent media. The sensors transmit this information to a control panel that predicts a media consumption date based on a proprietary algorithm.

Features

- Input Power: 120/230 V
- Long-lasting sensors; replacements are supplied at no charge when using PureAir media
- Instantaneous readings means no more sampling, waiting on test results, or dependence on a media supplier for accurate test analysis
- Transmits results wirelessly or wired
- Predictive alarm sends alert when media is partially and completely consumed
- Provides odor control accuracy and system reliability
- Facilitates advance scheduling for media changeouts
- Avoids contaminant breakthrough and extended downtimes

+1 678.935.1431 | Toll Free: 866.543.7479
www.PureAirFiltration.com | 6050 Peachtree Pkwy, Suite 240-187, Atlanta, GA, 30092 USA

PRODUCT SPECIFICATIONS

ELECTRONIC BED MONITORING SYSTEM

The PureAir ELECTRONIC MEDIA BED MONITORING SYSTEM is a device designed to operate on PureAir deep bed air purification systems.

The media adsorber shall include an electronic media consumption monitor which will measure the actual media consumption in real time. The system shall provide consumption resolution of one percent. The media consumption shall be displayed on a local NEMA 4X panel at the air filtration unit as well as provide SCADA remote alarm and communicate percent value of the media consumption. The system will have the following outputs:

- Analog signal corresponding to the remaining amount of usable media (4-20 mA)
- Dry contacts for two alarm states
    - Media almost consumed (order replacement adsorbant media)
    - Media completely consumed (replace adsorbant media)

FEATURES:	ADVANTAGES:
A. Instantaneous Reading	1. No time consuming sampling required. 2. No waiting for test results. 3. No dependence on media supplier for accurate test analysis.
B. Predictive Planning	1. Plot time and spent media depth to predict contaminant breakthrough in advance. 2. Anticipate, budget, and coordinate replacement media requirements in advance of contaminant breakthrough. 3. Advance scheduling for media changeouts, manpower availability to avoid emergency, and extended downtimes.

TAB 5

CALCULATIONS

AIRFLOW AND MEDIA LIFE CALCULATIONS

PureAir Filtration

6050 PEACHTREE PKWY, SUITE 240-187
NORCROSS, GA 30092
Ph: 678-935-1431, Fax: 678-935-0648

Airflow and Media Life Calculations
SAH12 Units

Flow Height	84	in	7	ft
Flow Width	84	in	7	ft
Airflow	11000	cfm		
Inlet Static Pressure	2	iwc		
M&G Filter Pressure Drop	1	iwc		
Matrix Filter Pressure Drop	1	iwc		
Module Type	PP 12			
No. of Passes	3			
No. of Modules High	7			
No. of Module Sets Wide	3.5	(2 modules per set)		
Total No. of Module Sets	73.5			
Flow Area	49	sqft		
Face Velocity	224.49	fpm		
Residence Time	0.34	sec		
Media Pressure Drop	1.5	iwc		
Total System Pressure Loss	5.5	iwc		
Total Media Volume	73.50	cuft		
Media 1 Density	26	lbs/cuft	Media Type:	
Media 1 No. of Passes	2			
Media 1 Proportion	49.00	cuft	Sulphasorb XL	
Media 1 Proportion	1274	lbs		
Media 2 Density	40	lbs/cuft	Media Type:	
Media 2 No. of Passes	1			
Media 2 Proportion	24.50	cuft	CPS12	
Media 2 Proportion	980	lbs		
Total Media Weight	2254	lbs		
Average H2S Concentration	5	ppm		
Amount of H2s per Year	2505.8	lbs		
Amount of H2s per Day	6.9	lbs		
Media Capacity	50%	by weight		
Anticipated Media Life*, **	3.1	months		
Anticipated Media Life*, **	0.3	years		

*based upon 24/7/365 operation
**Media 1 only in calculation