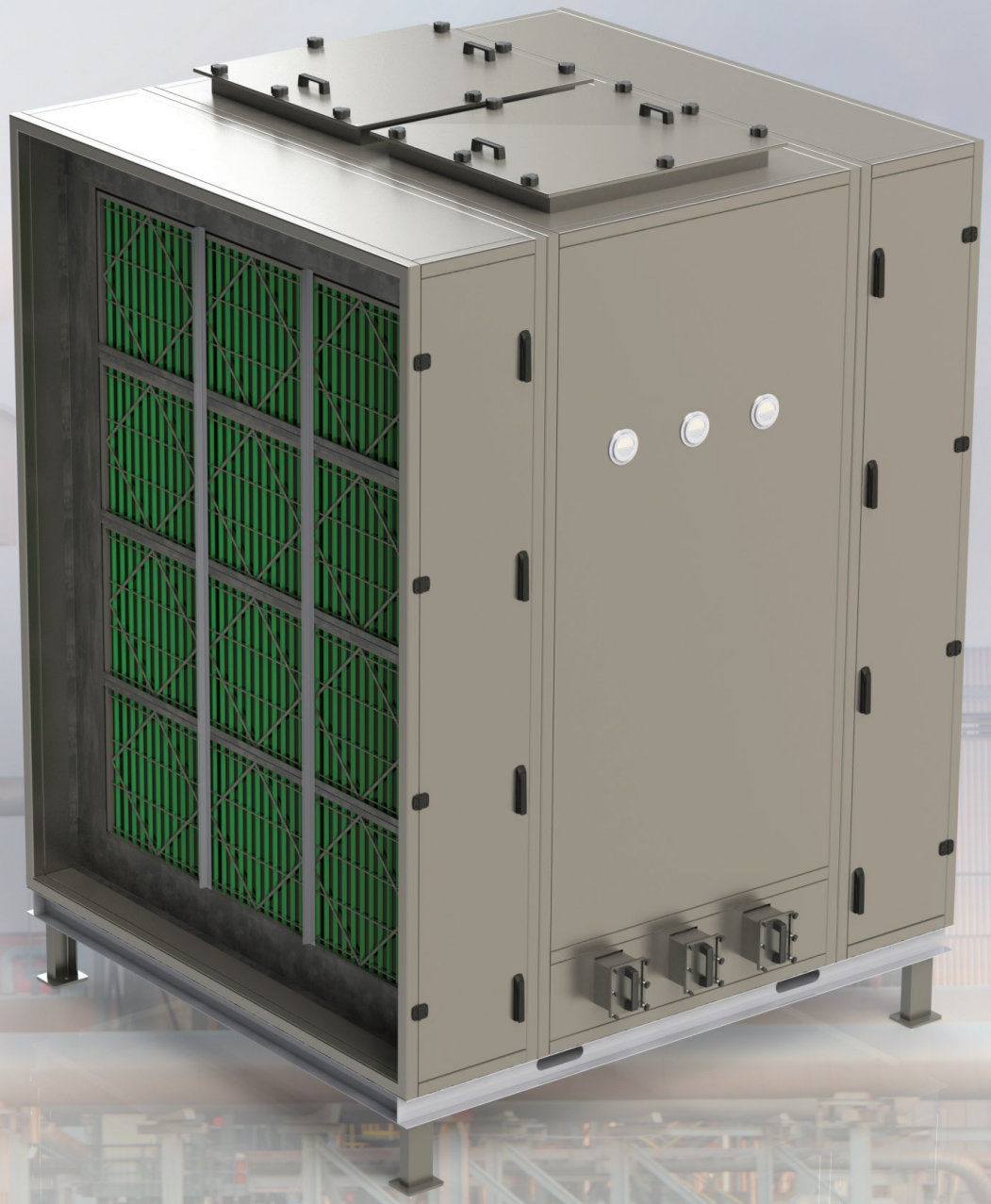
camfil

PROCARB VERTICAL DEEP BED FILTER (VDBs)

Molecular filtration solutions for industrial supply air applications

Metric



Clean air solutions

PROCARB VERTICAL DEEP BED FILTERS (VDBs)

INTRODUCTION

Vertical Deep Bed Supply filters (VDBs) are members of the Camfil "ProCarb" range of industrial molecular filtration solutions.

This product is designed to ensure the very highest levels of performance in those applications where the elimination of corrosive gases is essential to meet the tightest environmental conditions that are specified by electrical equipment manufacturers. Normally this means achieving the requirements of ISA S71.04: 2013, class G1 or a similar category of air quality from IEC 60721-3-3.

Depending on airflow, VDBs filters are available in two different configurations. For low airflows (1,000 to 10,000 m^3/hr) the "F" range uses media beds that are arranged across the full area of the filter and perpendicular to the airflow. In this arrangement it is simple to arrange up to 3 different media beds in series so that different medias can be used to control a range of different contaminants.

For intermediate and high airflows (6,000 to 28,000 m3/hr) the "P" range uses 2 media beds that are arranged parallel to the airflow. P-range filters will normally be used with a single grade of media.

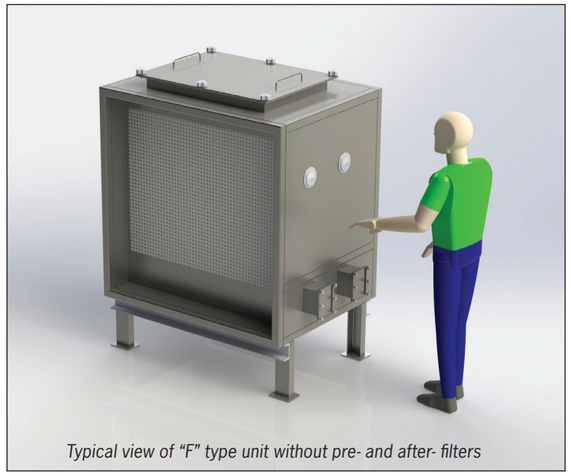
As a result of a highly engineered leak-free design, VDBs filters are high performance devices and will provide very high contaminant removal efficiency and the maximum possible lifetime for the media.

Standard features ensure safe and reliable operation. VDBs filters are completely passive in operation and require minimum routine maintenance apart from changing filters and media at the end of their life.

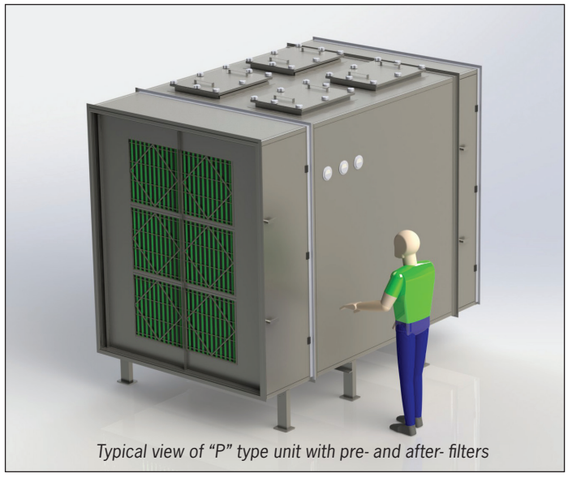
VDBs filters may be constructed from various materials to suit different applications and locations.

OPTIONS:

- Built in, fully housed fans
- VFD speed control
- Stainless steel construction
- Plastic laminated steel construction
- Pressure gauges with electrical switches and alarms



Typical view of "F" type unit without pre- and after- filters



Typical view of "P" type unit with pre- and after- filters

FEATURES	CUSTOMER BENEFITS
Long contact time to ensure optimum media usage and lifetime.	Lowest possible life cycle cost (LCC) and highest protection of production assets.
Inherently leak-free design.	Extremely high removal efficiency.
Integrated pre- and after-filters	Compact footprint and convenient installation of a single piece of equipment.
Double skin with insulation	Internal temperature control, and reduced risk of condensation
Multiple bed arrangement	Ability to target multiple gases utilising different media types
Media contact parts from 316 quality stainless steel.	Corrosion resistant and durable installation
Magnahelic pressure loss gauges for all filter stages	Easy to establish conditions of pre- and after-filters and filter media.

EXAMPLE INDUSTRIES	TARGET GASES
Petrochemical, oil and gas (corrosion control)	Sulphur dioxide, sulphur trioxide, hydrogen sulphide, mercaptans
Pulp and paper (corrosion control)	Hydrogen sulphide, chlorine
Waste water treatment (corrosion control or odour control)	Hydrogen sulphide, mercaptans, indoles, other organic molecules with sulphur and nitrogen atoms.
Metal refining (corrosion control)	Acidic sulphur gases

APPLICATIONS

Heavy process industries rely on sophisticated electronic control systems and power distribution systems to operate their processes safely and with high efficiency. In certain industries, acidic gases that are strongly corrosive are present in the air. These gases are liberated from the process raw materials. If left uncontrolled, these gases can degrade; even destroy the electronic/electrical control systems.

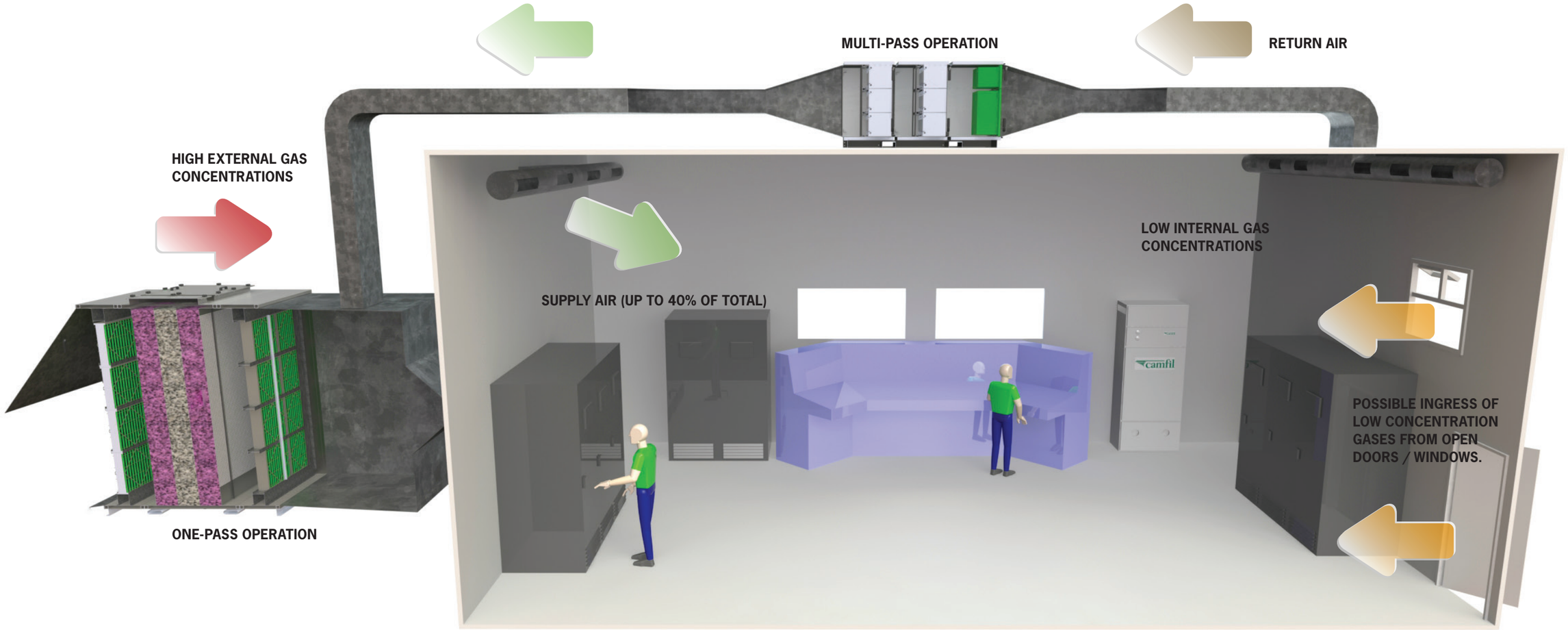
The control equipment will be located inside "control rooms" which themselves might be inside a larger factory space. The rooms may or may not have regular human presence however they will almost certainly be provided with a ventilation air system to ensure the environmental conditions specified by the equipment manufacturers are achieved. The ventilation system is the vehicle for conveying the acidic gases into the control rooms. The sources of the corrosive gases are external to the control rooms, so the concentrations of corrosive gases are always highest in make-up or fresh air supply system.

Molecular filtration provides a very effective method of cleaning the air. Since the concentrations of gases are high and the filter must operate with very high efficiency on a single pass basis, it is logical that a molecular filter installed in a make-up air system must be a robust device. Normally this means deploying a relatively large amount of media in the filter and ensuring leak-free operation. Camfil ProCarb VDBs filters are intended for this specific purpose.

To prevent ingress of fugitive corrosive gases, the make-up air system is used to pressurise the control room. However for various reasons such as open doors/ windows, construction defects etc., pressurisation is not always achieved. As a precaution, many control rooms are also provided with a recirculation air system where secondary molecular filtration can be applied. Due to lower gas concentrations and multi-pass operation, these filters will be lighter duty than those installed in the make-up air system.

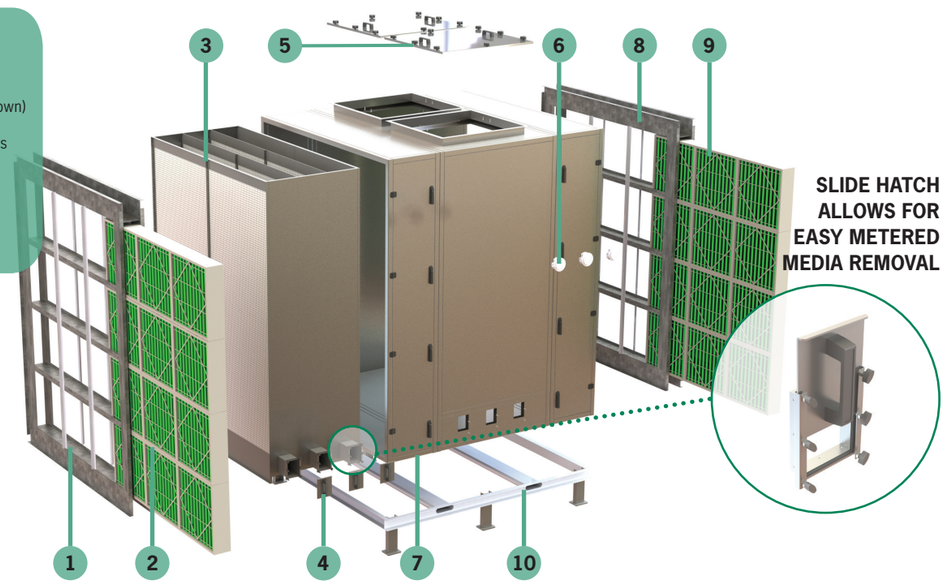
Camfil CamCarb VG filters in PSSA housings are suitable for this purpose. If it is not possible to install molecular filters in a recirculation mode, then a Camfil CamCleaner Molecular can be used to provide addition control of fugitive gases inside the control room. Depending on the industry and specific process, examples of corrosive gases include hydrogen sulphide, sulphur dioxide/trioxide, nitrogen dioxide, hydrogen fluoride, chlorine and ozone.

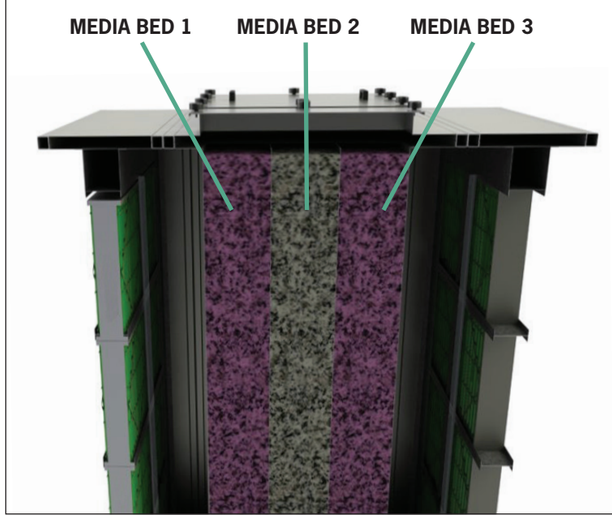
TYPICAL CONTROL ROOM VENTILATION SYSTEM



ITEM LIST:

1 Pre-filter frame
2 Pre-filters
3 Media beds (3 beds shown)
4 Media removal ports
5 Media filling port access
6 Pressure loss gauges
7 Main housing
8 Post filter frame
9 Post filters
10 Supporting frame





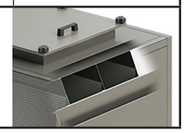
The VDBs has the capacity to target multiple gases, through using differing media in a multiple bed arrangement. This multiple bed systems allows an engineered approach to selection of filtration media.

TECHNICAL DATA

'F' - Range	Full Face					
Airflow [m³/h] (1)	Model Number	Dimensions [mm] (2)(3)(4)	Qty. of particle filters 610 x 610 [mm]	Qty. of particle filters 305 x 610 [mm]	Pressure drop [Pa] (5)	Weight [kg] (6)
1000	VDBS-F-(1/2/3)-1000	1680 x 1400 x 3450	4	0	260	775
1500	VDBS-F-(1/2/3)-1500	2340 x 1400 x 3450	6	0	260	1140
2500	VDBS-F-(1/2/3)-2500	2340 x 2060 x 3450	9	0	260	1775
4500	VDBS-F-(1/2/3)-4500	2595 x 2315 x 3450	9	3	260	2590
5500	VDBS-F-(1/2/3)-5500	3205 x 2315 x 3450	12	4	260	3320
7000	VDBS-F-(1/2/3)-7000	3205 x 2925 x 3450	16	4	260	4140
10000	VDBS-F-(1/2/3)-10000	3510 x 3230 x 3450	25	0	260	5680

Foot note:
1) Rated flow at 1 second residence time per bed
2) Overall approximate dimensions. Includes pre-filter, final filter and fan sections
3) Length for single-bed model. Add 12 inches per additional bed
4) Dimensions H x W x L
5) Estimated pressure drop across one (1) bed of molecular filtration media
6) Estimated maximum weight during operation. Please refer to technical drawings for detailed information

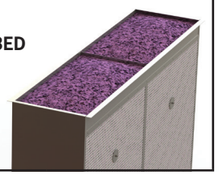
MULTIPLE MEDIA BEDS, POSITIONED PERPENDICULAR TO THE FLOW OF AIR



'P' - Range	Parallel bed, non-partitioned					
Airflow [m³/h] (1)	Model Number	Dimensions [mm] (2)(3)	Qty. of particle filters 610 x 610 [mm]	Qty. of particle filters 305 x 610 [mm]	Pressure drop [Pa] (4)	Weight [kg] (5)
12000	VDBS-P1-12000	2315 x 2010 x 4830	6	0	800	5400
17000	VDBS-P1-17000	2315 x 2010 x 5840	6	0	800	7955
23000	VDBS-P1-23000	2315 x 2010 x 6850	6	0	800	10365
28000	VDBS-P1-28000	2315 x 2010 x 7860	6	0	800	12820

Foot note:
1) Rated flow at 1.2 second residence time
2) Overall approximate dimensions. Includes pre-filter, final filter and fan sections
3) Dimensions H x W x L
4) Estimated pressure drop across one (1) bed of molecular filtration media
5) Estimated maximum weight during operation. Please refer to technical drawings for detailed information

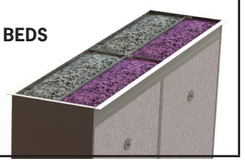
SINGLE MEDIA BED



'P' - Range	Parallel bed, partitioned					
Airflow [m³/h] (1)	Model Number	Dimensions [mm] (2)(3)	Qty. of particle filters 610 x 610 [mm]	Qty. of particle filters 305 x 610 [mm]	Pressure drop [Pa] (4)	Weight [kg] (5)
6000	VDBS-P2-6000	2315 x 2010 x 4830	6	0	200	5500
8500	VDBS-P2-8500	2315 x 2010 x 5840	6	0	200	8090
11500	VDBS-P2-11500	2315 x 2010 x 6850	6	0	200	10550
14000	VDBS-P2-14000	2315 x 2010 x 7860	6	0	200	13050

Foot note:
1) Rated flow at 1.2 second residence time
2) Overall approximate dimensions. Includes pre-filter, final filter and fan sections
3) Dimensions H x W x L
4) Estimated pressure drop across one (1) bed of molecular filtration media
5) Estimated maximum weight during operation. Please refer to technical drawings for detailed information

DUAL MEDIA BEDS



PRE–FILTRATION

Pre-filtration provides protection from particles, which could cause blocking of the media bed. Blocking increases the pressure drop across the media bed, and potentially can result in a reduction in supply airflow.

A VDBs filter can be fitted with one or two stages of pre-filtration depending on the application conditions. Normally, the minimum level of pre-filtration recommended by Camfil is F7 (EN779:2012). Pre-filters are easily installed in robust purposed designed frames that are integrated into the VDBs housing.

AFTER–FILTRATION

After-filtration is recommended since most corrosion control applications will have a high sensitivity to particle contamination. VDBs filters are readily fitted with after-filters.

The grade of filter applied is flexible, depending on the application and other filters that might be fitted elsewhere in the supply air system

MINIMAL LIFE CYCLE COST

It is a fact that the most cost efficient way to use any molecular filtration media is to provide the maximum possible contact time and ensure an even air velocity profile across all the media.

In reality, practical considerations such as physical size and cost serve to limit the achieved contact time. In designing the ProCarb VDBs series Camfil have balanced an acceptably long contact time with an acceptable pressure loss value so that the associated fan will have the minimum possible kW rating, without any compromise on performance.

The layout of the media beds and the design pressure loss ensure even and very effective use of all of the filter media. When media lifetime, service cost, downtime and energy costs are all taken into account, VDBe filters will return minimal LCC values.

DESCRIPTION

Camfil VDBs filters are robustly constructed to reflect the industrial environment where they are used. They will be installed in make-up air system and their construction can be compared to a typical air handling unit (AHU).

An outer frame will be clad with double skinned and insulated body panels. Material options are available depending on the application. The internal filtration media compartments will always be constructed from 316 grade stainless steel.

Media is loaded from small cartons or super-sacks by gravity through access ports on top of the filter. Spent media can be removed by vacuum though the filling ports or by gravity through emptying ports located at the bottom of the sides of the filter housing.

The side emptying ports (F series) allow the flow of spent media to be regulated and easily stopped when required. This ensures the process is as safe and clean as possible for operatives and the local environment. The choice of emptying technique will depend on various factors including the size of the filter, location and availability of equipment.

Pre- and after-filters are fitted in dedicated chambers upstream and downstream of the molecular media beds.

The particle filters are access through service doors on the side of the housing. Pre-and after-filters are held in the frame work by a robust clamping mechanism. This ensures elimination of internal leaks.

If optional fans are selected, these will be installed without wiring in a fully integrated downstream chamber.

Optional differential pressure loss gauges will be mounted on the side of the housing.

The filters are provided with external inlet and outlet flanges to facilitate connection of ductwork using industry standard connections.

Filters are provided with lifting points to facilitate off-loading and installation.

SERVICING

VDBs filters are passive in operation and require very little routine maintenance.

The pre- and after-filters must be replaced when the differential pressure drop reaches the upper limiting value. The filters are access through hinged doors on the side of the filter chambers. Used filters are removed from the housing and should be transferred directly to plastic bags prior to disposal. New Camfil filters should then be fitted in the housing framework.

The molecular filtration media must be replaced when it is exhausted. Spent media is removed by gravity through the side access ports or by vacuum through the top filling ports. A combination of techniques can also be used, depending on the availability of equipment and site conditions. All waste media must be disposed of in accordance with all applicable site, local and government regulations. New media is loaded from small cartons or super-sacks by gravity through the access ports on top of the filter.

In summary, the super-sacks are suspended above the top filling ports, the bottom discharge chute on the sack is opened by releasing the draw-cord and the media empties by gravity directly into the media bed in a very short time.

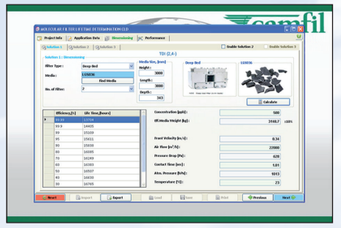
SPECIALISED SOFTWARE

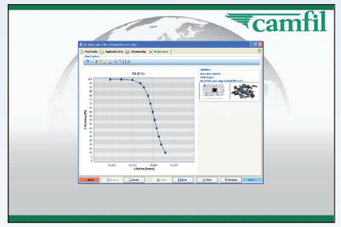
The lifetime of a VDBs filter can be simulated using the unique Camfil Carbon Lifetime Determination (CLD) software for molecular filtration.

The purpose of this software is to provide "best estimates" of the performance of molecular filtration products under selectable conditions that approximate real applications. Predicting the performance of molecular filters in the real world is a complex issue.

This software takes account of the key factors that affect the performance of molecular filters; the gas/vapour to be controlled, concentration, type of adsorbent, amount of adsorbent (contact time), and temperature.

The software has been developed using adsorption theory, many years application knowledge, field measurements and results of extensive product testing in Camfil's unique molecular filtration test rig.





Camfil – a global leader in air filters and clean air solutions

For more than half a century, Camfil has been helping people breathe cleaner air. As a leading manufacturer of premium clean air solutions, we provide commercial and industrial systems for air filtration and air pollution control that improve worker and equipment productivity, minimize energy use, and benefit human health and the environment.

We firmly believe that the best solutions for our customers are the best solutions for our planet, too. That's why every step of the way – from design to delivery and across the product life cycle – we consider the impact of what we do on people and on the world around us. Through a fresh approach to problem-solving, innovative design, precise process control and a strong customer focus we aim to conserve more, use less and find better ways – so we can all breathe easier.

The Camfil Group is headquartered in Stockholm, Sweden, and has 30 manufacturing sites, six R&D centres, local sales offices in 30 countries, and 4,800 employees and growing. We proudly serve and support customers in a wide variety of industries and in communities across the world. To discover how Camfil can help you to protect people, processes and the environment.

www.camfil.com

www.camfil.com

For further information please contact your nearest Camfil office.