camfil

# PROCARB

INDUSTRIAL MOLECULAR FILTRATION SOLUTIONS
HORIZONTAL DEEP BED FILTERS (HDB)



Clean air solutions

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## INTRODUCTION

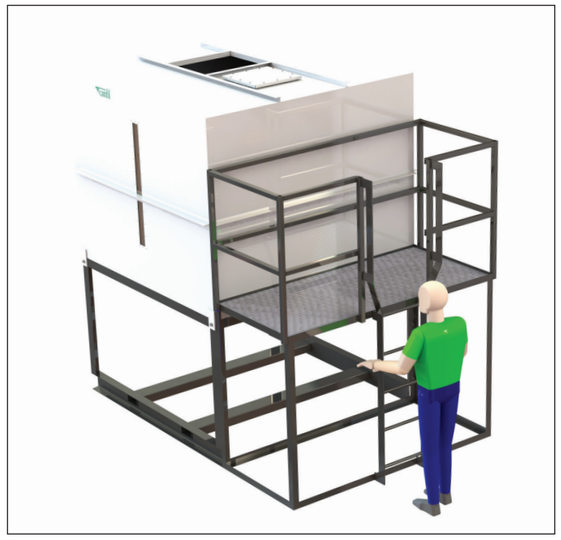
Horizontal Deep Bed filters (HDBs) are highly durable cost effective molecular filtration scrubbers for process industries. HDB can be used in either supply air or exhaust air applications. This product is designed to give the very highest levels of performance in those applications where plant reliability and elimination of corrosive gases, toxic gases and odours is essential for operational security and regulatory compliance.

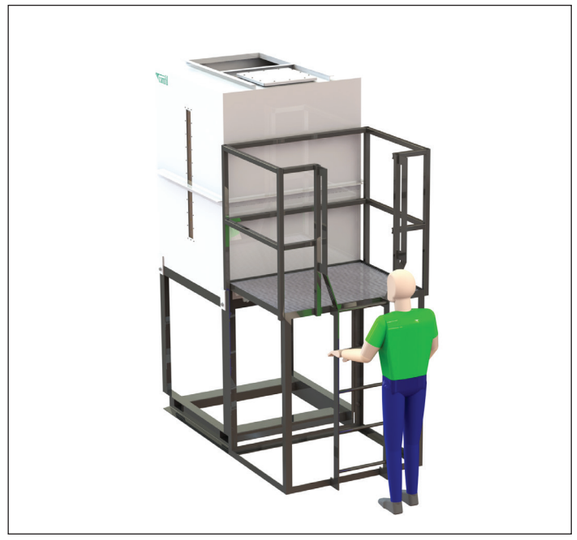
Performance is delivered in terms of extremely high removal efficiency and the longest possible lifetime per fill of filtration media. Standard and optional features ensure reliable and safe operation. Five standard sizes are available with airflow. capacities ranging from 850$m^3h^{-1}$ to 5,100$m^3h^{-1}$

## OPTIONAL ACCESSORIES:

- Fan
- VFD speed control

- Sight glass for visual indication of media condition (for certain applications)
- Sampling points and sampling spear ensure collection of meaningful media samples for residual lifetime analysis.
- Pre-and after filters from standard Camfil range
- Access platform and ladder in painted steel
- Magnahelic pressure loss gauges
- Larger sizes upon request





| FEATURES | CUSTOMER BENEFITS |
|---|---|
| Very long contact time to optimise media usage and lifetime | Confidence in high level protection for downstream equipment/environment |
| Covenient gravity removal of spent media, easy to regulate media flow | No requirement for expensive vacuum equipment to change media |
| Can be used in conjuction with any filtration media (single or multiple layers) | Ability to target specific gas types |
| Air contact parts from 6061 T-6 aluminium or 316 grade stainless steel, depending on application | Corrosion resistant |
| Painted steel support frame | Robust support |
| Inherently leak-free design | Highly reliable performance |
| Media supported on 316 quality stainless steel screen | Corrosion resistant |
| Lifting points for fork lift truck | Simple and safe to install |
| Compact rectangular footprint for minimal use of plant room space | Minimum requirement for concrete or steel foundation |



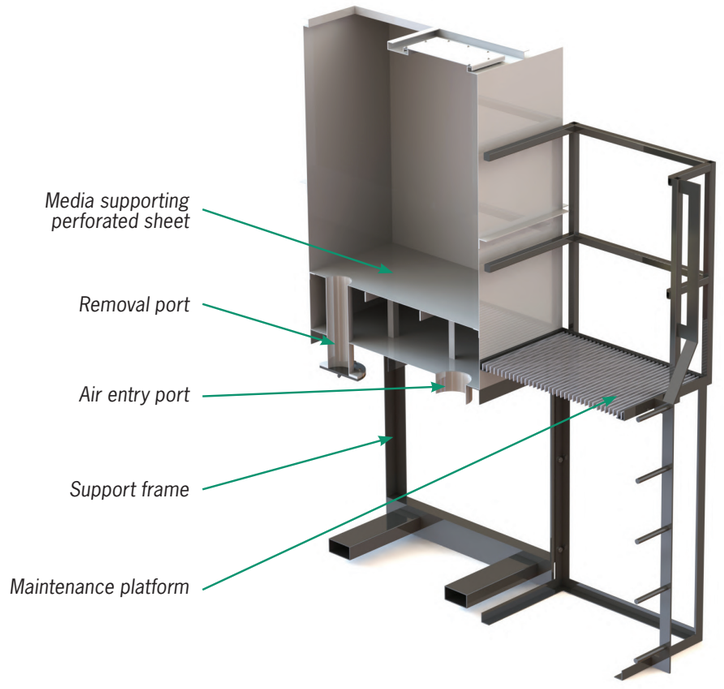
| EXAMPLE INDUSTRIES | TARGET GASES |
|---|---|
| Waste water treatment: Odour control | Hydrogen sulphide, mercaptans and nitrogen containing molecules |
| Petrochemical | Toluene diisocyanate (TDI), amines, VOC |
| Food processing: Odour control | Wide range |
| Waste processing: Odour control | Wide range of organics, aldehydes, alcohols and acids etc. |
| Chemical processing | Wide range |
| Industrial processes | Wide range |
| Biogas | Hydrogen sulphide, siloxane, VOC |

## DESCRIPTION

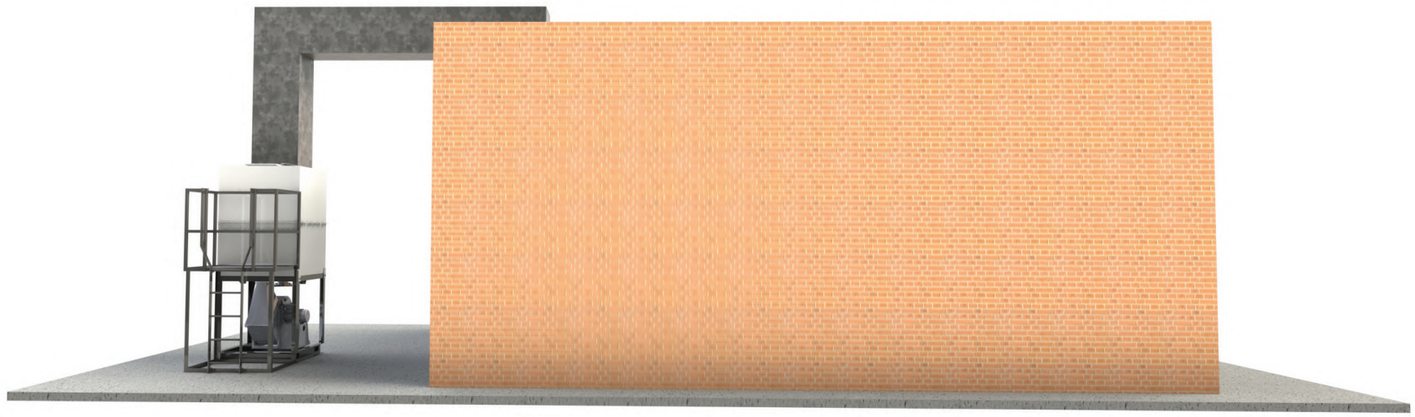
HDB's are configured for vertical airflow and allow a single deep bed of media to cover the entire surface area of the filter, using this arrangement enables an engineered approach to create an inherently leak free unit, ensuring zero air bypass of the media.

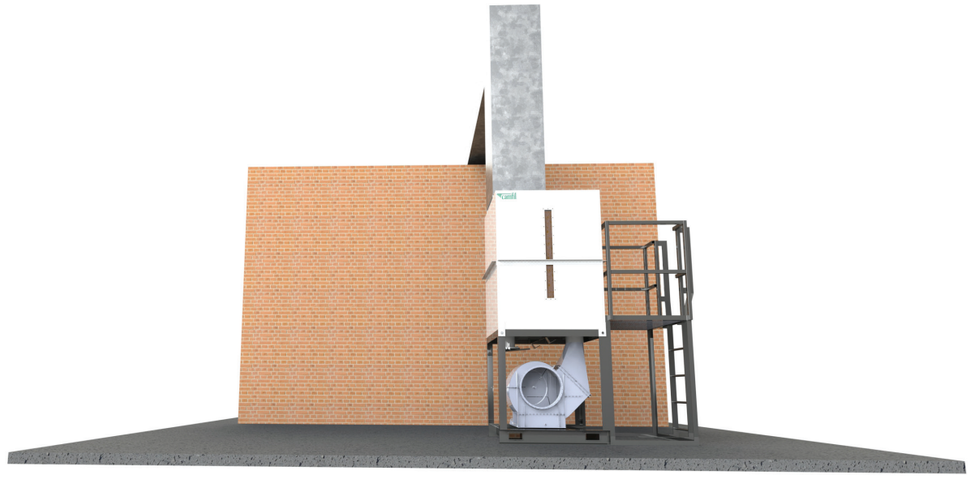
The housings are fully welded unit and constructed using stainless steel or aluminium. They are designed to ensure ease of installation and servicing procedures. Effectively, any molecular filtration media may be selected for use in the HDB units, depending on the contaminant(s) to be controlled. These may be used individually or in a layered configuration.

The media is easily introduced into the units from the top filling port. Media is simply emptied under gravity via the removal port on the side of the unit. This enable a quick and clean media change out.

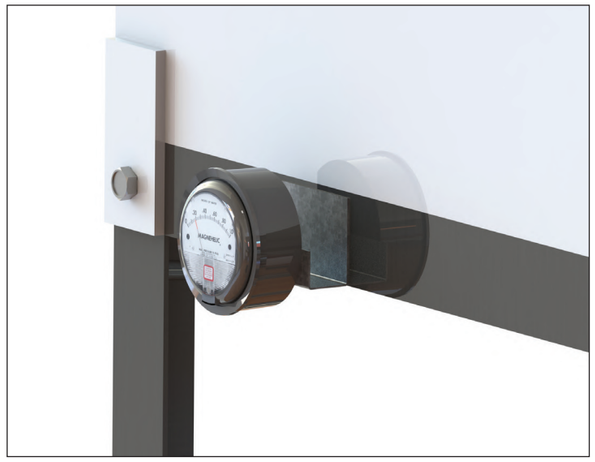



*Typical cross sectional view of a HDB unit*

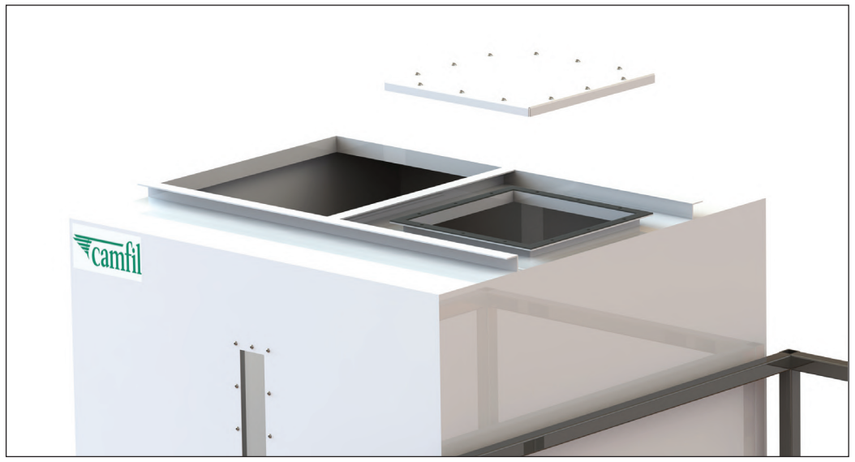




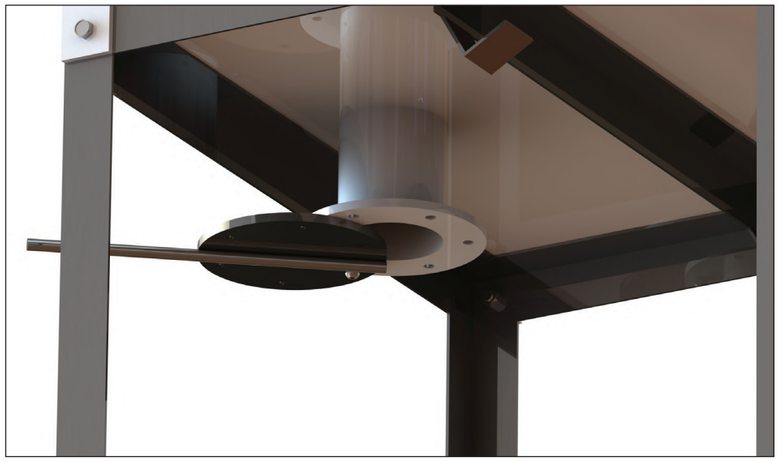
HDB in situ.
Above image shown in a supply air scenario.



HDB units can be fitted with magnehelic gauges to establish the working pressure.




HDB units are filled with media from above.



Media is easily and effectively removed via a media removal port.
Media evacuates under the assistance of gravity.

## HDB FOR BIOGAS APPLICATIONS

Biogas is an important global industry. Organic waste is used to replace non-sustainable fossil fuels for energy production. When organic waste is digested in an anaerobic process, the resulting methane, which is the fuel for energy production, may be heavily contaminated with hydrogen sulphide ($H_2S$).

If high concentrations of $H_2S$ reach the gas engine where the methane is combusted, the engine can suffer internal corrosion due to the combination of acidic gas and high temperatures. Engine corrosion requires unscheduled downtime for maintenance and repair, which results in loss of output and profit.

Another risk for biogas engines comes from siloxanes. These compounds are widely used in consumer products which reach land-fill disposal sites. Biogas generated at these facilities may be contaminated with siloxanes, e.g. D5. When siloxanes are combusted, they leave behind deposits of solid silica and silicates. These cause abrasion in moving parts and put engine components out of balance, all leading to loss of efficiency and unscheduled downtime.

Many anaerobic digesters and Biogas engines are located close to the feedstock of organic waste, i.e. on farms or waste processing sites. Molecular filtration is the accepted method of removing hydrogen sulphide and siloxanes from Biogas prior to combustion.

To optimise the efficiency of energy production, the biogas is fed to the engine at elevated pressures, typically up to 0.5 barg. The design and construction of HDB filters for biogas applications takes account of the system pressure. Biogas HDB filters are constructed from heavier gauge material, have cylindrical shells and use dished ends. Flanged inlet and outlet connections and bosses for instrumentation will be according to a recognised standard.

The preferred molecular filtration media for $H_2S$ Biogas applications is CamPure 32. This media has a very high capacity for hydrogen sulphide and has a UL flammability rating. The ball shaped geometry of the adsorbent means it is very easy to load and remove from the HDB filter vessel.

## TECHNICAL DATA

| Model Number | | | HDB85 | HDB170 | HDB255 | HDB340 | HDB510 |
|---|---|---|---|---|---|---|---|
| Rated Airflow | | cfm | 500 | 1000 | 1500 | 2000 | 3000 |
| | | m3/hr | 850 | 1700 | 2550 | 3400 | 5100 |
| Overall Height | | mm/in | 2794 / 110 | 2794 / 110 | 2794 / 110 | 2794 / 110 | 2794 / 110 |
| Overall Width | | mm/in | 901 / 35.5 | 1257 / 49.5 | 1524 /60 | 1700 / 67 | 2057 / 81 |
| Overall Depth | | mm/in | 901 / 35.5 | 1257 / 49.5 | 1524 /60 | 1700 / 67 | 2057 / 81 |
| Media Volume | | m3/ft 3 | 0.57 / 20 | 1.19 / 40 | 1.81 / 60 | 2.29 / 80 | 3.42 / 120 |
| Bed Depth (nominal) | | mm/in | 700 / 28 | 750 / 30 | 800 / 32 | 800 / 32 | 800 / 32 |
| Media Velocity | | m/s / fpm | 0.29 / 57 | 0.3 / 59 | 0.3 / 59 | 0.33 / 65 | 0.34 / 67 |
| Contact time at rated air flow | | sec | 2,4 | 2,5 | 2,6 | 2,4 | 2,4 |
| Media Weight | Campure 8 | kg | 500 | 1000 | 1600 | 2000 | 2900 |
| | Campure 32 | kg | 500 | 1000 | 1600 | 2000 | 2900 |
| | Carbon (LGS036) | kg | 300 | 600 | 950 | 1200 | 1750 |
| | Carbon (CEX004) | kg | 300 | 600 | 950 | 1200 | 1750 |
| | Carbon (CEX004A3) | kg | 350 | 700 | 1100 | 1350 | 2000 |
| Nominal pressure drop | Campure 8 | Pa | 1350 | 1350 | 1350 | 1350 | 1350 |
| | Campure 32 | Pa | 1350 | 1350 | 1350 | 1350 | 1350 |
| | Broad Spectrum Carbon (LGS036) | Pa | 850 | 850 | 850 | 850 | 850 |
| | Broad Spectrum Carbon (CEX004) | Pa | 1000 | 1000 | 1000 | 1000 | 1000 |
| Weigh: Basic filter unit (aluminium) | | kg | 160 | 230 | 285 | 330 | 410 |
| Weigh: Basic filter unit (stainless steel) | | kg | 220 | 330 | 430 | 500 | 650 |
| Weight: access platform | | kg | 125 | 140 | 175 | 190 | 215 |

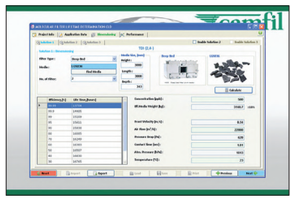
## SPECIALISED SOFTWARE

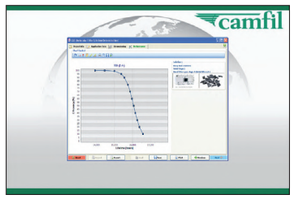
The lifetime of a HDB filter installation can be simulated using the unique Camfil Carbon Lifetime Determination (CLD) software for molecular filtration.

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 laboratory.







## MEDIA FILTER LIFE ANALYSIS

With the aim of optimizing time to change the media, Camfil disposes an analysis service to check the condition and remaining lifetime of the media.

The media is simply check by taking a sample of the media from the media bed. A sampling spear can be provided upon request. This media is sent to Camfil for analysis. With reasonable frequency, it is possible to determine the optimum lifetime of the media.

## SERVICING

After commissioning the filters and housings are completely passive in operation and require minimal routine maintenance.

The molecular filtration media will need to be replaced when it is exhausted. The media is easily removed via removal port located on the side of the unit. The media can be collected into media sack or another suitable container. Pre and after-filters must be replaced when the differential pressure drop reaches the upper limiting value.



Typical HDB filters for Biogas applications.





CamPure 32 adsorbent for sulphide removal. Low flammability



## 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 28 manufacturing sites, six R&D centres, local sales offices in 26 countries, and 4,180 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.

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