# BIOREM
TECHNOLOGIES INC.

BASYS™

BIOFILTAIR™

SYNERGY™

BIOSERVE™

***INNOVATION IN BIOFILTRATION***
for odor and VOC control

# LEADING THE EVOLUTION OF BIOFILTRATION

BIOREM manufactures a comprehensive line of high-efficiency biofilters that use an innovative permanent biofilter media. Over a decade of biotechnology experience has produced many pioneering technical advancements in the biological treatment of contaminated air streams. Innovations developed or enhanced at our state-of-the-art research and manufacturing facilities include:

- **BIOSORBENS™** - The world's first permanent biofilter media.
- **BASYS™** - The first integrated modular biofilter for odor control
- **BIOFILTAIR™** - A simple yet effective biofilter design for large air flow treatment
- **SYNERGY™** - Ultra-compact biofilters for high-concentration VOC control
- **BIOSERVE™** - Biofilter preventative maintenance program with monitoring, media analysis and technical support

Biofiltration has emerged as the most cost-effective option for controlling odors, VOCs, $H_2S$ and other hazardous air pollutants. Biofiltration is a complete destruction technology and is as effective as thermal oxidation but without the energy consumption; more efficient than carbon but without the high cost of frequent replacement and more capable than chemical or bio-scrubbers but without the need for hazardous chemicals or messy recirculating nutrient formulas. Annual operating costs of BIOREM biofilters can be as much as 60-75% lower than any other treatment technology!

For the latest developments, to review completed projects with photos, download technical papers or sales presentations or to find out where we've been and where we are going, visit our website at www.biorem.biz. You can also obtain a "quickquote" by simply completing the form in the "Products" section. Looking for an odor expert to help you with your plant odor assessment? Just follow the skunk on our website and he will lead you to a list where you will find a qualified independent consultant working in your area!


**Available with BIOREM's ground-breaking performance guaranties and warranties, BIOSORBENS™ media is standard in all our biofilters.**

**"I'm glad I chose BIOREM. Their people are knowledgeable and cooperative. They approach the technology from a sound scientific background and were able to engineer the best solution for us. Their Biofilter media is far superior to anything we've ever used before and I expect it to last at least twice as long as any other product I've tried."**

Russell Higdon, Plant Maintenance Manager, Skretting, BC.

# BIOSORBENS™ - PERMANENT biofilter media.

BIOSORBENS™ was the very first engineered, permanent biofilter media available. This mineral-based, practically indestructible media, is homogenous and uniform in shape, providing consistent and predictable performance with less maintenance when compared to other medium like clay, lava, woodchips, carbon or layered combinations of these materials.

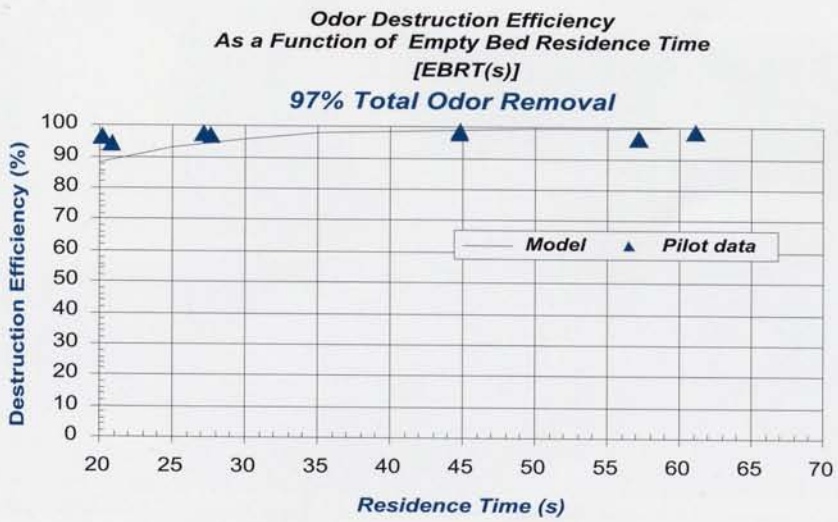
The specially selected inert mineral is taken through a high-temperature heat treatment process where, at almost 1800 degrees Fahrenheit, it is expanded to produce an extremely strong, yet light, porous substrate. Onto this substrate we add coatings of nutrients, pH buffers, adsorbents and other ingredients that enhance the way contaminants are drawn out of the air. The coatings are sealed into the internal structure as well as the surface of each media granule and they are essential because together they provide an environment ideal to support a thriving microbiological population. BIOSORBENS™ is the result.

Data from real applications demonstrate how well BIOSORBENS™ performs for removal of ALL odor causing pollutants including the reduced sulphur compounds like Methyl Mercaptan, Dimethyl Sulphide and Dimethyl Disulphide.

Developed by industrial microbiologists using a unique patented process of stabilization and nutrification, BIOSORBENS™ is the perfect biofilter media to provide a surface on which a controlled biomass film can flourish.

BIOSORBENS™ retains moisture while being completely resistant to decomposition, degradation or compaction even in strongly acidic environments. This feature allows for a pressure drop of only 2 inches across the entire 6-foot bed depth. A low pressure drop helps maintain even air distribution throughout the biofilter bed and also minimizes power costs.

BIOSORBENS™ performs well for removing total odors at residence times as low as 20 seconds. Even under shock loading conditions and high inlet concentrations you'll get a compact, highly efficient biofilter – guaranteed!




BASYS™ BIOFILTAIR™ SYNERGY™ BIOSERVE™

# COMPACT, MODULAR $H_2S$ & ODOR CONTROL

## Compact, Efficient, Modular Design

The BASYS™ integrated modular biofilter was developed using state-of-the-art air-flow theories to produce an advanced biofilter that is truly modular. Featuring integrated air pre-humidification, BIOSORBENS™ permanent media and a compact size, the current design is easy to install and allows customers to add additional capacity by simply connecting another filter module to their system.

System controls are straight forward and range from low-cost manual controls to fully automated instrumentation with 24 hour remote monitoring, alarms, continuous data collection or integration with our exclusive BIOSERVE™ preventive maintenance program.


**Available in 316 Stainless Steel or Fibreglass**

## Proven Performance

With installations worldwide, BASYS™ delivers a proven technology that has clearly demonstrated its superiority over alternative systems at treating a wide range of odors, VOCs and $H_2S$.

The BASYS™ module is available in six sizes as shown in Table 1. Manufactured from 304 or 316 stainless steel the BASYS™ series is strong and durable. For clients that prefer, the identical series is also available in FRP.

The BASYS™ biofilter is available in either up-flow or down-flow configurations and features a pre-installed, corrosion-resistant, high-density recycled plastic flooring.

A surface irrigation system is automatically actuated on a timer to provide additional moisture to the media bed. It further acts as a flushing system to remove acids or biodegradation by-products.

**"I find the BIOSORBENS™ media and the BASYS™ biofilter to be…one of the better, if not the best, package units I have seen on the market."**
Senior Engineer, Odor Expert, CH2MHill, PA.

BIOSERVE™ BIOFILTAIR™ SYNERGY™

Being Canadian we have a somewhat unique perspective on winter and no-one is more familiar with challenges of biofiltration in cold weather climates! The BASYS™ system comes with optional automatically actuated steam generation for those systems operating in cold winter months.

Vessel insulation and cladding further enhance the biofilters ability to retain heat and maintain optimum performance for consistent odor removal. This option also works well to protect against intense heat in desert climates.

BASYS™ 16 unit with quick-release wing fasteners

Oversized quick-release wing-fasteners on the segmented covers of the BASYS™ units allow for easy inspection and sampling of the BIOSORBENS™ media. Maintenance of the irrigation system nozzles is also made easy.

# BASYS™ SERIES INTEGRATED MODULAR BIOFILTER

## SYSTEM SPECIFICATIONS

| Approximate Treatment Capacity (Depends on Residence Times Selected) (Typically Between 20 and 30 seconds) | Approx Treatment Capacity Air Flow (cfm) Depending on EBRT.* (Typically between 20-30 seconds) | BIOSORBENS™ Media | | Approx External Dimensions | | | |
|---|---|---|---|---|---|---|---|
| | | Depth (ft) | Approximate Volume ($ft^3$) | Width (ft) | Height (ft) | Length (ft) | Weight (lbs) |
| BASYS™ 8 | 500 - 750 | 5.5 | 250 | 10 | 8.5 | 8 | 22,600 |
| BASYS™ 16 | 750 - 1800 | 5.5 | 600 | 10 | 8.5 | 16 | 48,400 |
| BASYS™ 24 | 1800 - 3000 | 5.5 | 1000 | 10 | 8.5 | 24 | 78,400 |
| BASYS™ 36 | 3000 - 4000 | 5.5 | 1500 | 10 | 8.5 | 36 | 116,900 |
| BASYS™ 44 | 4000 - 6000 | 5.5 | 2000 | 10 | 8.5 | 44 | 153,400 |
| BASYS™ 44X | 6000 - 9000 | 5.5 | Up to 3000 | Designed According To Requirements | | | |

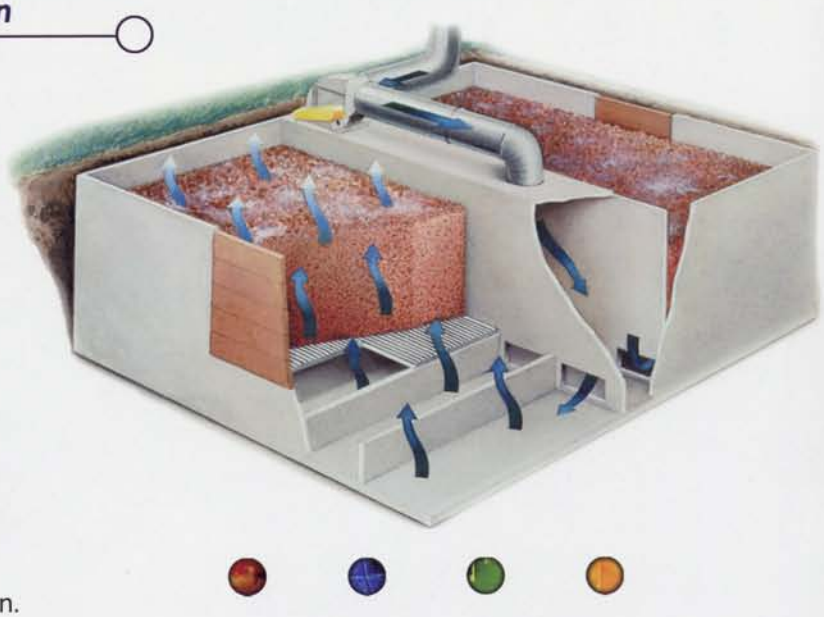
* EBRT - Empty bed residence time

BIOFILTAIR™

# RELIABLE, AFFORDABLE ODOR CONTROL FOR HIGH FLOW TREATMENT

## *Effective , Econonmical Custom Design*

BIOFILTAIR™ is a custom engineered biofilter system built at your facility. It's built to last from a reinforced, corrosion-resistant ternary-blend concrete. It has a patented, silica fume concrete slotted support floor that is strong enough to handle the weight of bobcat-type machines. **The entire system is guaranteed against acid corrosion for 10 years.**



BIOFILTAIR™ features include a gate entrance which provides quick and easy access for media replacement and a pneumatic humidification manifold, located in the plenum, which conditions and humidifies the air stream and ensures >98% relative humidity at all times. For clients that prefer, a cost-effective cross-flow scrubber option can be substituted for our standard "in-plenum" humidification.

The BIOFILTAIR™ system was developed for reliable, affordable odor control at agribusiness and wastewater treatment plants for airflows as high as 500,000 cfm! Like all of our high-performance biofilters, BIOFILTAIR™ uses the revolutionary BIOSORBENS™ permanent biofilter media.

You can choose an open-top or covered system with an up-flow or down-flow configuration. Every system is custom engineered to meet your specific requirements. We work with your consulting engineer to design the system that best meets your needs and your budget.

With BIOREM's approach, ducting, fan, and accessories can be included in the design. We will work with your contractor or plant personnel to minimize disruption to your plant operations while the BIOFILTAIR™ is being built.

Once installed, we'll take the time to explain the easy-to-follow monitoring procedures. And you can be confident that we'll be here to help you long after the installation has been commissioned.

**"BIOREM's BIOFILTAIR™ process has completely eliminated the odors at our facility.....We now enjoy a significantly improved relationship with our community"**
Jim Murray, President, Central By-Products, ON.

BASYS™ BIOSERVE™ SYNERGY™

## *Proven, REAL-LIFE Results!*

BIOFILTAIR™ has demonstrated it's effectiveness at eliminating odors. Visit our website www.biorem.biz to review dozens of examples where facilities now enjoy improved relationships with their communities because they installed BIOFILTAIR™.

Even at sites with high-intensity odors like animal rendering, sewage sludge, septage or biosolids, BIOFILTAIR™ has demonstrated odor removal rates as high as 98%.

For these types of applications BIOFILTAIR™ consistently outperforms bioscrubbers, lava-rock, and woodchip or compost biofilters.

Data from this real case study prove it:

- **A 250,000 cfm BIOFILTAIR™ was installed at a rendering plant in Canada. The design, constructed from concrete, consisted of 2 banks of 3 cells of equal dimensions with a central air plenum and a hollow core concrete roof** *(see picture below)*.
- **Foul air passes down flow, under negative pressure, through a 5.5 ft bed of BIOSORBENS™ permanent media with a 35 second residence time.**
- **The design criteria were established from a three month pilot plant which was used to develop a mathematical model for odor removal efficiency.**

*Installation of BIOSORBENS™ over concrete slotted flooring*

Odor tests were carried out following ASTM E679-91 standards and demonstrated overall average removal of 97% which exceeded model design of 90% and demonstrated reliability of scale up from pilot to full scale.

| BIOSORBENS™ Media Temp 16°C | | | |
|---|---|---|---|
| | Inlet ou/$m^3$ | Outlet ou/$m^3$ | % Removal |
| Sample 1 | 10,168 | 164 | 98% |
| Sample 2 | 10,212 | 173 | 98% |
| Sample 3 | 10,212 | 164 | 98% |
| Average | 10,197 | 167 | 98% |

| BIOSORBENS™ Media Temp 14°C | | | |
|---|---|---|---|
| | Inlet ou/$m^3$ | Outlet ou/$m^3$ | % Removal |
| Sample 1 | 4,218 | 237 | 95% |
| Sample 2 | 5,905 | 228 | 95% |
| Sample 3 | 7,060 | 182 | 95% |
| Average | 5,728 | 216 | 95% |

SYNERGY™

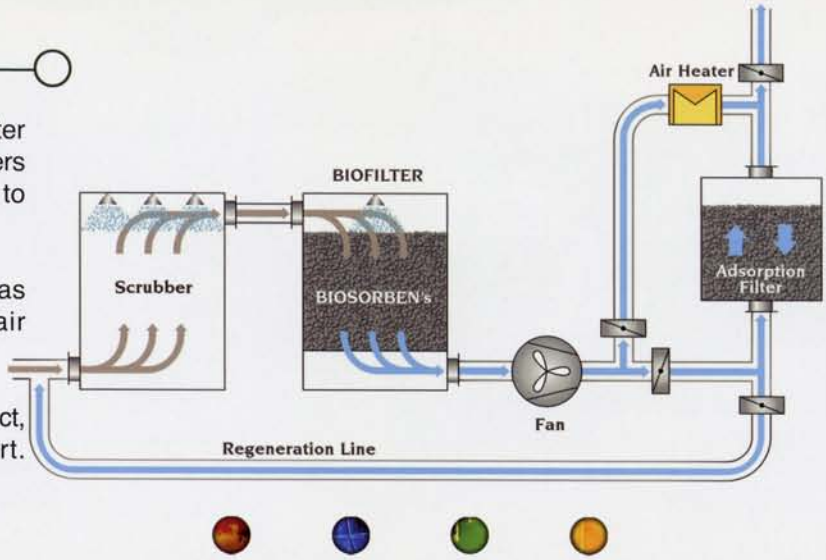
# ULTRA COMPACT, HIGH-EFFICIENCY VOC CONTROL

## *Revolutionary Concept*

The SYNERGY™ system is a highly effective biofilter in combination with upstream or downstream adsorbers and pre-humidifiers which operate synergistically to guarantee unrivaled treated air qualities.

It does so even under difficult conditions such as concentration fluctuations, changing waste air compositions and batch operations.

SYNERGY™ is completely self-contained in a compact, steel container vessel that's easy to transport.




## *Highly effective combination of biofilters with pre- & after-adsorbers*

## *Ultra-Compact*

SYNERGY™ is a revolutionary concept. Unlike conventional biofilters which are designed on the basis of 'residence time', SYNERGY™ is designed on the basis of degradation efficiency of the microbiological consortium.

Conventional biofilters use the residence time required for nearly complete absorption and degradation as the primary design parameter. Even with the highly efficient BIOSORBENS™ media, this approach can often result in a large single-stage biofilter. SYNERGY™, however, looks more closely at the degradation rates of the microbes and uses this as the primary design criteria.

**"I've seen a lot of odour control system in my time and the BASYS bioflter with BIOSORBENS media is by far the best I have ever seen"**
Gavin Keylock, UNIFEEDS Inc., BC, Canada

BASYS™ BIOSERVE™ BIOFILTAIR™

## *High VOC Inlet*

SYNERGY™ provides a sophisticated, cyclical, closed-loop treatment technology. It works by maintaining a high VOC inlet concentration to the initial biofilter which forces the microbial population to degrade contaminants at a faster than normal rate. But at very short residence times there is insufficient time for complete treatment in the initial biofilter. So the after-adsorber module collects any contaminants that pass through the initial biofilter and recycles them back for further degradation. This configuration ensures that the desired high inlet concentrations are maintained and guarantees incomparable outlet levels.

SYNERGY™ is a proven technology. It is especially suitable for plants that have batch processes or irregular operating conditions including wildly fluctuating contaminants, contaminant concentrations, or airflow rates. **SYNERGY™ is effective in a wide variety of applications:**


Requiring only a fraction of the space of a conventional biofilter, SYNERGY™ is an ultra-compact modular air treatment system that can be designed for guaranteed VOC removal rates. This is because of the unique closed loop design of the SYNERGY™ process.

The breakthrough BIOSORBENS™ media, featuring extended bed life and remarkable adsorption properties makes SYNERGY™ by far the most advanced biofilter system available.

BIOSERVE™

# BIOFILTER MONITORING & PREVENTATIVE MAINTENANCE

## Comprehensive Service

BIOREM offers the most comprehensive ongoing monitoring and support program in the industry. For the first year after your new BASYS™, BIOFILTAIR™ or SYNERGY™ system is installed, BIOREM will monitor its performance at no additional cost to you.

Every three months, you simply collect and send us a sample of your BIOSORBENS™ media. In our lab, we'll examine both microbiological and physio-chemical properties like:

- **pH**
- **moisture content**
- **particle size analysis**
- **nutrient availability**
- **microbial enumeration**
- **microbial speciation**

We'll also review your plant records for:

- **air flow rate and inlet characteristics**
- **media differential pressure**
- **media bed temperature**
- **water consumption rates for humidification and irrigation**


***Preventative Maintenance, through ongoing biofilter media monitoring is critical to long term reliable performance***

Our engineers, industrial microbiologists and analytical chemists can determine if any trends are occurring that could cause problems down the road if they were left unmonitored. In this way, we will develop for you a unique BIOSERVE™ preventative maintenance program. It's these small but important details that assure reliable performance of your biofilter system and demonstrate our commitment to you.

**Manufacturing Quality · Proven, Predictable Performance · Incomparable Service**

It all adds up to the most comprehensive system for controlling and eliminating odorous gases and VOCs in the industry.

**No other biofilter systems come with supporting research data, published performance curves and state of the art predictive modelling of contaminant removal efficiencies.**

BASYS™ BIOFILTAIR™ SYNERGY™

BIOSERVE™ marks another first for BIOREM. The first integrated media monitoring, service and preventative maintenance program in North America. Expanding upon the success of your initial 1-year media testing **(Level 1)**, BIOREM has developed and now offers two additional levels of service managed by a 24-hour on-call dedicated BIOSERVE™ program manager.

**Level 2: System Monitoring with Manual Adjustment**

- **On-line $H_2S$ analyzer with digital read out and download capabilities.**
- **Web hosted active biofilter system monitoring.**
- **Local alarms with personal direct-call for system management and key parameter adjustment.**

**Level 3: Automated System Controls & Monitoring**

- **Remote web-hosted active system monitoring of key inlet air characteristics.**
- **Remote manned system observation.**
- **Remote adjustment of key performance related parameters.**

For all biofilter systems installed by BIOREM we provide a comprehensive operation and maintenance manual with an accompanying interactive DVD introducing your plant operators and managers to the operation of the system installed.

The DVD gives you access to key frequently asked questions as well as direct email links to your project manager and service manager for answers to quick questions or for troubleshooting.

*To obtain answers to any biofiltration related technical question, visit the BIOREM website at www.biorem.biz and complete the form in the "resources" section. Your question is automatically submitted by email to us and will be answered promptly.*

## *Research & Applied Technology*

BIOREM is committed to the advancement of biofiltration technology. Significant investments in research and applied technology has lead to the development of the revolutionary BIOSORBENS™ media and new styles of biofiltration.

To date our research has already yielded an enormous empirical database; data that has been used to create the first predictive software model — a tool being employed by engineers to design and size biofilters for dozens of contaminants. You can be confident that further research will deepen our understanding of biofiltration kinetics and the impacts of antagonistic and synergistic microbiological effects on biofilter performance.

These pioneering advancements mean that no other biofilters are offered with as much published supporting data including predictive removal efficiency curves, odor performance data, microbial and chemical media analysis and proof of superior reliability over other medias and other biological treatment systems.

Investments we are making today will result in improved media formulas for tomorrow which will translate into more compact, higher efficiency biological treatment systems for you. For regular updates on new projects, research papers, technical memos and much more, call 1-800-353-2087 X224 or visit our website at www.biorem.biz.

**W W W . B I O R E M . B I Z**

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