

Biological Scrubbers

The next generation of H₂S odour treatment



Cost-effective control of odours

Biological Scrubbers, also known as bio-trickling filters (BTFs) are fast becoming the green technology of choice for many H₂S odour removal applications at wastewater treatment plants and other applications. They efficiently remove objectionable sewage H₂S, VOCs and other odours from air streams using controlled biological activity.

Key benefits of Biological Scrubbers are:

- **Lower operating costs** than other systems and better Life Cycle Cost than Chemical Scrubbers and Carbon Filters at >25 ppm H₂S.
- **Compact footprint.** Biological Scrubbers require approximately 10% of the footprint of equivalent Soil Bed Filters.
- **Excellent performance.** >98% removal of H₂S – better than soil bed filters.
- **Proven performance** even at higher H₂S concentrations - to over 200ppm.
- **Simple operation** No chemicals needed, just small amounts of nutrients.
- **Consistent performance** No degradation of performance over time or due to weather.
- **Highly controllable** as all key processes are within vessels.
- **No hidden operating costs**
- **Existing system upgrade** Able to add to an existing setup to reduce operating costs.
- **Extensible** with the ability to extend the quality of air discharge with a carbon bed installation in the future.

Biological Scrubbers are the next generation of H₂S Odour Control. Historically biofilters, chemical scrubbers and carbon bed adsorbers have been the main treatment technologies. Biofilters or soil bed filters are widely used for odour control in many industrial applications because they are simple, cost effective with low environmental impact. Each technology have their different strengths, weaknesses, capital and operating costs. For instance biofilters prefer regular, low concentration H₂S loadings.

In many situation these systems are now being superseded by biological scrubbers. Biological Scrubbers have been developed to address the limitations of other technologies whilst retaining the economic and environmental advantages of biological treatment. Biological Scrubbers are now increasingly being used for removal of H₂S, VOCs and general odour control in many applications.

Biological Scrubbers are used in

- Wastewater treatment plants
- Pumping stations
- Rendering plants
- Pulp & Paper plants
- Food processing plants



How Biological Scrubbers work

Armatec Biological Scrubbers treat gaseous contaminants in an airstream by passing it through a bed of microorganisms that feed on the gaseous molecules, consuming the H₂S and other compounds as food removing them from the airstream.

These microorganisms (Thiobacillus genus) live on a high surface inorganic bed inside the dedicated vessel at a low pH. Because H₂S is what they consume, this eliminates the need for continuous carbon replacement in carbon bed adsorbers or chemical consumption in chemical scrubbers.

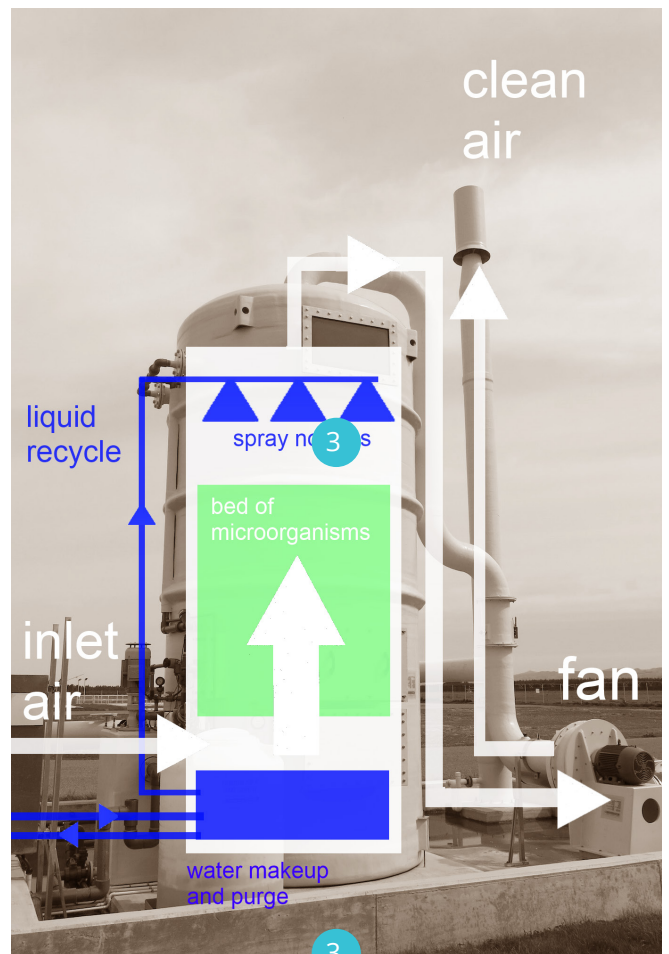
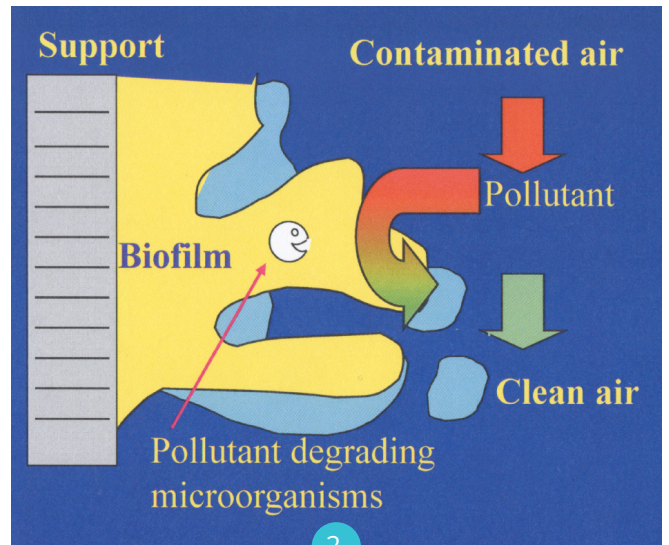
Biofilters are similar but unique compared to soil bed filters. Biological Scrubbers use the same microbial activity as soil bed filters to remove H₂S and other contaminants, but require only 10% of footprint of an equivalent soil bed filter. Additionally the process is inherently more stable, efficient and independent of weather conditions as the biological activity is contained inside the vessel where pH and nutrient levels can be controlled.

Only small amounts of nutrients are needed in Armatec Biological Scrubbers for optimizing microorganism health. No oxidising chemicals are required, greatly reducing daily operating costs. The nutrient is typically a multi mineral garden fertilizer product, and can be minimized or eliminated when the fresh water stream contains sufficient nutrients.

To keep the conditions optimum for the microorganisms, a small stream of fresh water must be continuously supplied to the biological scrubber sump, and excess water at approximately the same rate overflows to waste. This waste stream contains spent microorganisms, waste acid and any toxic byproducts formed. Recycled treated water from the wastewater treatment plant can be used as the fresh water source, as long as it does not contain any chlorine.

Please consult Armatec for more details on the effective operation of a Biological Scrubber.

1: Armatec Biological Scrubber installed in Fertiliser Plant, Christchurch removing 98% of 300ppm H₂S. **2:** Biological action removing pollutants from air **3:** Flow diagram of key process within biological scrubbers.



World-class Biological Scrubbers from Armatec

Armatec provides Biological Scrubbers with world-class design, materials and end-to-end service. Our Biological Scrubbers deliver amongst the highest & most stable performance in the industry that is both affordable and simple to operate and maintain.

To achieve this, we design our Biological Scrubbers in conjunction with international expert Marc Deshusses and use only the highest-grade materials. We provide a full end-to-end service from concept, design, supply, installation, commissioning and support for all our Biological Scrubber installations. Every Biological Scrubber we make is backed with our satisfaction-guaranteed support service, using our extensive on-site experience in NZ and Australia.

Healthy bugs means reliable performance

The key to good performance in a Biological Scrubber is a thriving colony of the required species of odour-eating microorganisms. This is our overarching design focus in everything we do. The bed of microorganisms is continuously wetted to provide both water and nutrients for their optimum health. Very small amounts of nutrients (N,P,K+traces) are dosed to ensure optimum health of the microorganisms. As the H₂S-consuming microorganisms perform best at pH 1 to 2, the pH of the recirculating liquor is monitored and the rate of fresh water supply adjusted so that the pH is kept within this range. Chemical consumption is eliminated or greatly reduced compared to a chemical wet scrubber. The only requirement is an occasional dosing of nutrients.

Corrosion-resistant Fibreglass and high-grade materials

H₂S is extremely corrosive, particularly to concrete and steel. Armatec biological scrubbers are built in corrosion resistant fibreglass built to international standards under ISO 9001 quality assurance at our own factory. Fibreglass is ideal and proven in this application and guarantees low maintenance and long life. Stainless steel and high-grade PVC piping are used for non fibreglass components. We use proven inorganic packing media that lasts >10 years to house the army of microorganisms.

Easy Startup & Restart

As soon as there is a load of H₂S in the incoming gases, H₂S consuming microorganisms start establishing. The waste acid they produce lowers the pH to their favoured range of pH 1 to 2. Startup time can be reduced by seeding the recirculating liquor. Once a population of microorganisms is established, they are able to handle fluctuating H₂S loads, large sudden peaks, and restarts after shutdowns.

Performance does not degrade over time, and is not subject to changing weather. If the average weekly H₂S load reduces/increases, then the only change needed is a small reduction/increase in the fresh water supply so that the pH remains in the optimum range.



4: Armatec Biological Scrubber in Pines II WWTP, Christchurch removing >99% of 11-42 ppm H₂S
5: Inorganic packing media used for microorganisms

Standard models and key features

Optimised designs backed by international expert Marc Deshusses

We have a range of different Biological Scrubber types available to suit any application. Our three styles are:

- Vertical towers
- Horizontal crossflow style
- Combination “plug & play” units (see page 7)

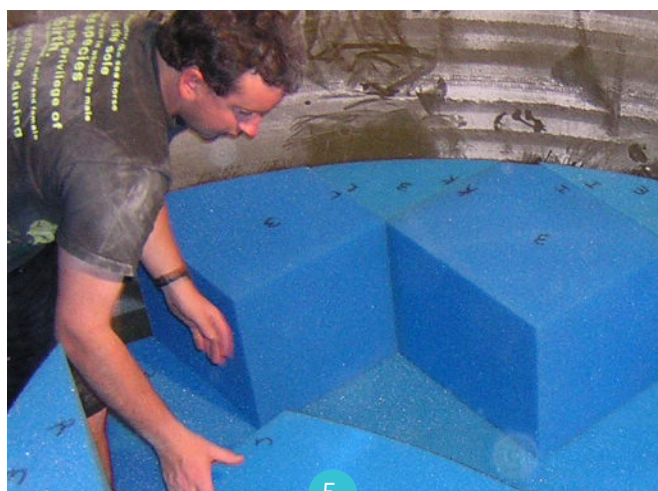
As well as standard sizings, we have the design flexibility to deal with any sized application with confidence. Below is the table of standard vertical tower Biological Scrubber sizes available.

Model	Nom. Dia (mm)	Typical Airflow (m ³ /s)
BS-60	1500	0.3 - 1.0
BS-70	1800	0.4 - 1.3
BS-80	2000	0.5 - 1.6
BS-100	2400	0.7 - 2.3
BS-110	2800	1.0 - 3.1
BS-120	3000	1.2 - 3.5
BS-140	3500	1.6 - 5.0

Please note choice depends on many factors including inlet load and removal performance required. Horizontal crossflow styles available on request. Consult ARMATEC to confirm sizing.

Key Features of Armatec Biological Scrubbers

- Corrosion resistant construction.
- Lower scrubber shell serves as integral sump for recirculating liquid supply.
- Standard accessories including access doors, spray headers, piping connections, nozzles, internal structure supports, packing, support plates and hold-down lugs.
- Circulation pump can be mounted on side of scrubber to minimise footprint.
- Nutrient dosing & storage componentry are optionally included.
- No complex controlling instrumentation. pH monitored only.



5

Design Considerations

There are many considerations in deciding a biological scrubber is right for your application, and the successful implementation of that vision. We can assist you in the careful selection, design, commissioning, optimisation and operation of an Armatec biological scrubber that is ideal for your project. We are happy to assist with our years of experience and expertise across all aspects of this process, and we will work with you to ensure your project is a total success.

The key design considerations to begin the journey are knowing: H₂S load, H₂S removal efficiency required, other odourous compounds, scrubber style, design details. Please consult with one of our highly experienced chemical engineers at Armatec to help guide you through this process.

Not sure? Pilot plants are available for site trials using a representative stream of the air to be treated. This has the advantage of giving actual performance data allowing for accurate scale up to the full unit. A successful pilot plant trial gives all parties the confidence to proceed with the full scale unit.

Proven performance, guaranteed

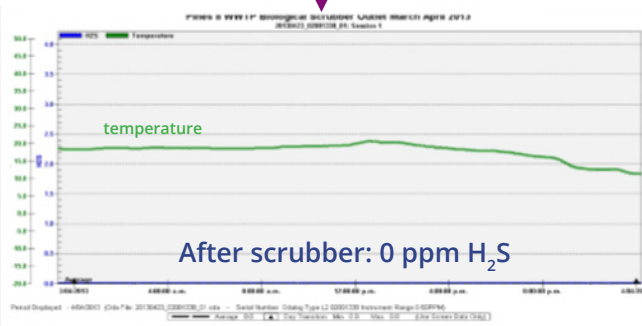
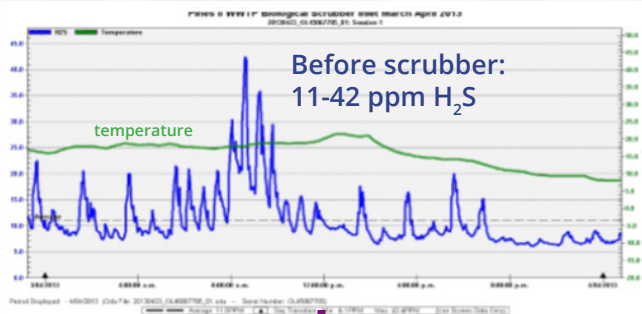
Our Biological scrubbers have excellent credentials – they are proven performers and can remove up to 99% of H₂S in air streams and simple to operate.

Armatec's Biological Scrubbers are expertly built and we have met every agreed performance target. We are so confident in our delivery that we guarantee the performance of all our Biological Scrubbers, and provide complete service to ensure it meets the requirements. Below are a cross-section of Biological Scrubber projects designed and delivered by Armatec, with associated performance data.

Pines II WWTP, Rolleston, Christchurch: >99% performance



Armatec installed a Biological Scrubber at the WWTP that removes >99% of 11-42ppm H₂S (as shown in the graphs below) from the 2.0 m³/s air stream. This is the installation featured on the front cover of this booklet.



Fertiliser Plant, Christchurch: Soil Bed Filter problems resolved



Armatec installed a Biological Scrubber at a fertiliser plant that removes more than 98% of 300ppm H₂S from the 0.8 m³/s air stream. The previous soil bed filter was overloaded, and required frequent maintenance. As a result there were many odour complaints from neighbours. The ARMATEC Biological Scrubber has solved these problems, and been in operation for a number of years now. The excellent performance of this biological scrubber was reported in an engineering paper published at a conference in 2007.

Richmond WWTP, West Sydney: Biological Scrubber & Carbon Bed



Armatec designed and optimised a Biological Scrubber with Carbon Bed that removes >97% of H₂S from the 0.6 m³/s air stream measured at 7,765 Odour Units. The Biological Scrubber performance is >92% H₂S removal, and the final odour loading in the Carbon Bed outlet is 208 Odour Units.



6: Armatec-designed Biological Scrubber at Richmond WWTP.
7 & 8: Armatec BSCB Plug & Play unit installed in Motueka WWTP, New Zealand removing >99% of 20-100ppm H₂S at 0.2m³/s.

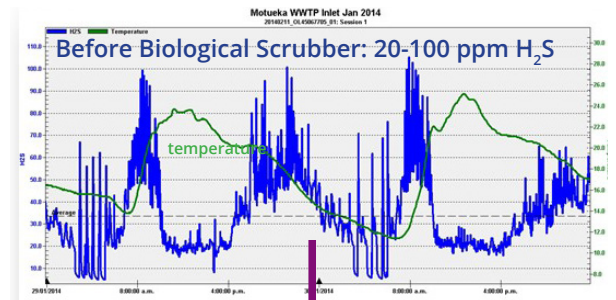
Plug & Play units: simplicity at site for small air flows

The Biological Scrubber & Carbon Bed (BSCB) Plug & Play units are a unique modular combination style available from Armatec that delivers complete odour control from the first day.

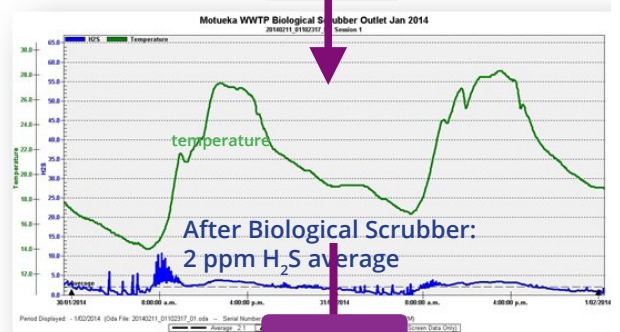
The BSCB Plug & Play units are ideally suited to >99% remove medium to high odour loads at low air volumes of 0.5 m³/s and below. They are compact, simple to specify, ship, install and operate.

The BSCB Plug & Play units have built-in complete odour removal and redundancy upon startup for total assurance. There is low activated carbon usage giving significant reduction in operating costs. All BSCB Plug & Play componentry and systems are factory built and commissioned ready for immediate use.

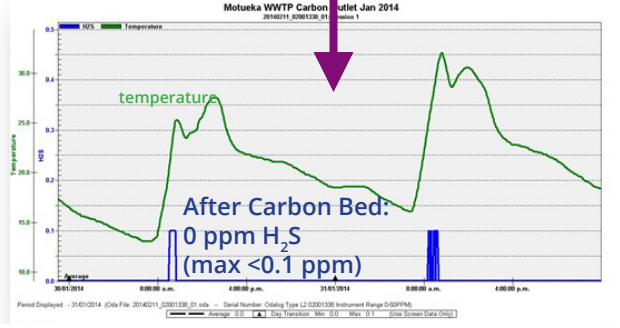
For higher airflows above 0.5 m³/s we provide other integrated 2-stage systems to suit your needs.



Biological Scrubber



Carbon Bed



7



8

- ### Key features of the Plug & Play BSCB units
- Pre-filter to remove fats, grease
 - Biological scrubber bed to remove 95% of H₂S and other gases
 - Heater to lower humidity
 - Fan to drive the air
 - Carbon adsorption bed to polish air at final stage

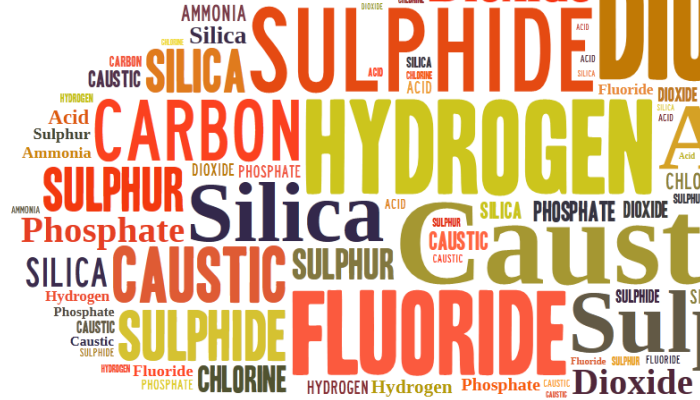
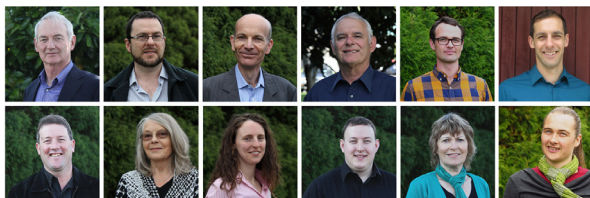
Reducing emissions to the environment

We deliver world-class industrial fibreglass products and solutions to reduce emissions to the environment.

We provide full service from quality technical advice at concept through detailed design, pilot plant trials, fabrication, installation, commissioning and optimisation services.

We combine strong, established solutions with leading edge technologies to create the best outcomes for our customers. We are on the forefront of technological innovation in environmental protection as well as manufacture many best-in-class products under international licenses.

Our company is made of skilled, passionate and highly experienced specialist Chemical Engineers & Fibreglass Technicians with many years of experience between us. We have established a reputation as a leading supplier of air pollution control equipment and industrial fibreglass products, with a reputation for highest quality products for tough environmental and corrosion resistant applications.



Air Pollution Control

Hoods, Covers, Fans, Ducting, Scrubbers, Void Towers, Venturis, Strippers, Stacks, & more



Odour Control

Carbon Bed Adsorbers, Biological Scrubbers, Wet Scrubbers, Green Dome® Odour Filters



Surface Protection

Coatings, Linings, Floorings & Grouts



Wastewater Management

Manholes, Pump Stations, DAF & IAF, Clarifier Components, Flumes, Vortex Dropper Formers, Phos/Algae Removal & more



Chemical Containment

Tanks, Piping, Drainage, Sump liners & more



Call us today to assist with your project

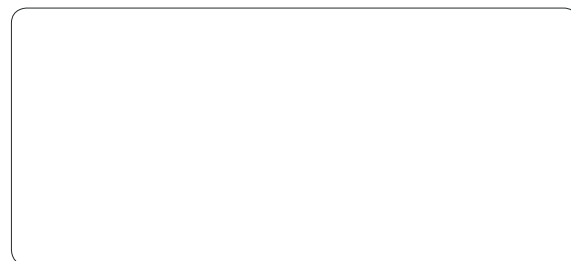
Armatec Environmental Ltd

P.O. Box 3046 New Plymouth, New Zealand

Ph +64-6-755-0410 | Fax +64-6-755-2346

enquiries@armatec.co.nz

www.armatec.co.nz



armatec

ENVIRONMENTAL