

Mónafil Data Sheet

Product Overview



“Anua Clean Air International offer proven, patented clean air bio-technologies, which provide best-in-class process performance with the lowest utility and life cycle costs”

Control of hydrogen sulphide and VOCs is a concern in many wastewater treatment, composting and industrial plants.

Hydrogen sulphide, and many VOC's, create odours, are corrosive, cause air pollution and can be detrimental to health.

Monafil is an engineered organic biofilter media which is used almost exclusively on high volume airflows with low to moderate levels of VOC, H₂S, Organic Sulphur, Ammonia and Organic Nitrogen compounds.



Figure 1 - Mónafil Installation in Milan, Italy

The combination of excellent mechanical properties, longevity, uniformity and porosity, results in a long-life media with a long life which can be installed to a depth of 3m. The features of the resulting biofiltration system are low footprint, high performance and low system pressure delivering a low initial capital cost which in turn combined with the properties of the media yields low life cycle costs particularly on large airstreams due to the low energy requirement and long media life.

The combination of high performance and low life cycle cost means Monafil is the premium media of choice for most large municipal and Industrial odour control applications.

Mónafil Biofiltration Benefits Over other Biofilters:

- ✓ Mónafil systems have high performance and low running costs.
- ✓ The media is resistant to breakdown, which provides long media-life up to 10 years.
- ✓ Proven high performance with systems in operation for more than 20 years.
- ✓ The deeper depth of the media, up to 10 feet, allows for a greatly reduced footprint versus wood chips or soil type media
- ✓ No chemical or nutrient addition
- ✓ Achieves >99% removal of H₂S and greater than 95% OUE/m³ dependent on the application
- ✓ Mónafil is an excellent option to replace other organic media which suffer from short media life.
- ✓ The media is regarded as the best available technology in Italy following a seven-year trial and was used to replace the
- ✓ organic media used in other trial units.
- ✓ The media can be graded at the time of replacement and up to 50% recycled and reused.

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Treatment Details and Product Selection Considerations



Mónafil Treatment and Product Selection Considerations		
Compound	Concentration Range	Removal Efficiency
Odour	1000 - 50,000 OUE	95% +
H₂S	0-30ppm (50 ppm max)	98% +
VOC's	0 - 100 mgC/m ³	50%
Reduced Sulphur Compounds	0 -10 ppm	90%
Amines	0 - 10 ppm	99% +
Ammonia	0 -20 ppm	98%
Typical design contact times.	36 to 55 seconds	
Water Consumption per kg H₂S.	46 m ³	
Typical Media Life.	7 years ++	
Typical Pressure Drop per m³.	100 pa	
Comments on Selection of Technology	In general ideal for high volume airstreams with low levels of VOC, reduced sulphur, amines and ammonia.	
Comments on Life Cycle Cost	Long media life and low pressure drop gives excellent life cycle cost on high air volume applications such as composting	

Table 1- Mónafil Data

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Treatment Details and Product Selection Considerations



Application	Odour		H ₂ S		VOC's		Reduced Sulphur		Amines		Ammonia	
	Odour [Inlet Concentrations] [O _u E]	Removal Efficiency [% O _u E]	H ₂ S [Inlet Concentrations] [ppm]	Removal Efficiency [% H ₂ S]	VOC's [Inlet Concentrations] [mgC/m ³]	Removal Efficiency [% g.C/m ³]	DMS [Inlet Concentrations] [ppm]	Removal Efficiency [% H ₂ S]	Amines [Inlet Concentrations] [ppm]	Removal Efficiency [% ppm]	Ammonia [Inlet Concentrations] [ppm]	Removal Efficiency [% ppm]
ACAI Technology												
Mónafil	1000 - 50,000	95% +	0 - 30ppm (50 ppm max)	98% +	0 - 100	50%	0 - 10	90%	0 - 10	99% +	0 - 20	98%
Mónashell [Single Stage]	1000 - 100,000	98% +	0 - 50 ppm (100 ppm max)	98% +	0 - 200	50 - 80%	0 - 30	95%	0 - 5	95% +	0 - 30	95%
Monashell EBF	1000 - 40,000,000	99.9% +	0 - 2000 ppm (4000 ppm max)	99.9% +	0 - 1000	90 - 95%	0 - 500	99%	0 - 50	98% +	0 - 100	98%
Monashell Dual Pass	1000 - 4,000,000	99% +	0 - 200 ppm (500 ppm max)	99.5%+	0 - 400	85 - 95%	0 - 100	98%	0 - 20	98% +	0 - 50	98%
Monashell Dual Pass/Dual Media	1000 - 4,000,000	99% +	0 - 200ppm (1000 ppm max)	99.5%+	0 - 400	85 - 95%	0 - 100	98%	0 - 20	98% +	0 - 50	98%
CrumRubber	1000 - 10,000,000	90% +	0 - 500 ppm (1000 ppm max)	95% +	0 - 100	50%	0 - 50	85%	0 - 10	98% +	0 - 20	95%
Hybrid Multi-Media Multi-Stage [Crumb Rubber/Shell Media]	1000 - 20,000,000	99.9% +	0 - 1000 ppm (2000 ppm max)	99.9%+	N/A	50 - 80%	0 - 100	98%	0 - 20	98% +	0 - 50	98%
CrumRubber [Biogas/Landfill Gas]	N/A	N/A	0 - 2000 ppm (4000 ppm max)	85-95%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lava	1000 - 50,000	95%	0 - 30ppm (100ppm max)	98%+	0 - 50	20 - 50%	0 - 10	90%	0 - 5	90%	0 - 20	80%
Woodchip	1000 - 20,000	85%	0 - 10ppm (30ppm max)	90%+	0 - 100	50%	0 - 5	80%	0 - 5	90%	0 - 30	90%

Table 2 - Anua Clean Air Product/Treatment Matrix

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Treatment Details and Product Selection Considerations



Application	Typical design contact times.	Water Consumption per kg H ₂ S.	Typical Media Life.	Typical Pressure Drop per m ³ .	Comments on Selection of Technology	Comments on Life Cycle Cost
ACAI Technology						
Mónafil	36 to 55 seconds	46 m ³	7 years ++	100	In general ideal for high volume airstreams with low levels of VOC, reduced sulphur, amines and ammonia.	Long media life and low pressure drop gives excellent life cycle cost on high air volume applications such as composting
Mónashell [Single Stage]	25 to 55 seconds	0.4 m ³	5 years	50 pa	In general for ideal airstreams with moderate levels of H ₂ S, VOC, reduced sulphur, and ammonia.	Low water consumption, low pressure drop and no requirement for carbon polishing gives very low life cycle cost
Monashell EBF	36 to 90 seconds	0.4 m ³	2 - 5 years	250 pa	This technology was developed for high high levels of H ₂ S and VOC's generally used for industrial process emissions	Low life cycle costs for high high VOC and H ₂ S emissions when benchmarked against chemical scrubbers and Thermal oxidisers
Monashell Dual Pass	18 to 36 seconds	0.4 m ³	5 years	100 pa	In general ideal for high strength airstreams where two stages of treatment required (no requirement for carbon polishing.	Dual pass negates the requirement for Carbon polishing so low running cost due to this and low water and power consumption for Monashell
Monashell Dual Pass/Dual Media	18 to 36 seconds	0.4 m ³	8 years	75 pa	Ideal for high strength H ₂ S airstreams where two stages of treatment and a long media life is required (no requirement for carbon polishing)	Similar performance to dual pass but media life enhanced by use of denser shells in first stage so lower running cost due to less frequent media replacement
CrumRubber	25 to 55 seconds	3 m ³	15 years +	100 pa	This technology was developed as a inert biotrickling filter for high H ₂ S applications, particularly suited where water availability a high cost as media can with stand low pH	Inert media biotrickling filter with low running cost due to inert nature of media. Polishing required if high odour removal efficiencies are required
Hybrid Multi-Media Multi-Stage [Crum Rubber/Shell Media]	25 to 55 seconds	2.4 m ³	10 years +	120 pa	This dual stage system offers the High H ₂ S removal and long media life of CrumRubber coupled with excellent organic sulphur, VOC and odour removal of Monashell. Monashell media enhanced by factor of up to 5.	Hybrid with CrumRubber stage followed by Monashell this is ideal for very high H ₂ S applications where very high odour removal and long media life is a requirement.
CrumRubber Biogas/Landfill Gas	50 to 100+ seconds	0.2 m ³	10 years +	75 pa	Inert media for H ₂ S removal, also goOd removal for long chain volatile organic siloxanes	Ideal technology to complement activated carbon polishing and significantly reduce cost of landfill and biogas cleaning.
Lava	36 to 55 seconds	46 m ³	15 years +	100 pa	In general media is suitable when used with a carbon polishing filter for removal of low to moderate levels of H ₂ S. Application limited by water availability and if no final effluent available running costs due to consumption of water, carbon and power is high	Lava is suitable for low to moderate H ₂ S levels where high volumes of water are available to maintain pH very often carbon is used as a polisher which can leave life cycle costs high
Woodchip	50 to 90 seconds	46 m ³	2 years	250 pa	Wood chip media is low cost but requires long contact time, high water to work effectively and frequent change out.	Wood chip is a low performing media which requires very long contact times and has limited application. In general low media life and high pressure negate lower capital investment.

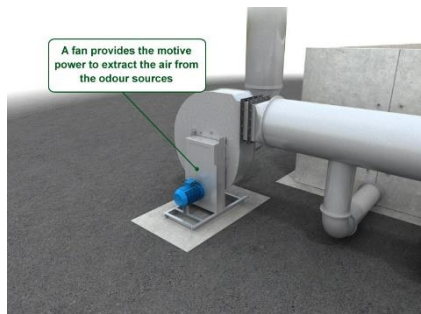
Table 3 - Product Selection Considerations

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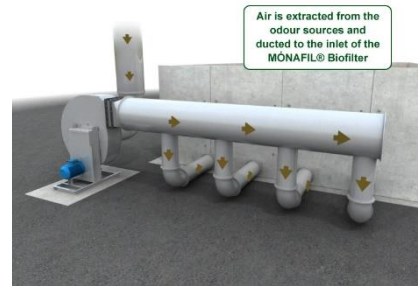
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Mónafil Data Sheet

How the Mónafil System Works



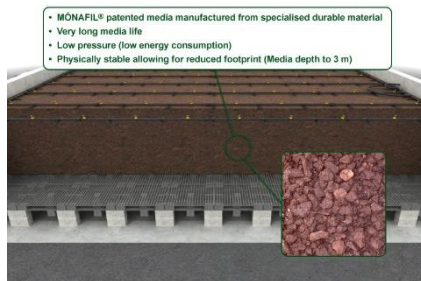
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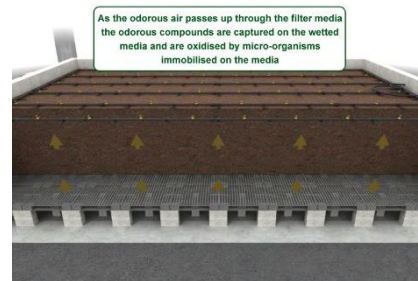
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Step 3



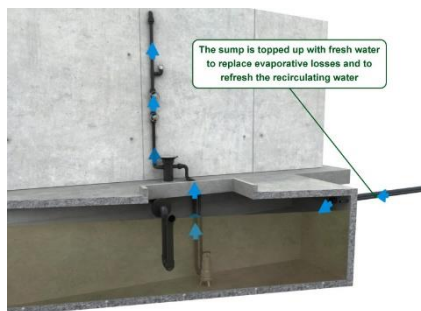
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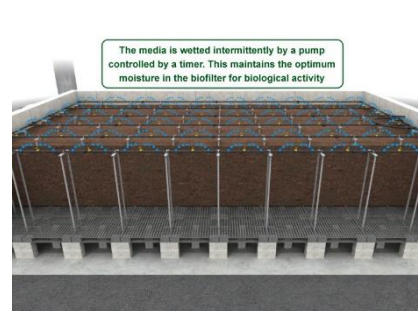
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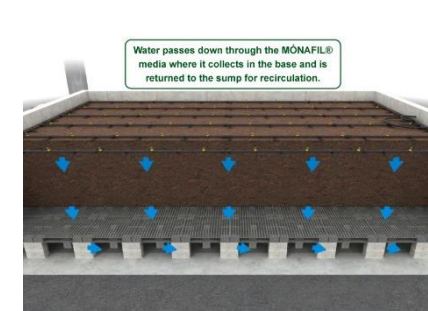
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Step 7



Step 8



Step 9