



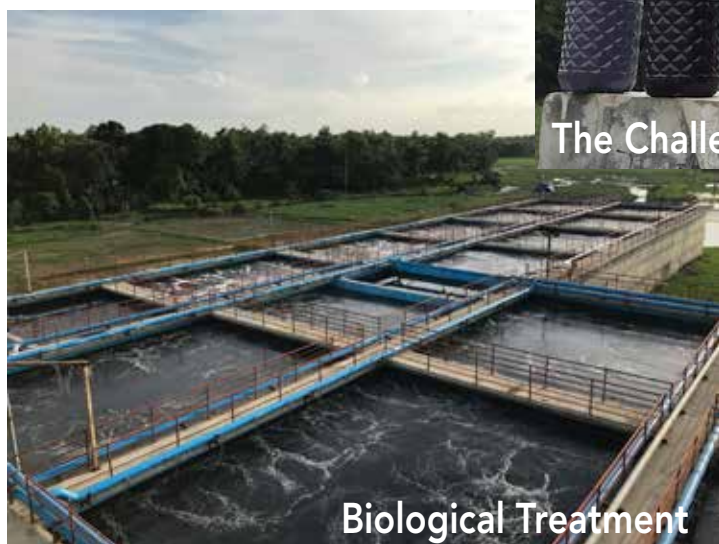
DRYDEN
AQUA

PRICE LIST 2019 US DOLLAR

Water Treatment



The ChallengeThe Results!



Biological Treatment



AFM® Filtration

Dryden Aqua

About us

Dryden Aqua is one of the largest manufacturer of glass filtration media in the world. Our activated filter media AFM® is verified to be the best. AFM® doubles the performance of sandfilters without the need for additional investments in infrastructure.

We are marine biologists and provide innovative solutions for clean water, waste water, aquatic life support systems and swimming pools worldwide.

Our Mission

Our mission is to provide solutions that have a positive environmental impact on our ecosystem. We help to make this world a better place - a non-toxic environment for everyone.

Our Production in Edinburgh, Scotland:



Dryden Aqua Water Treatment

Dryden Aqua Technology is applicable in all areas where biology has a role or might influence the quality of water treatment. Some key examples are as follows:

Pre-treatment prior to membranes

Fouling of membranes for RO and ultra-filtration is a major cost. AFM® reduces fouling because it does not contain free silica to prevent silicate blockage. Sand filters are biofilters and constantly discharge bacteria into the product water to foul the membranes. AFM® resists biofouling and does not become a biofilter.

Removal of arsenic, ferric and manganese

AFM® will remove many heavy metals from the water, and is particularly effective for arsenic and ferric. Contaminated water is usually ground water which must be strongly aerated for a period of at least 30 minutes prior to filtration. If arsenic needs to be removed additional ferric may be added to achieve a ratio of 10:1 (ferric:arsenic) to facilitate oxidation and co-precipitation.

Cooling tower side-stream filtration

Water treatment is essential for cooling tower recycled water to control pathogenic bacteria such as Legionella and to maximize heat transfer.

Tertiary treatment of effluent

AFM® replaces sand in tertiary treatment filters without the need for any modifications. AFM® will not biofoul and will more than double the performance of the treatment system, offering a sustainable, low cost and high performance alternative to sand.

These are only a few extracts from a large spectrum of applications for AFM and Dryden Aqua Technology.

Dryden Aqua's AFM® is the highest performance, most tested and most certificated filtration media.

Dryden Aqua thrives on the challenge of new applications and welcomes any enquiry where our technology might make a difference.

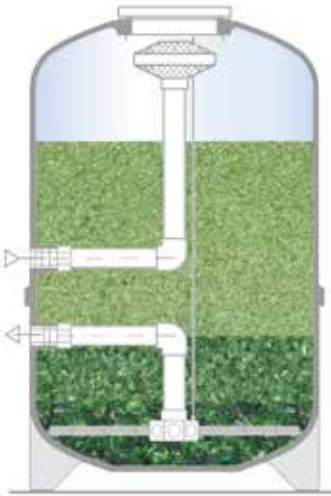


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Water Treatment

AFM® Activated Filter Media

Product ID:



Name:	Dryden Aqua AFM® - Activated Filter Media
Usage:	Replaces sand in all media filtration applications
Material:	Green & amber up-cycled glass. Optimised mechanical filtration performance with activated mesoporous surface
Unique Features:	Bio-resistant, self-sterilising, predictable performance, filtration down to 1 micron (Grade 0), 4 microns (Grade 1)

About AFM®:

AFM® is quite simply the most efficient granular filtration medium available on the market. It is highly engineered to give optimum mechanical filtration performance in a range of industrial and municipal water filtration applications.

AFM® replaces sand in all filtration applications and can be used in a conventional sand filter without modification.

AFM® Production:

AFM® is:

- manufactured from very specific green or brown glass types
- engineered to obtain optimum and consistent particle size and shape,
- activated to increase the surface area up to 300 times that of crushed glass or sand.
- chemically and thermally treated to ensure permanent negatively charged surface properties that make AFM® self-sterilising.



AFM® Performance:

AFM® :

- will not support bacterial growth
- at up to 20m/h will consistently filter, without flocculation:
 - >95% of 4µ particles (Grade 1)
 - >95% of 1µ particles (Grade 0)
- will selectively filter positively charged ionic particles such as heavy metals
- will not suffer from channelling or preferential pathways
- will consistently evacuate more than 95% of retained particles using 50% or less water than required for sand. (backwash duration 5 mins max at 45m/h).
- has a service lifespan of 10 - 15 years or more.



NSF/ANSI 50 & 61

AFM® Certification:

Certified:

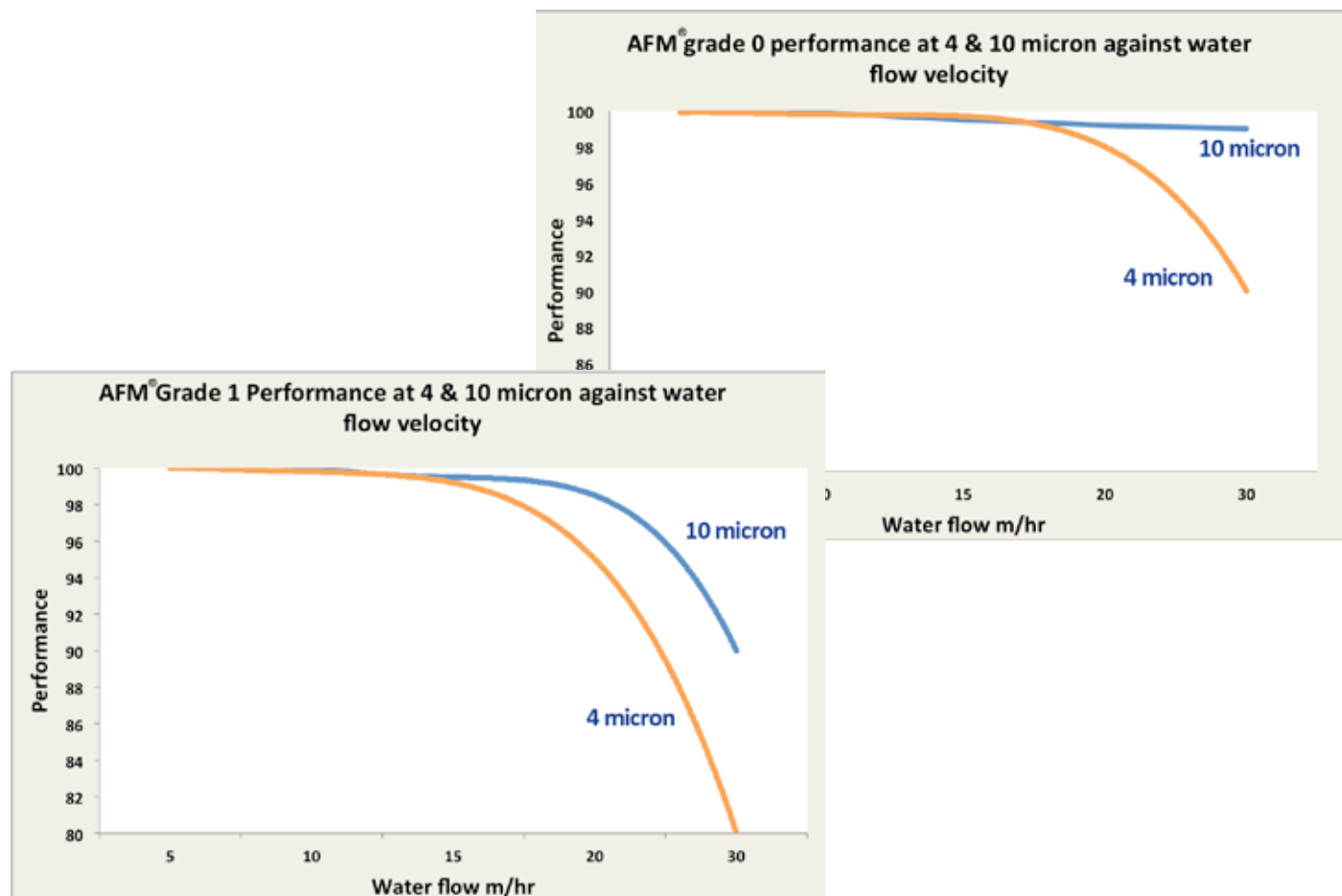
- ISO 9001, 14001 & 18001.
- NSF 50 & 61 for potable water use.
- DWI EC Regulation 31 certification for potable water use.
- European Water Directive (98/83/EC) & 80/778/EEC) compliant.
- BSEN12902 and BSEN12904 compliant.
- Independently tested by accredited laboratory, IFTS (Institute of Filtration and Techniques of Separation) according to EC ETV (Environmental Testing Verification) programme. Found to give vastly superior performance in filtration and backwash than any other product tested.

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Water Treatment

AFM® Performance & Benefits

Filtration performance and grade of filter media:



Main Benefits:

- Is a direct replacement for sand in any type of sand filter.
- Has more than double the fine particle retention performance of any other media, without the need for any other investments.
- Guaranteed prevention of biological fouling and resultant channelling.
- Has an engineered, activated surface to remove specific priority substances, heavy metals and metalloids including arsenic.
- Substantially reduces product water oxidation demand.
- Reduces backwash water demand by an average of 50%.
- Provides quick return on investment, usually less than 2 years on water consumption alone.
- More than 4 times longer lifecycle than sand.
- ISO, DWI, NSF50/61 certified .

For detailed instruction please consult the Dryden Aqua AFM® IFU (Information For Use) document which can be downloaded from the Dryden Aqua Website www.drydenaqua.com via the following link.
<https://www.drydenaqua.com/files/AFM-general/AFMInstructionsforUseJune1,2017.pdf>

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Water Treatment

AFM® Applications

Recommended applications for Dryden Aqua AFM®

Application Type	Associated Processes		PSF Typical flow m/hr		%age reduction
Drinking water			min	max	
Arsenic removal	Oxidation 30 mins by aeration prior to AFM® filtration.	FeCl coagulation prior to AFM® filtration	>5	<20	90% reduction
Iron removal	Oxidation 30 mins by aeration prior to AFM® filtration.		>10	<20	95% reduction
Manganese removal	Oxidation 500mV with H ₂ O ₂ or NaHOCl + 30 mins aeration	FeCl coagulation prior to AFM® filtration	>10	<20	98% reduction
Membrane pre-filtration	AFM® filtration to 5µ (AFM® Gd1) or 1µ (AFM® Gd0)	1 micron cartridge filter	>10 >5	<15 <10	SDI <5
Municipal Wastewater	Phosphorous & Bacteria, BOD, COD & TOC				
Tertiary Treatment	Pre-filtration to <100 µ + FeCl coagulation then AFM®	Oxidation 30mins with NaHOCl after AFM® filters	>5	<15	-95% COD
Industrial Process Water	Organic pollutants & oils, TSS, VSS & particles >1 micron				
Cooling tower sidestream filtration	Filtration 15 - 20m/hr with AFM®		>10	<20	
Industrial Wastewater					
Low conc' mineral oil (<50mg/l) removal	Oxidation 30 mins by aeration	Coagulation & PAC flocculation prior to AFM®			98% reduction
Medium conc' mineral oil (<500mg/l) removal	Oxidation 30 mins by aeration + Coagulation & PAC flocculation	Dissolved Air Flotation prior to AFM® filtration at 5 - 15m/hr max.	>5	<15	98% reduction
Chromium or Copper removal	pH correction 7.0-7.5 by MgO ₂ or 8.5 (caustic). Reduction by dosage of Calcium polysulphide via ZPM + injection of DA GF50 (sub 50 micron glass powder).	Sedimentation 30 mins prior to AFM® filtration at 5 - 10m/hr max	>5	<10	95% reduction
Aquaculture / Aquaria					
Seawater Intake Filtration	Pre-screening of macro-algae by mesh or wedgewire screens	AFM® filtration	>10	<20	
RAS Systems Hatchery & Ongrowing	Biological Filtration after AFM®	Aeration	>20	<30	
Mechanical Filtration in Biological LSS	Biological Filtration Prior to AFM®	Side Stream Protein Skimming	>20	<30	
Mechanical Filtration in Chlorinated LSS	Coagulation & Flocculation prior to AFM® filtration	Chlorine + ACO® in external facilities	>20	<30	

AFM® can be substituted for sand in any pressure or rapid gravity sand filter. It is suitable for many applications beyond those identified above and can be substituted for e.g. membrane filtration in many applications. It will significantly outperform sand in terms of particle retention, stability, backwash water consumption and service life.

For further information on AFM® applications see the Dryden Aqua IFU document on www.drydenaqua.com and Dryden Aqua Process Application sheets.

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AFM® Specification

AFM® product specifications

Specification	Grade 0	Grade 1	Grade 2	Grade 3
Particle size	0,25 - 0,5 mm	0,4 - 1,0 mm	1,0 - 2,0 mm	2,0 - 4,0 mm
Undersized	< 5 %	< 5 %	< 10 %	< 10 %
Oversized	< 5 %	< 10 %	< 10 %	< 10 %
Effective size (expressed as d10)	0,30 mm	0,45 mm	1,1 mm	2,1 mm
Hardness	> 7 mohs	> 7 mohs	> 7 mohs	> 7 mohs
Sphericity (average range)	n/a	0,75 - 0.8	n/a	n/a
Uniformity coefficient (d60/d10)	1,3 to 1,4	1,6 to 1,8	1,4 to 1,5	1,4 to 1,5
Aspect ratio	2 - 2,4	2 - 2,4	2 - 2,4	2 - 2,4
Organic contamination	< 50 g/tonne	< 50 g/tonne	< 50 g/tonne	< 50 g/tonne
Coloured glass (green/amber)	> 98 %	> 98 %	> 98 %	> 98 %
Specific gravity (grain)	2,4 kg/l	2,4 kg/l	2,4 kg/l	2,4 kg/l
Embodied energy	< 72 kw/tonne	< 65 kw /tonne	< 50 kw/tonne	< 50 kw/tonne
Bulk bed density	1,28 kg/l	1,25 kg/l	1,23 kg/l	1,22 kg/l
Attrition, (50 % bed expansion, 100 hour's backwash.	< 1 %	< 1 %	< 1 %	< 1 %



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Use of AFM® & Prices

How to use AFM®:

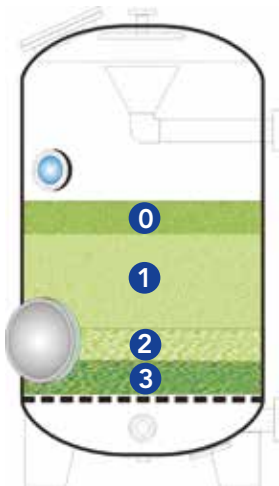
- AFM® is a direct replacement for sand in any type of sand filter
- AFM® has a 15 % lower density than sand: e.g. if your filter takes 1,000 kg of sand it will only require: $1,000 \times 0.85 = 850$ kg of AFM®.

AFM® Grades

- AFM® is produced in 4 grades
- Grades 0 and 1 provide fine filtration
- Grades 2 and 3 provide support and ensure good flow distribution through the filter.

Recommended operational parameters

Parameter	Value
Filtration velocity	1 - 30 m ³ /h/m ²
Back Wash Velocity	< 45 m ³ /h/m ²
Max. operating differential pressure	< 0.5 bar
Back Wash Duration	for 3 - 10 mins
Water pH limits	4 - 10
Water temperature limits	1 - 100°C



Recommended AFM^f Grades and arrangement from top to bottom, in Pressure Filters

Grade, Size (mm)	Commercial Purification	High Purification	Ultra Purification
Grade 0 0.25 - 0.50	n/a	20 %	60 %
Grade 1 0.4 - 1.0	70 %	50 %	20 %
Grade 2 1.0 - 2.0	15 %	15 %	10 %
Grade 3 2.0 - 4.0	15 %	15 %	10 %

Before first use of AFM®:

Backwash AFM® for 5 minutes, 3 consecutive times, with potable water and then rinse for 5 minutes.

Item No.	Description	Package quantity	List Price \$ excl. VAT
10000	AFM® 0, particle size 0,25 - 0,4 mm	Bags of 25 kg	45.00
10001	AFM® 1, particle size 0,4 – 1,0 mm	Bags of 25 kg	45.00
10002	AFM® 2, particle size 1,0 – 2,0 mm	Bags of 25 kg	45.00
10003	AFM® 3, particle size 2,0 – 4,0 mm	Bags of 25 kg	45.00
40 bags/pallet – 24 pallets/truck			
10010	AFM® 0, particle size 0,25 - 0,4 mm	Bulk bags of 1000 kg	1,800.00
10011	AFM® 1, particle size 0,4 – 1,0 mm	Bulk bags of 1000 kg	1,800.00
10012	AFM® 2, particle size 1,0 – 2,0 mm	Bulk bags of 1000 kg	1,800.00
10013	AFM® 3, particle size 2,0 – 4,0 mm	Bulk bags of 1000 kg	1,800.00

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Other Media and Cleaning Agent

MEDIA FOR USE ON TOP OF AFM® (Mixed Media Applications)

Product ID:



Anthracite N				C/90
For use as a supplementary layer on top of AFM® to increase particle retention capacity in applications with high TSS levels				
<ul style="list-style-type: none"> • 0.8 - 1.6 mm for increased retention capacity of fine particles (<20 microns) • 1.4 - 2.5 mm for larger particle sizes 				
Specific weight: 700 kg / m ³				
Packing unit: 20 pcs per pallet = 1 m ³				
Item No	Description	Package quantity	Pallet quantity	List price \$ excl. VAT
90106	Anthracite N - 0.8 - 1.6mm	50l / 35kg	20	80.00
90107	Anthracite N - 1.4 - 2.5mm	50l / 35kg	20	80.00

Product ID:



ACTIVATED CARBON from coconuts shells (type CC 8x16)				C/90
For a variety of industrial water treatment processes.				
<ul style="list-style-type: none"> • AFM® provides support without risk of media contamination • Use of coarse grade active carbon limits risk of media loss in backwash • Activated Carbon bed expansion at 45m/hr backwash velocity = 50% 				
Specific weight: 500 kg / m ³				
Packing unit: 20 pcs per pallet = 1 m ³				
Only Activated Carbon made of Coconut shells will provide good results!				
Item No	Description	Package quantity	Pallet quantity	List price \$ excl. VAT
90105	Activated carbon from coconut shells 1.18 - 2.36mm	Bags of 50 l/25 kg	20 on CP-1	195.00

Fully BPR compliant



Product ID:

DryOx				B/20
DryOx removes biofilm easily and economically				
Each tablet of DryOx dissolved in water generates 2g of chlorine dioxide. Chlorine dioxide is a soluble gas that penetrates biofilm and removes it. DryOx is about 100 times more effective in removing biofilm than chlorine. The higher the concentration and the longer the exposure time, the more effective DryOx will be.				
Dosage				
<ul style="list-style-type: none"> • For Deep Clean: Add 2 DryOx tablets per 10m³ of water and backwash after 30 minutes. The concentration of chlorine dioxide cannot exceed 0.4 mg/l. • Disinfection of filter media: Fill the balance tank. Add 2 DryOx tablets per 10 m³ of water in the balance tank/feed reservoir. Dissolve the tablet and stop the pumps for 5 minutes. Turn the pumps on for 5 minutes and then turn off again for 1 hour. 				
Cleaning solution:				
Add 1 tablet to 20 litres of water for cleaning floors & surfaces (channels, gratings) with this solution. Let it work for 1 hour and rinse with water.				
Item No.	Description	Package quantity		List price \$ excl. VAT
20032	DryOx pack	8 tablets	20 pcs. / carton - 480 pcs / pal (EUR-1)	64.00
20033	DryOx tub	60 tablets	144 pcs / pallet (EUR-1)	370.00

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Water Treatment

Zeta Potential Mixer

Product ID:



Name:	Dryden Aqua ZPM - Zeta Potential Mixer
Usage:	Mechanical coagulation and oxidation reactions and as injection point for coagulants, flocculants, oxidising agents or gas (CO ₂ , O ₃ , O ₂)
Unique Features:	Aggressive mixing and cavitation of the water, can increase redox potential and drop Zeta Potential, stresses oocysts and parasites such as sporidians, rendering them more susceptible to oxidation.

About ZPM:

Manufactured by Dryden Aqua, the ZPM is a cavitating static mixer used for the injection of coagulants and flocculants prior to media filtration by sand or Dryden Aqua AFM® (Activated Filter Media), for potable water as well as wastewater.

It cavitates the water and can increase oxidation potential by up to 100 mv without addition of oxidising chemicals and/or electrical current. As the redox potential increases, the zeta potential decreases and coagulation as well as mechanical flocculation reactions are initiated.



Main Benefits:

- The only cavitating static mixer available in the market
- Increases oxidation potential by up to 100 mV, therefore initiating disinfection without chemicals
- Injection point for coagulants, flocculants, chlorine, ozone, or any gas
- Improves coagulation/flocculation by at least 30%
- 100% 316ti (1.4571) grade stainless steel.
- Flanges directly into the pipework

ZPMs should be dimensioned according to pressure loss which should be between 2 and 3 mH₂O (0.2 – 0.3 bar).



External Thread
ZPM DN 65



Flange
ZPM DN 80 - 300

Item No.	Size	no of finns	conn. ²	length	weight	Pressure loss ⁴			List price \$ excl. VAT
						0.2 bar	0.3 bar	0.5 bar	
30004	DN 65	3	2½" ET ³	331.6 mm	2.8 kg	17 m³/h	22 m³/h	27 m³/h	390.00
30014	DN 65	New 2	2½" ET ³	331.6 mm	2.8 kg	24 m³/h	30 m³/h	38 m³/h	455.00
30005	DN 80	3	3" FL	423.6 mm	11.2 kg	20 m³/h	30 m³/h	45 m³/h	1,100.00
30015	DN 80	New 2	3" FL	423.6 mm	11.2 kg	40 m³/h	47 m³/h	63 m³/h	1,030.00
30006	DN 100	3	4" FL	523.6 mm	14.4 kg	50 m³/h	60 m³/h	80 m³/h	1,350.00
30016	DN 100	New 2	4" FL	523.6 mm	14.4 kg	68 m³/h	83 m³/h	108 m³/h	1,285.00
30013	DN 125	3	5" FL	640 mm	21.0 kg	70 m³/h	85 m³/h	115 m³/h	1,595.00
30017	DN 125	New 2	5" FL	640 mm	21.0 kg	100 m³/h	125 m³/h	165 m³/h	1,490.00
30007	DN 150	3	6" FL	765.6 mm	26.8 kg	100 m³/h	125 m³/h	170 m³/h	1,900.00
30018	DN 150	New 2	6" FL	765.6 mm	26.8 kg	160 m³/h	200 m³/h	260 m³/h	1,785.00
30008	DN 200	3	8" FL	989.6 mm	41.2 kg	175 m³/h	220 m³/h	290 m³/h	2,630.00
30009	DN 250	3	10" FL	1,229.6 mm	58.6 kg	260 m³/h	325 m³/h	420 m³/h	3,550.00
30010	DN 300	3	12" FL	1,437 mm	77.2 kg	385 m³/h	475 m³/h	500 m³/h	4,200.00

² FL = flange / ET = External thread

³ Old models with External Thread, some stock left

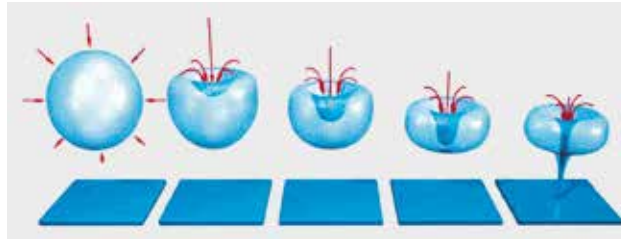
⁴ 1 bar ≈ 10 mWS ≈ 10 m H₂O ≈ 15 psi

All ZPMs are equipped with 2 x ½" BSP, female threaded injection points

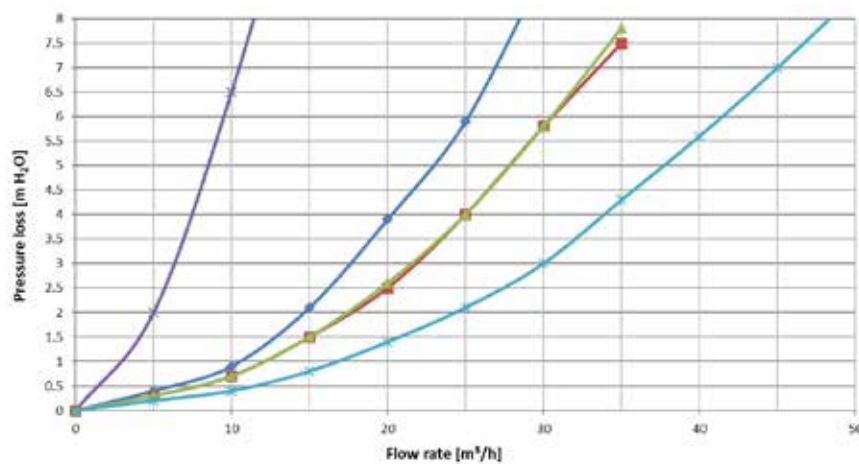
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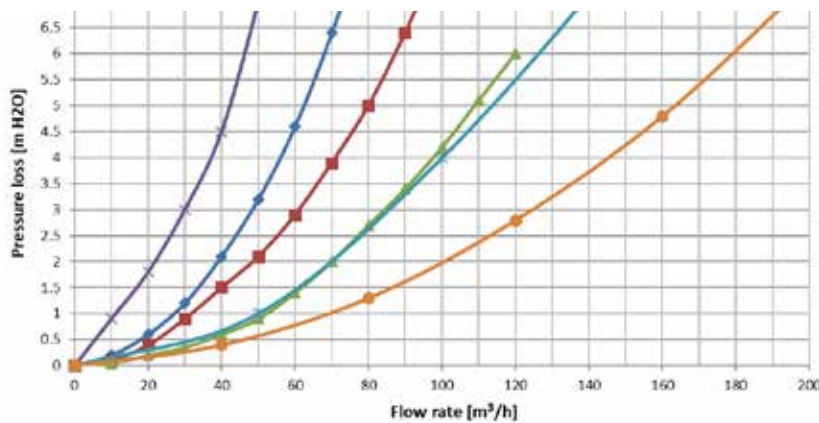
Zeta Potential Mixer



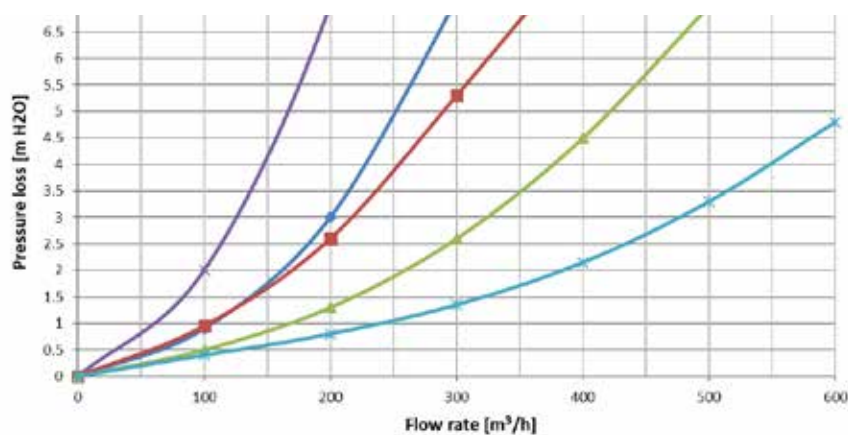
Nano-bubble implosion generated by cavitation in ZPM



Pressure loss DN 40 - DN 65



Pressure loss DN 80 - DN 125



Pressure loss DN 150 - DN 300

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Water Treatment

Fine Bubble Air Diffusers

Product ID:

Name:	Dryden Aqua Air Diffusers
Usage:	Aeration, biological treatment, oxidation, destratification of reservoirs and lakes
Unique Features:	Fine bubble air diffusers, high energy yield, semi-flexible, self-ballasted, simple maintenance, high durability, high cost effectiveness



About Dryden Aqua Air Diffusers:

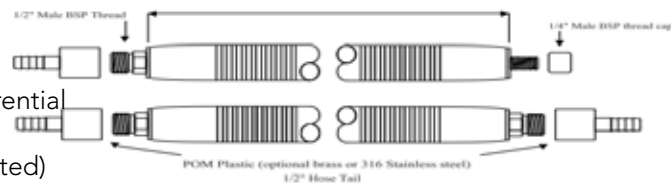
Dryden Aqua Air Diffusers are the best semi flexible fine bubble aeration system available in the market. They are 5 times more efficient than coarse bubble air diffusers in mixing action and aeration capacity, with an average bubble size of 1 mm. They usually connect to a circular ring main pipe with quick connections. The ring main pipe connects to a low pressure (around 1 bar) roots type or rotary vane air blower.

Dryden Aqua's Air Diffusers are very easy to install in tanks, plastic lined reservoirs or lagoons, and can be maintained while air blowers are operating and the water reservoir is full.

The Air Diffusers are equipped with integral ballast and non return valve and will stay on the bottom without needing to be secured to the base.

Specification

- Tubular diffuser up to 3m in length
- Air flow from 1 to 10 m³/h
- Oxygen transfer up to 5kg/kwh
- Less than 0.2 Bar (3psi) pressure differential
- Outer polyester jacket
- Internal glass bead ballast (self weighted)
- Plastic & stainless steel construction
- Simple installation
- Very easy maintenance



Performance

3 Primary performance factors condition the use and benefits of use of DA fine bubble diffusers in any application. These are:

- Oxygen Transfer Efficiency (OTE)
- Quantity of water moved per m³ of air
- Energy consumption per Kg of oxygen transferred and per m³/h of water moved.



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Water Treatment

Fine Bubble Air Diffuser Benefits

Oxygen Transfer Efficiency

Product Code	Description Length of diffusers	Diffuser weight	Air Flow m ³ /hr	Oxygen Transfer kg of O ₂ /day per diffuser at different depths at 20°C and 50% O ₂ saturation		
	m	kg	(+/- 20 %)	2m depth	3m depth	4m depth
70000	0.33 m	0.5 kg	1	2 kg O ₂	2.5 kg O ₂	3 kg O ₂
70001	0.66 m	1.0 kg	2	4 kg O ₂	5 kg O ₂	6 kg O ₂
70002	1.00 m	1.5 kg	3	6 kg O ₂	7.5 kg O ₂	9 kg O ₂
70003	1.33 m	2.0 kg	4	8 kg O ₂	10 kg O ₂	12 kg O ₂
70004	1.66 m	2.5 kg	5	12 kg O ₂	12 kg O ₂	15 kg O ₂
70005	2.0 m	3.0 kg	6	14 kg O ₂	15 kg O ₂	18 kg O ₂
70006	2.33 m	3.5 kg	7	16 kg O ₂	17 kg O ₂	21 kg O ₂
70007	2.66 m	4.0 kg	8	18 kg O ₂	20 kg O ₂	24 kg O ₂
70008	3.0 m	4.5 kg	9	20 kg O ₂	22 kg O ₂	27 kg O ₂

Oxygen Transfer Efficiency should not be confused with Standard Oxygen Transfer Rate (SOTR). SOTR will be much higher as it considers oxygen transfer with 0% O₂ saturation. The above table is therefore more realistic in real world conditions. OTE will vary with water depth and water density (contact time & bubble size), with temperature and with O₂ saturation levels. Cold salt water will have a much higher OTE than warm freshwater

OTE in typical installations ranges from 1 - 2kg/h for a 3m long diffuser

Water movement per m³ of air

Water movement can be as important as OTE as it serves to re-suspend particles to facilitate oxidation, nitrification or mixing. Airlift movement is the most cost effective mechanism to achieve mass vertical motion of water.

Water movement generated by a 3m, 10m³/hr diffuser in a typical 3m deep tank will be 100m³/h.

Water depth in meters	Amount of water lifted by 1m ³ of air passed through a diffuser
3	10 m ³ /hr
4	15 m ³ /hr
6	20 m ³ /hr
10	40 m ³ /hr
20	80 m ³ /hr
30	120 m ³ /hr
40	150 m ³ /hr
60	200 m ³ /hr

Energy consumption per Kg of oxygen transferred

Pressure loss across the diffusers is less than 0.2 Bar with an Oxygen Transfer per Kw of up to 5 kg/kwh.

Main Benefits:

- Semi-flexible fine bubble aeration system with average size bubbles of 1mm making them 5 times more efficient than coarse bubble diffusers
- Available in 9 different lengths up to 3 m with air flow from 1 – 10 m³/h with < 0.2 Bar (< 3 psi) pressure differential
- Provides oxygen transfer up to 5 kg/kwh. 1 x 3 m air diffuser and 10 m³/h of air provide 1 kg of O₂/h. 1 x 3 m air diffuser is equal to 50 - 100 PE (population equivalents) for municipal wastewater treatment
- Semi flexible construction with its own internal ballast. Will stay on the bottom without the need to be anchored to the floor
- Very easy and quick to install in tanks, plastic lined reservoirs or lagoons
- Can be maintained while air- blowers are operating and water reservoir is full

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Fine Bubble Air Diffuser - Biological Treatment Applications

Biological Treatment Applications

Application Type	Residence Time	Other Treatment	Typical TSS performance	Typical BOD performance	Typical COD performance	Typical NH ₄ performance
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Biological Treatment of Municipal Waste Water

Typical Activated Sludge + Decantation	0.5 days	No	-90%	-95%	-85%	-50%
Dryden Activated sludge with decantation	3 days	AFM	>99%	>99%	>95%	>99%

Dimensioning

1 x 3 m diffuser or 10 m³/h of air for every 50 - 100 PE (Population Equivalent).

Biological Treatment of Industrial Waste Water

Industrial Waste - DA sludge with decantation	3 - 15 days	AFM	>95%	>95%	>90%	>95%
Landfill leachate - DA sludge SBR treatment	5 - 45 days	AFM	>95%	>95%	>90%	>95%

Dimensioning

Example: If COD = 100 x 0.3 = 30 kg/hr = 30kg of oxygen per hour = 720 kg per day.

If the water depth is 3m, then from the performance table; 1 x diffuser code 70008 will deliver 27kg/day.

Number of diffusers required = 720 / 27 x application factor 1.5 = 40 diffusers and an air flow of 400 m³/hr

Ammonium will exert an autotrophic nitrification BOD on the system, which is not measured as COD.

1 kg of ammonium = 5 kg of oxygen demand or (COD equivalent)

If the ammonium concentration is 40mg/l in 100m³/hr water flow, then mass of ammonium = 4kg/hr = 96kg/day.
ammonium = 5 kg of COD, then the COD equivalent = 96 x 5 = 480kg

The above calculation assumes that the ammonium reduction is by nitrification which will not be the case if there is organic matter in the water. For further information see the diffusers IFU document (see below).

Biological Treatment of Agriculture Waste Water

After solids removal 1 x 3m diffuser will mix the slurry from 20 cattle/100 swine. After a treatment time of 40 to 50 days (summer - winter), effluent from SBR/decantation tanks will have TSS <100mg/l.

Effluent can be clarified with flocculants and filtered by AFM to reduce the suspended solids content to <5 mg/l.

Additional calcium and pH correction may be needed.

Agriculture Waste Water Treatment Performance Summary

Parameter	Influent	Effluent
COD	5,500mg/l	- 95%
BOD	5,000mg/l	- 99%
Ammonium	1,500mg/l	- 98%
TSS	2,000mg/l	- 98%

For detailed instruction please consult the Dryden Aqua Diffusers IFU (Information For Use) document which can be downloaded from the Dryden Aqua Website www.drydenaqua.com via the following link.

[https://www.drydenaqua.com/files/water/air-diffusers/pdf/AirDiffuserManual\(IFU\)June,2017.pdf](https://www.drydenaqua.com/files/water/air-diffusers/pdf/AirDiffuserManual(IFU)June,2017.pdf)

PRICE LIST 2019

Water Treatment

Fine Bubble Air Diffuser - Other Applications

Other Applications - Ground water, Gas stripping, Lake destratification & Aquaculture

Application Type	Residence Time	Other Treatment	Typical performance
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Oxidation of ground water for the removal of ferric, arsenic & manganese

Ferric	10 - 30 mins	AFM	Fe reduction to <0.1mg/l
Manganese & Arsenic	10 - 30 mins	AFM	>90% reduction in cases where Mn or As concentrations are < 20% of Fe concentration.

Dimensioning

1m³/hr of air per 1 m³/hr of water treated in 3m deep contact tank, 30 mins contact time.

Gas stripping of THMs and Radon from drinking water

1m³/hr of air per 1 - 2m³/hr of water treated in 3m deep contact tank, 10 - 30 mins contact time, 50% reduction

Thermal and Chemical Destratification of Lakes

Locate diffusers at deepest point of lake or locate to achieve best circulation. Dimension to move a minimum of the entire volume of water in the lake at least once every 7 days (see Water movement per m³ of air table).

As a rule of thumb a typical 3m deep lake a minimum of 1 x 3m diffuser or 10 m³/hr of air will be required for every 1,000 m² of water surface area. Turnover must be increased in very shallow lakes or heavily stocked fishing lakes.

Aeration of Aquaculture systems

Salmonids, need an O₂ concentration above 7mg/l to avoid stressing the fish and for good feed conversion. If concentration is 6 - 7mg/l fish will survive but will be stressed with reduced feed conversion and resistance to disease. Between 4mg/l and 6mg/l fish mortalities can be expected, Below 4mg/l the fish will be under severe stress and mass mortalities are likely.

Dimensioning Guidelines

If you know the oxygen demand of the stock, you can calculate the approximate amount of air and the number / size of diffusers to meet the demand.

In cold water systems you need 1 – 1.5kg of O₂ per day per kg of feed.:

- 20kg of fish feed per day in a tank, needs 30kg to 40kg of O₂ per day for fish to metabolise the feed.
- At 20°C in shallow 0.75 - 1m deep tanks 10m³/hr of air will deliver on average 250 to 500g/h of O₂.
- In seawater systems, at salinity >15 ppt, bubble size is smaller and O₂ transfer efficiency is 350 to 600g/hr.

Based on 1000kg of fish at water temperatures below and above 15°C

- 1000kg of smolts below 15°C, or 1 tonne of trout require = 10 - 20m³/hr of air
- 1000kg of smolts/trout above 15°C, require = 20 - 30m³/hr of air

In Tropical or warm water systems:

- at water temperatures above 25°C, 4 x diffusers and 40m³/hr of air are required per tonne of shrimps/fish.

Safety Margins

It is not possible, in any of the applications described, to over-aerate. It is however difficult to add to any system if restricted by blower or pipes specification. It is therefore wise to allow a reasonable safety margin in any calculation. This will allow for seasonal or future fluctuations in load.



PRICE LIST 2019

Water Treatment

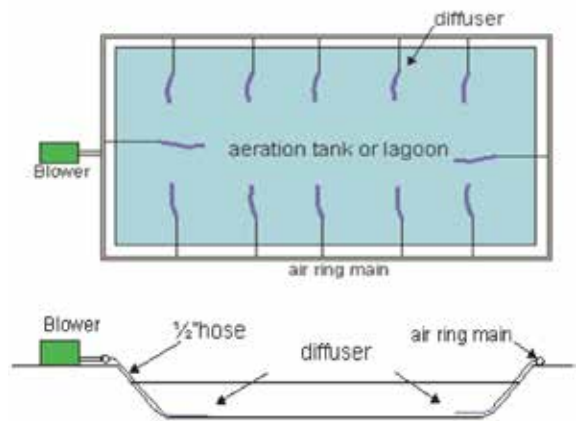
Fine Bubble Air Diffusers Installation and Use

Installation of aeration systems

Dryden Aqua air diffusers are suited for installation in tanks, plastic lined lagoons, lakes or reservoirs of virtually any size or configuration. There is no limit to the size of the aeration system.

Air blower specification

Blowers should be oil free positive displacement blowers or rotary vane blowers for smaller installations (<150m³/hr). Pressure rating should take account of the diffuser pressure loss (0.2Bar) + water depth (0.1 Bar per metre of water depth) + any system's losses and, should be sized for the maximum airflow. A generous length of steel pipe should be inserted between the blower and any plastic pipe in order to dissipate heat from the blower.



Installation

The diffusers are ideally suited for clay or plastic lined lagoons but they are also perfect for steel and concrete tanks, lakes and aeration ditches.

For installation in a lagoon or tank an air ring main pipe should be installed around the perimeter of the lagoon. Valved 1/2" hose connections should be fitted to the air ring main at regular intervals for connection of diffusers. Diffusers should be connected via 1/2" braided flexible hoses cut to ensure they reach the bottom of the pool. The diffusers require no fixings within the pool they are simply thrown into the water.

Maintenance

The diffusers can be recovered by simply pulling on the flexible hose but require virtually no maintenance. In areas with high alkalinity and water hardness some degree of scaling can occur. Simple flexing of the diffuser will crack off any rigid scale deposits.

For cleaning, recover the diffuser, give it a quick shake and brush, and then throw back into the water. Frequency of cleaning depends upon the quality and temperature of the water, but is usually once every 4 weeks to every 6 months. The diffusers can be maintained with the blowers running and with tanks full of water.

Extra ballast

In water depths of >3 - 5m there may be a tendency for the diffusers to lift. Stainless steel ballast blocks are available that fit onto the hose end of the diffusers. These have a single air connection on the top and either one or four diffuser outlets, one on each side.



PRICE LIST 2019

Water Treatment

Fine Bubble Air Diffusers Specification & Prices

Item No.	Description	List Price \$ excl. VAT					
		Diffuser Weight kg	Air Flow m ³ /hr (+/- 20 %)	Oxygen Transfer kg of O ₂ /day per diffuser at different depths at 20 °C and 50 % O ₂ saturation			
				2 m	3 m	4 m	
70000	0.33 m Diffuser	0.5	1	2 kg O ₂	2.5 kg O ₂	3 kg O ₂	138.00
70001	0.66 m Diffuser	1.0	2	4 kg O ₂	5.0 kg O ₂	6 kg O ₂	155.00
70002	1.00 m Diffuser	1.5	3	6 kg O ₂	7.5 kg O ₂	9 kg O ₂	173.00
70003	1.33 m Diffuser	2.0	4	8 kg O ₂	10 kg O ₂	12 kg O ₂	195.00
70004	1.66 m Diffuser	2.5	5	10 kg O ₂	12 kg O ₂	15 kg O ₂	212.00
70005	2.00 m Diffuser	3.0	6	12 kg O ₂	15 kg O ₂	18 kg O ₂	230.00
70006	2.33 m Diffuser	3.5	7	14 kg O ₂	17 kg O ₂	21 kg O ₂	248.00
70007	2.66 m Diffuser	4.0	8	16 kg O ₂	20 kg O ₂	24 kg O ₂	265.00
70008	3.00 m Diffuser with NRV	4.5	9	18 kg O ₂	22 kg O ₂	27 kg O ₂	276.00
70020	Dryden Aqua Weight for Air Diffuser 75mm x 75mm; 2 Connections 1/2"						198.00
70021	Dryden Aqua Weight for Air Diffuser 75mm x 75mm; 5 Connections 1/2"						240.00



PRICE LIST 2019

Water Treatment

Ceramic Oxygen Diffuser

Product ID:

Name:	Dryden Aqua Ceramic Diffuser
Usage:	Aeration and oxidation
Unique Features:	High efficiency, most robust, easy to maintain

About Dryden Aqua Ceramic Oxygen Diffuser

Our diffusers are manufactured from a solid cast aluminium base which has been protected against corrosion. The ceramic plate is epoxy bonded into the cast, and prevented from experiencing any torsion moments, this can only be achieved by using a solid cast metal frame. However strength is nothing unless you have a high gas transfer coefficient, and this respect our diffusers excel. The bubbles are so fine that the oxygen diffusion cloud coming out of our diffusers looks like milk. The diffusers can be used as individual units or can in banks of 6 on a stainless steel frame.



Main Benefits:

- Smallest bubble size and greatest O₂ transfer efficiency.
- Robust and virtually indestructible.

Specification

- Model DAD600
- Oxygen transfer > 90 % efficiency
- Plate dimensions 400 mm x 90 mm
- Overall dimensions 430 mm x 100 mm x 20 mm
- Maximum oxygen flow rate 6 litres per minute, 500 g O₂/h
- Operating pressure approx. between 2 – 2.5 bar (32 to 40 psi)
- Connection size 1/4" bsp female threaded, supplied with 1/4" or 3/8" hose tail, Compression fitting can also be fitted, sizes available at 6/4mm and 8/6mm hose fittings

316L grade stainless steel support frames for 6 diffusers are available. These are provided separately for client mounting of diffusers on-site. Dimensions l x w x h are 1435 x 482 x 30 mm.



Item No.	Description	List Price \$ excl. VAT
74000	DAD 6 Ceramic oxygen diffuser	320.00
74001	Oxygen Diffuser Frame	240.00

PRICE LIST 2019

Water Treatment

Dissolved Oxygen Probes

Product ID:

Name:	Dryden Aqua Dissolved Oxygen Probes
Usage:	Dissolved Oxygen monitoring
Unique Features:	Accurate, reliable, robust & easy to maintain replacement for standard OEM probes. Average lifespan >10 years.

About Dryden Aqua Dissolved Oxygen Probes

The Dryden Aqua Dissolved Oxygen Probe is a high performance, extremely robust oxygen probe manufactured for the measurement of oxygen in water and air. The probe is a low cost, easy maintenance unit suitable for connection to 90% of third party DO meters. Probes are accurate to 10 ppb (0.01 mg/l), and are as stable and as accurate as optical probes but at a fraction of the cost. Probes have a high mv output for PLC based controllers. The high output increases accuracy and reduces electrical noise problems. The unique shape provides a streamlined approach and minimises water turbulence.



Main Benefits:

- More stable and reliable than standard probes
- Compatible with 90% of third party DO meters
- For portable use or fixed installation

Typical Applications

- Aquaculture
- Rivers and lakes
- Sewerage effluent
- Industrial waste water treatment systems
- Hydroponics
- Almost any application where oxygen content of a liquid needs to be measured
- Air quality monitoring, environmental applications

Specifications

- No zero point error, calibrate in air to 100 % saturation
- Very accurate usually better than +/- 0.2 mg/l
- Self-temperature compensating from 5 to 40° C for 2 & 5 wire probes
- Diameter = 63 mm, length = 73 mm
- 6 to 12 millivolts per ppm (mg/l (depends on temp))
- Response time, to change in approx 15 to 30 seconds
- Optional, built in PT100 temperature sensor. Alternative sensors can also be used
- All probes are provided with both ppm & %sat membranes



Item No.	Description	List Price \$ excl. VAT
61002	Oxygen Probe with ppm + pack of %sat membranes and 5 metre cable	430.00
61012	Oxygen Probe with ppm + pack of %sat membranes and 10 m cable	465.00
61022	Oxygen Probe with ppm + pack of %sat membranes and 20 m cable	530.00
61032	Additional cable length in 10m increments	80.00
61040	Adapter for DO Probe installation in pipework, DN65 to fit 75mm Tee/Skt	80.00
61051	Pack of 25 ppm membranes	20.00
61052	Pack of 25 % sat membranes	20.00
61008	1l bottle of electrolyte	20.00

PRICE LIST 2019

Water Treatment

Degassers

Product ID:

VACUUM DEGASSING COLUMNS FOR INDUSTRIAL WATER APPLICATIONS

Dryden Aqua degassing columns are manufactured from MDPE. All components in contact with the water are plastic so the columns are ideally suited for both marine and freshwater applications and are in compliance with drinking water regulations for most countries. The degassing columns are designed for counter-current degassing in either pressure or vacuum mode. For high partial pressures of nitrogen vacuum degassing is required, for other applications pressure mode is advisable.

General Information:

Water often has a high partial pressure of nitrogen, especially borehole water or water drawn from depth in lakes.

In addition to nitrogen gas, borehole water or water abstracted from depth may have a low redox potential, high heavy metal concentrations, especially iron and manganese. There may also be VOC's (volatile organic carbon) such as methane or hydrogen sulphide. The zeta potential also tends to be high and +ve which makes it very difficult to remove heavy metals.

Passage of water through a Dryden Aqua partial vacuum degassing / stripping column can have a profound impact on the quality of the water from the following typical sources;

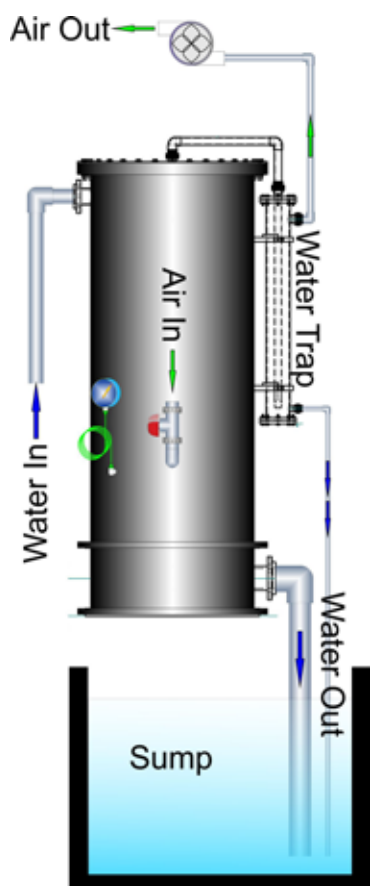
- Borehole or Thermal spring water
- Deep water abstraction from Fjords or freshwater lakes
- Any anoxic or low redox or +ve zeta potential water
- Long pipe runs high water pressure systems
- Pumped systems Hydro Power Generating stations
- Ice formation Intake pipe drawing air
- Heated water systems faulty pipe/pump seals
- Cavitating pumps venturi injectors and some aeration systems
- Any marine pump ashore or recycle system

Borehole water

The benefits of degassing of borehole water with the Dryden Aqua partial vacuum degassing system are as follows;

- reduction of total gas pressure to less than 100%
- reduction of nitrogen partial pressure to less than 100%
- reduction and restoration of carbon dioxide partial pressure
- stabilisation of the pH of the water (usually increase pH)
- blowing off of volatile organic gas such as methane
- blowing off and oxidation of hydrogen sulphide
- raising the oxygen level close to 100% saturation
- oxidation of heavy metals such as iron and manganese prior to removal by AFM filtration.
- raising of the RedOx potential of the water and reduction of fungal & pathogenic bacterial risk

The degasser should be located on a level platform and secured in an upright position adjacent to a sump tank. Once the column is secure, connect pipes to the outlet of both the degasser and watertrap with end fully submerged in the water of the sump tank. It is important that the degasser discharges underwater. Connect the water supply pipe to the top flange connection on the side of the column.



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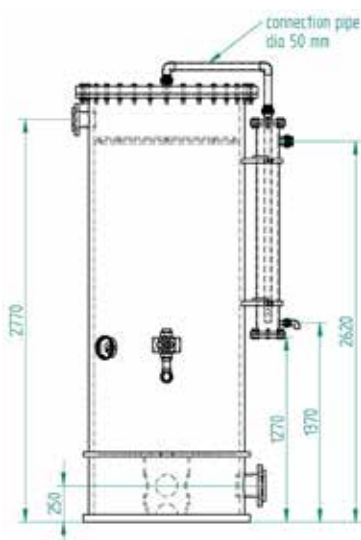
Water Treatment

Degassers Vacuum Pump

VACUUM DEGASSING COLUMNS

75

Item No	Description	Diameter mm	Height mm	Inlet	Outlet	Vacuum Pump required*	List Price \$ excl VAT
75000	Degasser MDPE plastic 25 m ³ /hr	400	3000	DN80	DN100	see below	7,110.00
75001	Degasser MDPE plastic 50 m ³ /hr	600	3000	DN100	DN150	see below	11,510.00
75002	Degasser MDPE plastic 100 m ³ /hr	1000	3000	DN150	DN200	see below	21,410.00



Dryden Aqua degassing towers* are supplied ready filled with packing in both the column and watertrap. Support for the watertrap is integral to the column and the vacuum gauge, control valve and associated fittings are all included. In the interests of local serviceability however the vacuum pump is not included.

* Delivery 6 weeks, ex works Germany



Packing media

Vacuum pumps** can more logically be obtained from local suppliers with whom most clients normally have existing discount and service agreements.

The following is intended as an aid to vacuum pump selection. The Becker vacuum pumps identified are readily available in most countries and there are also many technically equivalent models available on the market from alternative manufacturers.

VACUUM PUMPS** (NOT INCLUDED)

Side channel blowers** are ideal for moving large volumes of air either as a compressor or vacuum pump. Side channel blowers are considered to be one of the most cost effective methods of moving air and can operate continuously on their stated performance curve. Amongst the other major benefits of side channel blowers are their low maintenance requirements, they are oil-less and will not contaminate the application with oil or carbon dust. They also known as regenerative blowers.



Item No	Becker Model reference	Phase	kW	Airflow m ³ /h	Vacuum Rate kPa	Weight kg	List Price
n/a	25 m ³ /hr Vacuum Pump SV 7.190/1-01 50 Hz	1	1.1	100	-10	32	n/a
n/a	50 m ³ /hr Vacuum Pump SV 7.330/1-01 50 Hz	3	3.0	200	-10	40	n/a
n/a	100 m ³ /hr Vacuum Pump SV 7.430/1-01 50 Hz	3	4.0	300	-10	40	n/a

** = order as a separate item from 3rd party supplier

PRICE LIST 2019

Water Treatment

Water Treatment Products

Product ID:

APF® - ALL POLY FLOC

20

The best Coagulant and Flocculant

APF® (All Poly Floc) is a multi spectrum coagulant and flocculant containing 5 components and is therefore covering a wide spectrum. APF® also contains 0.5l NoPhos.

Dosage: 0,5 to 1 ml per m³/h water flow. It is most efficient to use APF® with a ZPM (static mixer).



Item No.	Description	Package quantity	List Price \$ excl. VAT
20012	APF® water treatment 20 kg	24 pcs / pallet	82.00
20018	APF® water treatment 1000 kg	1 Intermediate Bulk container (IBC)	3,960.00

Product ID:

NOPHOS - NO PHOSPHATE

20

NoPhos => No Phosphate => No Problems

NoPhos extracts phosphate from the water. Phosphate is a vital nutrient for algae and bacteria. If all phosphates are removed from the water, algae and bacteria will starve and die. NoPhos is a biological solution and the best preventive treatment replacing the need for all algicides. NoPhos is the best solution for zoos and aquaria, for ponds, water features and fountains and for recirculating industrial systems such as heating/cooling circuits. Acting also as a coagulant, it will make the water much clearer as well.

To bond 1 gramme of free phosphates 10 ml NoPhos is required.



Item No.	Description	Package quantity	List Price \$ excl. VAT
20000	NoPhos 1 l / 1.2 kg	12 pcs / carton - 480 pcs / pallet	28.00
20001	NoPhos 5 l / 6 kg	4 pcs / carton - 160 pcs / pallet	98.00
20002	NoPhos 20 l / 24.5 kg	24 pcs / pallet	360.00

Product ID:

ACO® - PHOTO CATALYST AND CHLORINE STABILISER

20

ACO® is a highly innovative, ecofriendly liquid product, especially effective in any outdoor pools, including salt water pools. ACO® has 2 main features:
ACO bio is designed specifically for outdoor biologically filtered animal systems

1. ACO® increases the natural disinfection power of the sun.

Amplifies in the production of free radicals by the sun.

2. ACO® protects chlorine from photo oxidation through the sun.

The half-life of inorganic chlorine (40min) is increased by factor 4, eliminating the need for cyanuric Acid (CYA) or stabilised chlorine.

Dosage: 1 l per 100 m³ of process water per week or 5l per 100 m³ per month. Shake well before use and always dose via dosing pump in animal systems or can be dosed manually directly into the process water in other systems.

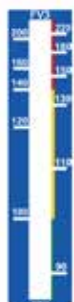


Item No..	Description	Package quantity	List price \$ excl. VAT
20021	ACO® 20 kg	24 pcs / pallet	79.00
20023	ACO® Bio 20 kg	24 pcs / pallet	75.00
20020	ACO® IBC (1,000 litres)	1 x IBC	3,550.00

PRICE LIST 2019

Water Treatment

Accessories: - Flowmeters and Stenner Dosing Pumps



Product ID:

H₂Flow - FlowVIS Flowmeter

C/90

The Flow Meter FlowVis® from H2Flow can be installed in every direction and includes a non return Valve (DN 40 to DN 65). The average accuracy is 97.9%. The product is NSF 50 certified and a product of high quality. Scale in LPM. Made in the USA.

Item No.	Description	List price \$ excl. VAT			
90020	New FlowVis® Flow Meter DN 40 d 50 mm with nrv				205.00
90021	New FlowVis® Flow Meter DN 50 d 63 mm with nrv				205.00
90022	New FlowVis® Flow Meter DN 80 d 90 mm				600.00
90023	New FlowVis® Flow Meter DN 100 d 110mm				650.00

Color	Velocity (Meters Per Second)
Green	<1.52
Yellow	1.53 - 2.73
Red	>2.74

Recommendations in Filtration mode:

Suction Side: 1 to 1.5 m/s (Green area)
Pressure Side: 1.5 to 2.0 m/s (Yellow area)



Item No.	Description	List price \$ excl. VAT
Dryden Aqua Floc-Dos-Pump		C/50
50016	Dryden Aqua floc-dos-pump New: 3.2-160ml	510.00
50017	Replacement-tube 3.2-160ml/h for floc-dos-pump (F)	25.00
50018	Replacement-tube 1.3- 70ml/h for floc-dos-pump (M)	25.00

Stenner Dosing Pump for pH or Cl DOSING		C/50
50030	Stenner dosing pump Econ VS 0.15 - 1.2 l/h	395.00
50031	Replacement tube A for Econ VS 0.15 - 1.2 l/h	25.00
50032	Replacement tube B for Econ VS 0.3 - 2.2 l/h	25.00

Stenner Dosing Pump		C/50
50003	Stenner dosing pump 45M-1 (20 – 400 ml/h; adjustable)	600.00
50005	Pump tube Stenner no 1 20 - 400 ml	25.00
50006	Pump tube Stenner no 2 60 - 1,250 ml	25.00
50007	Pump tube Stenner no 7 140 - 2,800 ml	25.00
50008	Pump tube Stenner no 4 210 - 4,400 ml	25.00
50009	Pump tube Stenner no 5 320 - 6,300 ml	25.00

Replacement Parts Stenner		C/50
50011	Suction weight 6 mm	18.50
50010	Injection valve Stenner ¼" & ½" with non return valve for APF®	26.00
50013	Duckbill for non return valve (50010)	4.00
50022	Injection valve Stenner ¼" & ½" without non return valve for ACO®	23.00
50015	Ferrule 6 mm blue	1.50
50021	Connection nut for tube	3.50
50023	Replacement pump head cover	17.50
50024	Replacement pump head roller	33.00



PRICE LIST 2019

Water Treatment

Skid Mounted Filtration Systems

Product ID:

Skid mounted, complete filtration system with filter, controller, pump & besgo valves



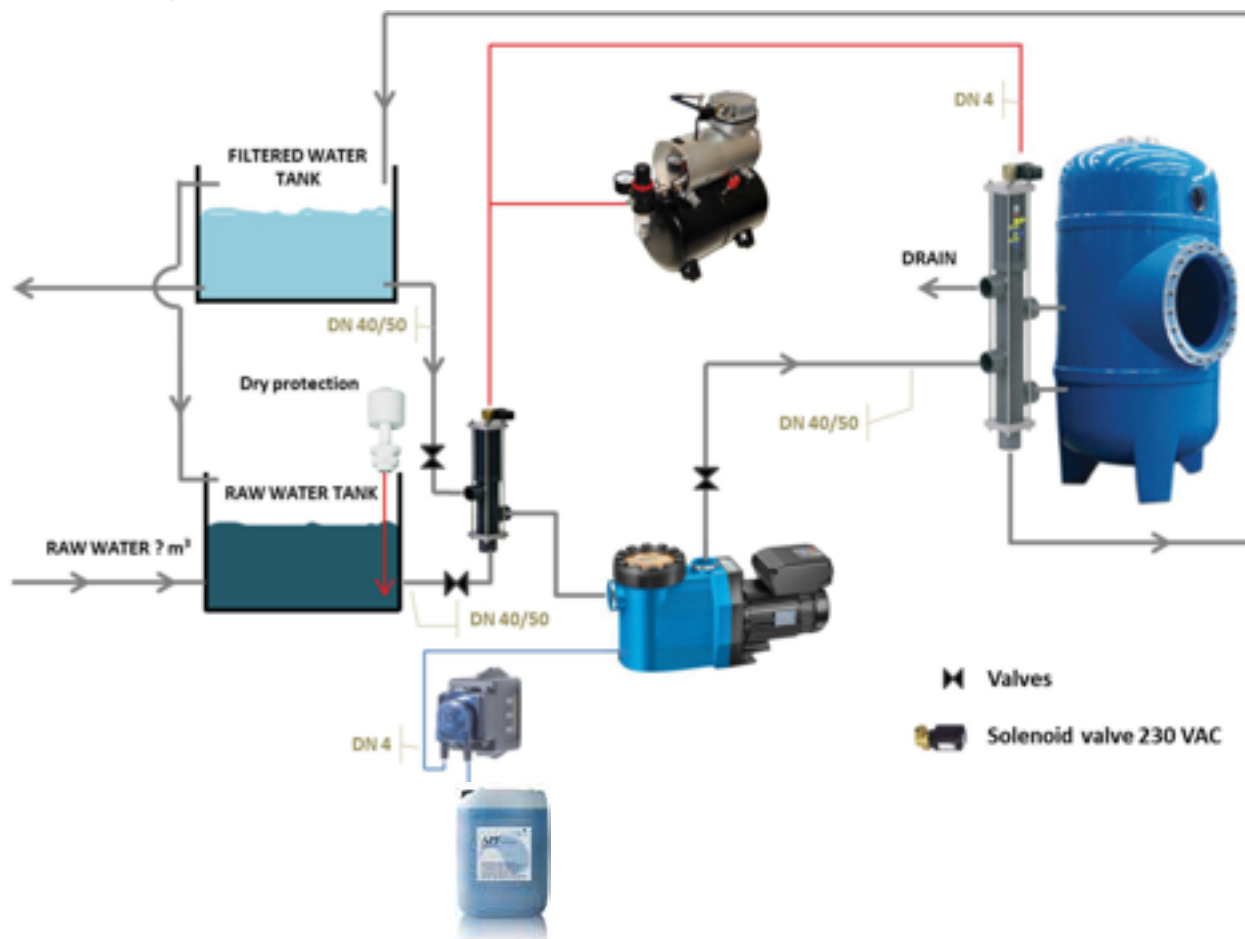
Item No	Description	Filtration Velocity:Flowrate	List Price \$ excl VAT
044924	Calplas Filter AFM®-640 mm, 0.3m ² Speck Badu 90 ECO VS 1.10 kW 230 V Besgo DN50/d63 & air compressor Filtration control panel - ASC2, APF® dosing pump. Dimensions l x w x h: 1500 x 780 x 1800 mm	15m/h : 4.5m ³ /h 10m/h : 3m ³ /h 5m/h : 1.5m ³ /h	10,500.00
044928	Calplas Filter AFM®-720 mm, 0.4m ² Speck Badu 90 ECO VS 1.10 kW 230 V Besgo DN50/d63 & air compressor Filtration control panel - ASC2, APF® dosing pump. Dimensions l x w x h: 1500 x 780 x 1800 mm	15m/h : 6m ³ /h 10m/h : 4m ³ /h 5m/h : 2m ³ /h	11,900.00

* Delivery 2-4 weeks

Price of systems without AFM®; exWorks Switzerland

	Total No of AFM® 25kg Bags required:	Grade		
		1	2	3
640mm Filter	16	10	3	3
720mm Filter	22	14	4	4

Filtration with Calplas 640/720 mm



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