

INTEGRATED-AQUA

BioE Biofilters for Recirculating Aquatic Systems

BioElement moving bed biofilters from Integrated Aqua Systems, Inc. represent the latest advances in biofiltration technology for aquaculture. At the core of BioE Biofilter is IAS BioElement biological media. IAS BioElement provide some of the highest usable surface area per unit volume ($750\text{m}^2/\text{m}^3$, $228\text{ft}^2/\text{ft}^3$) in a high quality, form-stable, injection molded plastic element. IAS BioElement are not prone to binding together, wedging or disintegrating over time like comparable medias. IAS BioElement are engineered in a medium density product designed specifically for use in moving bed biofilters. Medium density media allows better mixing in the vessel with less aeration required ultimately leading to a more energy efficient filter.

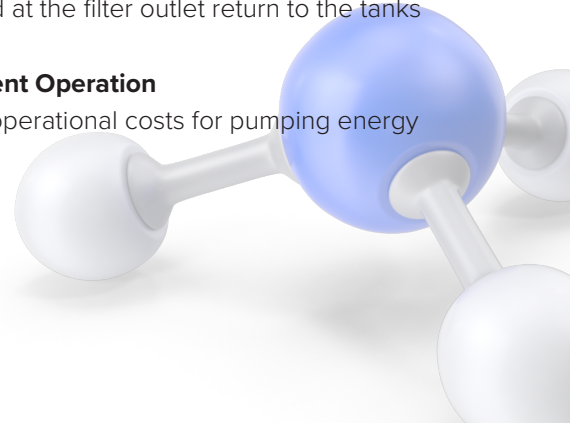


BioE BIOFILTERS™

Some Advantages of BioE Biofilters

- **Excellent Water Quality Performance**
over a broad range of ammonia loading scenarios. IAS will provide biofiltration calculations to determine sizing for optimal water quality.
- **No “Crashing”**
or loss of bacterial colonies during short loss of flow events like fluidized biofilters.
- **Oxygenated Water on Outlet.**
BioE Biofilters include aeration which allows effluent water to be oxygenated at the filter outlet return to the tanks
- **Low Head Efficient Operation**
saves money in operational costs for pumping energy used

BioE Biofilters are offered in a complete product line with standard HDPE models ranging from 23” diameter to 103” diameter. **BioE Biofilter** vessels are constructed of UV resistant, opaque, high density polyethylene material with all inlet/outlet fittings included as well as air supply and distribution manifolds. For larger projects, IAS will assist with sizing and selecting the biofilter specific to the project and can be built on-site with a detailed set of engineering plans.



BioE BIOFILTERS™

Please consult the selection charts below for general sizing criteria and contact IAS today for application assistance and pricing. For a complete biofilter sizing assessment, download our Biofilter Sizing Request Sheet from www.integrated-aqua.com and send to us for evaluation. Please contact our technical support team for help regarding:

- Calculation of ammonia loading rates from feed application rates
- Correction factors for in situ nitrification and system water exchange
- System design based on criteria for toxic un-ionized ammonia
- Parallel staging of bioreactors based on water flow rates
- Serial staging of bioreactors for optimized oxidation of organic carbon and ammonia
- Biofilter media conditioning procedures prior to stocking fish
- Management of water alkalinity and pH for optimized ammonia oxidation

GENERAL SIZING GUIDE FOR BioE BIOFILTERS

This guide provides bioreactor sizing for three general types of aquatic systems:

AQUATIC SYSTEM TYPE	OLIGOTROPHIC	MESOTROPHIC	EUTROPHIC
TAN* MANAGEMENT LEVEL	LOW TAN	MID TAN	HIGH TAN
FILTER INPUT TAN (mg N/L) (example values)	0.5	1.0	>= 2.0
FILTER OUTPUT TAN (mg N/L) (@ 50% TAN removal)	0.25	0.5	>= 1.0

* TAN - Total ammonia nitrogen (mg N/L) = mg NH₃-N/L + mg NH₄-N/L

WATER TEMPERATURE (°C)	5	10	15	20	25	30
WATER TEMPERATURE (°F)	41	50	59	68	77	86
RATE FACTOR	0.6	0.8	1.0	1.2	1.4	1.6

For each type of aquatic system, TAN removal rates in the table above are shown for a water temperature of 15°C. For water temperatures below and above 15°C, multiply TAN removal rate by the appropriate factors.

- 1 Biological Media:** IAS BioElement have high usable surface area, are form stable and offered in medium density which is ideal for best mixing performance.
- 2 Inlet/Outlet:** User configurable orientation and type of fitting used.
- 3 Air Supply:** Inlet and internal aeration manifold provided for best mixing performance. IAS selects and supplies the air pump with every unit.
- 4 Easy Access Manway:** 8" manway for models 23" & 29" diameter, 16" manway for models 36" diameter and larger.
- 5 High Quality Vessel:** UV resistant, opaque, high density polyethylene vessels are used for long life operation in any environment.
- 6 Drain Valve**



MODEL #	TANK DIMENSION (in)		TANK VOLUME (Gallons)	IAS BioElement MEDIA VOLUME (ft ³)	FLOW RATE (GPM) MAX	AIR REQUIRED (CFM)	INLET/ OULET (in)	TAN REMOVAL (g/day)		
	DIAMETER	HEIGHT						LOW TAN	MID TAN	HIGH TAN
BIOE-4	24	37	50	4	20	0.5	2"	14	28	56
BIOE-7	24	62	100	7	30	1.1	2"	25	49	98
BIOE-8	30	46	100	8	40	1.2	3"	28	56	112
BIOE-15	36	55	190	15	60	2.1	3"	53	105	210
BIOE-18	36	62	220	18	75	2.5	4"	63	126	252
BIOE-22	48	47	275	22	90	3.1	4"	77	154	308
BIOE-39	48	75	500	39	120	5.5	4"	137	273	546

*** Contact IAS for Free Biofilter Sizing and System Design Assistance ***

IAS BioElements are an efficient biological filtration media specifically suited for use in recirculating aquatic systems. IAS BioElements are used internationally in some of the largest and most advanced aquaculture systems in the world. As a leader in the supply of aquaculture filtration technologies, Integrated Aqua Systems, Inc. offers IAS BioElements as a key component in our BioE Biofilters and also separately in quantities to meet the requirements of small and large scale applications. Special packaging is available for specific market requirements. Contact IAS for BioE Biofilter sizing and selection assistance.

BioE BIOFILTERS™

HIGH USABLE SURFACE AREA

At 750m²/m³ (228 ft²/ft³) IAS BioElements have very high specific surface area per unit volume and also higher usable surface area than other biological medias on the market today.

FORM STABLE

BioElements are advance engineered, injection molded (NOT extruded) media that will not clog, compress, wedge or bind together. The result is a long lasting media that will maintain its form and not degrade over time.

IDEAL DENSITY

BioElements are available in 3 densities for 3 types of biological filtration formats. Our slightly buoyant Light media (0.93 g/cm³) is suited for up-flow style filters. Medium density media (1.00 g/cm³) is neutrally buoyant and designed specifically for moving bed biofilters which results in considerable energy savings by requiring less aeration for proper mixing. Heavy media has a density of 1.2 g/cm³ and is used primarily in down-flow fixed bed filters.

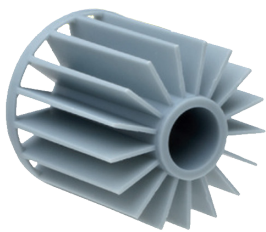
PACKAGING OPTIONS

BioElements are available with several different packaging formats to suit any scale project. IAS also builds and supplies complete BioElement biofilters for Recirculating Aquaculture Systems (RAS).

- 1 ft³ boxes (0.03 m³)
- 1 m³ pallet (35.3 ft³)
- 3 m³ Supersack (105.9 ft³)
- 60 m³ Full Container Load (2118 ft³)
- Complete BioElement™ MBBR Biofilters - Built to Order



DENSITIES TO MEET SPECIFIC NEEDS



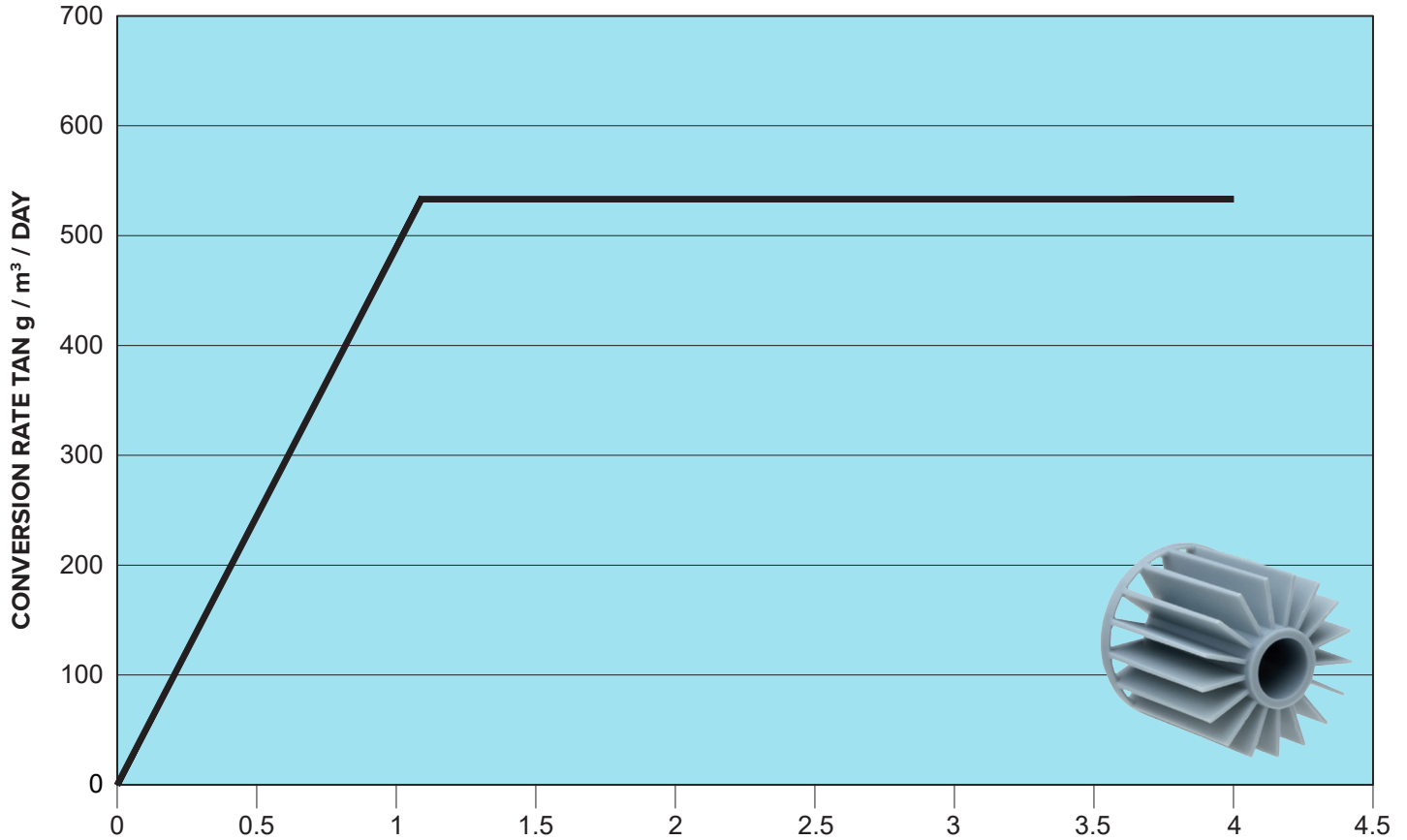
IAS BioElements LIGHT	IAS BioElements MEDIUM	IAS BioElements HEAVY
have a density of 0.93 g/cm ³ and are used in "up-flow" and "moving bed" filters.	have a density of 1.00 g/cm ³ and are used primarily in "moving bed" filters, where this density results in considerable energy savings.	have a density of 1.20 g/cm ³ and are used primarily in bottom filters down-flow fixed-bed" filters.

BioElements	LIGHT	MEDIUM	HEAVY
Volume Weight (kg/m ³)	158	172	210
Number (pcs/m ³)	255,000	255,000	255,000
Specific surface area (m ² /m ³)	750	750	750
Density (g/cm ³)	0,93	1,0	1,20

IAS BioElements are produced in Polypropylene (PP), which contains no halogens, and can be recycled or disposed of by incineration, where the end product is exclusively water and carbon dioxide.

The filling material used in IAS BioElements Medium and Heavy is Barium Sulphate. (BaSO₄). Barium Sulphate is environmentally neutral, ref. safety data sheet: "No danger of toxicity, the material is biological inactive".

CONVERSION RATE TAN (NH₃/NH₄⁺) PER m³ IAS BioElements PER DAY



CONCENTRATIONS (FILTER WATER) TAN g/m³ (mg/L)

Conversion rates TAN: 0.71 g/m² * Day = 532 g/m³ * Day

Conversion rates TAN: 0.002 oz/ft² * Day = 0.53 oz/ft³ * Day



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