

SELECTING THE BEST WET/DRY OR TRICKLE FILTER MEDIUM

by Michael Del Prete

Not All Filter Mediums Are Created Equal

A filter medium's ability to cultivate maximum beneficial nitrifying bacteria, increase essential dissolved oxygen and control the release of toxic gases and wastes is related to the usable surface area,[™] void space, shape, and size of the medium.

For aquatic applications, the ideal filter medium should offer the greatest usable surface area[™] with the proper ratio of void space.

Usable surface area[™] is that which system water actually comes in contact with the filter medium. If the filter medium is dry, it is not working. Void space is the open or hollow area within the framework or shape of the medium. The more void space, the less usable surface area.[™] The smaller the filter medium size, the more surface area per given volume.

Filter mediums that have high mass density, such as conventional spiked balls (bioball) or blocks/cubes with rods, have the lowest void space (approx. 20-27%), resulting in the poorest

degassing ability. Although these mediums claim high surface area, knowledgeable people consider these a poor choice because water does not go through them, but around them, dramatically reducing usable surface area.[™] Usually less than 40% comes in contact with aquarium water. When submerged, these mediums tend to plug, foul, and reduce oxygen. Systems using these mediums may require very oversized filters, de-nitrators and usually require direct oxygen injection to compensate for this poor design for use in aquatic applications.

"... textured deflection plate[™] w/drip rods, proper relative void space... allows total biological filtration..."

Conversely, mediums like out-dated saddles (Bio-Pak,[™]/Maspac[®]) and other forms (Tri-Packs,[®] Hiflow[®] rings, flex rings) have too much void space. This causes excessive removal of essential gases and offers varying degrees of nitrifying bacteria cultivation. Because of low surface area and excessive degassing characteristics, these mediums may require oversized filters and various

degrees of CO₂ injection to compensate for their design inadequacies.

DLS (double layer spiral) works best only in a pre-filter. When used under a drip plate or spray bar, DLS plugs rapidly with age. Biorings, spoked barrels, discs and wadding can restrict flow, plug, channel water and lower dissolved oxygen. PVC shavings (Bale) has great potential for misuse. As more Bale is forced into a filter, degassing, void space, usable filter area, and filter efficiency are dramatically reduced. Foam and sponge have no degassing ability, plug, and channel water.

BI OX[™]'s original, simple, and efficient design is the ideal form for all aquatic applications. **BI OX[™]**'s unique form of textured deflection plate[™] with drip rods, proper relative void space, size and shape allows system water to run through **BI OX[™]** for maximum usable surface area[™] contact. This allows total biological filtration for use in saltwater and freshwater aquariums and ponds. **BI OX[™]** offers proper void space for maintaining high levels of dissolved oxygen while controlling carbon dioxide release. Trace amounts of CO₂ are essential for both freshwater and saltwater plants and algae.

Table 1

COMPARATIVE TEST RESULTS

Usable Surface Area[™] Expressed In Square Feet Per Gallon Of Filter Medium
Various Filter Mediums Sold For Use In Aquarium Trickle Filters

MEDIUM	ACTUAL SURFACE AREA	* USABLE SURFACE AREA [™]	ABILITY TO DEGAS	ABILITY TO PLUG / CHANNEL	SALTWATER AQUARIUM CAPACITY (US Gallons)	REQUIRE CO ₂ INJECTION	REQUIRE O ₂ INJECTION
BI OX [™] Super	16.67	15	Optimum	No / No	45	No	No
BI OX [™] Regular	9.51	8.55	Optimum	No / No	30	No	No
Block or cube w/rods	22	8.5	Poor	Yes / Yes	14.9	No	Yes
Rena Cube 1"	17	8.3	Poor-Fair	Yes / Yes	9	No	Yes
Biokaskade [®] 1 1/16"	12.66	7.8	Very good	No / Yes	19	No	No
Bioball 1 1/4" (spiked ball)	15	7.25	Poor-Fair	Yes / Yes	16	No	Yes
Bio-Pak [™] /Maspac [®] 1"	8.33	6.66	Excessive	No / Yes	20	Yes	No
Tri-Pack [®] 1"	8.5	6.4	Excessive +	No / No	11.5	Yes	No
Bio-Ring 1"	8.7	6.4	Poor-Fair	Yes / Yes	10.7	No	Yes
Disc/wadding	16.7	6.2	Poor	No / Yes	12.6	No	Yes
Hiflow [®] 5/8"	5.9	5	Excessive +	No / No	7.6	Yes	No
Bioball 2" (spiked ball)	8.2	4.5	Poor-Fair	Yes / Yes	9.2	No	Yes
DLS, Sponge, Foam	N/A	++	Poor +	Yes / ?	++	No	Yes
Bale/PVC Shavings	?	?	Poor	Yes / Yes	?	No	Yes

Test results are for one gallon of filter medium. Results may vary with filter design, water temperature and flow. All mediums randomly packed in filter.

Actual surface area is determined by measuring the total surface area of each medium outside of a working filter.

*Usable surface area[™] is that which system water actually comes in contact with the filter medium.

+ Large void space in relation to small surface area results in excessive gas removal. Systems with this type medium may require a CO₂ injector.

++ Usable surface area,[™] carrying capacity and ability to remove toxic gases (void space) are greatly reduced with time and number of reef inhabitants.

Tests were conducted with system flow rate of 3 1/4-4 times per hour using MARINE ENVIRONMENT[®] Dual Phase Formula and BIO-SEA[®] Marinemix at 77°F/25°C with a specific gravity of 1.022-1.023. To use **BI OX[™]** with freshwater, multiply aquarium capacity shown by 1.6 (i.e., 1 gallon of **BI OX[™]** Super maintains 72 gallons of freshwater; 1 gallon of **BI OX[™]** Regular maintains 48 gallons of freshwater).

BI OX[™] Super is 20mmx25mm. There are approx. 325 pieces per gallon. **BI OX[™]** Regular is 40mmx45mm. There are approx. 62 pieces per gallon.

LESS BI OX[™] IS NEEDED PER GIVEN VOLUME OF WATER THAN ANY FILTER MEDIUM TESTED.

Distributed by: Aqua Craft Products @, 22960 Bernhardt Street, Hayward, CA 94545. (510) 264-1500, Fax (519) 264-1501

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U.S. Patent No. Des.345,410 international patents pending Printed in Hong Kong