

CURLER ADVANCE X-1

BIO-MEDIA FOR MOVING BED BIOREACTORS



- IMPROVED CLEANING
- VERY HIGH NITRIFICATION CAPACITY
- LARGE EFFECTIVE SURFACE AREA
 - COST EFFECTIVE
 - LONG LIFE SPAN
- PROVEN TECHNOLOGY

Curler Advance X-1 is a revolutionary new Bio-Media for use in Moving Bed Biofilters for water purification in recirculating aquaculture systems - developed by Inter Aqua Advance.

LARGE ACTIVE SURFACE AREA

The open curler design makes these elements particularly advantageous as carrier elements for nitrification in biofilters. These media stand apart from traditional bio-elements in their open profile which provides optimal conditions for maintaining a **thin active biofilm** on the surface. It is important to bear in mind that it is the active surface area that counts. This is the area that in practice can be utilized for bacterial growth and dictates the performance. In this respect the Cur Advance X-1 is superior to other products.

EASY TO CLEAN

Easy cleaning is a crucial aspect of maintaining optimal nitrification performance or active surface area. If inactive layers of old biofilm are not continuously exfoliated, the interstitial area can clog greatly reducing the active surface area resulting in decreased nitrification performance. The Curler Advance X-1 is designed to enhance the cleaning capability and hence provide optimal nitrification by facilitating easy maintenance of a thin healthy biofilm.



BEAD FILTER / MBBR DESIGN RECOMMENDATIONS

	PBF-3	PBF-5	PBF-5S	PBF-10	PBF-10S	PBF-25	PBF-25S	PBF-50	PBF-50S
¹ Flow Rate (gpm)	30	50	100	100	200	200	300	300	600
² Max Daily Feed Rate (lbs/day)	15	25	25	50	50	125	125	250	250
Feed Protein (%)	35	35	35	35	35	35	35	35	35
³ Total Daily TAN Production (g TAN/day)	220	366	366	732	732	1830	1830	3659	3659
⁴ Removal Assigned to PBF (g TAN/day)	15	25	25	50	50	125	125	250	250
Daily TAN Assigned to MBBR (g TAN/day)	205	341	341	682	682	1705	1705	3409	3409

TAN removal rate of 17.1 g TAN/ft³ Curler Advanced X-1 Media at 25 to 30 Deg. C.

⁵ Volume of Media (ft ³)	15	25	25	50	50	124	124	249	249
⁶ Reactor Volume (gal)	223	372	372	744	744	1860	1860	3720	3720
HRT (min)	7.4	7.4	3.7	7.4	3.7	9.3	6.2	12.4	6.2
⁷ Required Air Flow (scfm)	3.7	6.2	6.2	12.4	12.4	31	31	62	62

TAN removal rate of 13.3 g TAN/ft³ Curler Advanced X-1 Media at 15 to 20 Deg. C.

⁵ Volume of Media (ft ³)	19	32	32	64	64	161	161	321	321
⁶ Reactor Volume (gal)	288	480	480	960	960	2400	2400	4810	4810
HRT (min)	9.6	9.6	4.8	9.6	4.8	12.0	8.0	16.0	8.0
⁷ Required Air Flow (scfm)	4.8	8.0	8.0	16	16	40	40	80	80

TAN removal rate of 10.1 g TAN/ft³ Curler Advanced X-1 Media at 5 to 10 Deg. C.

⁵ Volume of Media (ft ³)	25	42	42	84	84	210	210	420	420
⁶ Reactor Volume (gal)	377	630	630	1260	1260	3140	3140	6290	6290
HRT (min)	12.6	12.6	6.3	12.6	6.3	15.7	10.5	21.0	10.5
⁷ Required Air Flow (scfm)	6.3	10.5	10.5	21	21	53	53	105	105

¹Maximum flow rate of corresponding PBF

²Based on PBF being operated for solids capture only, i.e. maximum daily feed input of 5 lbs/ft³ of bead media

³Calculation assumes 32.2 g TAN/kg feed for 35% protein feed and does not take into account in-situ nitrification which can range from 10 to 30%

⁴Assign a removal rate of 33% of normal nitrification capacity due to high backwash frequency and high loading rate, i.e. 5 g TAN/ft³ bead media-day

⁵A safety factor of 25% is included in the MBBR media volume

⁶Recommended starting with a fill volume percentage of 50%, maximum 70%.

⁷Includes 50% safety factor/spare capacity.

⁸Recommend utilizing two MBBR based on PBF-25 and PBF-25S design parameters.

BETTER – BUT NOT MORE EXPENSIVE

The advantages of Curler Advance X-1 make these bio-media the most cost-effective media available, but not the most expensive.

MOVING BED BIOREACTORS DESIGN RECOMMENDATIONS:

Maximum Feed Loading per MBBR: 125 lbs/day

BioReactor Tank:

Height/diameter ratio: 1 to 1.2

It is difficult to achieve good mixing and cleaning conditions in narrow/tall tanks and wide/shallow tanks when using only diffusers to provide agitation and mixing

Maximum Diameter: 2 m (6.5 ft)

Diameters greater than 2 m require special engineering to provide for mixing and cleaning

Depth – 1.5 m (50 to 60 inches)

Maximum depth for efficient aeration using regenerative blowers

Depths beyond 2 m may cause nitrogen super saturation conditions

Aeration for mixing, oxygen transfer, CO₂ stripping and cleaning:

4.4 scfm/m³ of reactor (0.125 scfm/ft³) volume

Five times the reactor volume per hour, plus 50% spare capacity

Use coarse bubble diffusers or perforated pipe manifolds
(3mm holes)

Create a circular pattern of mixing

Provides up to 60% CO₂ stripping

Media:

Use a safety factor of 15 to 50% of media volume

Design for 50% fill factor with ability to increase to a maximum of 70%

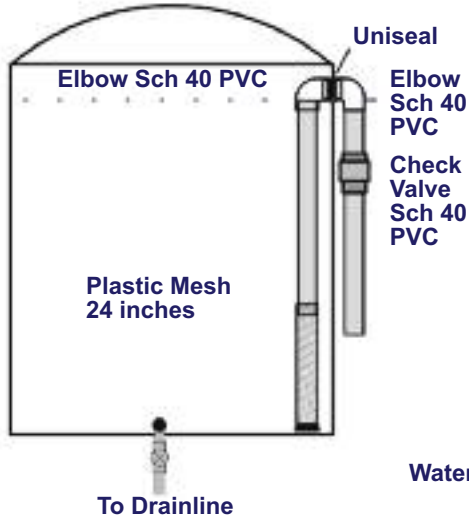
Screen Inlet/Outlet:

Design for a flow rate across the discharge screens of
0.2 to 0.5 ft/sec

Screen size to ensure the media cannot escape, but large enough to prevent clogging

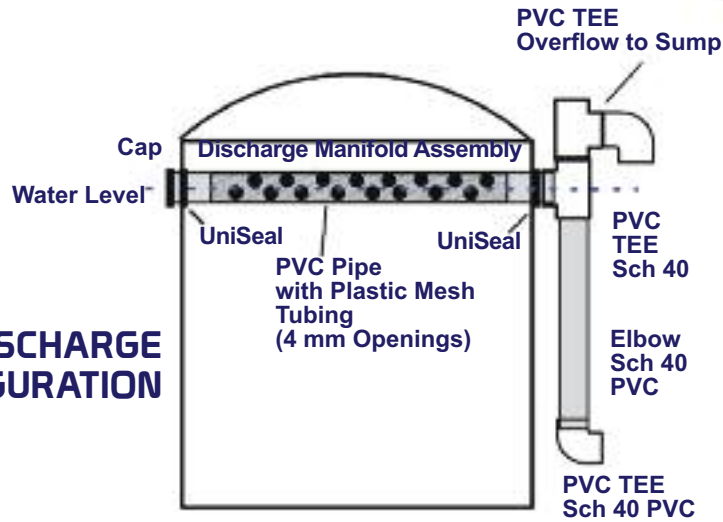
Please remember that these are only recommendations for MBBR designs. More specific system designs and recommendations are available from Aquaculture Systems Technologies, LLC..

MOVING BEAD BIOREACTOR TYPICAL CONFIGURATION SCHEMATICS



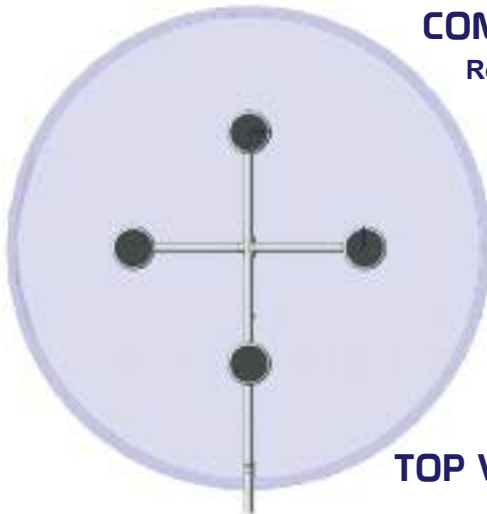
MBBR TYPICAL DISCHARGE MANIFOLD CONFIGURATION

MBBR INLET PLUMBING TYPICAL CONFIGURATION



MBBR TYPICAL AIR DISTRIBUTION CONFIGURATION

Recommended Air Volume (cfm):
 $5 \times \text{Tank Volume (ft}^3\text{)} / 60 \text{ min} + 25\% \text{ Safety Factor}$



TOP VIEW



PERSPECTIVE VIEW



**AQUACULTURE
 SYSTEMS TECHNOLOGIES**

THE SCIENCE OF BEAD FILTRATION

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