



BIOSTYR[®] Biologically Active Filter (BAF) BIOSTYR[®] DUO BAF + MBBR

WATER TECHNOLOGIES

BIOSTYR® Combines Biological Treatment and Upflow Filtration for High Quality Effluent

The BIOSTYR® process combines biological treatment, clarification, and filtration into one compact system. With over 150 installations throughout the world in operation for over 25 years, BIOSTYR is proven to be an exceptional technology for meeting today's stringent effluent limits. BIOSTYR's compact footprint makes it an ideal process solution for new plants, upgrades or existing plants.

The BIOSTYR® Process

The BIOSTYR process is a biological aerated filter (BAF) with a submerged media bed. Wastewater flows upward through the media bed. Air is injected through an air grid located below the bed at the bottom of the cell and rises upward concurrently with the wastewater.

The BIOSTYR media, BIOSTYRENE™, are buoyant polystyrene beads that provide the surface area for biomass attachment. The BIOSTYRENE media is retained in the BIOSTYR cell by a pre-cast concrete nozzle deck located above the media. The nozzle deck contains nozzle-type strainers that allow water and air to pass through the cell.

The BIOSTYR backwash is a counter-current flow. The backwash water (system effluent) is stored above the media, so no separate clearwell is necessary. Backwashing is accomplished by a series of valve operations that are controlled by the PLC. Gravity assists in removing stored solids as the media bed expands during backwash; thus, BIOSTYR does not require dedicated pumps, piping, valves, blowers or controls for backwashing.

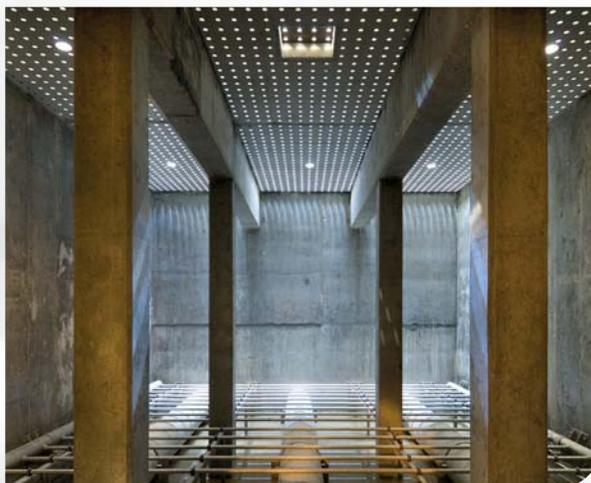
BIOSYTR® DUO Ground-Breaking Fusion of BAF + MBBR

BIOSTYR® DUO adds a second media layer for increased carbon, solids and nitrogen loading capabilities. The added layer of AnoxKaldnes™ media functions as a Moving Bed Biofilm Reactor (MBBR) within the lower portion of the BIOSTYR, providing impressive results:

- Up to 100% increase in BOD loading compared to traditional BAF
- Up to 40% increase in $\text{NH}_3\text{-N}$ loading compared to traditional BAF
- Negligible impact to system headloss for DUO media layer



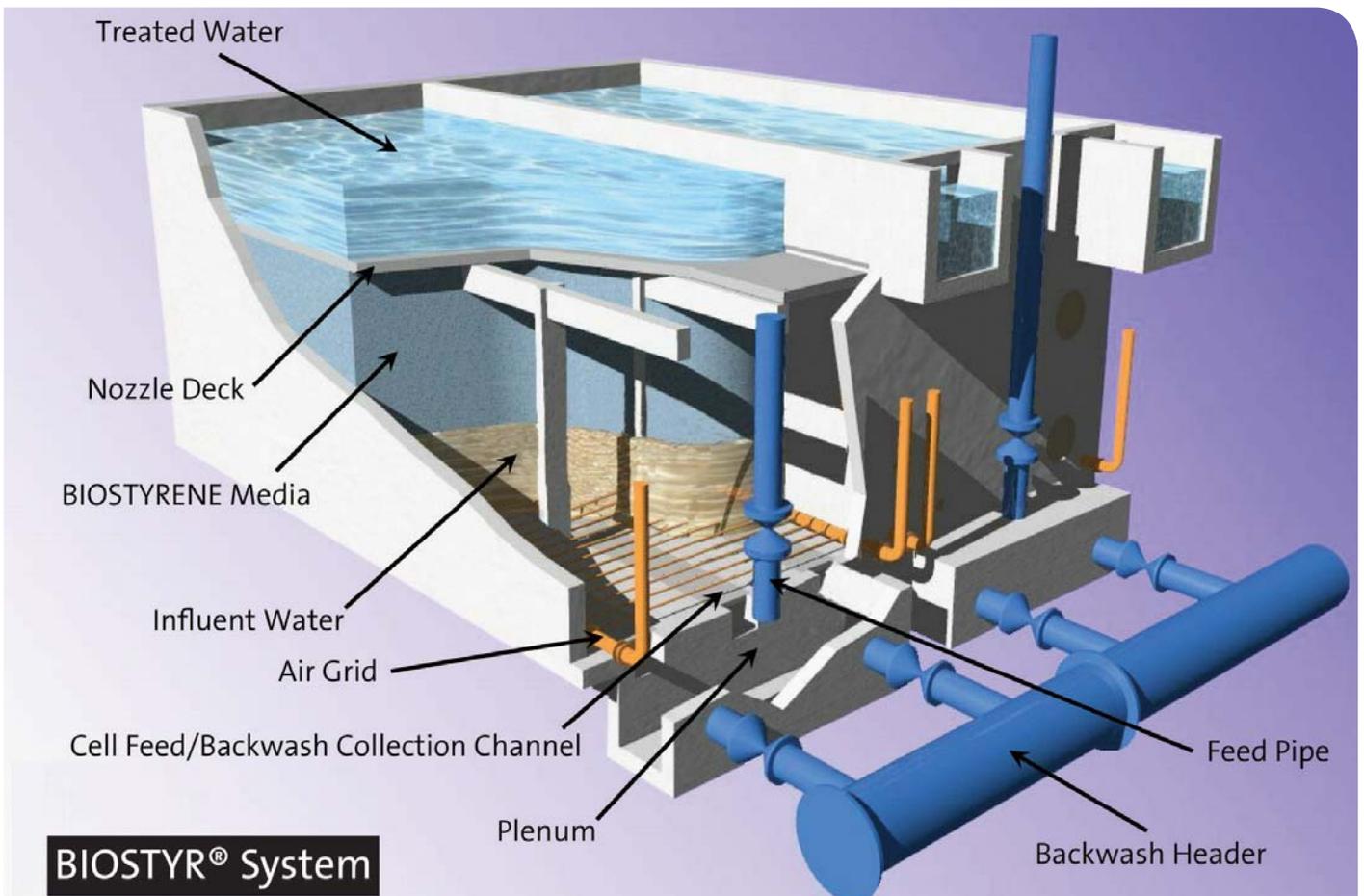
Treated effluent at top of cells



Empty cell



Dual media in BIOSTYR® DUO

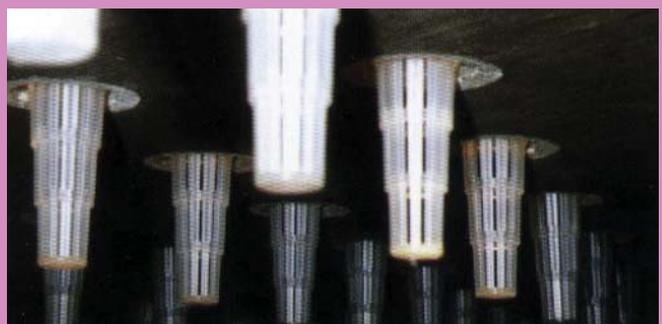


Engineered to Provide Value

- Multiple, parallel filter cells, allowing for flexible operational strategies and efficient treatment of variable flows
- Low weight BIOSTYRENE media (~3 lbs/ft³) minimizes foundation and other construction costs such as piles.
- Nozzle-type strainers in the precast concrete nozzle slabs only contact clean, treated effluent; not susceptible to fouling
- Robust stainless steel aeration grid resists clogging, requiring no routine maintenance
- Gravity backwash effectively cleans media with no pumping energy needed
- Fully automated PLC-based control system and centralized SCADA system, easing operation



Precast Media Retention Slabs for Nozzle Deck



Nozzles for Media Retention

Applications

Secondary Treatment

For facilities requiring increased capacity, particularly where primary clarification is already used and where a small footprint can provide significant value, the BIOSTYR DUO system can be used to provide complete secondary treatment. Carbon (BOD), ammonia (NH_3) and suspended solids (TSS) removal are all achieved with a single process that can realize average capacities of over 100 MGD per acre of treatment system area, compared to 5-10 MGD per acre for conventional activated sludge technologies.

Nitrification

BIOSTYR is the optimal approach to expand an existing secondary treatment process to provide tertiary removal of NH_3 with further polishing of TSS and BOD. The system is often identified as the best available technology to add nitrification to existing high purity oxygen systems and other processes that remove only BOD. BIOSTYR is a very efficient method to accomplish nitrification for reuse water production for power plants and other facilities.



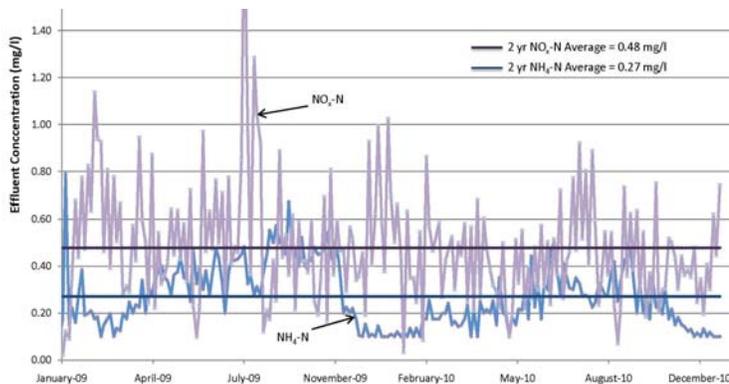
Kaukana, WI



Tahoe-Truckee, CA



Cheshire, CT



Nitrogen removal at Tahoe-Truckee S.A.

Denitrification

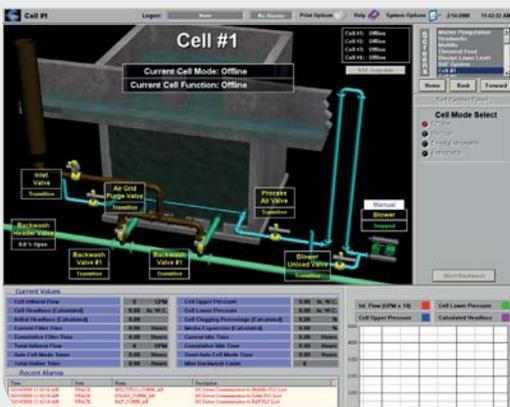
The BIOSTYR system can also meet the needs of facilities requiring denitrification. When added to the end of existing treatment systems, including any activated sludge plant or BIOSTYR system for secondary treatment, BIOSTYR provides all of the functions of traditional denitrification filters at a fraction of the footprint. It can also be coupled with secondary BIOSTYR systems as a Pre-Denitrification reactor to minimize the need for supplemental carbon.

BIOSTYR® & BIOSTYR® DUO: Compact, Efficient, Operator-Friendly Processes

- Footprint allows for reduced civil works, total system enclosures, and site flexibility
- Downstream clarifiers not necessary, significantly decreasing operation and maintenance requirements
- High quality effluent does not depend on solids settleability
- Treated water of exceptional quality, even in very cold climates
- Compact footprint; savings on excavation, space requirements
- Replenishment or replacement of media is not required as media is not lost or degraded
- Cell depth, which provides increased hydrostatic pressure and opportunities for air bubbles to contact media, leads to extremely efficient oxygen transfer and minimal aeration power requirements.



Process Control Features



- SCADA system customized for each particular application
- Automatic flow and load-based process controls
- Process diagnostic tools and data trending
- Automated cell headloss monitoring and backwash routines
- 24-hour alarm monitoring and notification
- KrugerLink™ remote process monitoring and control
- System-certified integrators

SCADA screen shot

Resourcing the world

Veolia Water Technologies

Kruger / 4001 Weston Parkway / Cary, NC 27513

Phone: 919.677.8310 • Fax: 919.677.0082

usmunicipal@veolia.com • www.veoliawatertech.com