



Defender® regenerative media filters

Aquatics applications

- Aquatic centers
- Colleges/universities
- Competition pools
- Health clubs
- Municipal pools
- Surf parks
- Swim schools
- Waterparks

Neptune Benson
xylem

Regenerative media filtration

Superior filtration vs. traditional high rate sand

How regenerative media filtration (RMF) operates

1

Precoat cycle

When the filter system is turned on—or after a bump cycle—water recirculates through the Defender for 10 minutes. The circulating water forms a uniform layer of perlite media on the flextubes. The perlite serves as the filtration surface.



2

Filter mode

After the flextubes are coated in perlite, pool water is circulated through the filter. Suspended solids (enlarged above) are captured on the surface of the perlite. Clean, filtered water flows out the top of the Defender.



3

Bump cycle

Typically once a day, a pneumatic mechanism rapidly deflates and re-inflates, creating a “bump” that dislodges perlite and captured debris. The filter can then be shut down or run the next precoat cycle. During the next precoat cycle, unfouled perlite is exposed to capture more particulates.

Rapid bump



Dislodged perlite

4

Media change

In typical applications after several weeks of operation, the perlite reaches maximum particle retention and the fouled perlite is flushed to sewer. A new batch of media is added and the Defender returns to normal operation.

Defender benefits

Versus traditional high rate sand filtration



Crystal-clear water

BETTER SWIMMING EXPERIENCE

Offering superior water clarity goes beyond aesthetics—it directly enhances the swimmer experience. Defender removes particles down to 1 micron more effectively than sand, creating sparkling, inviting water that looks and feels better.



Cost savings

REDUCED OPERATING COSTS

In addition to superior water quality, Defender filters reduce water, energy and chemical consumption, which translates into significant bottom line savings. Facilities typically see an ROI of 3-5 years, with some facilities seeing cost savings in less than one year.



Up to 50% savings

IN ENERGY, FUEL AND CHEMICALS

Consider the savings by not needing to re-heat and chemically re-treat the makeup water needed for sand systems. Defender filters also operate at a lower pressure drop, reducing pump power draw and reducing electrical costs.



Up to 75% savings

IN SPACE

The footprint of Defender filters can be up to 75% smaller than equivalently sized sand filters, freeing up space in existing mechanical rooms or enabling lower construction costs for new projects.

Plan view of Defender system vs. traditional horizontal sand filters sized for equivalent flowrate

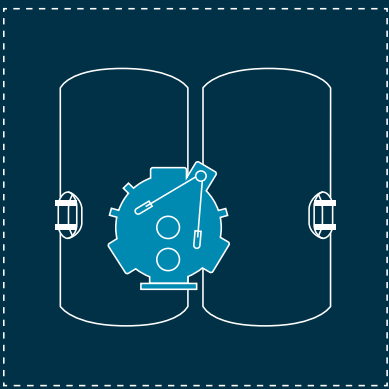


Up to 90% reduction

IN WATER AND SEWER

Defender filters do not require frequent backwashing like sand filters, significantly reducing fresh water consumption.

- Eliminates backwash holding tank
- Enables smaller waste line to sewer
- Addresses backwash flow rate restrictions



Inside the Defender

How flextubes and perlite work together

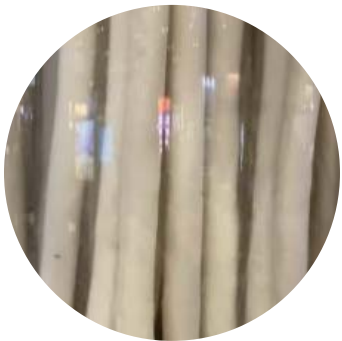
At the heart of the Defender RMF are two critical elements working together: stainless steel flextubes and perlite media. The flextubes, encased in a porous synthetic polymeric membrane, provide the structural framework and surface area. The perlite, applied as a coating during the precoat cycle, becomes the active filtration layer. Together, they form the foundation of the Defender’s surface-area-based filtration.

Flextube construction and filtration area

Each flextube is built from 316 stainless steel, selected for its superior resistance to corrosion in chlorinated water environments. Unlike lesser alloys, 316 SS provides long-term structural integrity even under continuous exposure to oxidizing chemicals and fluctuating water chemistry. Encasing the stainless core is a porous polymer membrane that offers two critical benefits: it prevents fouling and scaling on the metal surface while providing the optimal texture for uniform perlite adhesion during the precoat cycle. This dual-material design ensures strength, durability, and consistent filtration performance over years of operation.



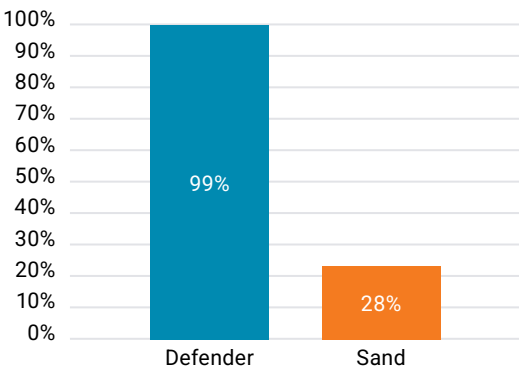
Flextube
316 stainless steel helix encased
in flexible membrane



Hundreds of flextubes create substantial
filter surface area

Perlite coating

Filtration efficiency, 5-micron particles



Together, the flextubes provide several hundred square feet of effective filter area within a compact vessel footprint. This is a fundamental difference from traditional high-rate sand filters, which rely on depth filtration through a granular bed. In contrast, the Defender RMF uses a broad surface filtration area, where the perlite-coated flextubes form a thin, efficient filter cake. The result is significantly finer particle capture, stable pressure differential, and extended operating cycles—delivering higher water quality and lower lifecycle costs than sand-based systems.

Perlite: advanced 1-micron filtration

Unlike traditional sand media, the Defender RMF filter uses perlite—a lightweight, porous volcanic glass expanded by heat into sharp-edged, irregular particles. This structure forms a dense yet permeable filter cake, enabling the Defender to remove suspended solids as fine as 1 micron with a low pressure drop.

Why perlite works better

- Particle size distribution—graded fines and coarse particles interlock to stabilize the filter cake while removing turbidity, organics, and microscopic debris.
- Media size vs. contaminant capture—smaller perlite particles create a tortuous path that traps fine contaminants.
- Float control—reduced low-density “float” means better coating, less bleed-through, and longer cycles.

- Permeability—high void fraction enables high flux rate while maintaining fine particle capture.
- Settling velocity—perlite's unique physical properties allow it to stay suspended in solution easier than traditional diatomaceous earth, allowing perlite to be discharged at 1.5 fps vs. DE's typical 3.0 fps requirement.

Not all perlite is the same

Neptune Benson recommends a specific grade of perlite, optimized to ensure:

- Complete, uniform flextube coating
- Superior oil and fine particle capture
- Consistent filtration performance of solids as fine as 1 micron

The Defender’s unique flextube design—combined with optimized perlite media—provide the filtration performance that delivers crystal-clear water.

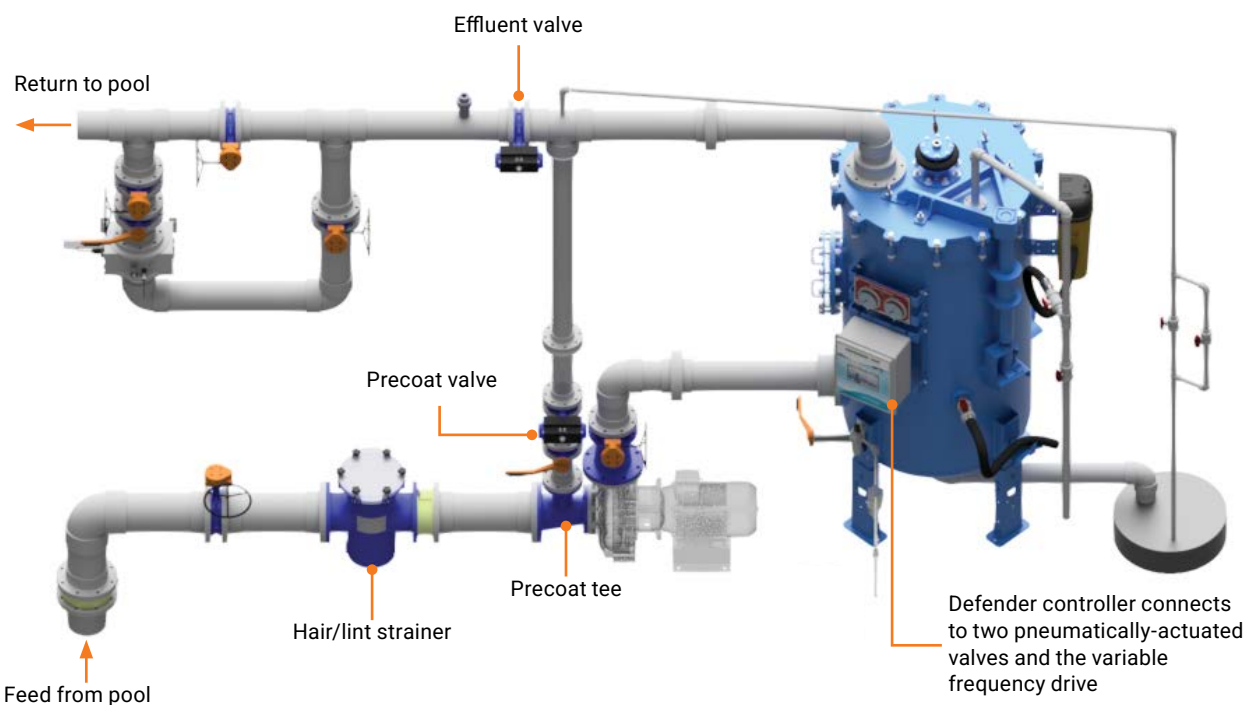
The Defender RMF difference is clear

By removing the fine particles that sand filters can't, Defender filters produce sparkling, crystal clear water. The difference in water clarity is like night and day. In addition, the dramatic reduction in turbidity improves transmission of UV light, which improves UV efficiency as well.

Photos depict different pools at same venue. Clarity shown for sand filters may not be representative of all sand filter facilities.



Typical mechanical room layout



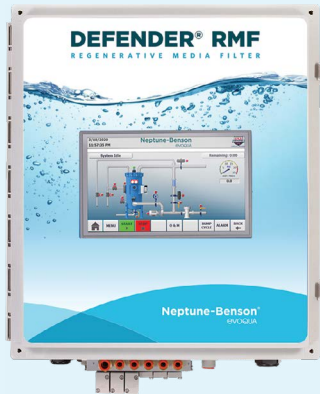
Valve operation	Precoat valve	Effluent valve
Precoat mode	Open	Closed
Filter mode	Open	Open
Bump cycle and media change	Closed	Closed

Equipment shown for illustrative purposes only. Refer to engineering submittal for all equipment, piping, and wiring requirements.

System controller

The Defender® RMF12 Controller combines industrial-grade Siemens PLC architecture with a NEMA 4X/IP65 enclosure, delivering reliable performance in the harshest pump rooms. Its 7-inch high-resolution touchscreen HMI provides intuitive control with animated graphics, multilingual menus, and guided operation for all core functions.

Beyond ease of use, the RMF12 offers advanced connectivity with Modbus/TCP and optional BACnet for seamless BMS integration. A built-in web server enables remote monitoring, operation, and alerts, while onboard data logging and diagnostics simplify troubleshooting and maintenance. The result is a rugged, intelligent control system that ensures operators and facility managers maintain peak filtration performance with confidence.



Why leading facilities choose Defender

Setting the global standard in water clarity and efficiency

Developed by Neptune Benson, a trusted name in aquatics industry since 1956, the Defender RMF sets the benchmark for performance and efficiency.

Trusted by leading facilities around the world

With over 5,000 installations in 50 countries—backed by decades of installation expertise—Defender has consistently delivered for aquatic professionals who demand reliability, sustainability, and top-tier performance.

Unsurpassed support network

At Xylem, we don't just provide industry-leading water technology—we back it with an unmatched support

network tailored to the unique needs of aquatic facilities. Our partner network of experts help facilities find solutions, maintain peak performance, reduce downtime, and meet evolving water quality standards with confidence.

3rd Party validation

NSF 50 certification assures customers that Defender has been rigorously tested to the highest safety and performance standards—delivering clean, safe, and reliable water you can trust.



Defender product line

	Traditional	Reduced Height	Assero	Virtuo
				
Flow rate	191–2,283 gpm 43–518 m³/h	191–2,283 gpm 43–518 m³/h	59–412 gpm 13–94 m³/h	216–1,712 gpm 49–389 m³/h
Height	98–111 in 247–280 cm	85–98 in 215–249 cm	80 in 204 cm	80 in 201–204 cm
Diameter	34–61 in 84–155 cm	34–61 in 85–155 cm	33 in 84 cm	38–61 in 98–155 cm

Approximate specifications above. Refer to separate technical documentation for exact specifications.



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