

Membrane Filtration for Municipal Wastewater Nutrient Removal



Nutrient Removal

Municipal wastewater treatment aims to remove nitrogen and phosphorus to prevent eutrophication in receiving waters. Nitrogen is typically removed through biological nitrification and denitrification, converting ammonia to nitrate and then to nitrogen gas. Phosphorus is removed either biologically—via enhanced biological phosphorus removal (EBPR)—or chemically, using metal salts to precipitate phosphorus into settleable solids.

Hollow fiber ultrafiltration (UF) membranes play a critical role in advanced nutrient removal. In membrane bioreactors (MBRs), UF membranes retain high concentrations of biomass, including nitrifiers and phosphorus-accumulating organisms (PAOs), helping to enable stable and efficient nutrient removal in a compact footprint. These systems are ideal for facilities targeting high effluent quality or water reuse.

Pressurized UF systems are typically used as tertiary filtration after conventional biological treatment. They provide a physical barrier to suspended solids, which includes phosphorus, and can enhance phosphorus removal when paired with chemical dosing by lowering the overall effluent phosphorus levels. Tertiary submerged UF systems are also used in polishing or reuse applications, helping to ensure low turbidity and pathogen-free effluent.

MemCor™ ultrafiltration (UF) systems—available with pressurized and submerged modules, and MemCor™ membrane bioreactor (MBR) systems with MemPulse™ MBR modules—are engineered to meet the demands of advanced nutrient removal in municipal wastewater treatment. These hollow fiber membrane modules provide a robust barrier against solids while supporting biological processes that remove nitrogen and phosphorus. MBR systems integrate submerged modules within a bioreactor for compact, high-performance treatment, while pressurized and submerged UF systems serve as tertiary polishing for high-grade effluent.

Together, these configurations help enable municipalities to meet stringent discharge standards for nitrogen, phosphorus and solids removal. MemCor™ systems incorporate proven membrane technologies that support resilient infrastructure, future-ready planning, and sustainable water stewardship across the full spectrum of municipal wastewater nutrient removal challenges.



System Configurations for Nutrient Removal in Municipal Wastewater

There are three primary MemCor™ system configurations that limit nutrients, provide filtration and separation, and retain solids.

Configuration	Benefits	Role in Nutrient Removal
MBR (Submerged type)	Compact footprint, high effluent quality, excellent nutrient removal	Integrates membrane separation with biological treatment. Retains biomass (including PAOs and nitrifiers), leading to high Mixed liquor suspended solids (MLSS) and stable nutrient removal. Ideal for suspended solids, nitrogen and phosphorus removal in compact footprints.
Pressurized UF	Modular, retrofittable, effective solids and pathogen barrier	Used as tertiary filtration after conventional biological treatment. Removes suspended solids and residual phosphorus (especially when combined with chemical dosing).
Submerged UF (non-MBR)	Energy-efficient for large flows, simple operation	

Typical Membrane Filtered Water Quality

Parameter	MemPulse™ MBR modules and MemCor™ UF modules
TSS*	<2 mg/L
Turbidity	< 0.1 NTU
SDI (Silt Density Index)	<3
Fecal Coliforms	<2 mpn/100ml
BOD	<2 mg/L
Nutrients as low as	<3 mg/L for total nitrogen <0.05 mg/L phosphorus

*Directly related to MemPulse™ MBR modules or MemCor™ UF modules. Other parameters shown are typical and may vary.

MemCor™ MBR Systems

Memcor™ MBR systems are advanced wastewater treatment processes that combines activated sludge treatment with hollow fiber MemPulse™ MBR modules—resulting in excellent effluent quality at a reduced life-cycle cost. The system delivers stable performance, operational flexibility and reduced maintenance requirements—resulting in significant cost savings. See below for a sample tertiary MBR process flow scheme.

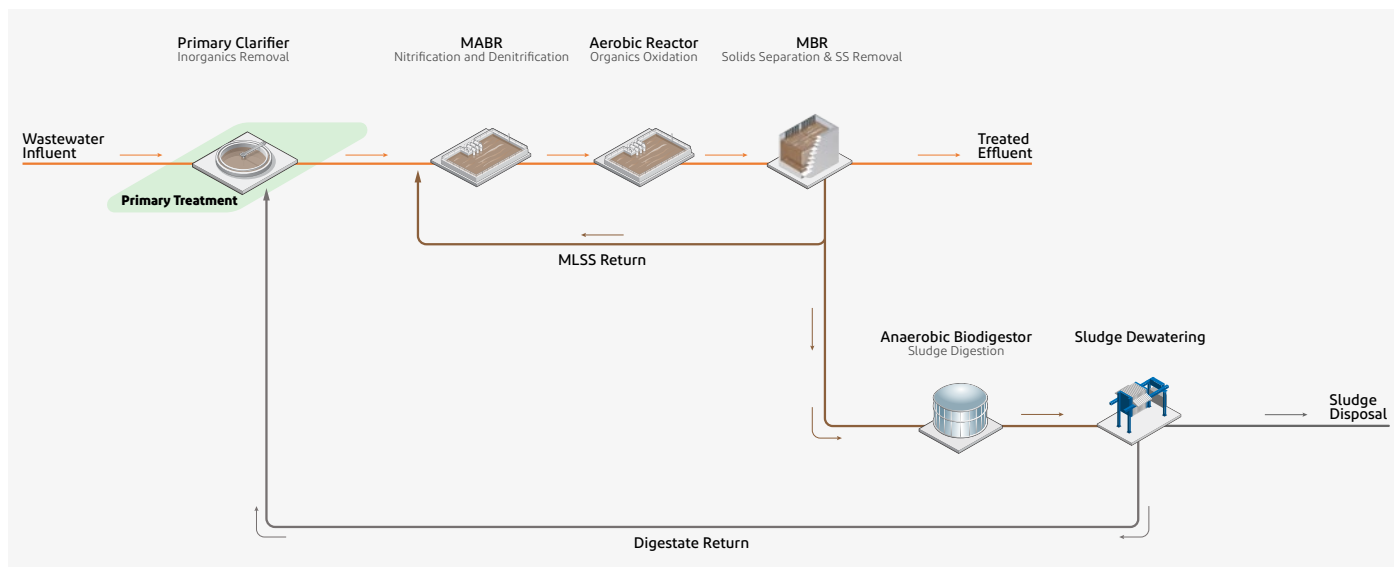
Benefits

Unlike competitive solutions, MemCor™ MBR systems have pulsed aeration designs that provide stable, low energy performance. MemCor™ MBR systems are designed with operators in mind, supported by our team's extensive product application knowledge of system design and operation.

MemCor™ MBR systems with MemPulse™ MBR modules can enable:

- High quality effluent
- Process intensification
- Efficient and cost-effective nutrient removal
- Modular expansion capacity
- Compact system footprint
- Eliminates sludge settleability issues

Sample Tertiary MBR Process Flow Diagram

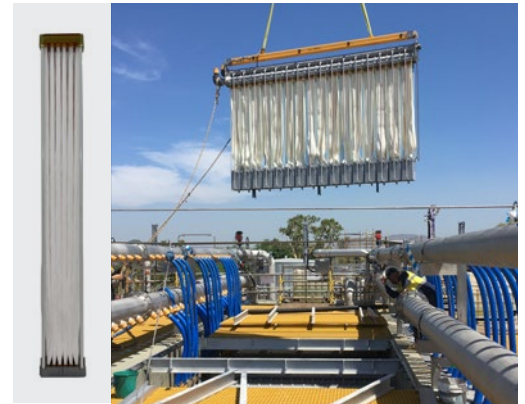


Modules

MemPulse™ B40N MBR Module

The MemPulse™ B40N membrane bioreactor module is a compact modular rack system that comes with integrity testing capable membranes ready to receive high quality effluent for reuse applications. This unique module does not require annual or semi-annual slack adjustment, making it operator-friendly.

- Filtration area 40 m² / 431 ft²
- Module Length (H) 1600 mm / 63.0 in
- Top Dimensions (L & W) 203 mm x 203 mm / 8.0 in x 8.0 in
- Can be installed as a kit, single rack, dual rack or after-market rack set



MemPulse™ B50N MBR Module

The MemPulse™ B50N membrane bioreactor module filtration module represents the latest advancement in MemPulse™ MBR portfolio. Compared to the B40N module, the B50N module provides 25% more flow per module and additional aeration energy savings with the same modular footprint.

- Filtration area 50 m² / 538 ft²
- Module Length (H) 2000 mm / 78.8 in
- Top Dimensions (L & W) 203 mm x 203 mm / 8.0 in x 8.0 in
- Can be installed as a kit, single rack, dual rack or after-market rack set



MemCor™ UF Systems

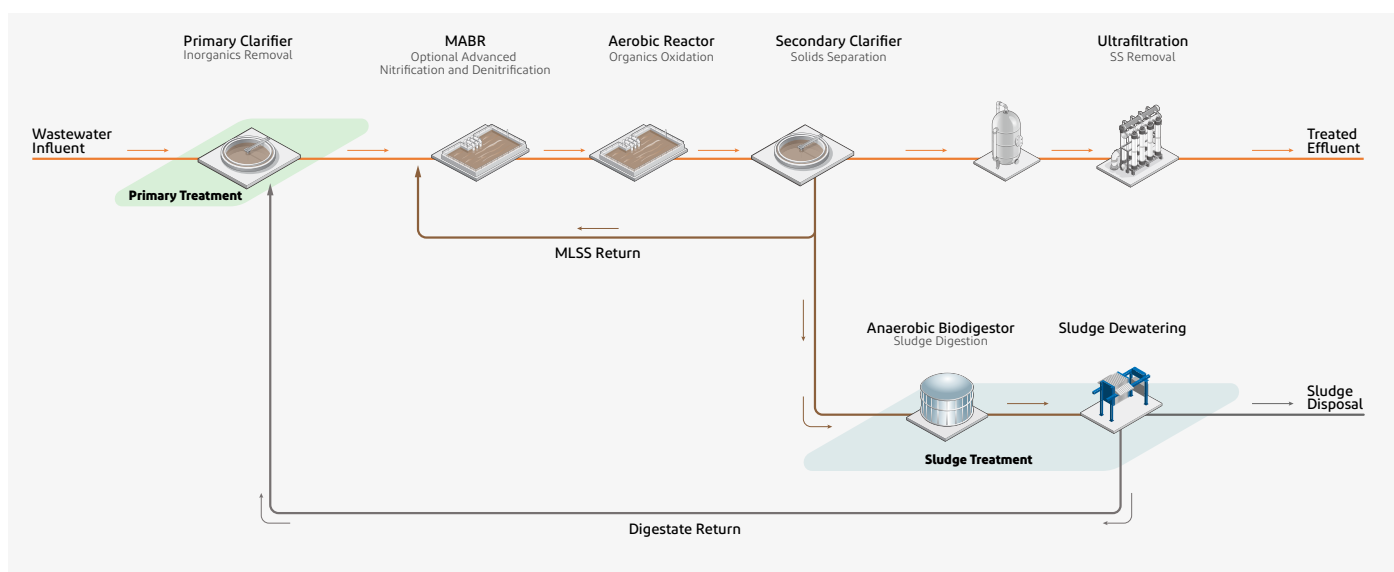
MemCor™ ultrafiltration systems offer industry leading performance in wastewater treatment and nutrient removal applications. For over 40 years, MemCor™ UF systems have delivered efficient and cost-effective solutions to reduce nutrient levels.

Benefits

- Flexibility: Available in pressurized or submerged configurations. Packaged units for small to medium systems and custom designs for large projects
- Ease of installation: Both the membrane modules, valve and instrumentation skids are pre-assembled, and factory tested to reduce site work
- Reduced capital and operating costs: Module and system design provide one of the lowest plant footprints
- High permeability membranes minimize energy use
- Hydrophilic (low fouling) membranes minimize chemical use
- Outside to inside hollow fiber ultrafiltration membranes provide greater recovery, virus removal and high solids handling capability

Unlike other pressurized ultrafiltration solutions, MemCor™ UF systems deliver cost-effective performance over the plant's lifetime thanks to long lasting fiber integrity, hydraulically efficient module construction, and fit-for-purpose process and engineering designs based on our extensive wastewater application knowledge. See below for a sample tertiary UF process flow scheme.

Sample Tertiary UF Process Flow Diagram



Modules

PVDF compact pressurized CPII systems

Pressurized MemCor™ L40N v2 & MemCor™ L40N R2 Ultrafiltration Modules

- 68 m² (L40N v2) & 67 m² (L40N) filtration area
- 7" (D) x 70" (H) size
- 0.03 µm pore size in a proven PVDF fiber with high mechanical and abrasion resistance capable of 15+ years in operation
- L40N R2 grade available for applications that need virus rejection beyond the typical standard.

Fully assembled CPII racks with

- Molded nylon rack headers
- ABS module housing center tube
- Mechanical fittings & accessories
- Painted, mild steel support skids

Features

- Up to 36 L40N modules per rack skid
- Self-supporting, self-manifolded for rapid installation
- Multiple configurations to fit a specific site
- Top and side module access point for ease of maintenance
- Standard seismic design
- Up to 5.0 bar operational pressure
- Most compact design for large scale projects



PVDF compact submerged (CSII) systems

MemCor™ L20N v2 & L20N Ultrafiltration Modules

- 42 m² & 35 m² filtration area
- 4.7" (D) x 70" (H) size
- 0.03 µm pore size in a proven PVDF fiber with high mechanical and abrasion resistance capable of 15+ years in operation
- Suitable for CSII Racks

Pre-engineered CSII racks (nylon or stainless steel) and in-tank rack support hardware

- Molded nylon or stainless steel rack headers
- Clear module aeration sleeve
- Mechanical fittings & accessories
- Stainless steel frames and brackets

Features

- Up to 44 modules per rack
- Scalable building blocks
- High solids handling capacity
- Single step direct coupling to RO
- Low total cost of ownership
- Low energy consumption
- Most compact footprint



Options vary by region.. Please contact your local DuPont representative for further information.

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