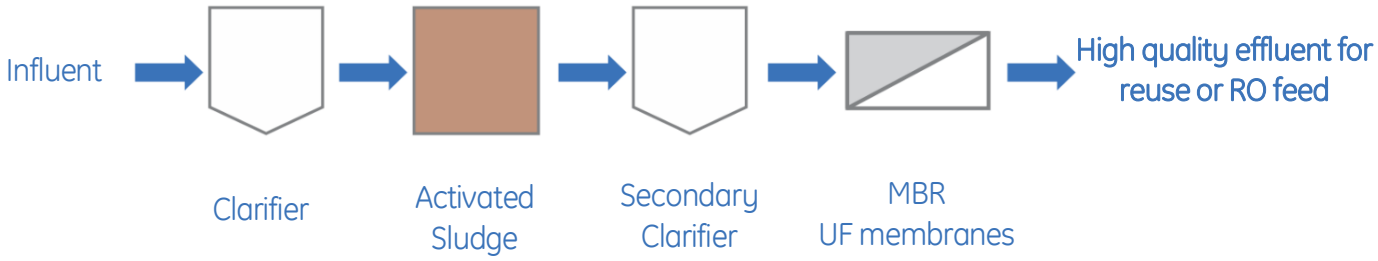
MBR UF membranes for municipal wastewater treatment

MBR Tertiary Filtration for Beneficial Water Reuse

MBR tertiary UF systems are designed to operate downstream of a conventional activated sludge process, where no further biological treatment is necessary, but where high quality water is required. The system features a small footprint that can be placed virtually anywhere or can even be used to retrofit existing granular filter media.

Tertiary Treatment Process



MBR Tertiary Filtration Features & Benefits

Physical ultrafiltration (UF) barrier - Produces high quality effluent suitable for direct non-potable reuse

Produces ideal reverse osmosis (RO) feedwater - Allows the RO to operate at peak performance, reduces cleaning and fouling

Eliminates plant upsets and turbidity spikes - Tolerates variable water quality and produces high quality effluent at all times

Modular design allows for simple and efficient sand filter retrofits - Reduced capital costs through use of existing infrastructure

Lowers chemical requirements - Pretreatment and cleaning chemical usage can be dramatically reduced

Compact design - Small plant footprint reduces capital costs

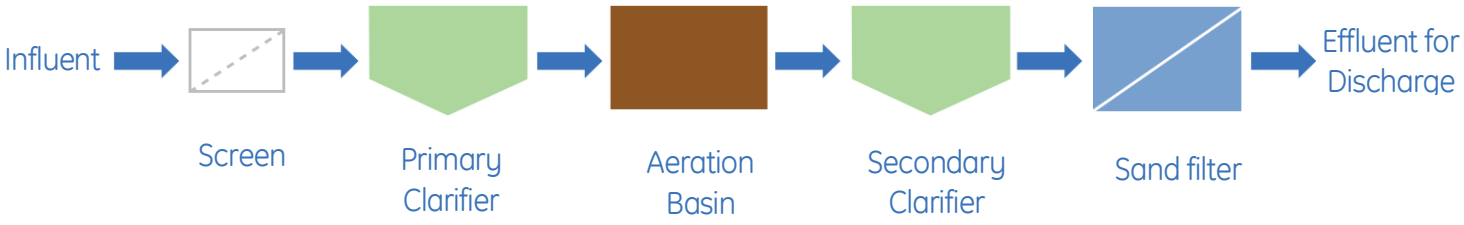
Greater level of automation - Reduces operating costs

MBR membrane bioreactors produce effluent for discharge or reuse that far exceeds the world's most stringent regulations

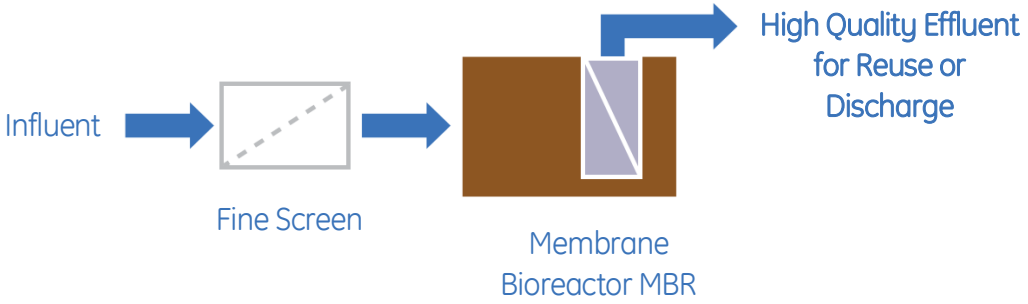
Simple and Reliable MBR Technology

MBR systems are increasingly being specified as the best available technology for virtually all wastewater treatment applications—from greenfield plants, to retrofits, to water reclamation projects. MBR systems offer economic and operational advantages over conventional wastewater treatment plants including extremely compact footprints, simplified operation and consistently higher quality effluent—all at comparable lifecycle costs

Conventional Multi-Step Tertiary Treatment Process



MBR Treatment Process



With MBR, you don't have to worry whether your system will meet current or future discharge and reuse regulations.

The physical barrier of the UF membrane ensures a crystal-clear effluent at all times that exceeds the world's most stringent regulations, including California's Title 22 reuse and the European Bathing Water Quality standards.

Our successful global track record with small, medium and large MBR projects ensures that you get the best value for your money with smart design features that provide trouble-free performance.

MBR Features & Benefits

- Physical UF barrier produces high quality effluent suitable for direct non-potable reuse
- Unmatched fiber ruggedness ensures long membrane life "Self-healing" fibers eliminate catastrophic membrane failures
- Multiple effective cleaning techniques maintains long- term, peak system performance and provides a simple, rapid method of recovery in the event of an upset

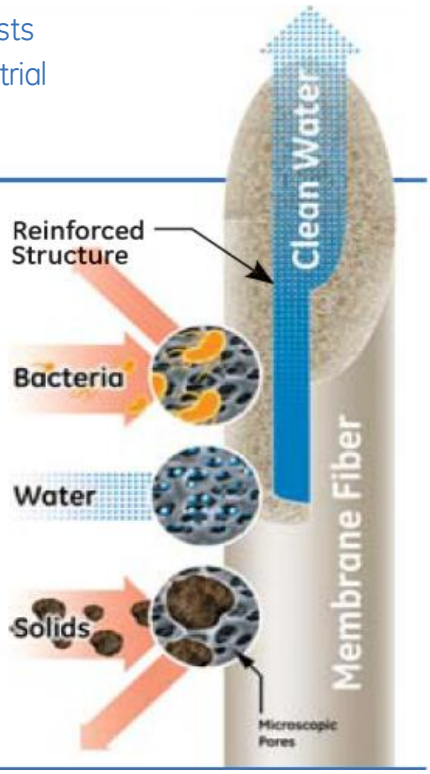
- Hollow fibers provide a greater filtration surface area that reduces plant footprint
- Automated in-situ cleaning simplifies operation and maintenance
- Compact design minimizes land acquisition and construction costs
- Proven system performance in hundreds of municipal and industrial applications provide you with peace of mind

Reinforced Membranes are the Key to MBR

MBR membranes are built tough to ensure a long operating life.

The reinforced, hollow fiber design is the key to reliable long-term membrane performance as it offers a large filtration surface area and can withstand the challenging high solids environment in an MBR

DEOMBR is an ultrafiltration (UF) membrane and produces high quality effluent from the moment you start the system



Enhanced Nutrient Removal (ENR) and Biological Nutrient Removal (BNR) of Nitrogen and Phosphorus

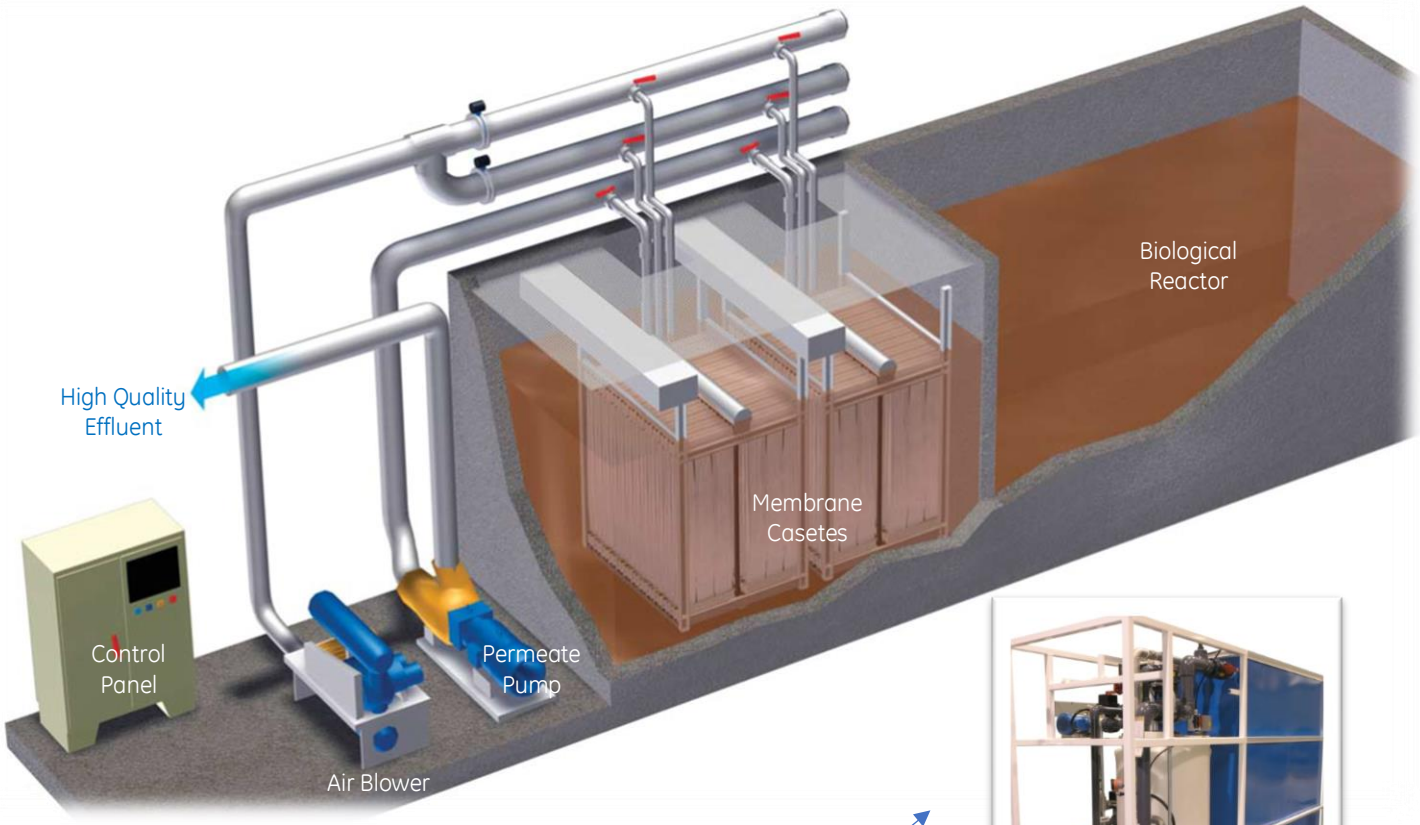
ENR and BNR effluent standards are among the most stringent in North America and demand the best available technology to ensure compliance at all times. MBR systems are extremely flexible and process configurations can be tailored to meet specific wastewater characteristics, discharge requirements and plant retrofit applications.

MBR UF membranes allow the biological reactor to operate at MLSS concentrations of up to 12,000 mg/L. This optimizes nitrification and denitrification, while extending the sludge retention times to ensure complete nitrification and conversion of organic nitrogen compounds.

Achievable MBR Treatment Results

BOD_5	< 2 mg/L
TSS	< 1 mg/L
NH_3-N	< 0.5 mg/L
Total Nitrogen	< 3 mg/L
Total Phosphorous	< 0.05 mg/L
Turbidity	< 0.1 NTU
Fecal Coliform	< 2.2 CFU/100 mL
SDI	< 2

MBR is a simple process. A basic production train consists of a biological reactor, membrane basin, permeate pump, air blower and automated control equipment.
Trains are simply expanded and/or multiplied to meet capacity requirements.



Immersible hollow fiber UF
Membrane cassette

MOD Packaged
Plants

MOD
Packaged Plants for Wastewater Treatment

MOD Packaged Plants are pre-engineered, modular wastewater treatment systems that bring advanced membrane bioreactor (MBR) technology to municipal, industrial, or land development applications.

Incorporating an expandable building-block design, MOD Package Plants can be quickly set up in virtually any location and feature scalable treatment capacity that can be quickly increased as demand grows.

These plug-and-play ultrafiltration (UF) systems outperform conventional treatment alternatives in all categories, offering superior quality effluent, reduced operating costs, smaller plant footprints, and more reliable performance.

MOD Features & Benefits

Pre-assembled and factory tested

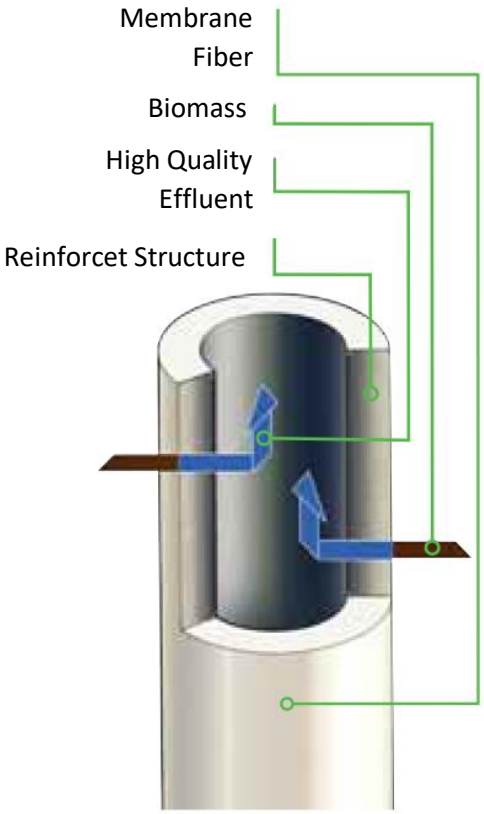
- Minimizes on-site construction costs
- Ensures quick delivery and simplifies plant start-up
- Cost-effective for virtually all wastewater treatment applications

Proven ultrafiltration technology

- Incorporates the advanced features and proven performance of large MBR plants into compact and cost-effective pre-engineered systems
- Protects the environment with high quality effluent that can be released to the most sensitive areas
- Produces near drinking water quality effluent that can be safely reused for irrigation, industrial processes or groundwater recharge

Simple operation and maintenance

- Requires minimal operator supervision
- Most comprehensive cleaning capability ensures peak system performance
- Significantly reduces sludge generation



UF membrane operates under a slight suction, drawing clean water to the inside of the fiber (outside-in flow path), while leaving impurities in the process tank.

Achievable MBR Effluent	
Turbidity	< 0.2 NTU
BOD	< 2 mg/L
TSS	< 2 mg/L
Total Nitrogen	< 3 mg/L*
Total Phosphorus	< 0.05 mg/L*
Fecal Coliform	< 10 CFU/100 ml

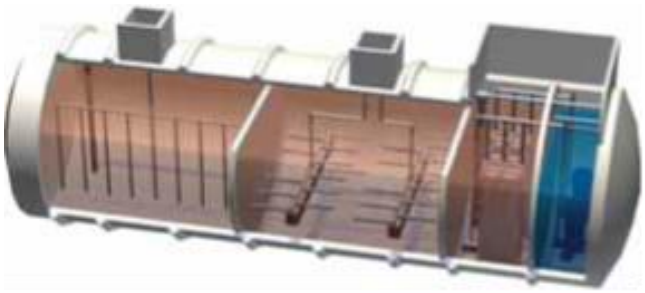
Reinforced Membrane Cassette

* with appropriate biological design and/or chemical addition

MOD-S

20 – 380 m^3/day

- Fully integrated system with biological processes, membranes, and ancillary equipment in a single tank
- A complete “plug-and-play” design
- Maximum capacity for a buried tank is 155 m^3/day
- Can be buried or installed above ground
- Compact design minimizes construction costs and plant footprint
- Highly automated PLC- controlled operation and cleaning



MOD-M

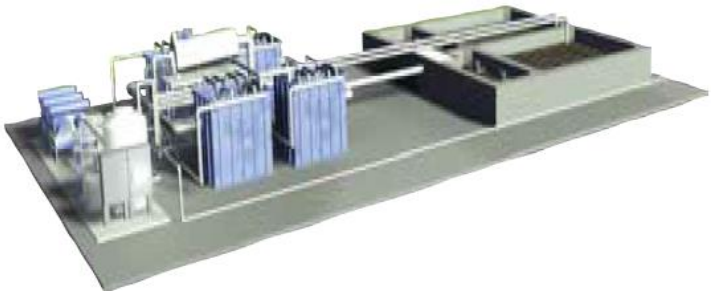
300 – 380 m^3/day

- Expandable to 160,000 gpd
- Fully integrated skid-mounted system
- Suitable for greenfield or retrofit applications
- Compact footprint
- Highly automated PLC-controlled operation and cleaning

MOD-L

300 – 4 000 m^3/day

- Modular system with expandable building-block design
- Containerized or skid-mounted components
- Suitable for greenfield or retrofit applications
- Compact footprint with flexible layout options
- Highly automated, PLC-controlled operation and cleaning
- Dual-train systems



MOD-X

4000 – 16000 m^3/day

- Modular building block design
- Single train systems
- Equipment skid comes complete with permeate pump, process blower, RAS pump, PLC, MCC, piping and wiring
- Minimal installation time required
- Compact footprint with flexible layout options
- Highly automated, PLC-controlled operation and cleaning