

GWT™ Ultra Filtration Systems Presentation



GWT™ Ultra Filtration Systems

- GWT Ultra filtration systems incorporate advanced membrane technology. These membranes are highly efficient low fouling and back-washable rigid spiral filtration membranes
- GWT Ultra filtration systems are flexible systems. These systems are available in conventional submerged or integrated membrane system configurations to meet your specific filtration requirements
- Cost effective high performance system solution for municipal water, industrial process water, wastewater reuse and surface water applications
- Lower capital, operating, and maintenance costs versus alternative ultra filtration system technologies on the market today
- GWT Ultra filtration systems can handle a wide range of Total Suspended Solids, BOD, COD, and turbidity while still providing consistent high quality product water



Market Segments

- **Industrial**

- Process water
 - RO Pre-treatment
- Wastewater reuse



- **Municipal**

- Tertiary waste applications
- Fixed film bio-reactors



- **Specialty**

- Swimming pool filtration
- Other specialty applications possible

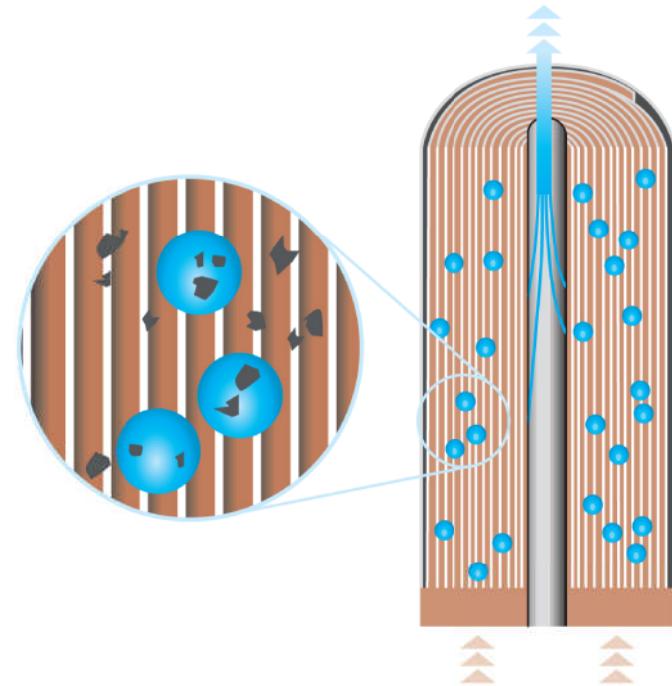
GWT UF System Applications

- Oil & Gas Facilities
 - RO Pre-treatment
- Power Plants
 - RO Pre-treatment
 - Cooling Tower Blowdown
- Industrial Wastewater
 - Heavy Metal Removal
 - Textile Waste
 - Chip Dicing
 - Landfill Leachate
 - Process Water
- Municipal Wastewater
 - Tertiary
 - Fixed Film Bioreactor
 - Landfill Leachate
- Specialty Applications
 - Hot Water Sanitizing
- Surface Water Applications
- Sea Water Applications



Aeration Process

- Air bubbles within membrane channels create highly effective scrubbing action
- Convective Flow Reduces Fouling
- Membrane Flow channels maintain extended bubble contact with membrane surface
- Membrane Aeration forces air and water up through the membrane element itself
- Low rise velocity maintains longer contact time enhancing scrubbing effectiveness
- Effective aeration process prevents solids from accumulating



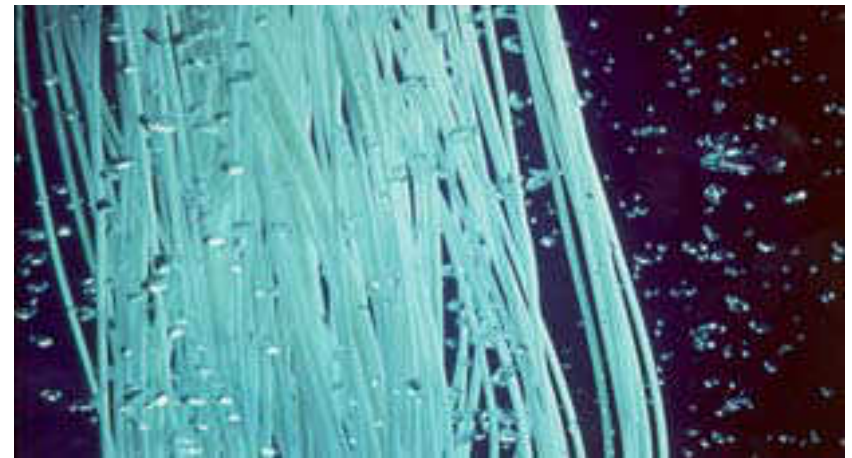
Membrane Feed Spacer



Membrane Aeration - Air Scour



The picture above illustrates the effective concentrated Membrane Air scour process utilized in the GWT spiral wound configuration UF systems



The picture above illustrates the inefficient Membrane Air scour bubbles process in hollow fiber membrane configuration UF systems

GWT UF System

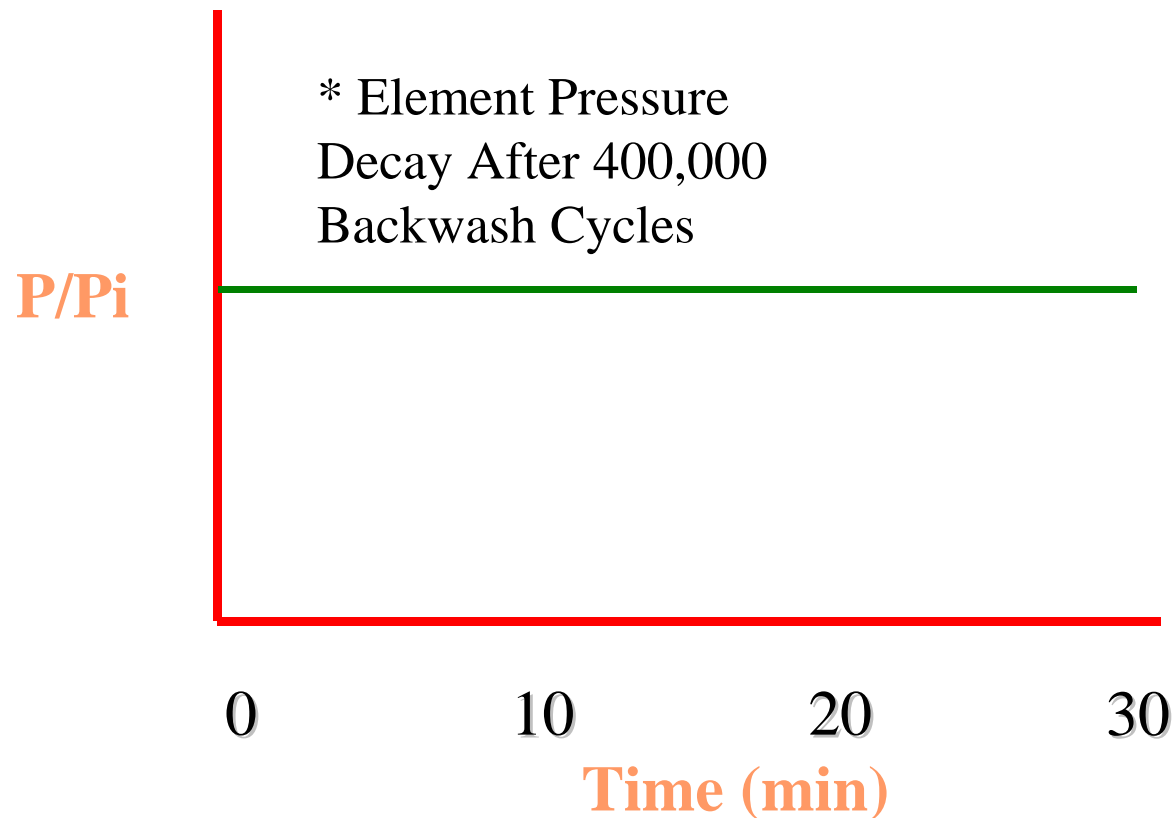
High Effluent Water Quality

- Essential for RO system pre-treatment applications
- Silt Density Index < 2.0
- Total Suspended Solids <1.0 mg/l
- Turbidity <0.1 NTU
- Removes solids, viruses, turbidity
- Complete barrier layer to protect RO system



GWT Ultra Filtration Systems

Long Term UF Membrane Mechanical Integrity



Membrane Backwash Function

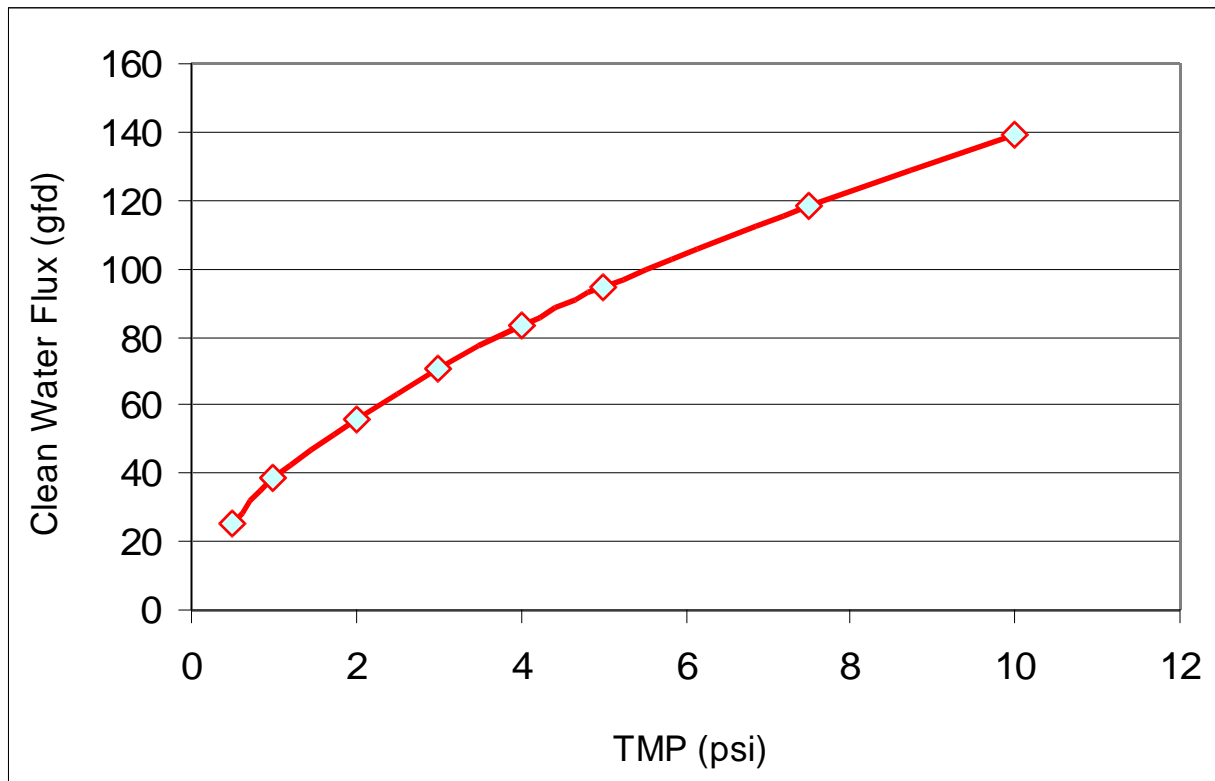


Beginning of Membrane Backwash



End of Membrane Backwash

UF Membrane Permeability



GWT Ultra Filtration System Solutions

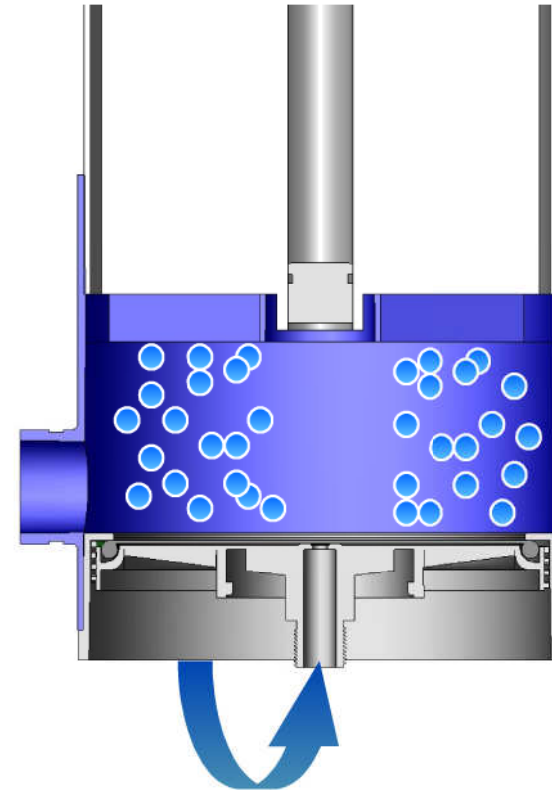
- GWT Ultra Filtration System Solutions
 - Integrated submerged membrane design
 - * iSep 500



GWT Ultra Filtration Systems

iSep Process Aeration Design

- Aeration completely contained within module assembly
- Fine bubble diffuser integrated into module assembly
- Advanced corrugated feed spacer design
- High cross flow
- Open Channel



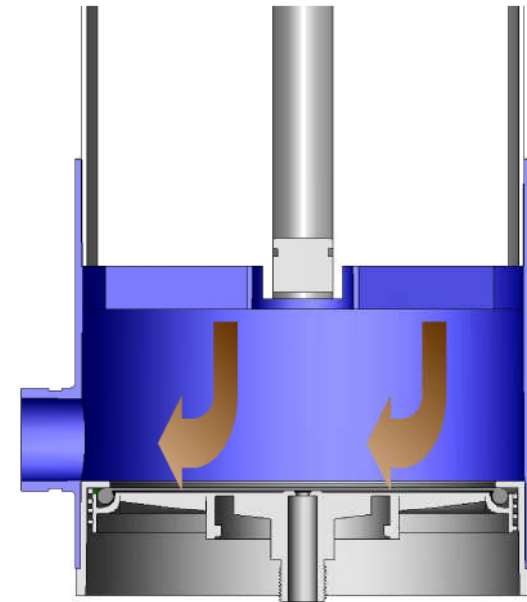
Solids Management

- Sludge accumulation can accelerate flux decline
- Solids draining is most effective method for solids management
- High tank intensity required to obtain benefits
- Quick drain time required to prevent extended down time
- Solids draining removes all solids accumulated inside membrane
- Solids accumulation can hinder UF system performance
- Sludge layers can cause TSS levels to increase when agitated



GWT Ultra Filtration System *i*Sep Process Solids Draining

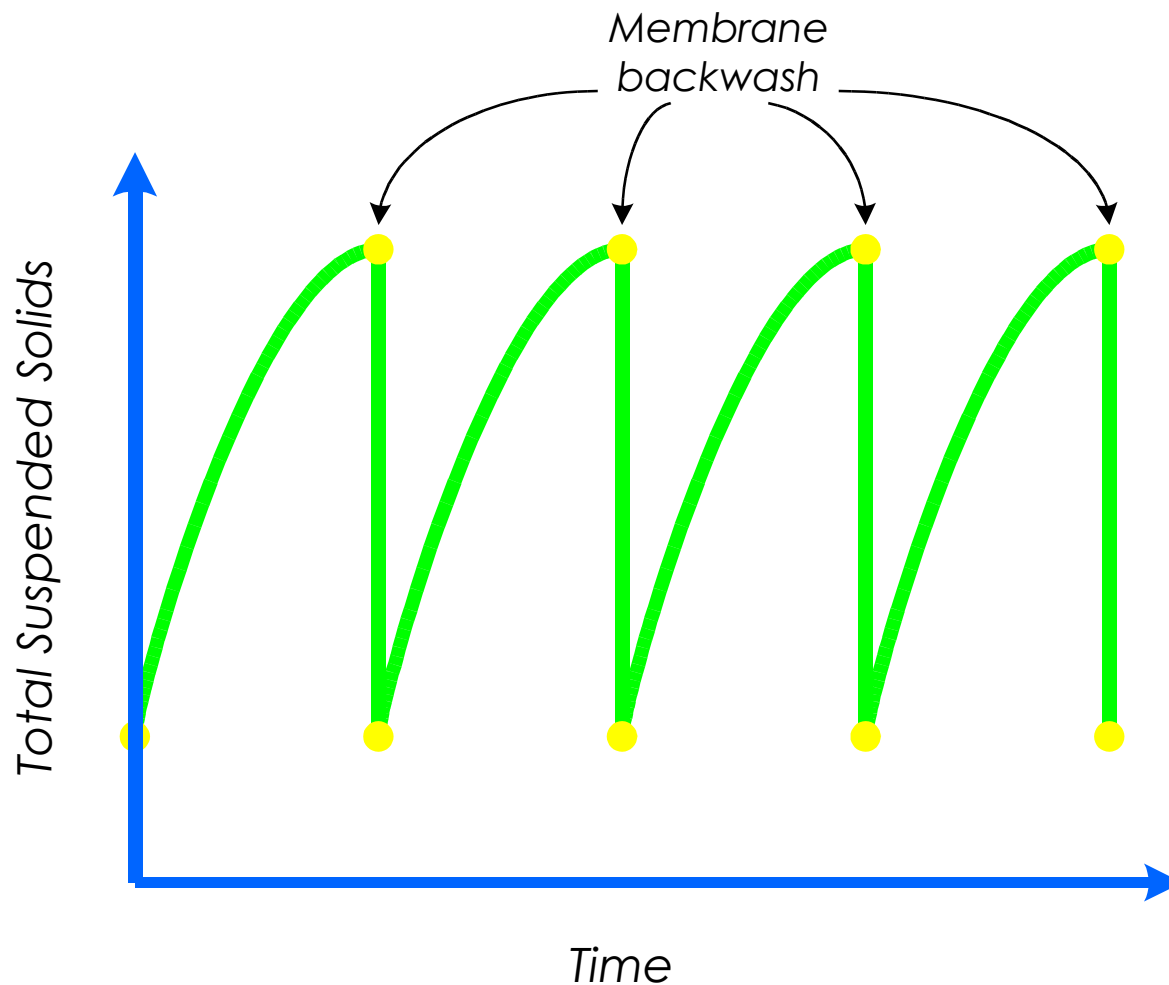
- It is essential to have small drain volume
- Solids are drained from each membrane module
- Rapid drain time of 10-15 seconds
- Tank intensity of 1,000 m²/m³
- Cross flow during draining provides additional effective cleaning action



GWT UF Systems

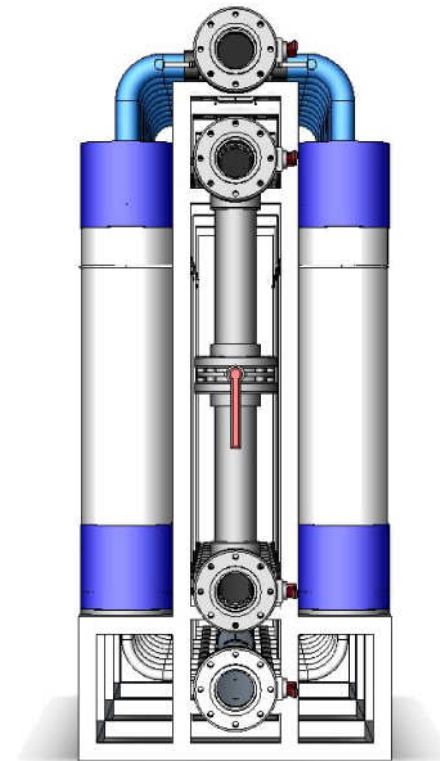
Solids Draining Backwash Process

iSep Integrated Membrane Configuration



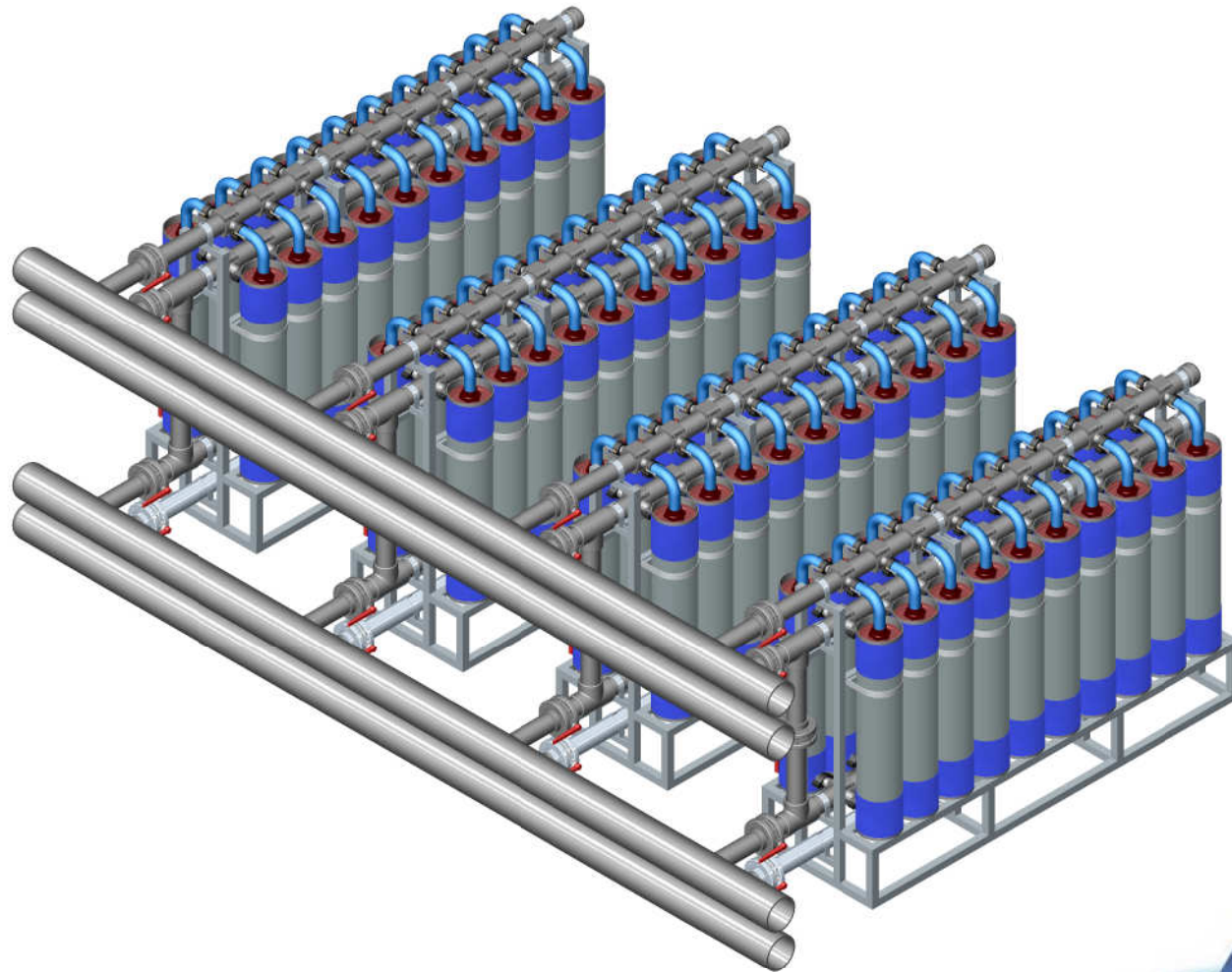
GWT UF System Skid Mounted Design

- Reduces capital and energy expenses
- Skid mounted design eliminates need for common process tank
- Flexible system design allows for easy configuration
- Ease of operation
- Solids draining process increases UF system efficiency and reduces maintenance expenses



GWT UF System

iSep Integrated Membrane Configuration Layout



GWT Ultra Filtration Systems Summary

- GWT ultra filtration systems provide a sustainable, cost effective solution to meet your specific filtration needs
- GWT ultra filtration system incorporating iSep advanced ultra filtration technology provide the highest effluent water quality and among the lowest energy costs versus alternative ultra filtration systems on the market today
- Lower capital outlay, operating and maintenance costs
- GWT ultra filtration systems are capable of performing effectively in multiple applications including high temperature sanitizing applications



Case Study

Surface Water Filtration Application

Membrane Type	GWT UF System Incorporating iSep Membrane Technology	UF System Incorporating Hollow-Fiber Membrane Technology
Average TMP	3.0 psi (.2 Bar)	3.0 psi (.2 Bar)
Avg. Feed Water Turbidity Level	10-15 NTU	10-15 NTU
Flux Rate	42 GFD	24 GFD
Peak Flux Rate	42 GFD	26 GFD
Membrane Permeability	14 GFD/psi (500 lmh/bar)	8 GFD/psi (230 lmh/bar)
Cleaning Frequency	3-4 months	weekly
Effluent Quality	< 0.1 NTU	< 0.1 NTU
Membrane Aeration Process	Yes	Yes
Backwash Frequency Cycle	15 minutes	20 minutes