MBR Application to Large-scale WWTPs

JS enhances MBR to apply to middle or Large-scale WWTPs with a capacity of 10,000m^3/day and over.

* There are many examples of large-sized MBR of tens of thousands capacity overseas.

JS's challenges for MBR application :

Cost reduction

- Develop a creative units specialized for large scale WWTPs
- Reduce air flow rate

Improvement of maintainability

- Improve system configurations
- Apply automatic chemical cleaning system

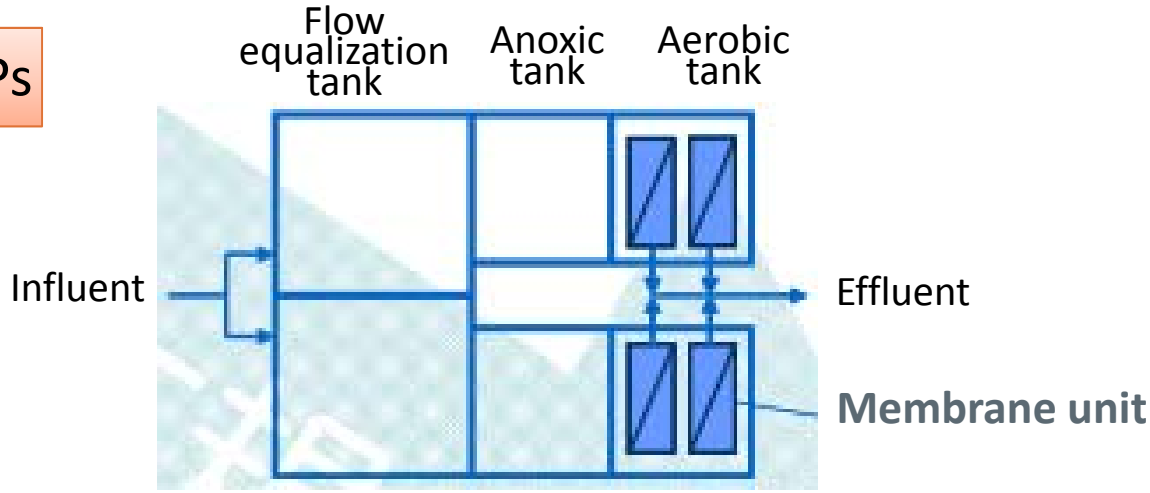
Optimization for retrofit application

- Optimize system configurations

MBR System Comparison

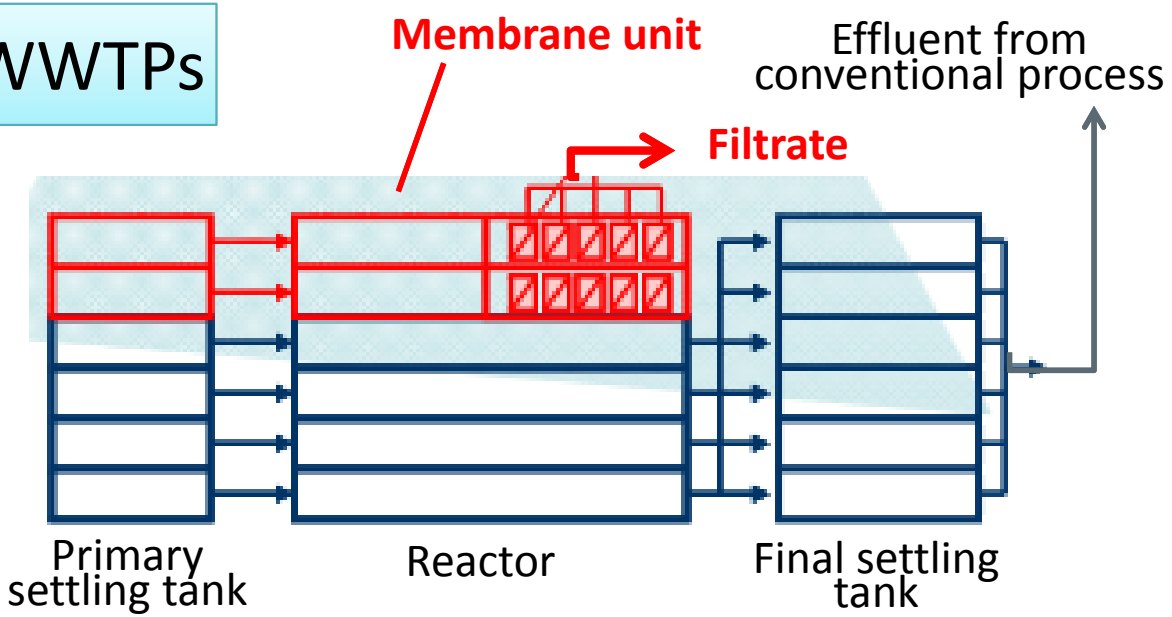
MBR for small-scale WWTPs

- 200-3,000m^3/d
- Fit for new WWTPs
- System configurations and specifications are standardized
- Ten MBRs are in-service



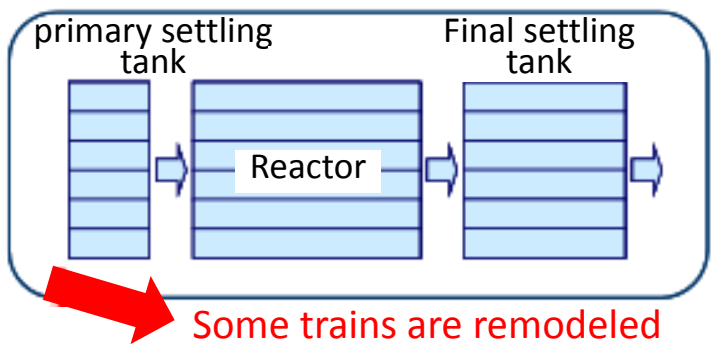
MBR for large-scale WWTPs

- 10,000m^3/d and over
- Fit for retrofits of WWTPs
- Optimization for various requirements of existing WWTPs



Hybrid MBR

When MBR is applied to an existing large-scale WWTP, ***Hybrid MBR*** is mostly adopted.
In Hybrid MBR, conventional treatment process and MBR process operate side by side.



Some trains are remodeled to MBR process

Use activated sludge process to evaluate the effluent quality

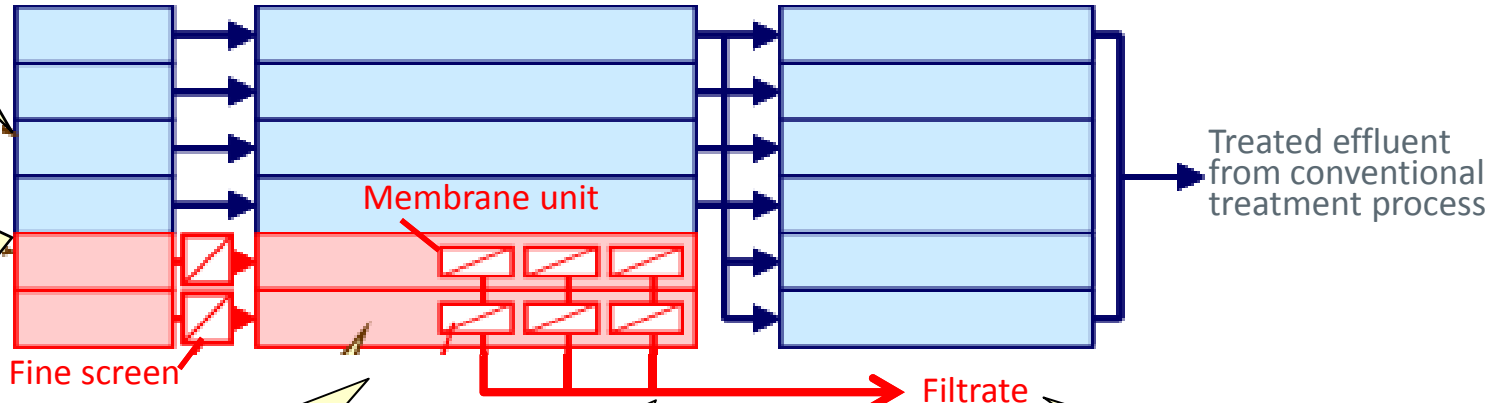
Gets to treat less influent than conventional treatment process

Nutrients removal is expected

Excess final settling tanks can be used for conventional treatment process

Conventional process equalizes inflow variation or flow equalization tank is set up

Some WWTPs require a primary settling tank. It depends on the condition of each WWTP.
-Use : reduce screen load and blow amount
-No use : accelerate N/P removal(Set up flow equalization tank alternatively)



A fixed membrane operation can reduce a frequency of membrane cleaning and extend its service life

Minimum retrofit can improve effluent quality without the extension of facilities

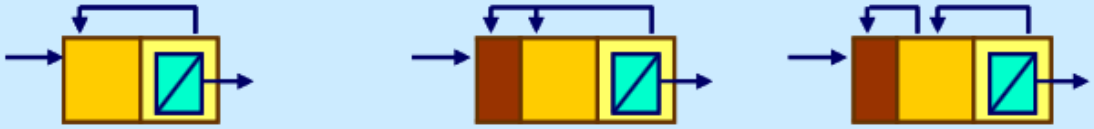
Can be reused without sand filtration or sterilization

Optimization Adapting to the Existing Systems

When MBR is applied to the existing WWTPs, it should be adapted flexibly to their conditions such as building structures, channels, pipe arrangement, facilities and equipment, etc. JS tries to develop the optimization methods including system configurations and type of membranes.

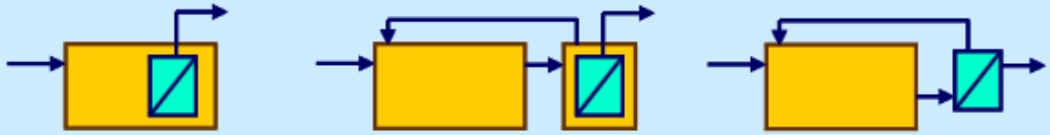
Biological treatment

- Nitrogen removal
- Nitrogen removal + biological phosphorus removal



Membrane separation

- Emersion type (built-in)
- Emersion type (separated)
- Outer tank



Evaluation methods

- Manualize system adoption and optimization
- Numerical simulation using activated sludge model

Type of membrane

- Flat sheet

- Hollow fiber

- Ceramic

Scope of application

Enhanced MBR can be applied for WWTPs that:

- Have a small site area
- Require nutrients removal
- Need to boost wastewater treatment capability
- Demand safe effluent
- Need to recycle/reuse effluent

◆In MBR process, filtrate can be reused for landscaping without sand filtration or sterilization.

◆ JS has been developing an advanced treatment technology: The advanced technology has reverse osmosis (RO) membrane that reprocesses filtrate from membrane separation bioreactor.

*Since filtrate from membrane separation bioreactor include no solids matter, it can be used for RO membrane treatment without pretreatment such as sand filtration.