



2. Membrane Bioreactor (MBR)

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- A combination of biological WWT (e.g. activated sludge) and membrane filtration as a measure for solid-liquid separation.

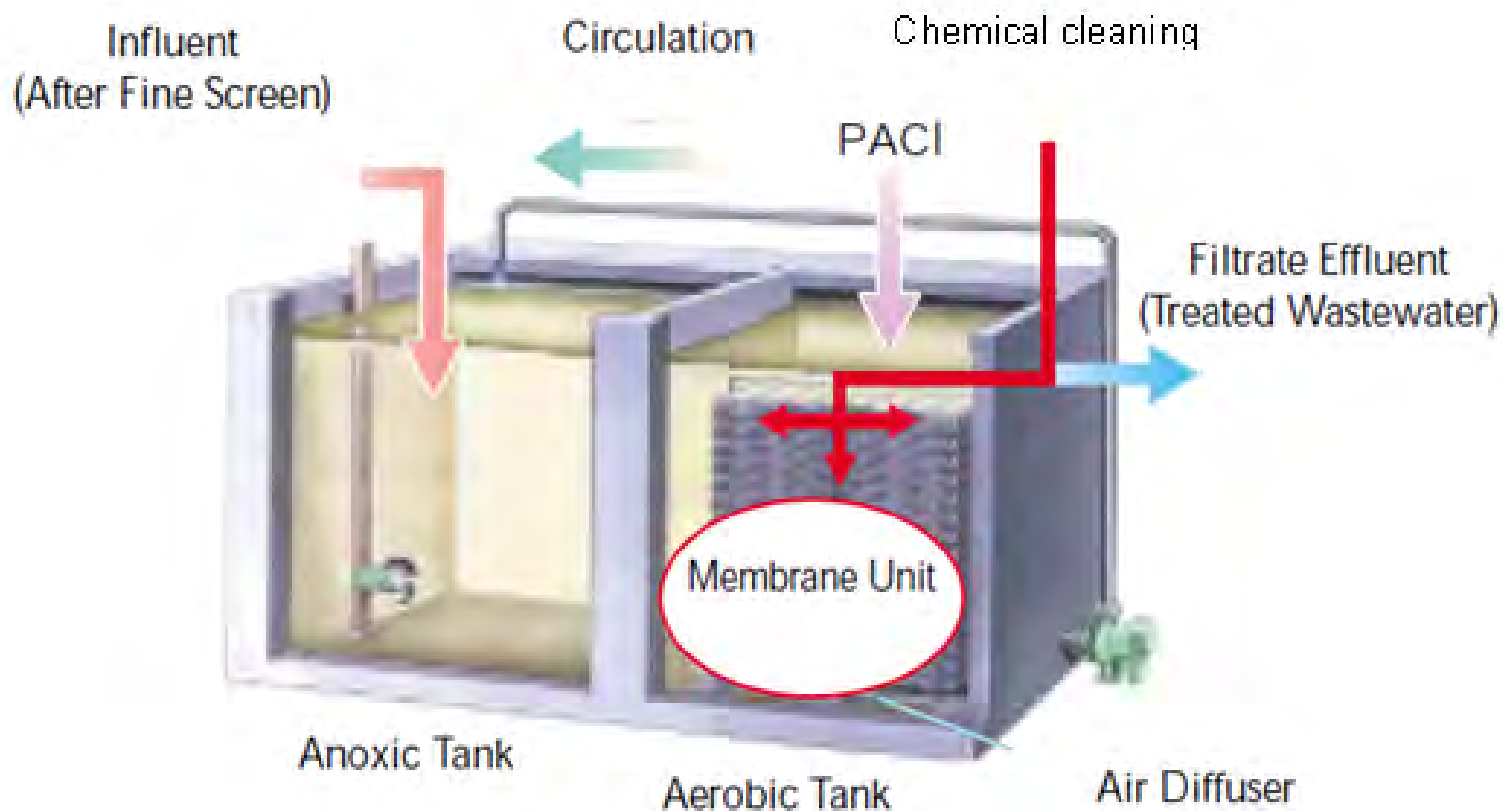
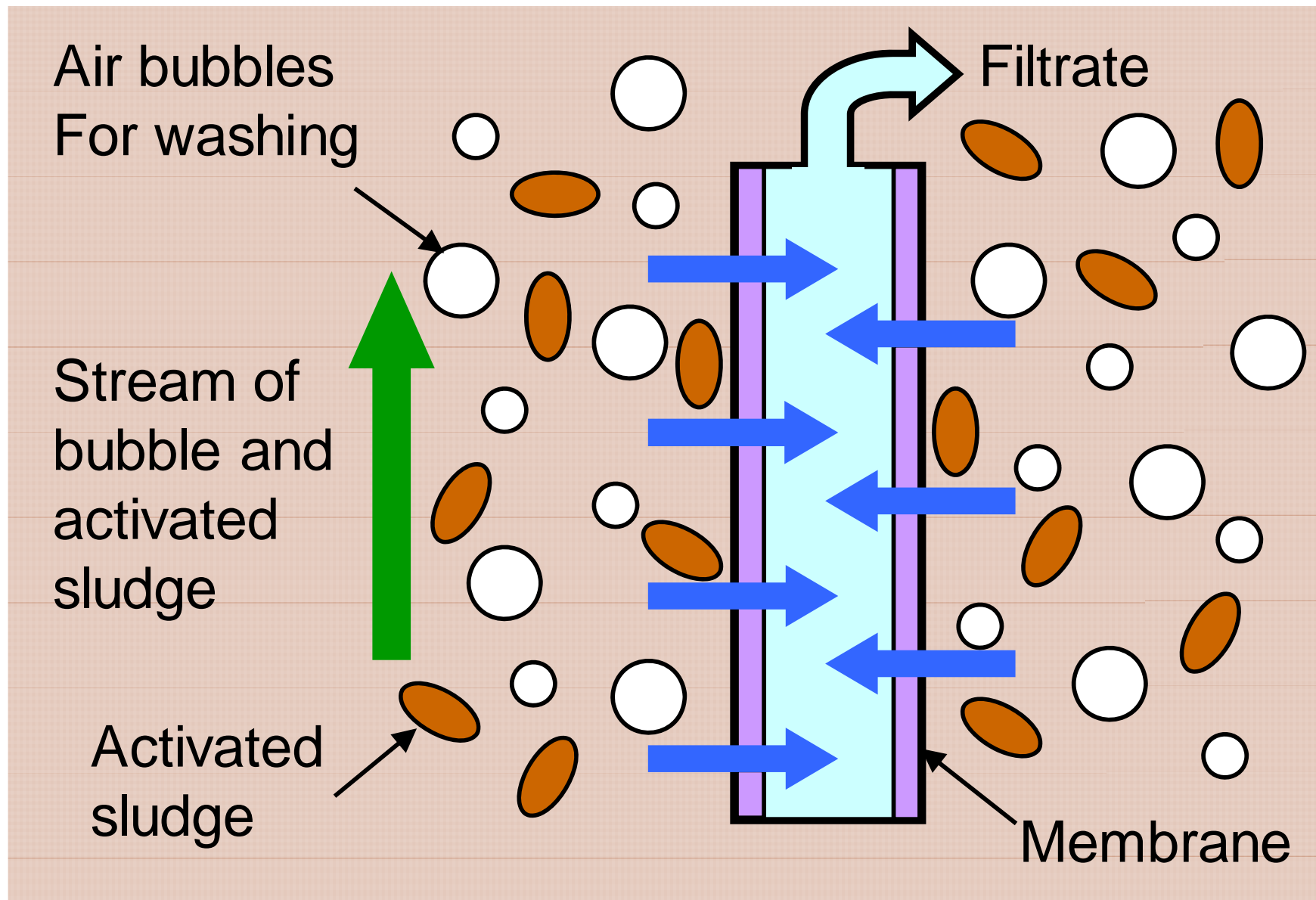
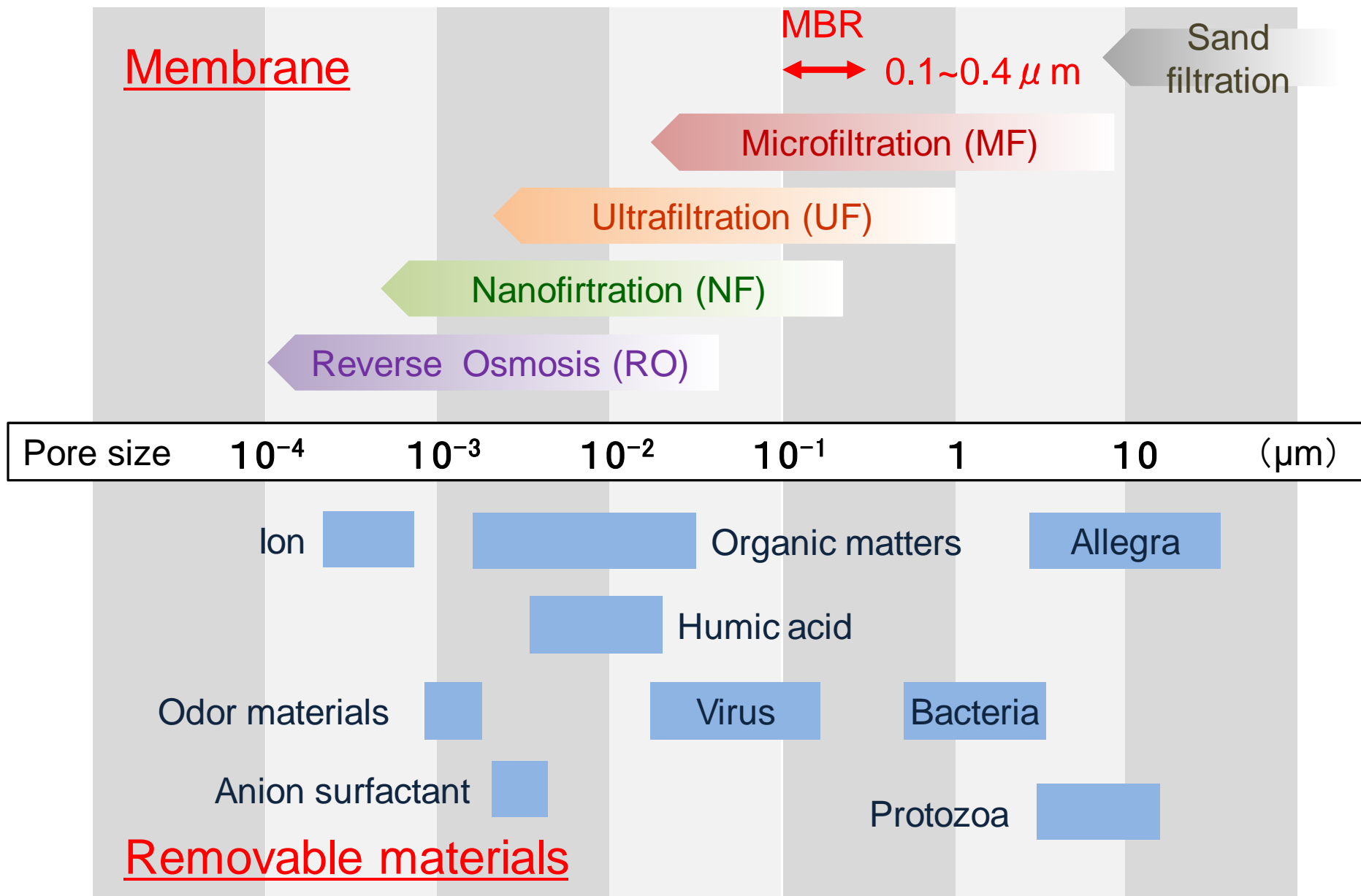


Image of Membrane Filtration on MBR



Membrane and Removable Materials

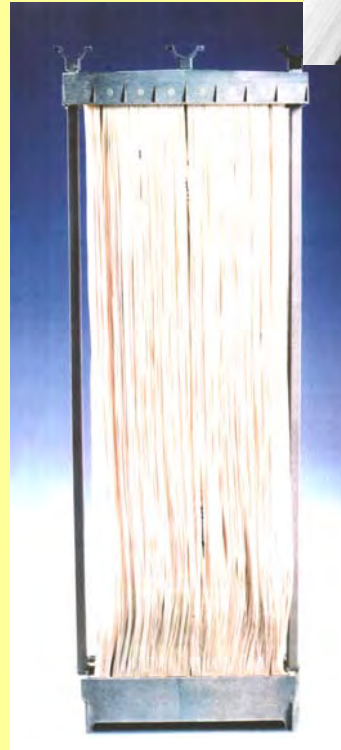


Membrane Type used for MBR

Flat sheet



Hollow Fiber

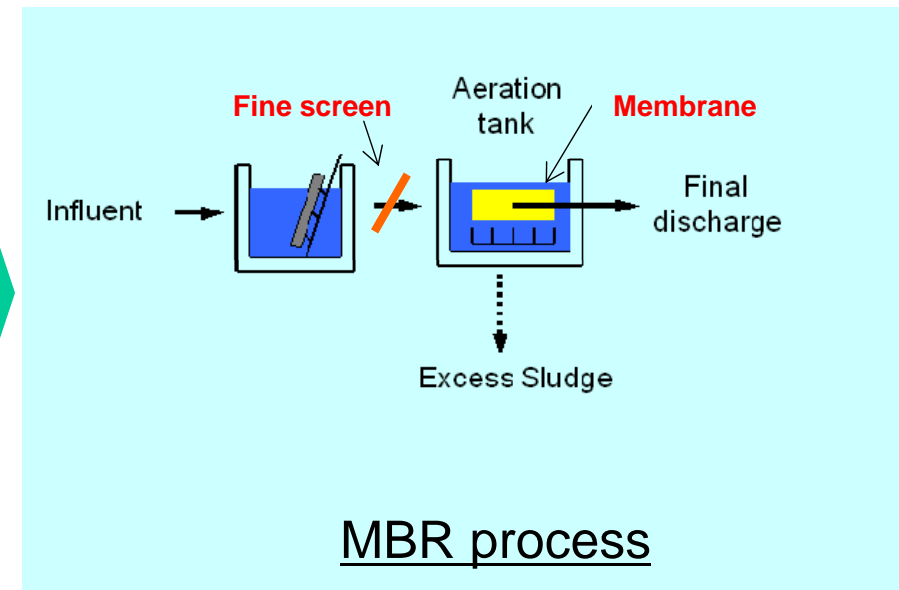
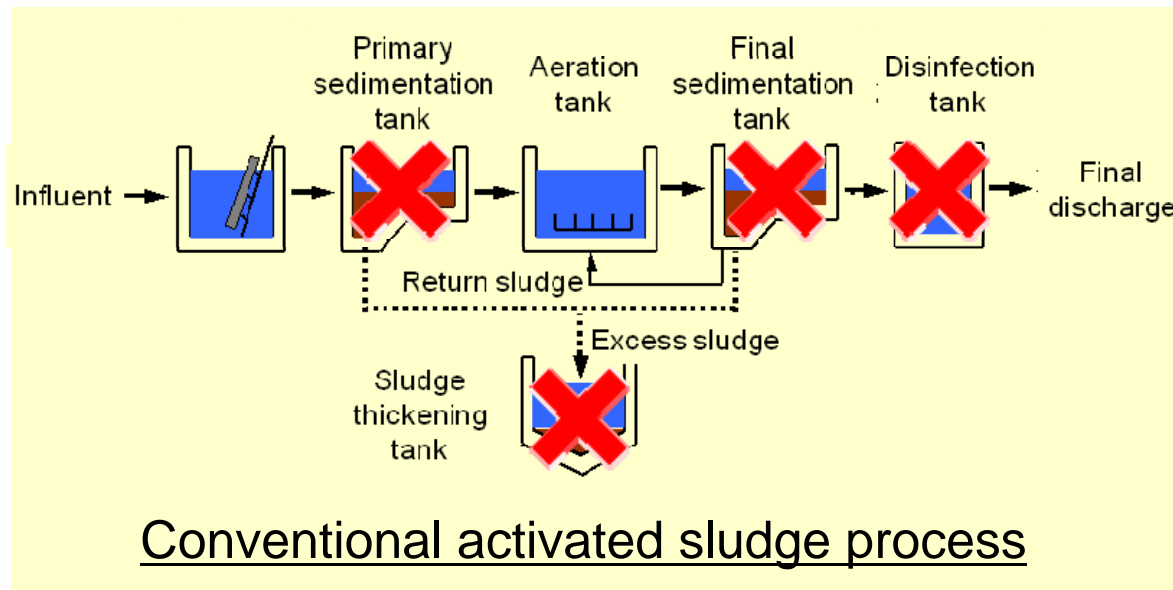


Ceramic



Advantages of MBR over Conventional Activated Sludge Process

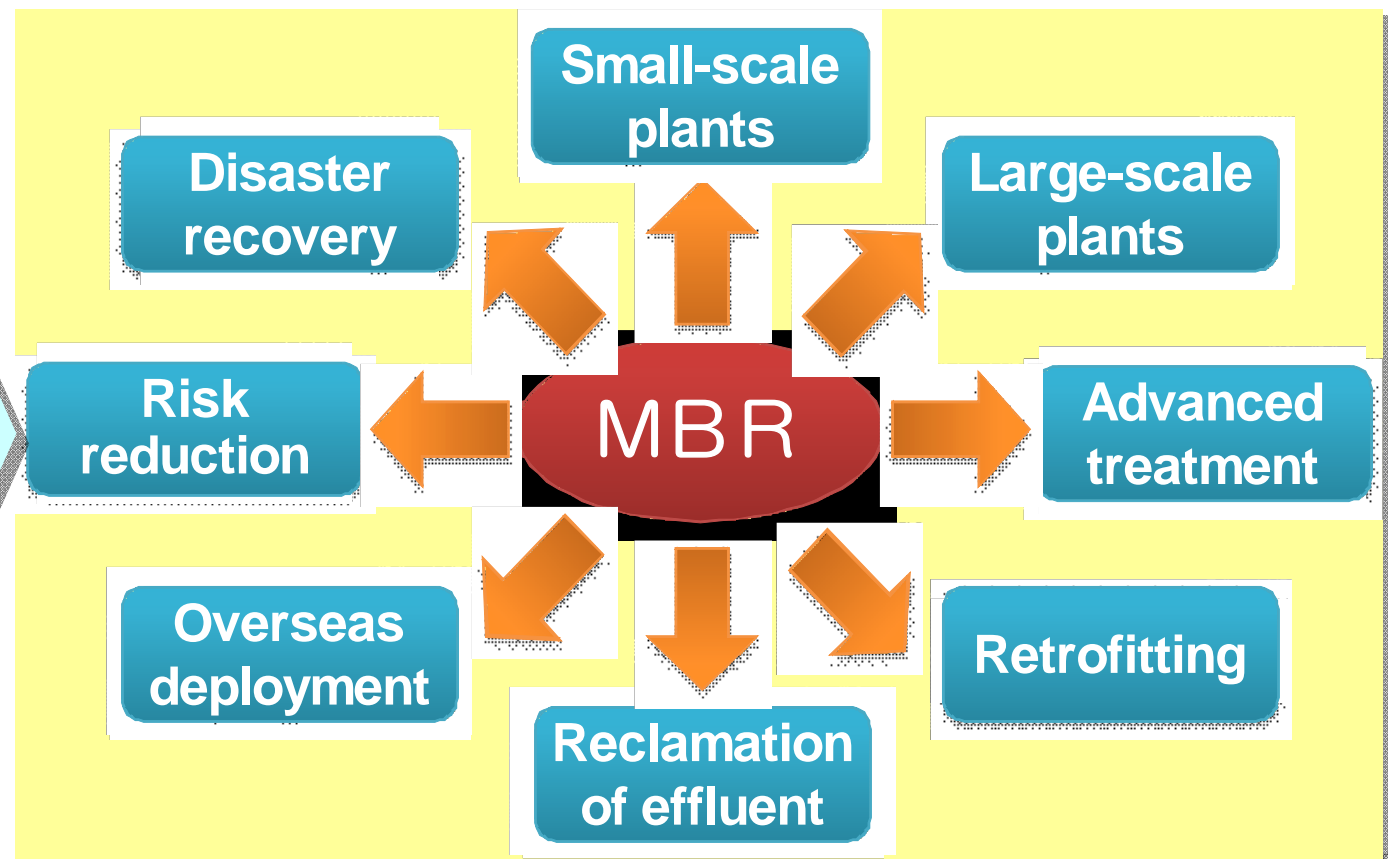
- Complete rejection of suspended solids.
- Higher mixed liquor suspended solids (MLSS) (>8 g/L).
- Smaller footprint (< 6hr for biological nutrient removal).
- Smaller sludge production.
- Simple monitoring parameters (e.g. transmembrane pressure (TMP)).



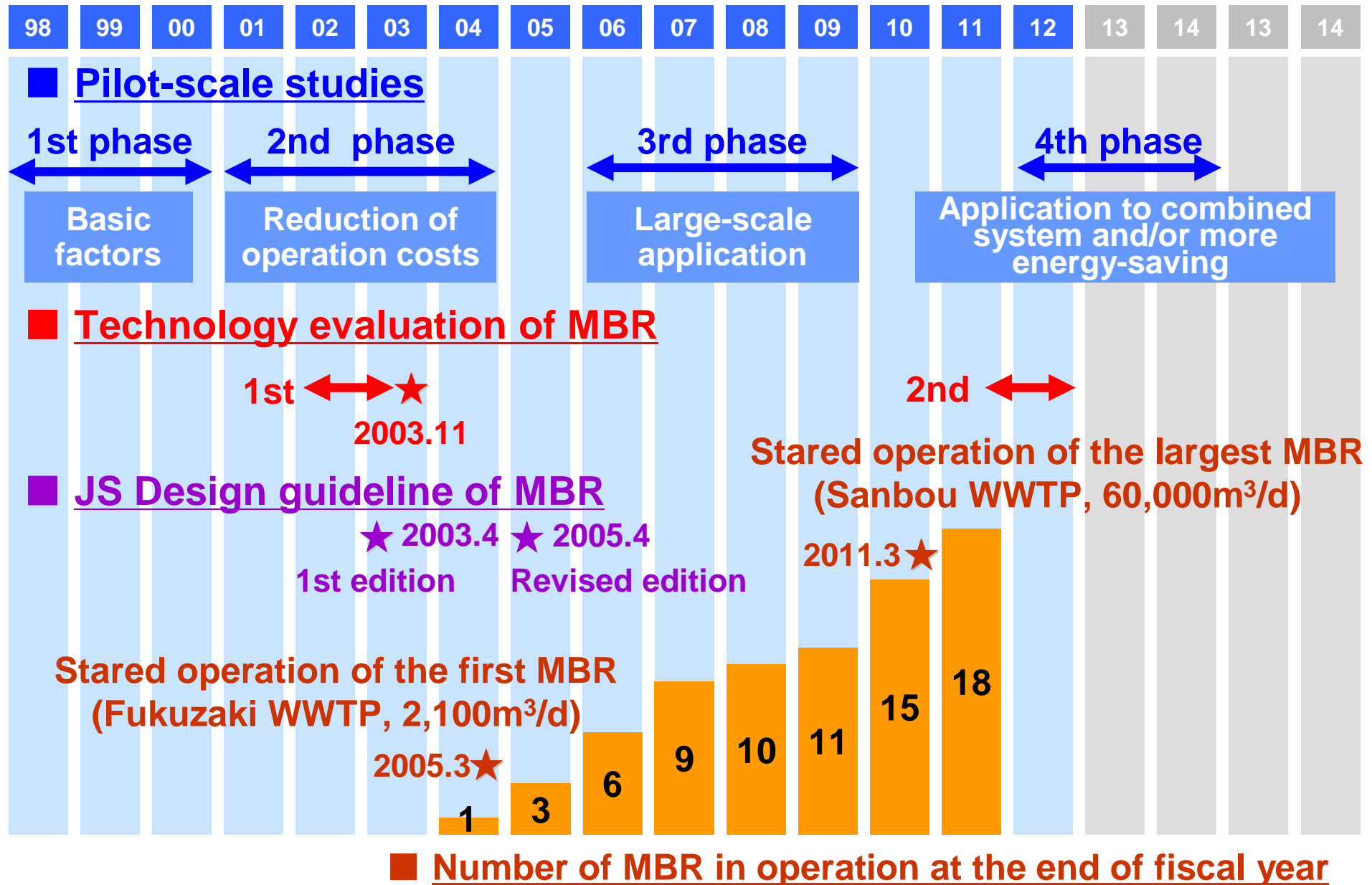
Various Evaluation of MBR technology

- MBR is a **core technology** for simultaneous dissolving current issues on sewage works in Japan and other countries due to its excellent characteristics

- Excellent and stable effluent quality
- Bacteria free effluent
- Nitrogen and phosphorus removal
- Small footprint
- Easy operation



Developments of MBR in Japan Sewage Works Agency



Example of MBR Facilities in Japan

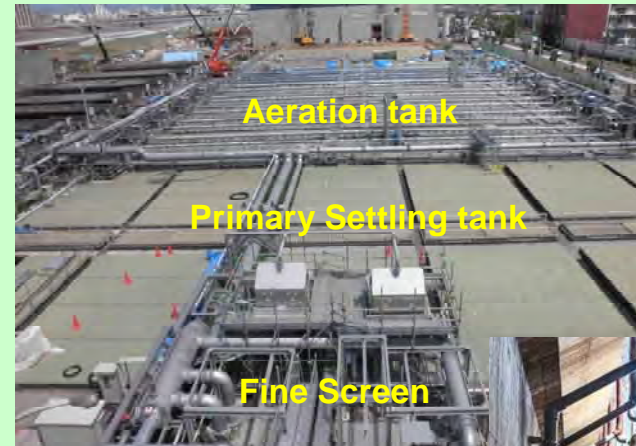
Fukuzaki WWTP

- Present treatment capacity 4,200m³/d
(entire capacity 12,500m³/d)
- The first MBR installation for Japanese sewage plant



Sanbo WWTP

- Treatment capacity : 60,000m³/d
- The largest MBR in Japan
- First application to retrofitting of existing facility and combined sewer system in Japan



Development of large-scale MBR on the 3rd phase pilot-scale studies

- A variety of system configuration was developed to fit to restrictions of existing facilities and requirements of upgrade.

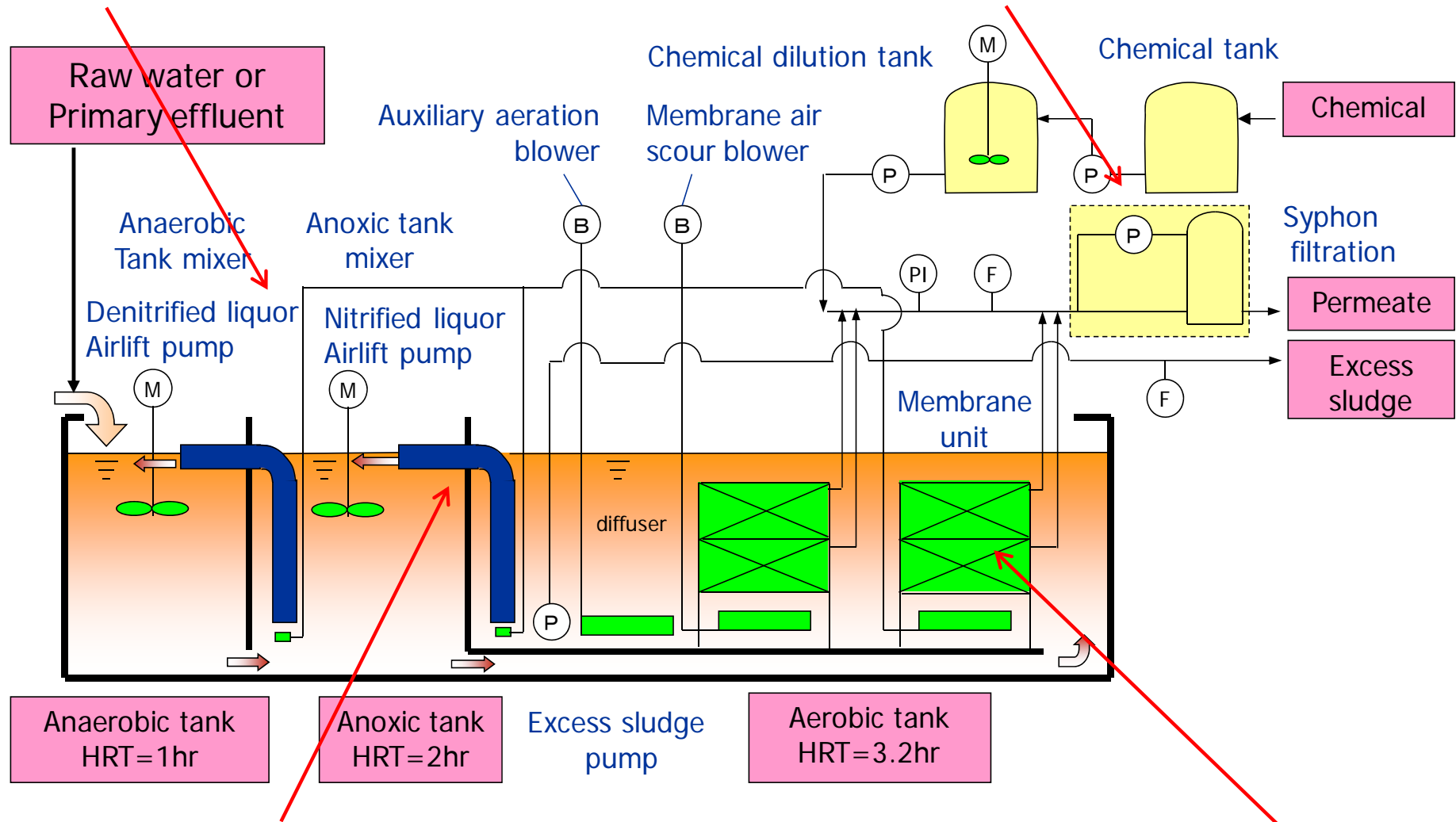
	Membrane type	MBR system	Biological treatment process	Others
A	Hollow fiber	Submerged Separate	A2O	Combined with RO for reclamation
B	Ceramic	External	A2O	
C	Flat sheet	Submerged Integrated	UCT	Gravity filtration Large-size membrane
D	Flat sheet	Submerged Separate	UCT	Gravity filtration NH ₄ -N control Combined with RO



Process Flow of UCT-MBR Process

④ Vertical axis mixer

② Syphon filtration system

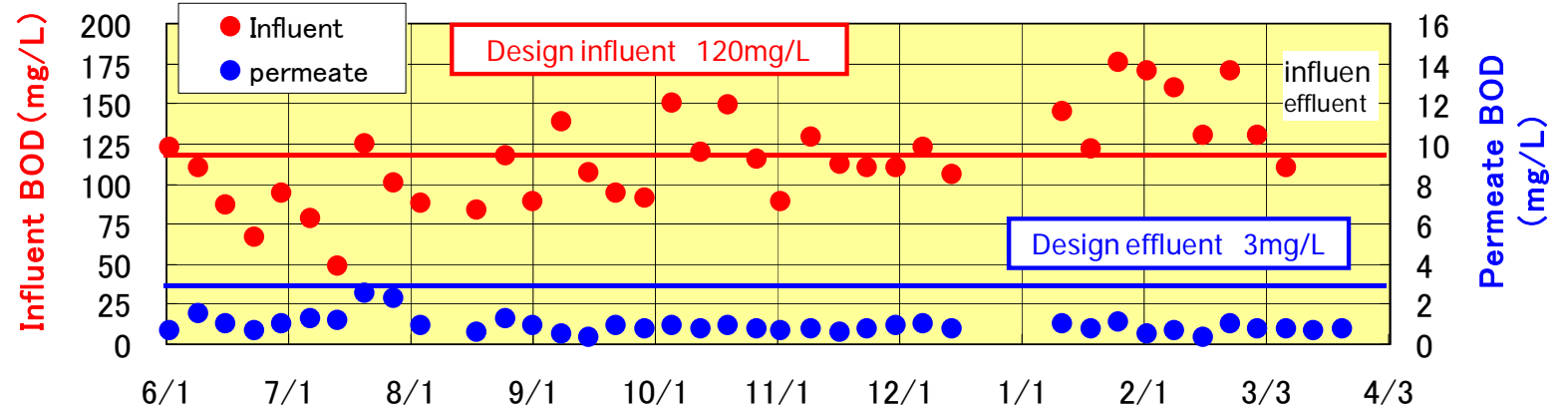


③ MLSS recirculation with airlift pump

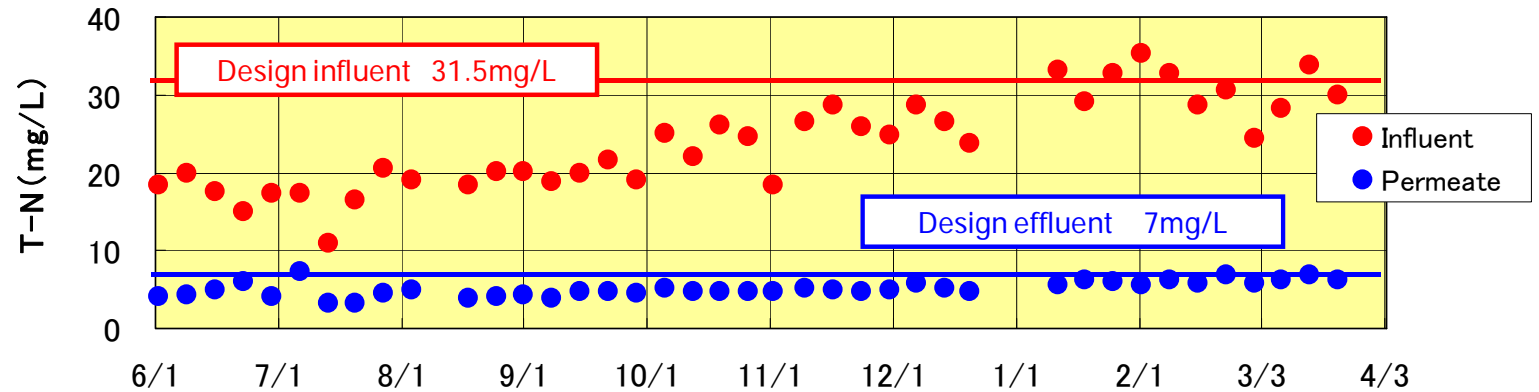
① Large-size membrane unit

Treatment Efficiency in UCT-MBR Process

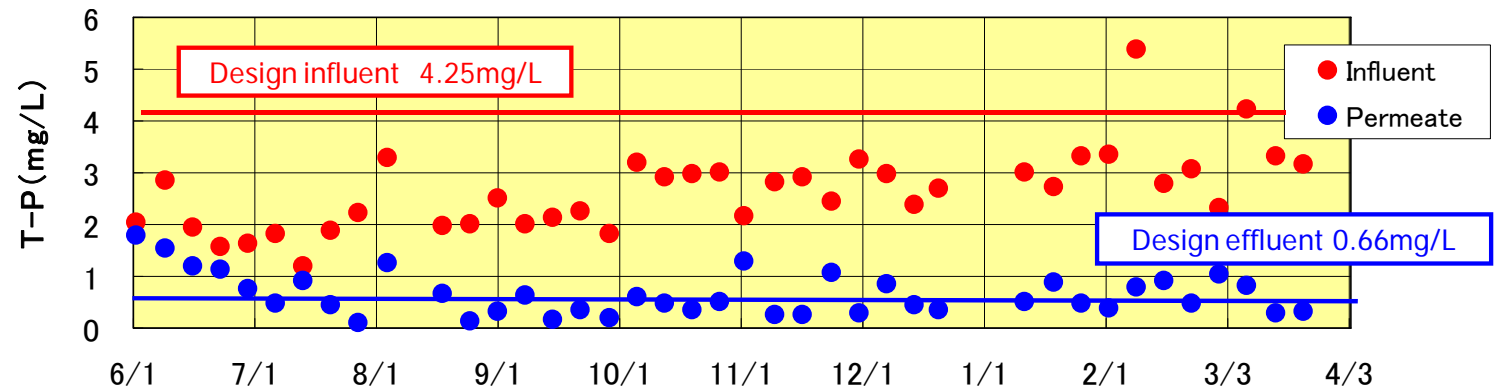
Biological Oxygen Demand (BOD)



Total Nitrogen (T-N)



Total Phosphorus (T-P)



Energy Saving Efficiency in UCT-MBR Process

