

# Selecting Biological Treatment Systems

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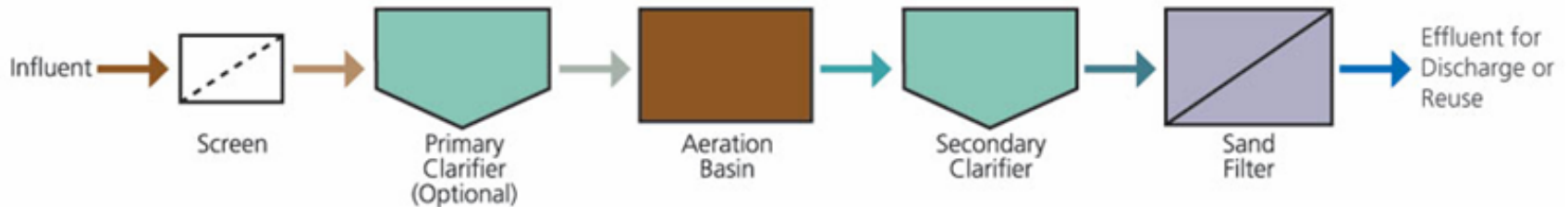
imagination at work

# Treatment Technologies

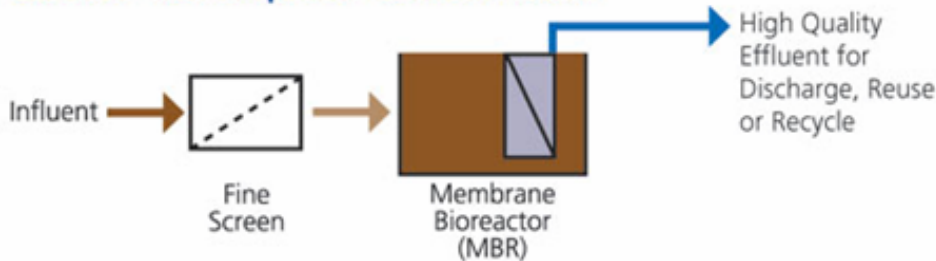
1. MBR – Membrane Bioreactor
2. SBR – Sequencing Batch Reactor
3. RBC – Rotating Biological Contactor
4. Flow Through Package Plants

# Simplifying Wastewater Treatment

## Conventional Multi-Step Tertiary Treatment Process



## ZeeWeed® MBR Simplified Treatment Process



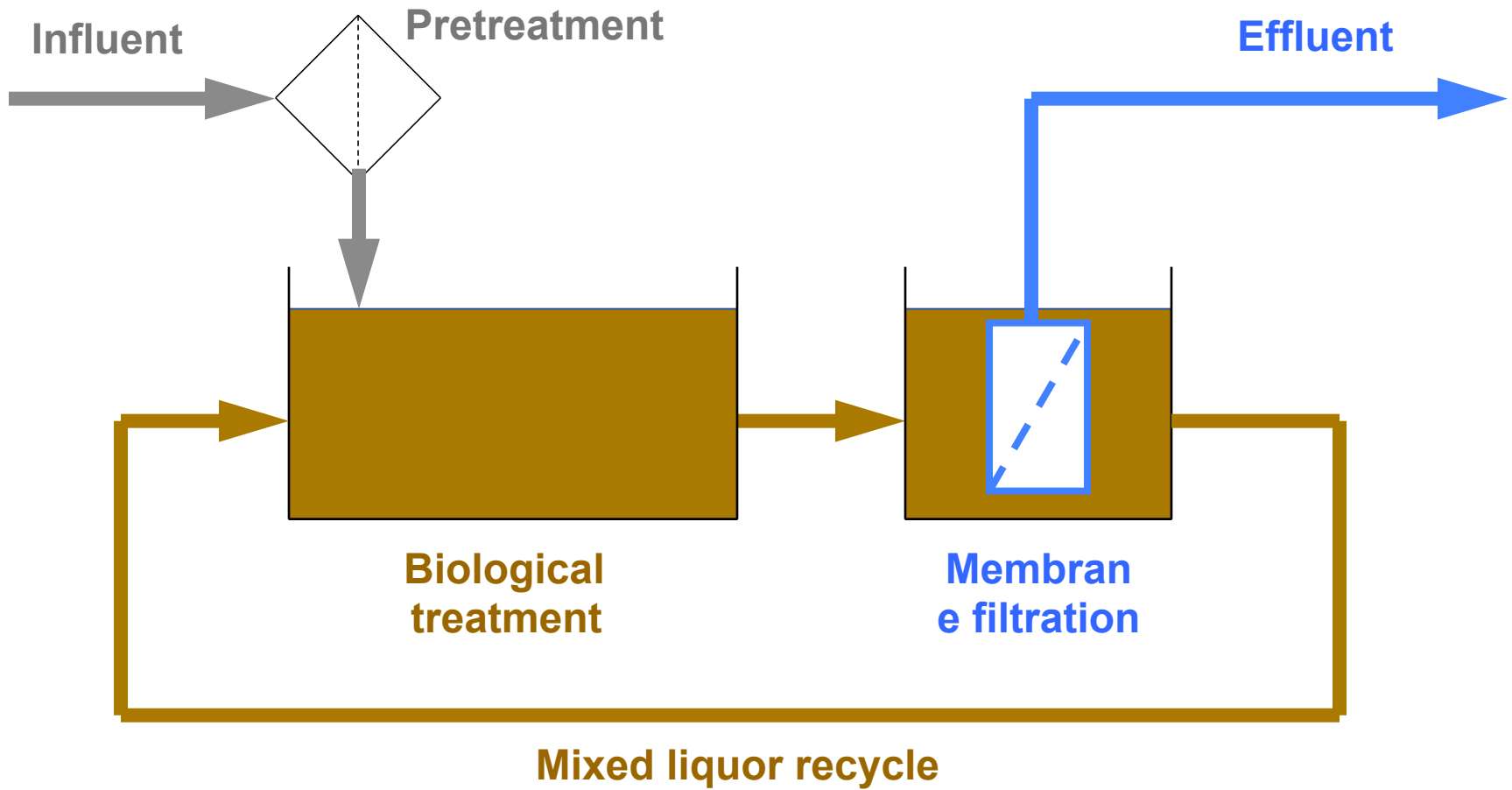
- Same Biology – Different concentrations
- Environment to make biology act as wanted.

# MBR Technology

1. Footprint – Smallest land space required
2. Effluent – Highest quality effluent
  - A. Reuse quality water
  - B. Re-flush / Irrigation
  - C. Car Wash in MA
3. Energy – Higher than conventional
  - A. Air Scour blowers
  - B. Permeate pumping
4. Flexibility – Excellent range of flows
5. Easily designed to increase flow



# GE MBR PFD



# Smaller Footprint and Building



## Features

- No Secondary Clarifiers
- No Sand Filters
- Small Bioreactor

## Benefits

- Large throughput
- Extra-compact footprint
- Low sludge production

# Treated Water Quality Exceeds the World's Toughest Standards – Current *and* Future



Raw Sewage

Treated Water

California's Title 22 Code of Regulations

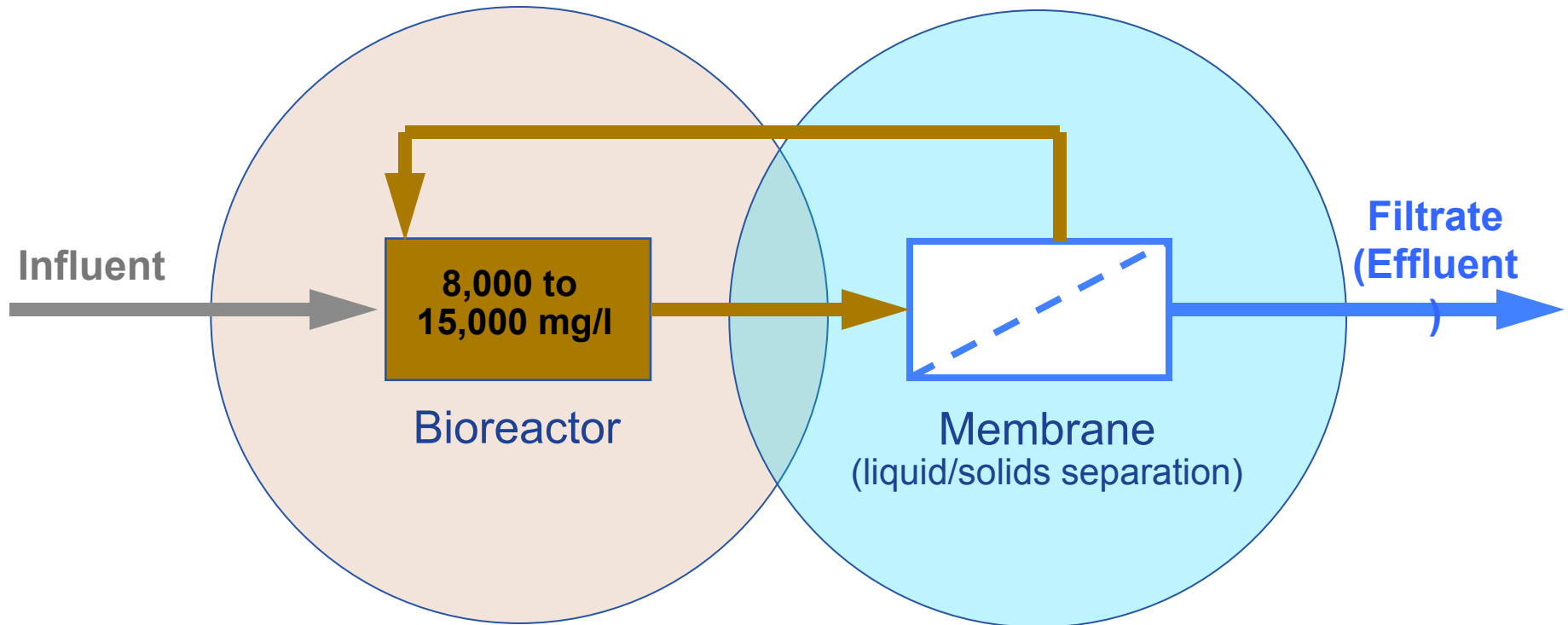
World Health Organization's Standards for Unlimited Irrigation

European Union's Bathing Water Directive

*US EPA turbidity limit for drinking water is 0.3 NTU*

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*Treated wastewater from an MBR system is typically <0.2 NTU*

# MBR Technology



## Hi-Rate Biological Treatment

- large capacity throughput
- compact footprint
- advanced treatment
- simpler, more reliable process

## Absolute / Positive Filter

- high degree of biomass/solids control
- consistently high effluent quality
- lower operator attention - less components





# Cassette



# Membrane equipment

## Pre-Engineered Packaged Plants



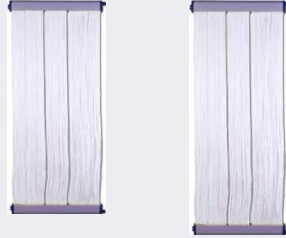
## Custom Engineered Systems for any size plant



# MBR Packaged Systems

Concrete tank  
systems  
Package skids

ZW500Ds – 300ft<sup>2</sup>/370 ft<sup>2</sup>



Train Flows  
10-65 kgal/day

System Max Flow  
2 trains  
100 kgal/day



Package skids  
(Integrated  
membrane Tank)

ZW500Ds – 300ft<sup>2</sup>



Train Flows  
30-65 kgal/day

System Max Flow  
2 Trains  
130 kgal/day



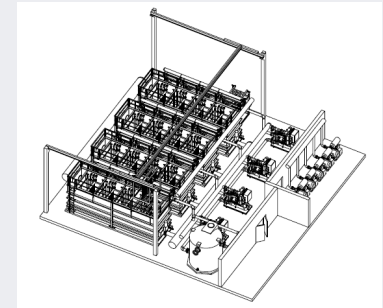
Component  
systems

ZW500D – 370 ft<sup>2</sup>



Train Flows  
130kgal/day – 1.3 MGD

System Max Flow  
4 Trains  
5.3 MGD



# Packaged MBR Systems (Small)

Two train system

10,000 – 80,000 gpd

Skid mounted permeate and backpulse pumps

Skid mounted blowers

Integral AB PLC and HMI





# Package Skid system with membrane tank

- Flows up to 130,000 gal / day
- 1 or 2 trains with integrated membrane tank(s)
- Integral permeate and backpulse pumps, backpulse tank and membrane blowers
- Integral AB PLC and HMI



# Large component skid systems

- Huge capacity range – 132,000 gal/day to 5.3 MGD
- Features LEAP - lowest energy MBR on the market !
- Easy to customize: inter-changeable pump & membrane designs
- 1-4 trains with concrete or steel membrane tanks
- Highly automated, even the cleans
- Smart network architecture. Easy to add future capacity, network to a SCADA/DCS.
- Uses remote I/O panel per train and central PLC, controls includes bioreactor designs for ease of integration.



# ZMODL-280 Process Skid



# SBR Technology

1. Footprint – More land space required.
  - A. Typically 2-3X MBR
2. Effluent – Highest quality effluent 10/10/5
  - A. Reuse quality water with filters
  - B. Title 22
  - C. Golf Courses
3. Energy – Low Cost
4. Flexibility – Good range of flows





# RBC Technology

1. Footprint – More land space required.
  - A. Typically 2-3X MBR
2. Effluent – Lower quality effluent 30/30
  - A. Total Nitrogen requires de-nite filters
3. Energy – Low Cost
4. Mechanically simple
5. Hydraulic flexibility is limited



# NE References

## Massachusetts (Recent Plants)

|                      |          |
|----------------------|----------|
| Cornerstone Square   | Westford |
| South Shore YMCA     | Hanover  |
| Mashpee Commons      | Mashpee  |
| Princeton Properties | Westford |

## Massachusetts

|                         |                 |
|-------------------------|-----------------|
| Berkshire School        | Sheffield       |
| Bolton School           | Bolton          |
| BOSE                    | Stow            |
| Camp Becket YMCA        | Becket          |
| Camp Hi Rock YMCA       | Sheffield       |
| Cape Cod Laundry        | South Yarmouth  |
| Cedarmere Development   | Cohasset        |
| Curriculum Associates   | North Billerica |
| Gillette Stadium        | Foxboro         |
| Hadley WTP              | Hadley          |
| Highland Meadows        | Weston          |
| Nantucket WWTP          | Nantucket       |
| Nashoba High School     | Nashoba         |
| Preserve at Oakhill     | Wrentham        |
| Primrose Park           | Westford        |
| Stop & Shop             | Catuit          |
| Stow Shopping Center    | Stow            |
| Sturbridge Campground   | Sturbridge      |
| Summer Village          | Westford        |
| Sutton School           | Sutton          |
| Taunton (WTP - Desal)   | Middleboro      |
| Town of Cohasset (WWTP) | Cohasset        |
| Town of Seekonk (WTP)   | Seekonk         |
| Town of Walpole (WTP)   | Walpole         |
| Village at Stone Ridge  | Westford        |

## New Hampshire

|                       |         |
|-----------------------|---------|
| Town of Epping (WWTP) | Epping  |
| Wal Mart              | Raymond |

## Rhode Island

|                               |              |
|-------------------------------|--------------|
| Point Judith Squid Processing | Narragansett |
| Jamestown WTP                 | Jamestown    |



# MBR Technology

## 1. Installations

## 2. Notable New England Systems

- a. Legacy Farms (expansion system)
- b. Cornerstone Square
- c. Patriots Stadium (re-flush)
- d. Wrentham Outlet Mall (re-flush)
- e. Sutton School (reuse)

# Legacy Farms



# Legacy Farms





# Duckett Creek



# Cornerstone Square



# Cornerstone Square





# Case Study – Walter Panas High School, NY

Design Flow: 12,600 gpd

N-1 Design Flow: 12,600 gpd

Commissioned: Summer 2014

Membrane: ZW500a

| Design             | Influent (mg/L) | Effluent (mg/L) |
|--------------------|-----------------|-----------------|
| BOD <sub>5</sub>   | 193             | <5              |
| TSS                | 166             | <5              |
| NH <sub>3</sub> -N | 23              | <1.5            |
| TP                 | 8               | <1              |



# Conclusions

## What drives selection

1. Desired effluent
2. Land space available
3. Expandability
4. Project cost
5. Astetics

# Thank You



imagination at work