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East Valley Water District **MBR Technologies**

Presenters: Scott Goldman, P.E.



Presentation Outline

- MBR Description
- MBR Technology
- Advantages to MBR
- Disadvantages to MBR
- Ancillary Equipment
- Key Design Considerations
- Case Studies



MBR Description

- Two parts
 - Biological reactor
 - Solids separation by membrane filtration
- Filtered effluent meeting Title 22 filtration requirements
 - Turbidity does not exceed any of the following: 0.2 NTU more than 5% of the time within a 24-hour period and 0.5 NTU at any time



Membrane Pore Size

- Pore size
 - 0.04 micron (avg)
 - 0.1 micron (max)
- Membrane fibers have billions of microscopic pores on the surface
- Pores form a barrier to impurities while allowing water molecules to pass





Membranes for Water Treatment





Membrane Types – Hollow Fiber

Manufacturers

- GE (Zenon) 23 Municipal CA installations
- Evoqua (formerly Siemens) –
 10 Municipal CA installations
- Koch/Puron 3 municipal CA installations

Design

Inside-out vs Outside-in





Koch PURON[®]





Membrane Types – Flat Plate

TUTUTIN

Manufacturers

- Kubota
- Enviroquip/Ovivo

Design

Membrane supports biofilm



1 Membrane Crossflow Filtered **Biofilm** Air Cartridge **bubbles** permeate

> Enviroquip/Ovivo Submerged Membrane Unit



Membrane Types – Tubular

Filtered Permeate

Manufacturers

- GE
- Koch
- Dynatec
- Pall

Design

- Shell houses multiple tubular membranes
- Inside-out flow





Dynatec DynaLift™

Advantages of MBR

- High quality (low turbidity, low BOD, low TSS) permeate for regulatory or reuse purposes
- Smaller plant footprint (Higher MLSS 8,000 mg/L)
- Not reliant on MLSS settling
- Pretreatment for RO system
- Good Clarity for UV disinfection



Potential Disadvantages of MBR

- Procurement (Manufacturers vary significantly)
- Capital and operating cost
- Higher energy
- Fine screening requirement (2 to 3 mm screen)



Membrane Maintenance

- Air scour separate blower system
- Backpulse reversing flow through membrane (hourly)
- Maintenance cleaning (backpulse with hypochlorite or citric acid) (1-2 times per week)
- Chemical soak recovery cleaning (2-6 times per year)

Chemical Soak



Ancillary Facilities and Equipment

- Fine screening (+/- 2 mm)
- Membrane blowers
- Backpulse units
- Chemical feed systems
 - Citric acid, sodium hypochlorite, carbon addition, pH control
- Bridge crane (membrane maintenance)





Case Studies - Hollister

- MBR selected due to potential salinity reduction needs
- ADWF: 5.0 MGD, PHF: 10.0 MGD
- Grinding and screening issues ahead of a Zenon MBR
 - Drum screen overwhelmed and panel failed



Case Studies – Thunder Valley Casino

- Lincoln, CA
- Avg. Flow: 0.2-0.3 MGD, Plant capacity: 0.7 MGD



- Fine screen only (no coarse screen, no grit)
- Expanded from 3 to 4 trains in 2010
 - Replaced Zenon
 MBR (pre-GE) with
 Koch
 - Ragging, cleaning difficulties and membrane breakage



Case Studies – Malibu

New MBR plant

- Effluent Disposal: Groundwater Injection
- Avg. Annual Flow: 0.095 MGD, Max Day: 0.14 MGD, Peak Hour: 0.33 MGD
- Coarse screen, grit removal and fine screen
- Designed around GE Zenon
 - Considered hollow fiber only (Siemens and Koch)
- Chemicals
 - Sodium hypochlorite, citric acid, sodium hydroxide and acetate



Case Studies – East Valley Water District

Recycled Water Feasibility Study in October 2014 for new Sterling Recharge Facility

- Surface application of recycled water for IPR
- Existing flows 6 MGD, projected flows 10 MGD
- Recommended MBR with UV disinfection compared against SBR

System Attribute	SBR System	MBR System
Operational Stability and Reliability	Effluent upsets can be caused by poor settling	More robust process capable of handling variations in loading without upset
Effluent Water Quality	Secondary	Tertiary
Footprint	Larger	Smaller
Expansion Potential	Concrete tanks inconvenient for future expansion	Modular – Easy
Incorporating RO Adv. Treatment	Tertiary filtration process required before advanced treatment	Can be directly incorporated upstream of RO
Public Concerns	Higher odor complaints	Relatively smaller with enclosed units



Questions

