The Application of MBRs for the Treatment of Industrial Wastewaters

MP 2007 Technical Symposium

Jason Rushing, PE (WDC)

Stacey Fredenberg (ATL)

April 20, 2007

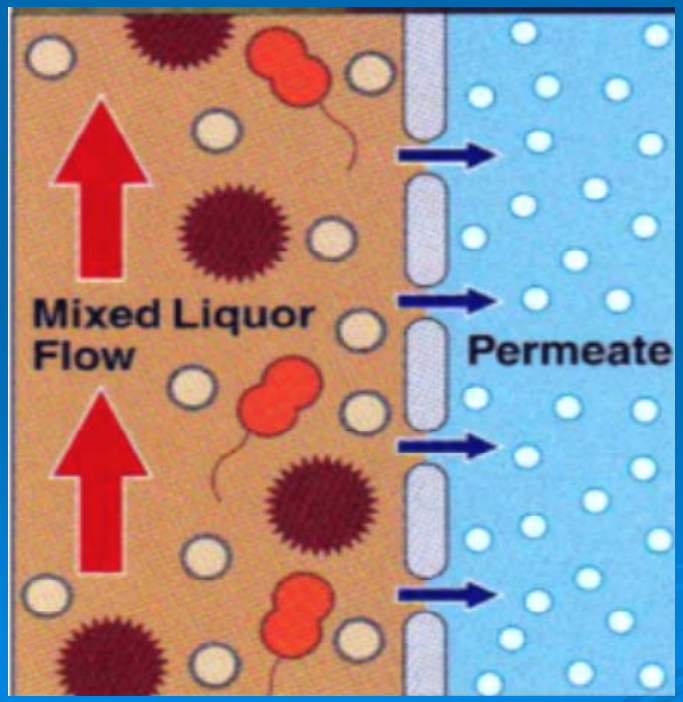
Contents

- Technology Overview
- Design Considerations
- Construction Considerations
- Startup and Operational Considerations
- Maintenance Considerations

MALCOLM PIRNIE

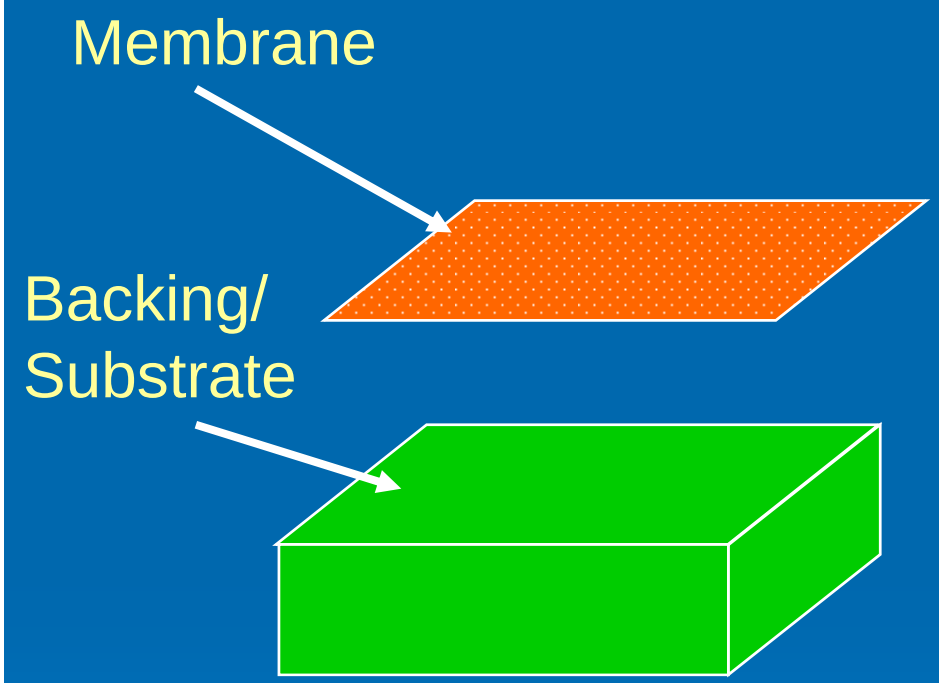
MBR Technology Overview

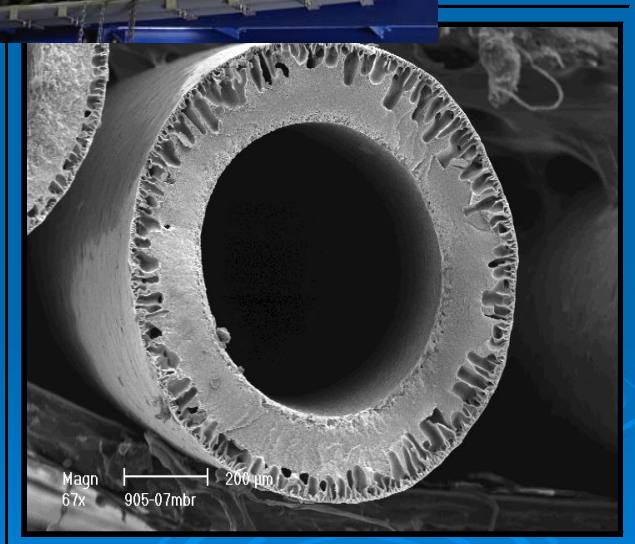
- Physical Barrier
- Pressure, vacuum or gravity



Item	Size (µ)
Membrane Pore	0.02-0.40
Sand Grain	400-2,000
Giardia	6 - 10
Cryptosporidium	3 - 5
Bacteria	0.5 -0.9
Virus	0.01–0.25

Hollow Fiber



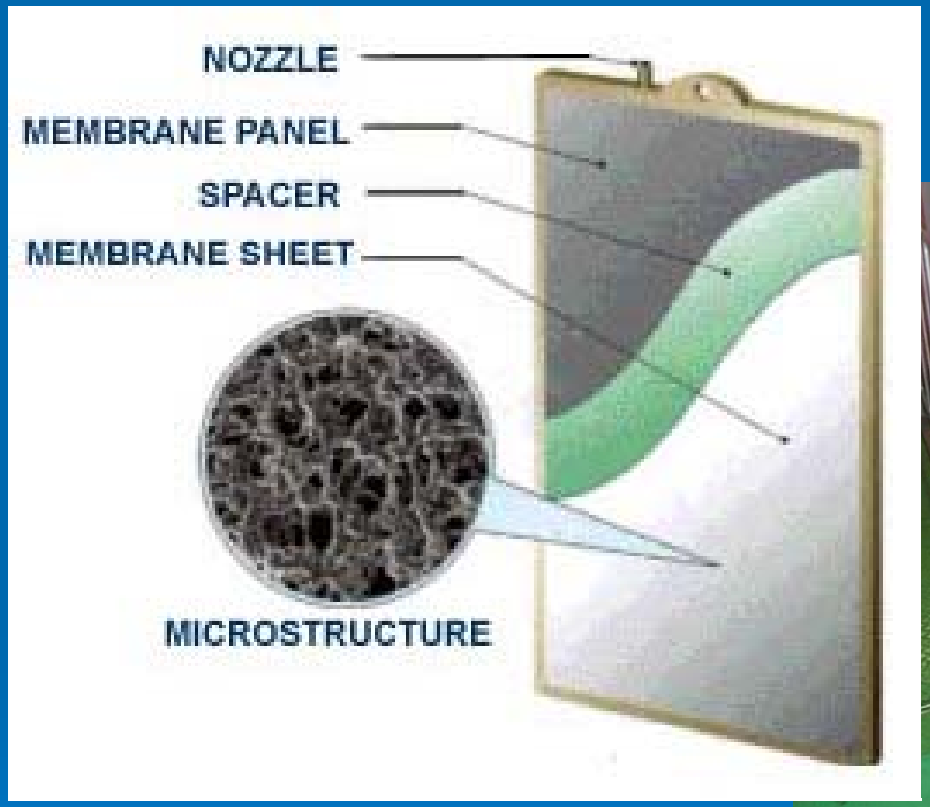


Membrane is applied to a substrate or backing for support

Pore Size 0.01 to 0.4 microns (Example- Zenon)

MALCOLM PIRNIE

Flat Sheets



Pore Size 0.4 microns (Example- Kubota)

Industrial MBRs Worldwide

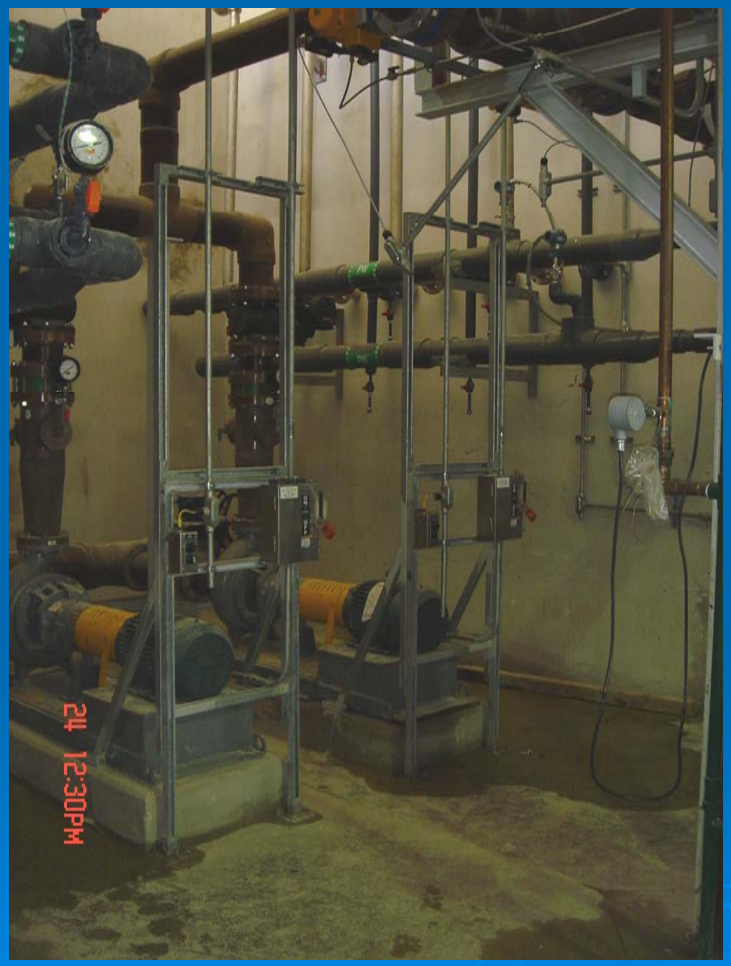
	Total	Industrial	Municipal
Kubota	1538	400	1138
Mitsubishi	374	204	170
Zenon (GE)	331	127	204
Siemens	16	1	15
Total	2259	732	1527

Source: W. Yang, N. Cicek, J Ilg. State-of-the art membrane bioreactors: Worldwide research and commercial applications in North America, Journal of Membrane Science 270 (2206) 201-211

MBR Design Considerations

- Screening requirements
- Recycle flow parameters
- Scaling concerns
- Dewatering concerns
  - Biological Sludge
  - Chemical Sludge

MBR Design Considerations Biological Nutrient Removal



- Location of the RAS
- Dissolved Oxygen Levels

MALCOLM PIRNIE

MBR Design Considerations
Foam Control / Surface Wasting

- No defoaming agents- coats membranes
- Engineered Surface Foam Removal System
- Spray water

Construction Considerations

- Drying out
- Construction debris
- Dust, dirt

Startup Considerations

- Permeability testing conducted in clean water
- Analysis Instrumentation and Supplies
- Operation and Maintenance Manuals
- Operator Training!!!!
- Seeding
- Food Availability
- Acclimatization

Operational Considerations

- Operators must check basins frequently
  - Use sight (foaming, color, aeration patterns, basin levels)
  - Use smell (type, intensity, changes)
  - Use instrumentation readings
- Check each MBR basin for all important parameters
- Report and respond to potential problems ASAP

Some Operational Parameters

- Biological parameters- DO, Temperature, pH, nutrient levels, MLSS
- TMP
- Basin Levels
- Filterability
- Viscosity
- Permeate TSS & SDI
- Aeration pattern and bubble size

Maintenance Considerations

- Cleaning screens
- Mineral Scaling- use citric acid to clean
- Biological Scaling- use caustic to clean
- Care in removing flat sheet membranes
- Do not use high pressure water hoses on flat sheet membranes
- Keep spare membranes on site

Questions