

Reverse Osmosis

Presented by Stephen Kenny



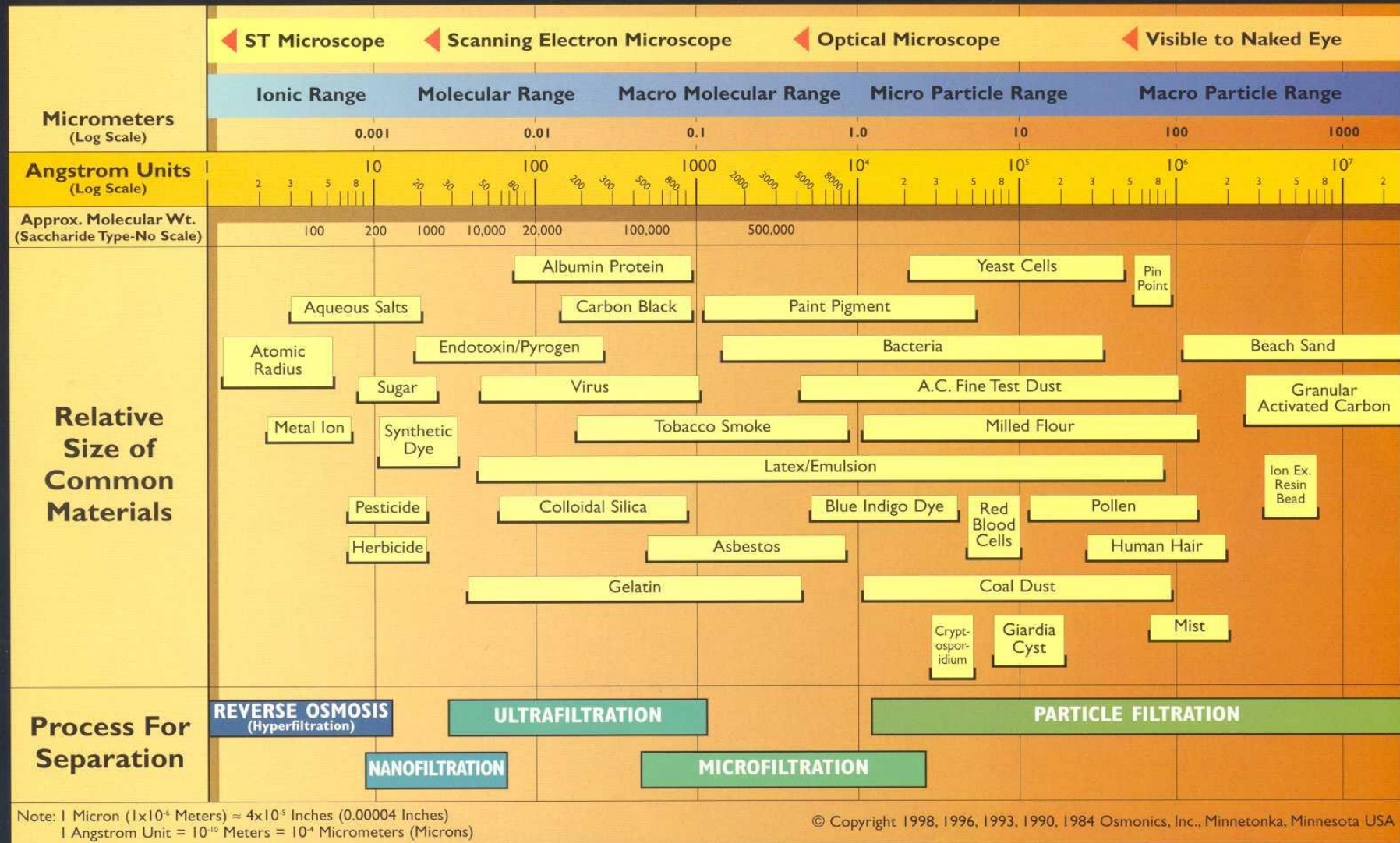
Columbia Water Technology

Industrial Water Treatment



OSMONICS

The Filtration Spectrum



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To Get RO or Not and RO Monitoring & Cleaning

Is RO a viable pretreatment for your operation?

What do you need to know before getting an RO?

How can you get the most from your RO?



Typical 8" RO Systems

Approximately

80 GPM and 65 GPM



Viability

Does Reverse Osmosis make sense for your operation? Can it even be used?

- Raw water quality and variability
 - Silt Density Index - **Procedure**
 - Turbidity
 - Water Analysis – Dissolved Solids
- Cost Benefit Analysis



Cost Benefit Analysis

What are the true costs of RO?

- Equipment Capital Cost
- High Pressure Pump
- Electricity
- Pretreatment
 - Softener Salt
 - Cartridge Filters
- Scale Inhibitor
- Increased Water Use
- Increased Waste Water Volume
- Membrane Element Cleanings
- Membrane Element Replacement



Cost Benefit Analysis

What are the benefits of an RO in your facility?

- Meet Water Quality Requirements
- Improved Boiler Chemical Treatment
- Decreased or Eliminated IX Demin Regen Chemicals
- Decreased Boiler Blow Down
 - Decreased Boiler Chemical Usage
 - Decreased Heat Loss
 - *Reduced Boiler Fuel Consumption*



Cost Benefit Analysis

Water and Energy Mass Balance



RO Cleanings

- When?
- How?
- Which Cleaning Products?



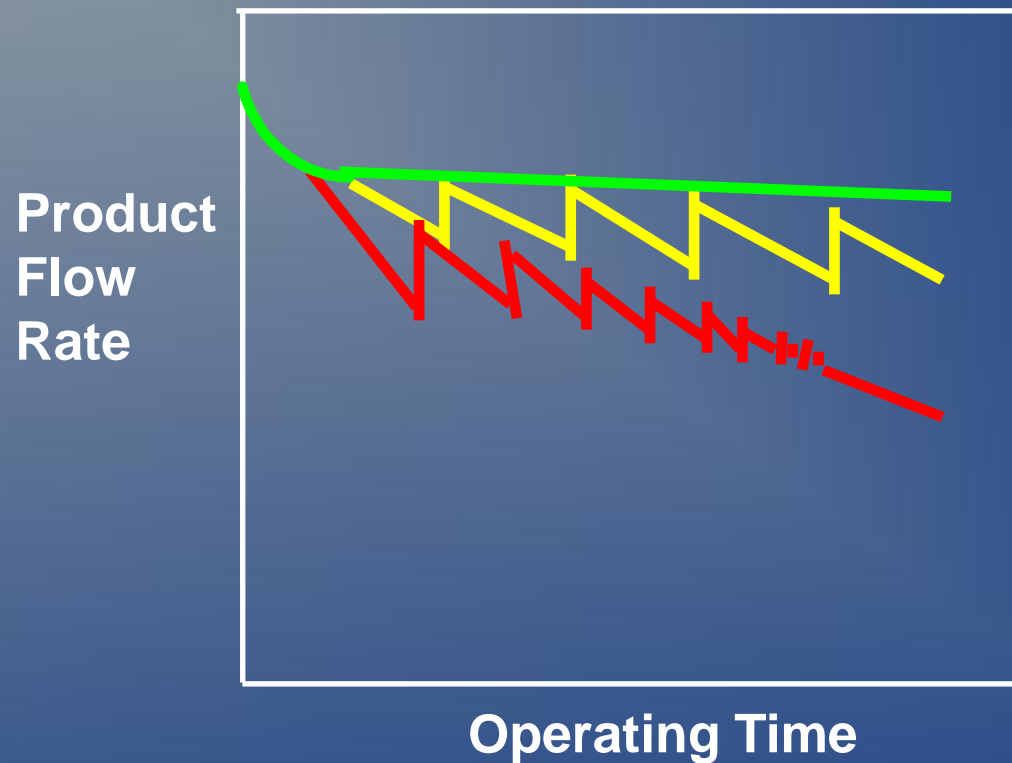
RO Cleanings

- Pressures Climb
- Permeate Flow Decreases

Data Normalization



Membrane Productivity as a Function of Operating Time



- Properly Pretreated Feed**
- Marginal Pretreatment, Periodic Cleaning**
- Inadequate Pretreatment, Frequent Cleaning**



RO Cleanings

Membrane Element Spec Sheets



RO Cleanings

Choosing the Right Cleaning Product



RO Cleanings

What is Fouling the RO?

- Scale
 - Hardness - *Acidic*
 - Iron – *Acidic First*
 - Exotic - *Depends*
- Suspended Solids
 - Inorganics – Silt, fine sandy grit - *Detergents*
 - Iron – Rust particulates – *Acidic First*
 - Organics – *Depends – Alkaline if no other fouling*
- Biological Growth
 - *Alkaline if no other Fouling/Scaling*



Questions



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