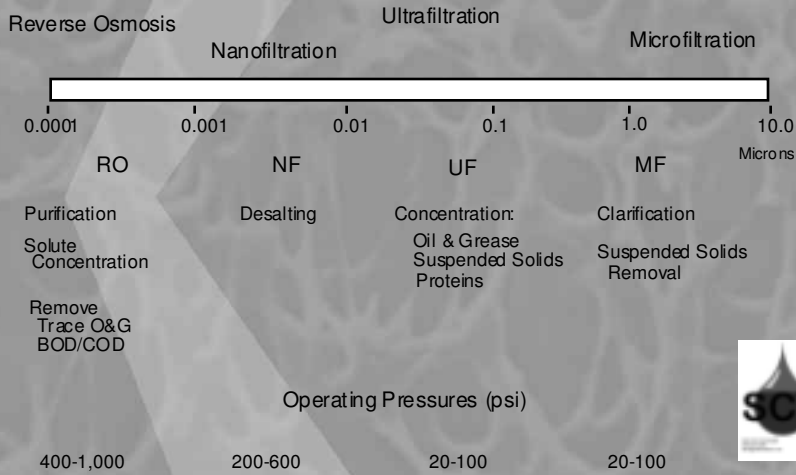


Membrane Filtration

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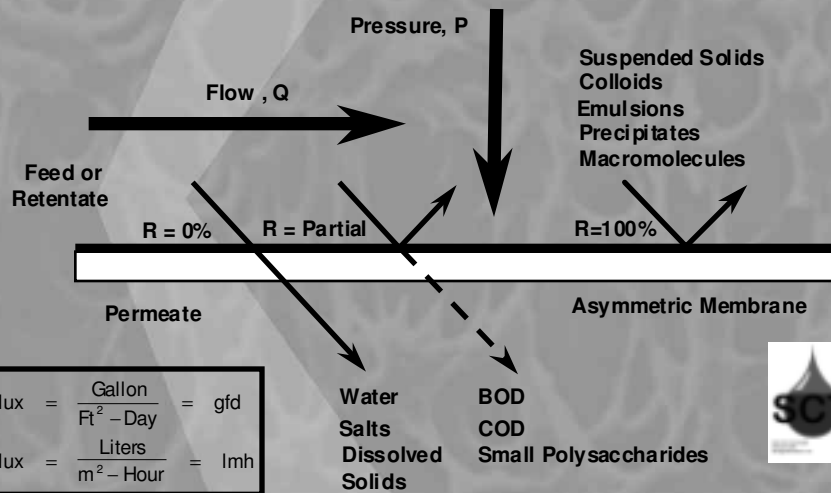
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Basic Membrane Terms

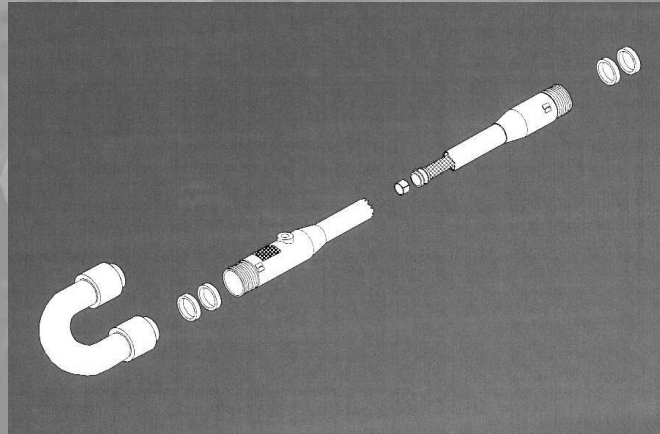
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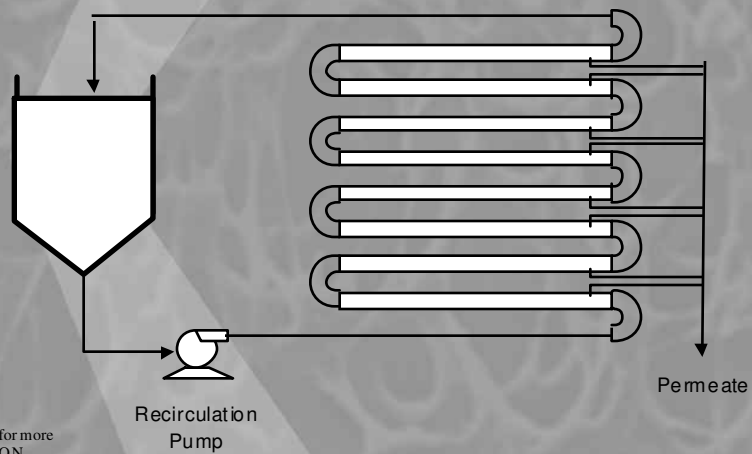
Ultrafiltration One-Inch Tube

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Ultrafiltration System Design Tubular Membrane Arrangement

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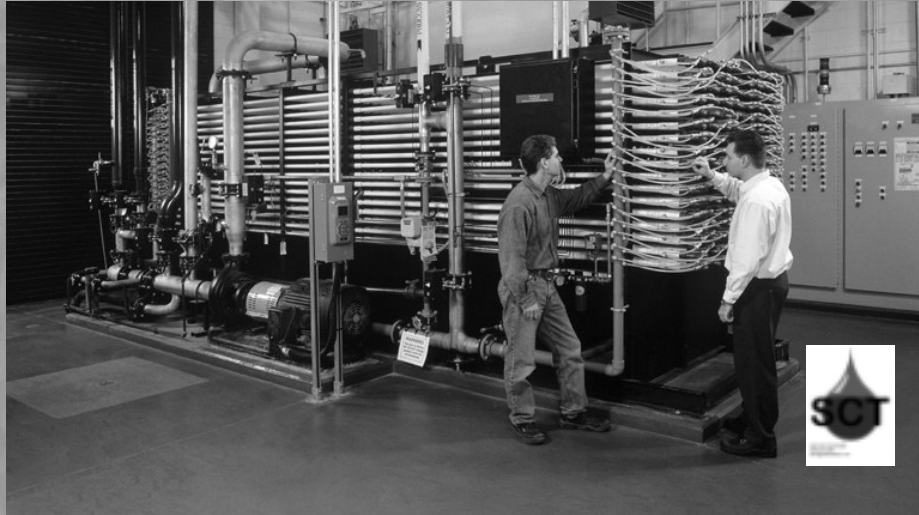


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Konsolidator 544 UF System

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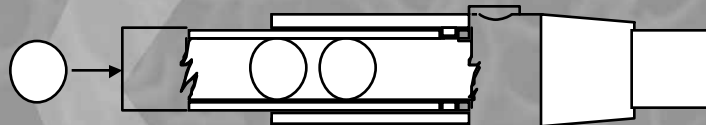
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One-Inch Tubular FEG Product Spongeball Option

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- **Spongeballs inserted during cleaning cycle**
- **Mechanically scours foulants from the membrane**

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Process Description

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- Sulfide precipitation
- Tubular ultrafiltration
- Concentrate suspended solids and heavy metals (Pb)
- Direct UF permeate discharge
- Pb Cake to Smelter



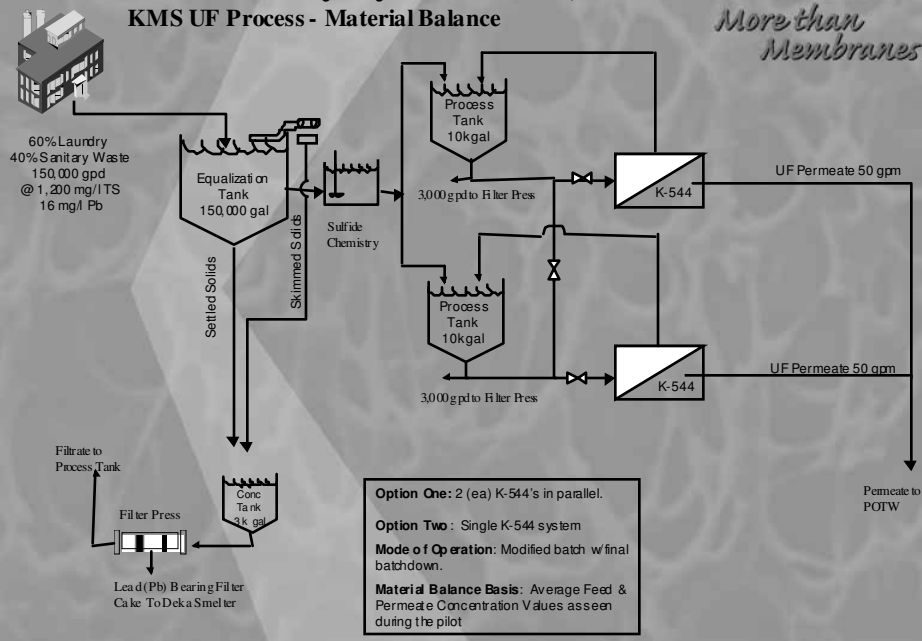
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Deka Battery Lyons Station, PA

KMS UF Process - Material Balance

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Advantages with UF

- Lower Operating Cost
 - Minimal Operator Attention
 - Significantly Reduced Chemicals
 - No lime required
 - Minimal sludge generated
 - Reduced maintenance
 - Pro-rated Membrane Warranty
- Superior Effluent Quality
 - Membrane provides a positive barrier
 - Insoluble Pb and TSS guarantee
 - Pb <0.5 ppm insoluble
 - TSS <50 ppm



Advantages with UF

- Ease of Operation
 - Process Mode Operation
 - “Set it and Forget it”
 - Review performance remotely
 - Data Acquisition available
 - Automatic shutdown with remote alarm alert
 - Semi-Automated
 - Initiate modes of operation at panel
 - Automatic repositioning of valves per operating mode
 - Infrequent CIP

Advantages with UF

- Modular Design
 - Single stage K-544 required for 50 gpm
 - Additional stage can easily be added to achieve 100 gpm
- Consistent System Performance
 - Change in feed concentration has insignificant impact on permeate quality
- Ease of installation
 - No additional building required

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Representative UF References

- Cintas
 - 2 systems
 - 50 gpm laundry wastewater
- United Oil Recovery
 - 5 systems
 - 20 gpm oily wastewater
- Dana Transport
 - 10 systems
 - 15 gpm of misc. tank car washwater
- Ford Motor
 - 4 systems
 - 50 gpm oily wastewater



Summary and Recap

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- With UF Technology:
 - Save money compared to other methods
 - Less labor
 - Lower chemical consumption
 - Simple to operate
 - Greater reliability
 - More consistency
 - Permeate Quality Guarantee
 - Pro-rated Membrane Life Warranty

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