

Cleaning Procedure for Ultrafiltration Membranes used for Oily Water Separations

This bulletin provides general cleaning instructions for 2000 type membrane modules which have been used to treat oily water solutions. The 2000 type membrane is a hydrophilic polyolefin which has no surface charge.

The ultrafiltration system should be cleaned when the permeate flux has decreased to 70% of its design rate of flow, or to an otherwise unacceptable level. Prolonged operation of a fouled membrane will shorten its useful life and make effective cleaning more difficult.

1. Shut down the UF unit to be cleaned. Be sure to follow all safety procedures for system shutdown.
2. Flush the UF membranes with UF permeate which has been stored in the cleaning tank. Flush for at least 10 minutes at normal operating flow to dislodge large foulants from the system.
3. Prepare the cleaning solutions. The cleaning solutions must be prepared with UF permeate or potable water. Prepare the solutions as per the instructions below in the "Instructions for Cleaning Solution Preparation." Note that the instructions are for making 100 gallons of cleaning solution. Adjust the volume of cleaning solution according to the size of the system to be cleaned.
4. Warm the cleaning solution to 90 - 100°F. **DO NOT EXCEED 105°F!** Cleaning with warm water is much more effective than cleaning with cold water.
5. Circulate the cleaning solution through the system for 30 minutes. Circulate at a fairly high flow rate, since high flow has a scouring effect which will assist in loosening foulants from the surface of the membrane. Normal operating flow rates (30 to 50 gpm/module or pressure vessel) should be used during the cleaning operation.
6. After the 30 minute circulation, stop the circulation pump and close all cleaning valves. Let the solution soak in the system for a minimum of 2 hours.
7. After the soak period, re-open the cleaning valves and recirculate the cleaning solution for another 30 minutes.

8. If using sponge balls to assist in cleaning the system (tubular modules only), introduce the sponge balls at the start of the second recirculation (Step 7). Be sure to count the sponge balls before introducing them into the system in order to insure their removal from the system.
9. Discard the cleaning solution and rinse the UF membrane with UF permeate or potable water until no traces of cleaning solution remain.

Instructions for Cleaning Solution Preparation

Cleaning Solutions for Removal of Organics

1. Detergent Solution

| <u>Component</u> | <u>Quantity per 100 Gallons</u> |
|--------------------------------|---------------------------------|
| Sodium Tripolyphosphate | 17 pounds (7.7 kg) |
| Sodium Dodecylbenzenesulfonate | 2 pounds (.91 kg) |
| UF permeate | 100 gallons (378.5 l) |

Note: When mixed at these dilutions, the cleaning solution will be at pH 9.6 to 10.

2. Sodium Hydroxide Solution (pH = 12)

| <u>Component</u> | <u>Quantity per 100 Gallons</u> |
|------------------|---------------------------------|
| Sodium Hydroxide | 1.8 pounds (0.85 kg) |
| UF permeate | 100 gallons (378.5 l) |

Cleaning Solutions for Removal of Metal Oxides

1. Acetic Acid Solution (pH ≈ 2.5)

| <u>Component</u> | <u>Quantity per 100 Gallons</u> |
|------------------|---------------------------------|
| Acetic Acid | 17 pounds (7.7 kg) |
| UF permeate | 100 gallons (378.5 l) |

2. Citric Acid Solution (pH \approx 2.5)

| <u>Component</u> | <u>Quantity per 100 Gallons</u> |
|------------------|---------------------------------|
| Citric Acid | 17 pounds (7.7 kg) |
| UF permeate | 100 gallons (378.5 l) |

3. Hydrochloric Acid Solution (pH \approx 2.0)**Sanitizing Solutions**

1. Free Chlorine 5 - 20 ppm solution
2. Sodium Bisulfite 1% solution
3. Hydrogen Peroxide 1% solution

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