

Cleaning Procedure for Ultrafiltration Membranes used for E-Coat Paint Applications

This bulletin provides general cleaning instructions for 2000 type membrane modules which have been used in electrocoat paint applications. The 2000 type membrane is a hydrophilic polyolefin which has no surface charge.

The membrane elements should be cleaned when the permeate flux decreases to 70% of its design rate, or to an unacceptably low level. Prolonged operation of a fouled membrane will shorten its useful life and make effective cleaning more difficult.

To clean the UF system:

1. Shut down the UF unit:
 - a. Observe and record permeate flux.
 - b. Open bypass valve.
 - c. Close feed inlet and outlet valves.
 - d. Stop paint pump.

2. Purge (Paint flush):
 - a. Using DI water, displace the paint in the UF unit with at least 2 to 3 volumes of UF permeate or clean city water.
 - b. Rinse the UF modules with clean water for 15 minutes.

3. Prepare cleaning solutions:
 - a. Add cleaning chemicals to cleaning tank according to the formulations in the attached table.
 - b. Warm the cleaning solution to 90 to 100°F.
DO NOT ALLOW THE TEMPERATURE TO EXCEED 105°F!
 - c. Use UF permeate or clean city water for preparation of cleaning solution.

4. Cleaning:
 - a. Circulate cleaning solutions for 2 hours.
 - b. Maintain feed pressure during cleaning between 30 - 40 psi.
 - c. Return (outlet) pressure should be between 5 - 10 psi.

5. Soaking:
 - a. Allow the cleaning solution to soak for 12 to 72 hours.
 - b. Recirculate the cleaning solution for 30 minutes every 4 hours during the soak period, if possible.
 - c. Recirculate the cleaning solution for 30 minutes at the end of the soak cycle.

6. Rinsing:
 - a. Stop the cleaning pump and drain the cleaning solution.
 - b. Drain the rinse water from the UF unit.
 - c. Repeat the rinse cycle 2 or more times until the rinse water loses its soapy feel.

7. Restart the plant:
 - a. Start the plant pump.
 - b. Open the plant feed inlet and outlet valves.
 - c. Close the bypass valve. Adjust the valves to achieve an inlet pressure of between 30 to 60 psi, and an outlet pressure of 10 - 20 psi.
 - d. Observe and record the permeate flux.

**Cleaning Formulations for Cationic ED Paint Removal
from the NTU-2020-M7S Ultrafiltration Tubes**

Name	Components	Supplier	Purpose
CR-1	- 10% Ethylene Glycol Monobutyl Ether (EB) - 5% Lactic Acid - 2.5% AWR-5441 - 82.5% DI Water or Permeate	- Ashland Chemical - Monsanto - PPG	General cleaning to remove paint (resin/pigment) fouling on membrane surface
CR-2	- 10% Ethylene Glycol Monobutyl Ether (EB) - 5% Lactic Acid - 5% AWR-5441 - 80% DI Water or Permeate	- Ashland Chemical - Monsanto - PPG	For more resistant fouling
CR-3	- 1% Ethylene Glycol Monobutyl Ether (EB) - 2% Ethylene Glycol Monoethyl Ether Acetate (EE) - 3% Lactic Acid - 0.25% Triton X-100 - 93.75% DI Water or Permeate	- Ashland Chemical - Ashland Chemical - Monsanto - Rohm & Haas	General cleaning to remove paint fouling & some inorganic salt deposition on membrane surface (except ZnPO ₄)
CR-4	- 2% Acetic Acid (pH not less than 2 solution)	- Various suppliers	Removing PbCO ₃ inorganic fouling
CR-5	- 5% Acetic Acid - 5% Ethylene Glycol Monobutyl Ether (EB) - 0.25% Triton X-100 - 89.75% DI Water or Permeate	- Various suppliers - Ashland Chemical - Rohm & Haas	Removing PbCO ₃ inorganic fouling

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