



6-5. Cleaning Chemicals

Choosing right cleaning chemicals is important since harsh and frequent cleaning will shorten the membrane life, and sometimes a wrong choice of cleaning chemicals can worsen the fouling situation. The cleaning will be more effective if it is tailored to the specific fouling problem. Therefore, the type of foulants should be determined prior to cleaning, there are helpful ways to determine the type of foulants as shown below:

- Analyze the plant performance data
- Analyze the feed water to find potential fouling substances
- Check the results of previous cleanings which may indicate specific fouling substances
- Analyze the foulants collected with a membrane filter used for SDI measurement
- Analyze the deposits on the cartridge filter

Table 5. Cleaning chemicals for CSM membrane

Foulant	Cleaning Chemical	Comments
Inorganic salts (CaCO ₃ , CaSO ₄ , BaSO ₄)	0.2% Hydrochloric Acid.	Best
	0.5% Phosphoric Acid.	O.K.
	2.0% Citric Acid.	O.K.
Metal Oxides (Iron)	0.5% Phosphoric Acid.	Good
	1.0% Sodium Hydrosulfite.	Good
Inorganic Colloids (silt)	0.1% Sodium Hydroxide (NaOH), 30 °C	Good
	0.025 Sodium Dodecylsulfate/0.1% NaOH, 30 °C	Good
Biofilms	0.1% Sodium Hydroxide, 30 °C.	Best
	1.0% Sodium Ethylene Diamine Tetra	Best when biofilm contains
	Acetic Acid (Na ₄ EDTA) and 0.1% NaOH, 30 °C	inorganic scaling
Organics	0.025% Sodium Dodecylsulfate/0.1% NaOH, 30 °C.	Good
	0.1% Sodium Triphosphate/1% Na ₄ EDTA	Good
Silica	0.1% Sodium Hydroxide, 30 °C.	O.K.
	1.0% Sodium Ethylene Diamine Tetra-acetic Acid (Na ₄ EDTA) and 0.1% NaOH, 30 °C	O.K.

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- Inspect the inner surface of the feed line tubing and the feed end scroll of the RO element. If it is reddish-brown, fouling by iron is possible. Biological fouling or an organic material deposit is often slimy or gelatinous.

Table 5 lists suitable cleaning chemicals depending on the type of foulants. The acid cleaners are to redissolve inorganic deposits including iron, while the alkaline cleaners are to remove organic fouling including biological matter. Sulfuric acid should not be used for cleaning because of the risk of calcium sulfate scaling.

For the preparation of the cleaning solutions, RO permeate is preferred, but prefiltered raw water may be used. The raw water could have some buffering ability, so more acid or hydroxide may be needed to reach the desired pH level, which is about 2 for acid cleaning and about 12 for alkaline cleaning at 30 °C, respectively. At 35 °C, the pH limit is in the range of 2 to 11, and at 50 °C the operable pH range is 3 to 10.

Table 5 shows the working formula for cleaning solutions, but brand name cleaning chemicals are frequently used in the field rather than self-made formulations. Most of the brand name chemicals are compatible with CSM membranes in short term test. The long term compatibility test including cleaning efficacy test should be carried out. In the mean time, they can be used as long as the membrane performance is carefully monitored to detect any long term effects at an early stage. In any event, make sure that the brand name chemicals do not contain cationic and nonionic surfactants, and the pH of the cleaning solution from the chemicals does not exceed the limits at the specified temperature.