BWT BEST WATER TECHNOLOGY | For You and Planet Blue.

CHEMICAL CLEANING OF REVERSE OSMOSIS UNITS FITTED WITH COMPOSITE MEMBRANES	EXP 47

Even with the appropriate pre-treatment and adequate operating conditions, membranes gradually become fouled in most cases. Chemical cleaning is almost always necessary in order to keep the installation functioning at its rated capacity.

It should be noted that excessively fouled membranes will not be restored to their original state, even after several chemical cleaning sessions.

FREQUENCY

The decision to subject a reverse osmosis module to chemical cleaning may be due to :

- the attainment of a maximum threshold in pressure loss, this loss corresponding to the difference in pressure between the inlet pressure downstream from the pumps and the outlet pressure of the osmotic device. This pressure loss must not exceed 15 % more than the nominal pressure loss determined during the first 25 to 48 hours of operation.

- a permeate flow reading where the decrease attains 10 % of the nominal flow rate (at constant temperature).

It should be noted that the water flow rate will drop if the feedwater temperature decreases. This phenomenon, which is quite normal, does not indicate fouling of the membrane. A pre-treatment, pressure regulation or pump-related incident might cause a drop in the feedwater pressure, the feedwater flow rate or the permeate flow rate, or else an increased salt flow. As soon as a problem is detected, check to see whether it is being caused by one of the latter. Cleaning may not be necessary.

- a systematic cleaning schedule. This is the case when the installation is large and comprises numerous modules. In this way, some of the modules can be cleaned while the others continue to produce.

CLEANING OPTIONS

The choice of cleaning methods depends on the nature of the deposits causing the fouling as well as the nature of the membranes ; in effect, the deposits must be dissolved without the membranes being destroyed.

The nature and concentration of the cleaning solution must be chosen in accordance with the nature of the membranes, but also with the features of the various apparatus components : seals, pump fittings, etc.

NOTE : Cleaning requires the use of chemical substances. Basic safety rules must be followed concerning the use, handling and elimination of these substances.

IMPORTANT

The use of other products than those advocated by BWT Permo is highly unadvised because it can cause a fast and irreversible damage to the RO membranes.

The use of formalin is prohibited.

PRÉPARATION

Cleaning requires the use of chemical substances. Basic safety rules must be adhered to concerning the use, handling and elimination of these substances.

Ensure that the proper safety equipment is worn at all times.

IMPORTANT

Depending on the equipment available and the flows used, if the cleaning solution needs to be diluted, it should better be with osmosed water, and if not, at least with water issued from an adapted pretreatment (softened, filtered, and with no chlorine).

It is really ill-advised to use raw or tap water.

CHOICE OF THE CHEMICAL CLEANING SOLUTION

Mineral salts and metallic oxydes : BWT OSMOCLEAN **A**

Caracteristics	pH around 1.3
Aspect	Pale yellow liquid
Density	1.24
Solubility	Miscible with water in all proportions
Stockage	Between +1°C et +40°C
Lifespan	2 years sealed in its original package
Dosage	1% (Vol/Vol)
Recirculation or contact time	30 to 60 minutes
Dilution	With osmosed water or at least softened, filtered and with no chlorine
Rinsing	With pretreated water
Conditionning	40 kgs jerricans
Code	P0007472A or P0007472BIB (recyclable Bag in Box)

Organic matter : BWT OSMOCLEAN **B**

Caracteristics	pH around 13.3
Aspect	Amber liquid
Density	1.16
Solubility	Miscible with water in all proportions
Stockage	Between +10°C et +40°C
Lifespan	3 years sealed in its original package
Dosage	4 to 5 % (Vol/Vol)
Recirculation or contact time	20 to 40 minutes
Dilution	With osmosed water or at least softened, filtered and with no chlorine
Rinsing	With pretreated water
Conditionning	31 kgs jerricans
Code	P0007473A or P0007473BIB (recyclable Bag in Box)

During the preparation of the cleaning solution, be careful, before injecting it inside the RO units, that the product has completely dissolved and the final solution is homogeneous.

IMPORTANT : In order to preserve the different elements of a membrane, the cleaning solutions temperature must not exceed 30°C.

PREPARATION OF THE CLEANING SOLUTION

IMPORTANT

Before starting the cleaning operation on the installation, be sure that proper measures have been taken concerning its isolation up and downstream and that no accidental manoeuvre could possible pollute the stock of water already treated.

Our advice, for this matter, is to physically disconnect the permeate pipe.

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In order to improve the efficiency of the chemical cleaning, it is possible to use both products. In that case, the OSMOCLEAN B should be the first one injected, then OSMOCLEAN A.

- The cleaning solution must be flushed over the osmosis membranes at a high flow rate and a low pressure (theoritical flow rates : 2.5 m^3/h for 4" units and 9 m^3/h for 8" units).

The cleaning solution recirculation on the membranes is highly recommended.

It can be fed into the apparatus in a number of ways, depending on the chaining of the installation (see diagrams of cases No 1 and 2).

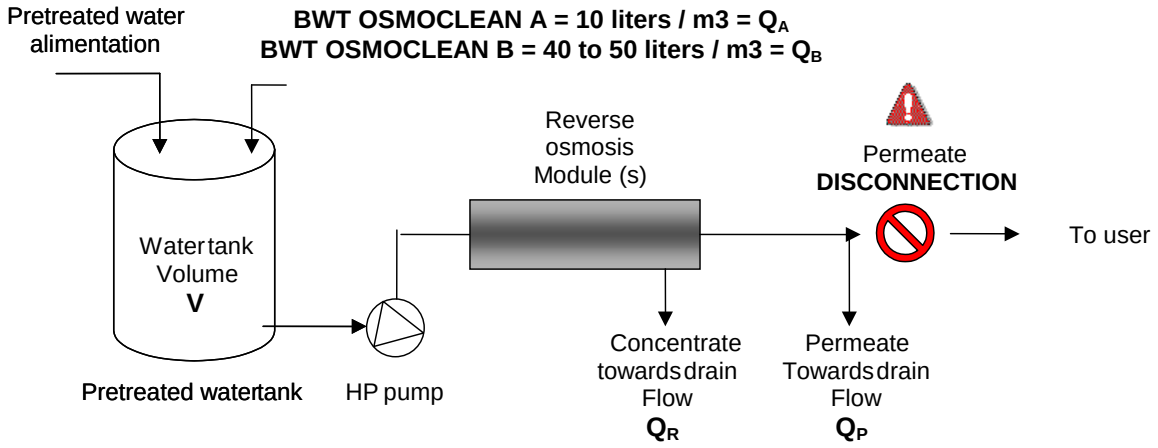
Case No 1 *: Injection with the HP pump of the reverse osmosis unit*

In the pretreated water tank situated upstream of the pump, prepare the cleaning solution using osmosed water or else pretreated water (TH = 0 - Filtrer 5 microns - Cl_2 = 0).

Disconnect the permeate piping and move it to the drain.

Open the discharge and by-pass valves as wide as possible.

Inject the cleaning solution using the apparatus' pump (diagram 1). As soon as the solution appears in the drain, discharge and permeate outlets, stop the pump and leave the solution to take effect for approx. 30 mins (see paragraph on checking and testing methods).



Case No 2-3-4 : *injection with subsidiary pump (example dosing pump)*

Depending the feeding flow of the reverse osmosis and the dosing pump caracteristics, the cleaning solution can be injected without dilution. However it's necessary to adjust the feeding and the injection subsidiary pump flow to obtain the concentration required on the reverse osmosis membranes.

Disconnect the permeate piping and move it to the drain or do not use loop osmosed water (case of loops).

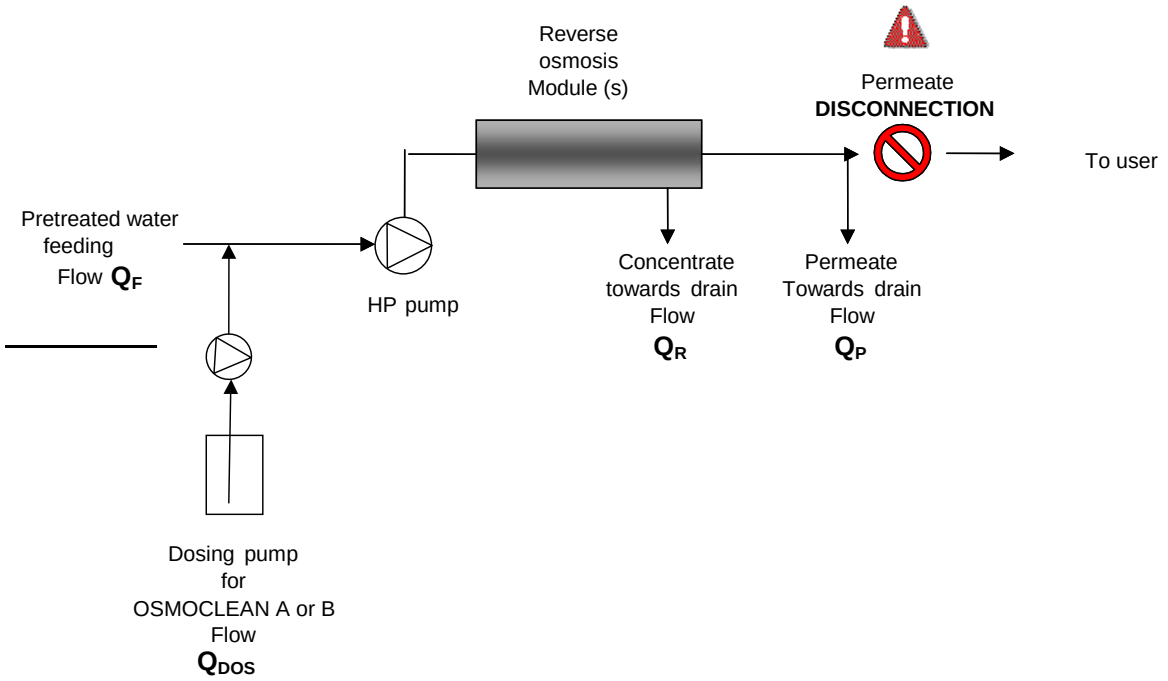
Open the discharge and by-pass valves as wide as possible.

Start the reverse osmosis unit.

Inject the cleaning solution.

As soon as the cleaning solution appears in the drain, discharge and permeate outlets, stop the pump and leave the solution to take effect for approx. 30 mins (see paragraph on checking and testing methods).

Simple reverse osmosis, OFF LINE

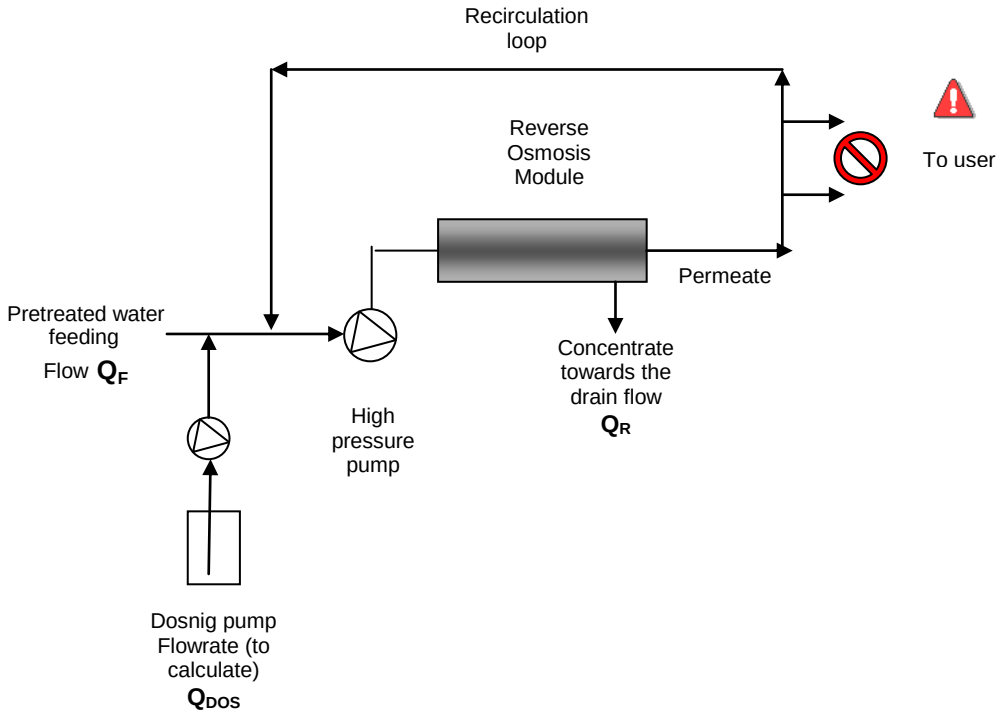


Dosing pump flow adjustment :

Feeding flow calculation Q_F (in m^3/h) = Q_R (in m^3/h) + Q_P (in m^3/h)

Dosing pump flow Q_{DOS} (in L/h) = Q_F (in m^3/h) x Q_A (in L/h) for OSMOCLEAN A
x Q_B (in L/h) for OSMOCLEAN B

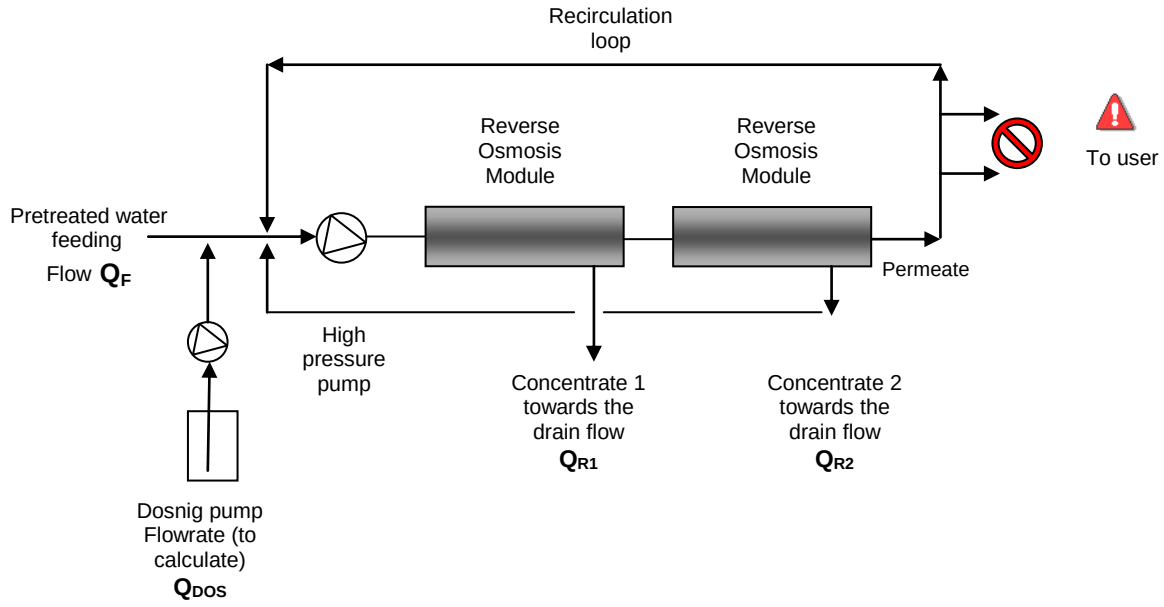
Simple osmosis with a **recirculation loop** upstream the RO unit.



Flowrate of the dosing pump :

Q_{DOS} (L/h) = Q_R (m^3/h) x Q_A (L/h) for OSMOCLEAN A
Q_B (L/h) for OSMOCLEAN B

Bi-osmosis with **recirculation loop** upstream the RO unit.



Flowrate of the dosing pump :

Q_{DOS} (L/h) = Q_R (m^3/h) x Q_A (L/h) for OSMOCLEAN A
Q_B (L/h) for OSMOCLEAN B

- Once the reageant has been injected, stop the osmosis unit in order to soak the membranes with the product (close the valve to the drain if necessary). Contact time in this position is half of what is recommended in the reageants specification tables.

- Once this time has elapsed, open the valve to the drain, start the osmosis unit (low pressure, high flow rate) and inject what is left of chemical cleaning solution. Check the pH on the concentrate.

- Stop the osmosis unit again and repeat the soaking operation (the other half of contact time).

- At the end of this operation, re-open the valve to the drain, start again the osmosis unit in order to rinse it with pretreated water (still low pressure and high flow rate) until the chemical reageant has been completely eliminated (pH measure on permeate and concentrate).

- Set back the different parameters (pressure, flow rate) of design functioning.

Drain the permeate water for at least 30 minutes.

- After checking there is no single trace of chemical product left in the permeate, you can put back the installation to normal.

- Note down the new values of pressure, flow rates and pressure loss.

NOTE 1

In the event of serious pollution, flush the chemical reageant through again and leave for the same contact time. Once this contact time has elapsed, rinse out the apparatus with pre-treated water. Rinse until all traces of chemical reageant have been eliminated.

NOTE 2

It is usually recommended, after proceeding to a chemical cleaning (OSMOCLEAN A and/or B), to do a disinfection.

Methods for testing disinfectants

A number of ready-to-use products are commercially available to test disinfectants quickly (Strips, tintometers or comparators, etc.)