Design guide

Energy Recovery Device
iSave
Membrane cleaning of RO-system

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Below procedures are general guidelines for the membrane cleaning of SWRO-systems with the Danfoss iSave. Procedure details may differ depending on the system design. **The numbers marked in () refer to the diagram's below.**

The purpose of membrane cleaning is to reduce scaling and fouling in the membranes. For optimal performance specific chemicals are required, depending on the cause of the contamination. After chemical treatment the system must be flushed with fresh water. The flushing water, coming out of the membranes, may consist of a large amount of suspended inorganic particles. It is important to assure that these particles are not fed into the iSave(s) or pump(s).

NB! It is recommended to disconnect the piping from the "HP in" of the iSave and flush the contaminated water from the membranes directly to drain. By disconnecting the pipes there will be no accumulation of contaminations in the HP-piping and HP-valves. See P&ID no 2.
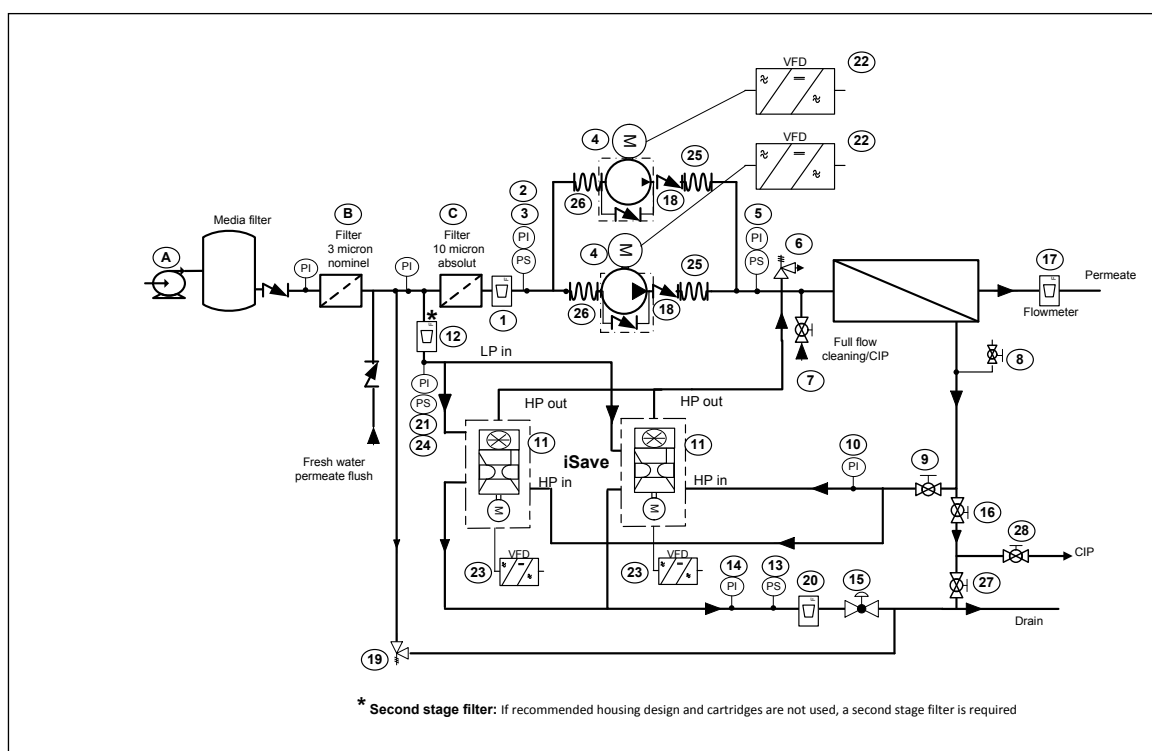
Membrane cleaning

The procedures below are based on Dow's Cleaning and Sanitization: Cleaning steps described in Dow's Form No. 609-02090-1005. Other procedure may be used depending on the membranes used.

Below procedure is according P&ID no 1.

1. Stop the high-pressure pump(s) (4), and stop the iSave(s) (11).

2. Stop the seawater supply pump (A).

3. Close valve (9 and 27) and open valve (16 and 28), and feed cleaning solution through valve (7).

4. Pump mixed cleaning solutions to the vessel at conditions of low flow rate and low pressure to displace the process water. Use only enough pressure to compensate for the pressure drop from feed to concentrate. The pressure should be low enough that essentially no or little permeate is produced. A low pressure minimizes re-deposition of dirt on the membrane. Dump the brine/concentrate to prevent dilution of the cleaning solution.

5. Recycle: After the process water is displaced, cleaning solution will be present in the concentrate/ brine stream. Recycle the cleaning solution from the piping to the cleaning solution tank.

6. Turn of the pump and allow the elements to soak.

7. Feed the cleaning solution at high flow into the "full flow cleaning" adapter (7). The high flow rate flushes out the foulants removed from the membrane surface by the cleaning.

8. Flush RO permeate or deionised water into the "full flow cleaning" adapter (7). Flush out the cleaning solution. It is essential that the water used for the final pre-flush is pre-filtered to a level described in the datasheet.

9. Open valve (9) and continue flushing. The iSave(s) may start to rotate backward – this is OK.

10. When flushing is finalised – assure that no foulants remain in the piping or valve (9).

11. Close the high pressure "full flow cleaning" valve (7) and close valve (16 and 28).

12. Open valve (27)

P&ID no. 1

* Second stage filter: If recommended housing design and cartridges are not used, a second stage filter is required

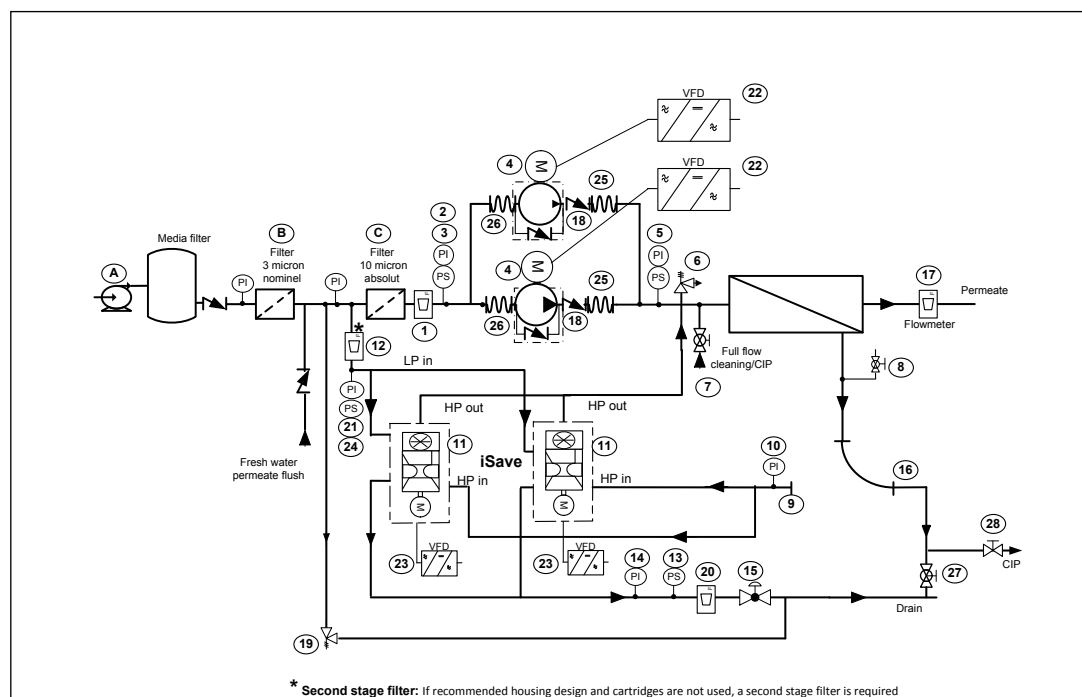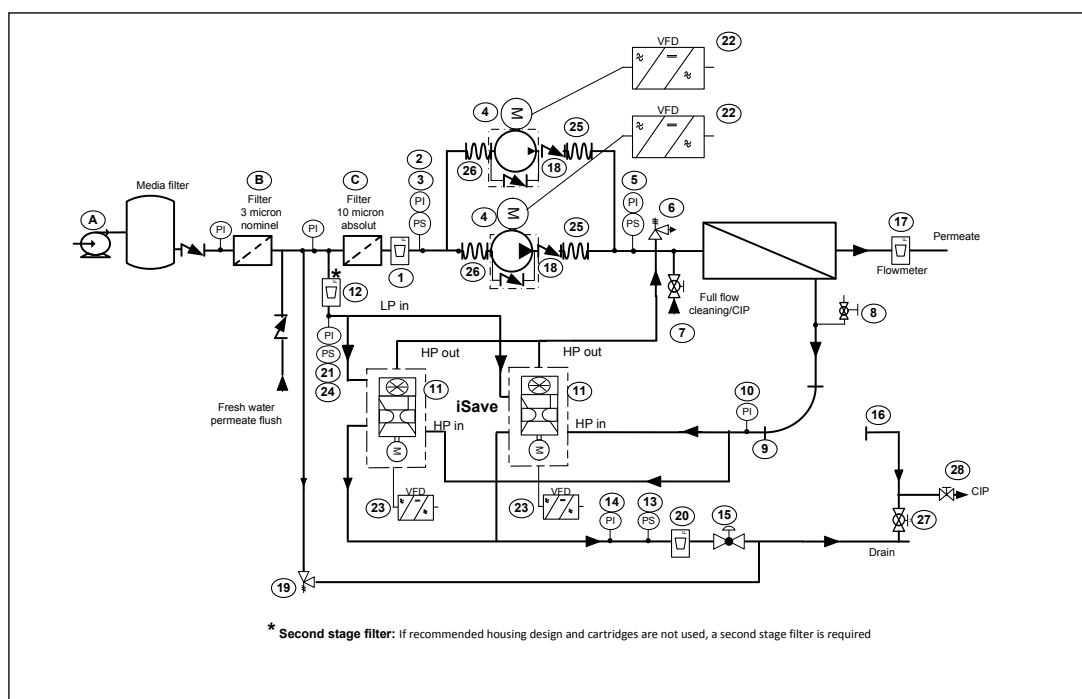Below procedure is according P&ID no 2.

1. Stop the high-pressure pump(s) (4), and stop the iSave (11).

2. Stop the seawater supply pump (A).

3. Disconnect pipe in joint (9) and connect the pipe to low pressure "Full flow cleaning" joint (16).

4. Plug pipe in joint (9).

5. Close valve (27) and open valve (28)

6. Pump mixed cleaning solutions through valve (7) to the vessel at conditions of low flow rate and low pressure to displace the process water. Use only enough pressure to compensate for the pressure drop from feed to concentrate.

The pressure should be low enough that essentially no or little permeate is produced. A low pressure minimizes re-deposition of dirt on the membrane. Dump the brine/concentrate to prevent dilution of the cleaning solution.

7. Recycle: After the process water is displaced, cleaning solution will be present in the concentrate stream. Recycle the cleaning solution from the piping to the cleaning solution tank.

8. Turn of the pump and allow the elements to soak.

9. Feed the cleaning solution at high flow into the "full flow cleaning" adapter (7) on the feed side of the membrane. The high flow rate flushes out the foulants removed from the membrane surface by the cleaning.

10. Flush RO permeate or deionised water into the "full flow cleaning" adapter (7) on the feed side of the membrane. Flush out the cleaning solution.
It is essential that the water used for the final pre-flush is pre-filtered to a level described in the datasheet.

11. When flushing is finalised – Close the high pressure "full flow cleaning" valve (7) and close valve (28).

12. Connect the high pressure pipe to joint (9) again.

P&ID no. 2

* **Second stage filter:** If recommended housing design and cartridges are not used, a second stage filter is required

* **Second stage filter:** If recommended housing design and cartridges are not used, a second stage filter is required