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Technical Information

Criteria for Replacement of RO Membrane Elements

This bulletin is designed to help you take replacement decision considering few key parameters. Life of a membrane element is dependent on various factors such as - basic design, pre treatment and operating practices.

Most of the time the membrane element replacement decision is taken based on deterioration in product water quality. Product water quality depends on various parameters like changing flux rate, recovery of system, feed water quality & temperature, scaling & fouling of membranes and the age of the membrane. If any one of these parameters change the product water quality will either deteriorate or improve.

Thus, the key parameters to be considered are:

- Operational practices
- Feed water quality & temperature
- Feed pressure limitation
- Scaling and fouling
- Physical condition of membrane

Operational Practice

The changes in system flux rate and recovery can deteriorate the permeate water quality. In that case operating parameters need to be restored to the original design before considering replacement of membranes.

Feed Water Quality & Temperature

The feed water quality and temperature can also cause deterioration of permeate water quality and quantity. This should be taken into consideration before considering replacement of membrane.

Feed Pressure Limitation

When RO/NF system operates continuously the membrane tends to scale or foul depending on the nature of the feed water. Due to which the feed pressure of the RO/NFs system increases. If the system is operated at increased pressure, over a period of time the high pressure pump will require elevated pressure to maintain the designed permeate flow. In that case the best solution is to clean the membrane with suitable cleaners which will bring down the feed pressure to a normal level.
But, over a period of time the effectiveness of membrane cleaning reduces with the age of the membrane and replacement of membrane becomes necessary.

Scaling and Fouling

While RO/NF system operates continuously, membrane element foul or scale depending on the impurities present in the feed water. This leads to deterioration of product water quality. Normally, the membranes are cleaned post 10% deterioration in product water quantity and quality which restores the system performance. However, if the system continues to underperform membrane replacement should be considered.

Membrane replacement is always capital intensive hence, sometime user may replace all the membranes or manage with partial replacement. It also depend on situation and product water quality requirement. Many of the large installation don't replace all the membranes in one go but replace small quantity every year.

Physical Condition of Membrane

The physical parameters responsible for deterioration of product water quality is leakage from inter connector & adaptor 'O' rings or damages to the brine seal. Profiling and probing of RO/NF module will help to locate damaged inter connector & adaptor 'O' rings or faulty membrane element. The quality of product water should restore immediately after replacing the damaged 'O' ring or brine seal. If replacement of 'O' ring or brine seal does not restore system performance than glue line damage could be the next possible reason of poor performance.

Profiling and probing of RO/NF module needs to be carried out again to locate the damaged membrane. Once a particular membrane is identified as a source of poor product water quality the same needs to be checked for glue line damage or mechanical integrity. If the glue line or mechanical integrity is damaged, then replacement of membrane is the only solution. But it is also important to identify the root cause of such damage or else, the replacement will not serve the purpose and new membrane may also get damaged.