

BFP® - Technology - Biofouling Prevention

Optimized RO – Pre-Treatment

Challenge

RO desalination technology experienced many successful improvements in the fields of general performance, energy consumption, operation, etc. during the last two decades. In spite of all these optimizations, organic and inorganic fouling, mainly biofouling, still causes big problems for most RO-plants and their operators.

E+B Umwelttechnik GmbH presents an optimized patented RO-pre-treatment process, which is able to overcome these problems.

RO Operation Problems

Scaling is the blocking of a membrane through inorganic precipitates which are created as consequence of the concentration effects inside the RO membranes. This scaling can be handled by a good plant design, dosing of anti-scalants and chemical cleaning.

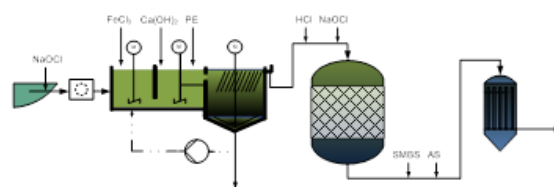


Fouling however, which is the blocking of membranes through organic and biological matter, can not be prevented sufficiently and causes problems in many RO plants. Fouling, especially biofouling, produces a slime on the surface of the membrane, which covers the whole membrane and which incorporates all the other constituents of the water, such as precipitates, bacteria, biomass, colloids, etc. Very often this slime produces irreversible blocking of the membranes.

Biofouling is one of the major reasons for a rapid increase of operation pressure of the RO-stage connected with frequent flushing and cleaning requirements combined with reduced plant availability.

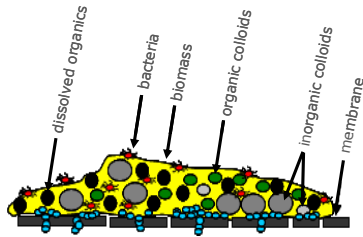
Conventional Pre-Treatment

Today's prevention against biofouling is done by means of chlorination in order to eliminate the bacteria by oxidizing their cell structures and so killing them. Due to the fact, that most of the membranes usually are damaged by oxidants as well, excess chlorine has to be removed upstream the RO through dosage of a reducing agent such as SMBS (sodium-meta-bisulphite). Experience however shows that this measure is not able to prevent biofouling despite this excessive usage and consumption of chemicals.



Conventional Pre-treatment upstream RO (surface water)

It has been proven that chlorination is not able to securely eliminate all bacteria quantitatively but that just some bacteria are killed, some are inactivated/passivated and some can adapt to the oxidizing environment and survive. After the elimination of excess chlorine, the bacteria can re-start their activities.



Due to the fact, that after de-chlorination bacteria can enjoy a perfect living milieu they will re-growth rapidly. This growth is supported by increased nutrient content in the water from produced biomass out of the deadened bacteria (side effect of chlorination). On top of that serves the membrane as perfect settling area and the concentration on the brine side enhances the slime production as well. Finally, there are frequently even more bacteria downstream the SMBS-dosing than in the raw water.

BFP® - Biofouling Management

The principle of BFP® is not to try to kill and destroy the bacteria but to eliminate their food (nutrients) and to so avoid their reproduction followed by dosing of a bio-inhibitor. The elimination of nutrients (BOM – biologically degradable matter) is realized by a biological filtration process using a special filter material and optimized operation and backwash conditions. The downstream dosing of a bio-inhibitor is an additional measure for bio growth-control and inhibition.



The BFP®- process does not require any other chemicals such as chlorine and SMBS.

By creating the best living conditions for the bacteria inside the filtration stage than in the RO stage the bacteria settle in the filter and eliminate the nutrients trough assimilation. Even if some bacteria may pass the filter stage, they won't find nutrients there and so are unable to re-grow downstream the filter. They pass through the RO-stage and are discharged with the brine.

BFP® - Reference Plants

- Leuna, Germany*) (brackish surface water)
- Helgoland, Germany*) (seawater, open intake)
- Rades, Tunisia*) (seawater, open intake)
- Biowanze, Belgium*) (brackish surface water)

*) Implemented by BHU Umwelttechnik GmbH

Advantages

- Reduction of operation problems
- Reduction of operation cost
- Extension of membrane lifetime
- Minimization of CF replacement
- Reduction of CIP- cleaning rate
- Raise of plant availability

