

## Research on Fouling Mechanism and Development of Anti-fouling Processes in Membrane Salt-production System

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### Summary

In membrane salt-production system, membrane fouling always degrades its performance, and biofouling due to growth of microorganisms on the surface of ion exchange membrane as well as the deposition onto the membrane surface of some inorganic compounds such as calcium sulfate and magnesium sulfate is a problem of vital importance. Therefore, the quantity and the quality of adherent dirt on the membrane and of suspended solids (SS) in the medium were investigated.

SS levels in sand filtered seawater were always 1/4-1/5 those in raw seawater. In particular, by sand filtration the number of planktons including nannoplanktons declined to less than 4% that of the raw seawater. The number of bacteria also decreased significantly during the sand filtration, but bacterial counts in filtered water fluctuated extremely (less than 1% to 30% those in raw seawater). Bacterial composition (*Acinetobacter* sp., *Pseudomonas* sp., *Vibrio* sp., *Moraxella* sp., *Pasteurella* sp. etc.) was not so affected by sand filtration.

The component of SS, on the other hand, changed considerably by sand filtration. This is probably because the carcass, the fecal pellets and some kinds of metabolites (mainly polysaccharides) of marine microorganisms were reloaded in sand filtration process.

The composition of the adherent dirt on ion exchange membrane was classified as organic matter (35-65%), ferric matter (5-15%), the ingredient of earth, sand and seawater, and others (Al, Si, Cl, P, S, Ca, K, Mn, Cu, Br). Large amount of bacteria survived on the membrane surface ( $10^5 \sim 10^9$  CFU/cm<sup>2</sup>). Similar kinds of bacteria are found on the membrane, with small amount of other bacteria such as *Alteromonas* sp. and *Bacillus* sp. existing. The rate of membrane fouling depended on the quantity of dirt substances, which included living microorganisms, their carcass, feces and metabolites in filtered seawater, with various kinds of inorganic matters crystallizing out.