

Biological Removal of Organic and Bacterial Contaminants Formed on Ion-Exchange Membranes in a Salt-Making Plant

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Summary

Biological fouling of ion exchange membranes affects seriously the performance. In the present study, enzymatic treatment of contaminating organic macromolecules and a complex microbial community formed on ion exchange membranes in a salt-making plant was conducted, as well as investigation of the properties of raw and sand-filtered seawater.

In sand-filtered seawater, suspended solids, organic nitrogenous compounds and total bacteria levels decreased by under 10%, 20% and 10% those in raw seawater, respectively. The number of planktons in sand-filtered seawater also dropped below 2% in the raw. Removal rate of polysaccharide by sand filtration, however, was low. It was also found that the carcass and the fecal pellets of marine microorganisms, alive bacteria and some kinds of metabolites such as polysaccharides, peptides and lipid were loaded in sand filtration process.

For enzymatic removal of organic and bacterial contaminants formed on ion-exchange membranes in a salt-making plant, trypsin, papain, α -amylase, neuraminidase, cellulase, pancrelipase and lysozyme were used at the same protein concentration of 0.1 mg/ml. Under optimum conditions (40°C, 0.8% NaCl, pH6.5 or 8.0), 48 hours enzymatic treatment decreased significantly contaminating organic macromolecules and bacteria as follows: protein; decrease the deficit to 15-25 % by trypsin, lipid; to 30-60% by pancrelipase, polysaccharide; to 45-55% by pancrelipase and lysozyme, live bacteria; to 30-35% by pancrelipase and lysozyme. Enzymatic treatment, that is, can be used as a pretreatment step to remove organic matters and bacteria community formed the ion exchange membranes in salt-making plant.