Seawater Desalination by Reverse Osmosis Utilizing the Static Pressure due to the Depth of the Sea

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Summary

A desalination device to be used to obtain fresh water from seawater, utilizing the high static pressure of deep sea without the use of electrical power, has been developed. A tube type membrane has been used as the reverse osmosis membrane in the device. The concentrated seawater flows out of the tube by natural convection caused by concentration difference. Increase of the flow rate in the membrane tube is effective in increasing the quantity of fresh water obtainable from seawater. For this purpose, a cylindrical rod was put into the central axis of the membrane tube.

A numerical analysis was conducted to determine the flow development and the mass transfer characteristics in laminar flow in the narrow annular passage between the membrane tube and the rod. A forward-marching, implicit method with iteration was used to solve the nonlinear partial-differential equations. The results show that the quantity of fresh water obtainable from seawater increases nearly in proportion to the length of the device. It also increases with the decrease of the width of the annular passage.

Experimental studies on the desalination of seawater was performed using this devices in the East China Sea. It has been proved that fresh water can be obtained from seawater utilizing the static pressure due to the depth of sea.