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Thermal type seawater desalination with barometric vacuum and solar energy

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Abstract

As well known, it cannot be denied that seawater desalination is the only commercial solution capable of breaking through the global water shortage. However, since seawater desalination is the process consuming a large amount of energy, saving energy to produce freshwater is extremely important in various seawater desalination processes. Energy consumption of desalination process is evaluated by the index called specific energy consumption (SEC), which means the energy for producing 1 kg of freshwater. For this reason, the renewable energies have been applied to the seawater desalination for energy saving. Usually, in such a case, the solar energies are adopted to heat seawater, and to transport seawater and freshwater. In this study, for the further reduction of the SEC, the passive vacuum pipe based on the hydrostatic head was applied. This study was mainly focused on the freshwater production rates with the height of a passive vacuum pipe. From the theoretical calculations, the freshwater production rate was over 7 % of the supplied seawater when the height of a vacuum pipe is 9.8 m and the seawater temperature is heated to 80 °C. This evaporating percentage is very high compared to other conventional thermal type desalination process.

Keywords: Desalination, Non-condensable gas release, Passive vacuum, Solar energy, Specific energy consumption, Vacuum evaporation

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