

A new multi-effect desalination system with heat pipes by falling film evaporation in the vacuum

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ABSTRACT

An innovative multi-effect heat pipes desalination system with falling film evaporation is presented, in which the evaporation and the condensation is in the negative pressure. The system makes use of the heat pipe to insulate heat source and cold source, has high heat transfer efficiency and effectively avoids producing salt on the surface of pipe because the system operates in the negative pressure and the seawater saturated temperature of evaporation or condensation is at 40–70°C. The multiple effect desalination system can use low-quality energy sources such as discharged smoke heat, cooling water, solar energy, and etc. The system can utilize the latent heat properly in which on one side the heat pipe is heated by condensing vapor generated in the previous stage, whereas on the other side, seawater is distributed by a falling film to evaporate. In conditions of similar water yield, compared with a nine-stage desalination system, MED with heat pipes has small heat transfer area which is reduced by 25%. It indicates that heat pipe multi-effect desalination technology has a good potential for practical applications.

Keywords: Desalination; Heat pipe; Falling film; Evaporation

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