

Experimental Analysis on the Thermal Performance of Vacuum Membrane Distillation Module Using Polyvinylidene Fluoride Hollow Fiber Membrane

Authors : Hong-Jin Joo, Hee-Yoel Kwak

Abstract : Vacuum Membrane Distillation (VMD) uses pressure lower than the atmospheric pressure. The feed seawater is capable of producing more vapor at the same temperature than Direct Contact Membrane Distillation (DCMD), Air Gap Membrane Distillation (AGMD) or Sweep Gas Membrane Distillation (SGMD). It is advantageous because it is operable at a lower temperature than other membrane distillations. However, no commercial product is available that uses the VMD method, as it is still in the study stage. In this study, therefore, thermal performance test according to the feed water conditions was performed prior to both construction of the demonstration plant, which uses VMD module of the capacity of 400m³/d in South Korea, and commercialization of VMD module with hollow fiber membrane. Such study was performed by designing and constructing the VMD module of the capacity of 2 m³/day which utilizes the polyvinylidene fluoride (PVDF) hollow fiber membrane. The results obtained from the VMD module manufactured by ECONITY Co., Ltd in South Korea, showed that the maximum performance ratio (PR) value of 0.904, feed water temperature of 75 °C, and the flow rate of 8 m³/h. As the temperature of and flow rate of the feed water increased, the PR value of the VMD module also increased.

Keywords : membrane distillation, vacuum membrane distillation, hollow fiber membrane, desalination

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