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Energy efficiency analysis of multi-effect membrane distillation (MEMD) water treatment

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Abstract : Traditional membrane distillation (MD) systems suffer from poor energy efficiency. Hence there is a need for improvement in the MD module in order to increase the energy efficiency and permeate flux. This paper presents a new modified energy efficient multi-effect membrane distillation (MEMD) module based on the air gap membrane distillation (AGMD) configuration for water treatment purpose. This 4-stage MEMD module with an energy recovery is implemented in this study. This MEMD module shows the high gain output ratio (GOR), low specific energy consumption, high thermal efficiency and product rate as compared to the traditional AGMD system. The maximum water vapor permeate flux of 42.75 L/m^2h, GOR of 1.19, specific energy consumption of 0.53 kWh/kg and thermal efficiency of 356.14% were obtained. Hence this module has great potential in increasing GOR and decreasing specific energy consumption, which is one of the important criteria for industrialization of the MD technology.
Keywords: Membrane distillation (MD); multi-effect membrane distillation (MEMD); energy efficiency; gain output ratio (GOR).

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