

Effect of Evaporator Temperature on the Performance of Water Desalination/Refrigeration Adsorption System Using AQSOA-ZO2

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Abstract : Many water desalination technologies have been developed but in general they are energy intensive and have high cost and adverse environmental impact. Recently, adsorption technology for water desalination has been investigated showing the potential of using low temperature waste heat (50-85°C) thus reducing energy consumption and CO₂ emissions. This work mathematically compares the performance of an adsorption cycle that produces two useful effects namely, fresh water and cooling using two different adsorbents, silica-gel and an advanced zeolite material AQSOA-ZO₂, produced by Mitsubishi plastics. It was found that at low chilled water temperatures, typically below 20°C, the AQSOA-ZO₂ is more efficient than silica-gel as the cycle can produce 5.8 m³ of fresh water per day and 50.1 Rton of cooling per tonne of AQSOA-ZO₂. Above 20°C silica-gel is still better as the cycle production reaches 8.4 m³ per day and 62.4 Rton per tonne of silica-gel. These results show the potential of using the AQSOA-ZO₂ at low chilled water temperature for water desalination and cooling applications.

Keywords : adsorption, desalination, refrigeration, seawater

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