

## Studies on a water-based absorption heat transformer for desalination using MED

G. Srinivas, S. Sekar, R. Saravanan\*, S. Renganarayanan

*Institute for Energy Studies, Anna University, Chennai 600025, India*  
Tel. +91 44 2220 3268; email id: rsaravanan@annauniv.edu

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### ABSTRACT

Vapor absorption heat transformer coupled with MED system is an attractive option for water desalination using low temperature waste heat. A simulation model has been developed to predict the performance characteristics such as coefficient of performance (COP), distilled water output, total specific thermal energy consumption (OSTEC) and performance ratio (PR) of the coupled system for various water based working fluid combinations. For waste heat input in the temperature range of 60°C to 80°C and sink temperature in the range of 20°C to 40°C, the performance of water based working fluids is compared, while considering gross temperature lift (GTL) up to 40°C. The results show that between the specified range of operating conditions, the working fluid system H<sub>2</sub>O–(LiCl+LiNO<sub>3</sub>) gives the highest COP while consuming the lowest specific thermal energy for water purification using the coupled system, followed by H<sub>2</sub>O–LiBr, H<sub>2</sub>O–LiI, H<sub>2</sub>O–(LiBr+LiNO<sub>3</sub>), H<sub>2</sub>O–(LiBr+ZnBr<sub>2</sub>+LiCl<sub>2</sub>) and H<sub>2</sub>O–(LiCl+CaCl<sub>2</sub>+Zn(NO<sub>3</sub>)<sub>2</sub>) systems respectively. It is also found that a working fluid combination H<sub>2</sub>O–LiCl+CaCl<sub>2</sub>+Zn(NO<sub>3</sub>)<sub>2</sub> produces the highest distilled water output compared to the other combinations. PR is the same for all working fluid combinations at given operating conditions and is found to increase with the number of effects (N) of MED.

*Keywords:* Water purification; Heat transformer; Water-based working fluids; Performance ratio

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\* Corresponding author.