

## Energy-consumption analysis of a configuration of an absorption vapor compression coupled to MED in a dual-purpose power plant

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### ABSTRACT

A dual-purpose power plant that produces heating-water-cooling-power cogeneration is presented. It comprises LiBr-H<sub>2</sub>O absorption vapour compression (ABVC), low-temperature multi-effect distillation (LT-MED) and combined heat and power plant (CHP). The low grade extraction or discharged steam from the steam turbine is used for heating as well as motive steam to drive LT-MED combined ABVC that produces fresh water and cooling. Based on the second law of thermodynamics, it is used to analyze the energy consumption of the dual-purpose power plant that the energy with different grades can be evaluated by the equivalent raw energy consumption. The effect of turbine's steam parameter on the specific raw energy consumption of water production is explored and the comparison of energy consumption between the dual-purpose power plant and CHP plant for different heating load is done. The results indicate that it is favourable to increase the parameter of fresh steam and reduce the parameters of the exit steam for reducing the energy consumption of water production. It is also shown that with the reduction in heating load, the raw energy consumption rate of generation and heating increases for the CHP plant and the specific raw energy consumption of water production reduces for the dual-purpose power plant. It is concluded that the dual-purpose power plant extends the evaporating temperature range by dramatically reducing evaporating temperature in the bottom evaporator, which results in effectively reducing the cost of water production, and contributes to alleviating the power load for refrigeration in summer, increasing the power production, and reducing the cost of heating by using surplus heating load for desalination.

*Keywords:* Low-temperature multi-effect distillation; Absorption vapor compression; Raw energy consumption rate; Dual-purpose power plant

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