World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:17, No:05, 2023

Integration of Two Thermodynamic Cycles by Absorption for Simultaneous Production of Fresh Water and Cooling

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Abstract : Cooling and water purification are processes that have contributed to the economic and social development of the modern world. However, these processes require a significant amount of energy globally. Nowadays, absorption heat pumps have been studied with great interest since they are capable of producing cooling and/or purifying water from low-temperature energy sources such as industrial waste heat or renewable energy. In addition, absorption heat pumps require negligible amounts of electricity for their operation and generally use working fluids that do not represent a risk to the environment. The objective of this work is to evaluate a system that integrates an absorption heat transformer and an absorption cooling system to produce fresh water and cooling from a low-temperature heat source. Both cycles operate with the working pair LiBr-H2O. The integration is possible through the interaction of the LiBr-H2O solution streams between both cycles and also by recycling heat from the absorption heat transformer to the absorption cooling system. Mathematical models were developed to compare the performance of four different configurations. The results showed that the configuration in which the hottest streams of LiBr-H2O solution preheated the coldest streams in the economizers of both cycles was one that achieved the best performance. The interaction of the solution currents and the heat recycling analyzed in this work serves as a record of the possibilities of integration between absorption cycles for cogeneration.

Keywords : absorption heat transformer, absorption cooling system, water desalination, integrated system
Conference Title : ICW 2023 : International Conference on Water
Conference Location : Montreal, Canada
Conference Dates : May 15-16, 2023