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Abstract Details

Title: Supermarket Cooling by Solar Power based Vapour Absorption Cooling System

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Abstract: This paper consists of two different research problems. In the first one, the aim is to model and simulate a solar-powered, single-effect, absorption refrigeration system using a flat-plate solar collector and LiBr-H_2O mixture as the working fluid. The cooling capacity and the coefficient of performance of the system are analyzed by varying all independent parameters, namely: evaporator pressure, condenser pressure, mass flow rate, LiBr concentration, and inlet generator temperature. The cooling performance of the system is compared with conventional vapor-compression systems for different refrigerants (R-134a, R-32, and R-22). The cooling performance is also assessed for a typical year in Easyday, New Delhi. Higher COP values are obtained for a lower LiBr concentration in the solution. The effects of evaporator and condenser pressures on the cooling capacity and cooling performance are found to be negligible. The LiBr-H2O solution shows higher cooling performance compared to other mixtures under the same absorption cooling cycle conditions. For typical year in Easyday, New Delhi, the model shows a constant coefficient of performance of 0.94. In the second problem, a numerical model is developed for a typical food retail store refrigeration system to study the effects of indoor space conditions on supermarket energy consumption. Refrigerated display cases are normally rated at a store environment of 24ºC (75ºF) and a relative humidity of 55%.

Keywords: Absorption, Evaporator, Condenser, Concentration, Refrigerants.