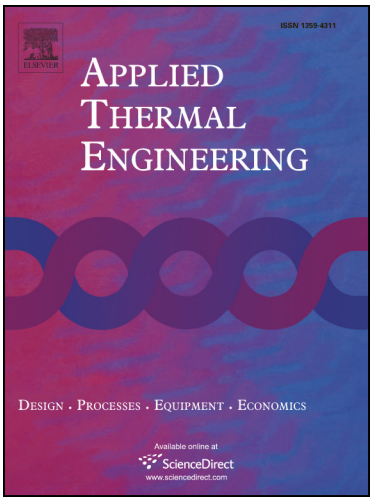

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Optimization of a multistage vapor-compression refrigeration system for various refrigerants

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ABSTRACT

This work focuses on theoretical investigation of the performance of a multistage vapor-compression refrigeration system using energy, exergy and economic analysis. The system was modeled using Engineering Equation Solver (EES) software and the model was validated against published data with maximum error of 1.14%. System optimization was carried out using Conjugate Directions method. Optimization objective function was maximizing the COP of the multistage vapor-compression refrigeration system by varying four optimization variables. Those variables were sub-cooling, de-superheating parameters, and evaporator and condenser temperatures of the system. Eight refrigerants were investigated which were: R717, R22, R134a, R1234yf, R1234ze(E), R410A, R404A, and R407C. Results show that COP increases with increasing the sub-cooling parameter. The maximum COP of 6.17 was achieved with ammonia while minimum