

# Thermodynamic study and System modeling of the Einstein refrigeration machine.

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A patent by A. Einstein and L. Szilard issued Nov. 1930 [1] discloses a single pressure thermally driven refrigeration cycle which does not require a pump. The circulation of the fluids is accomplished by a heat driven bubble pump and the working fluid is a triple mixture of butane, ammonia and water.

The objective of this paper is to present a thermodynamic model of the Einstein refrigeration machine, with operating conditions and different design parameters varied over a wide range to compare their performance.

To this end, a simulation program was built with *E. E. S* (Engineering Equation Solver) which makes it possible to simulate the Einstein absorption cycle in varying configurations.

The simulation investigate changes in system pressure, heat exchangers pinch temperatures, different back cooling temperature and finally evaporator temperature.

It is found that the system pressure is in important design parameter, with the *COP* having its optimum at 5 bar for air cooled condenser/absorber. It was also found that for a given system pressure, there is a minimum condenser-absorber temperature and a minimum evaporator temperature.

1. A. Einstein and L. Szilard (1930) *U.S patent N°1,781,541* 11 november 1930.