Modelling and Simulation of Adsorption Refrigeration System Using Low Grade Thermal Energy

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Adsorption refrigeration systems are among the promising thermally driven systems that can improve the effectiveness of utilizing low grade thermal energy resources such as waste heat or solar energy. The refrigerants used in these systems are environmental friendly like water, ammonia, methanol etc. Though, adsorption systems are capable alternative for conventional vapour compression refrigeration systems, till date they were not been commercialized for small scale. High initial cost and weight, coefficient of performance and specific cooling power are the major issues to divest adsorption system from commercialization. This study evaluates the effect of operating and design parameters on the performance of the adsorption refrigeration system. In order to evaluate performance of system, mathematical modelling has been proposed, developed and used to simulate at different operating and geometrical parameters of the adsorption system. For adsorption system, the model was used to study the influence of parameters identified via thermodynamic analysis on the the system performance in terms of coefficient of performance(COP) and specific cooling power(SCP).Till date, no open source software has been developed for simulation of adsorption system. Hence, simulation programming has been carried out in Microsoft excel environment. Macros has been used for coding of continuous cycle adsorption system. The proposed mathematical modelling was verified for it's validity by comparison with published theoretical and experimental results of other similar studies from literature. Simulation carried out by using current model has maximum 2 % of average error compared with original results obtained from literature

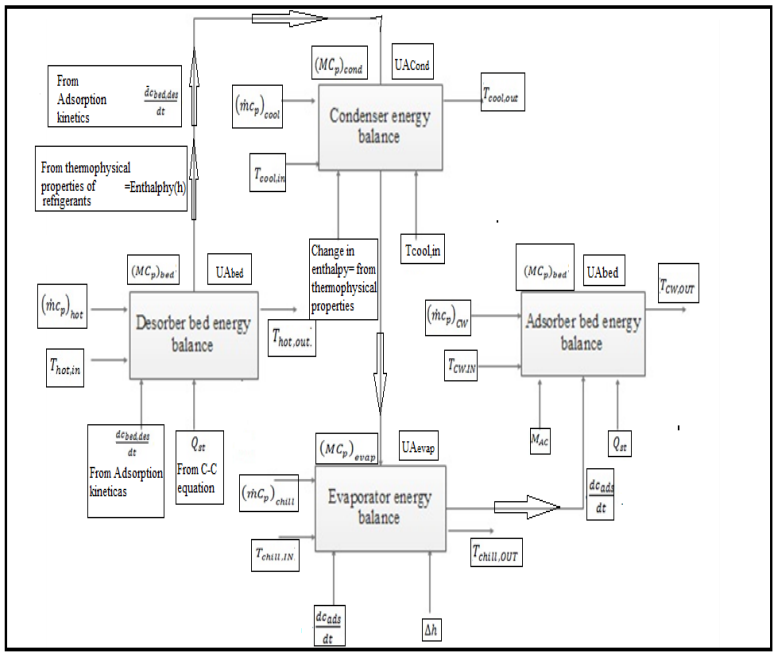

Fig. A block diagram for mathematical modelling.