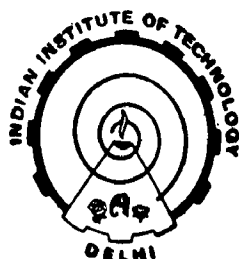


“Thermal Design And Parametric Studies On An Open Cycle Absorption Solar Cooling System”

by

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To my newly born Son, SAMEER

CANDIDATE'S DECLARATION

I hereby declare that the work, which is being presented in the thesis entitled "THERMAL DESIGN AND PARAMETRIC STUDIES ON AN OPEN CYCLE ABSORPTION SOLAR COOLING SYSTEM" in fulfilment of the requirements for the award of the degree of Doctor of Philosophy, submitted in the Centre of Energy Studies, I.I.T. Delhi is an authentic record of my own work carried out by me during a period from July 1982 to July 1985 under the supervision of Dr. S.C. Kaushik, Assistant Professor, Centre of Energy Studies, Indian Institute of Technology, Delhi. The matter embodied in this thesis has not been submitted by me for the award of any other degree.



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This is to certify that the above statements made by the candidate are correct to the best of my knowledge.

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A handwritten signature in black ink, appearing to read 'Jaivir Kaudinya', with a horizontal line drawn through the middle of the signature.

JAIVIR KAUDINYA

SUMMARY

Due to acute shortage of electricity cooling can be produced by vapour absorption cooling systems, least dependent on electrical energy. A closed cycle vapour absorption cooling system is known to be a casual alternative of the conventional vapour compression system. However a more promising, open cycle absorption cooling system (OCACS) is proved to be a better alternative for solar cooling/airconditioning applications in the present study.

This thesis presents some coherent and systematic thermal design investigations on an open cycle absorption solar cooling system. The proposed system differs from the conventional closed cycle absorption system in a way that OCACS does not need a condenser and a separate collector for regenerator under solar operation unlike the closed cycle. Thus a least bulky, more efficient and a survivor even at lower regenerator temperatures, an OCACS is studied in detail.

In particular, the present thesis has analysed heat and mass transfer processes in various solar regenerator systems. Design parameters and optimization along with experimental validation (wher-ever possible) of the theoretical studies have been reported. The analytical models developed are found to be consistent with the practical design and capable of predicting the regenerators performance under wide range of

operating conditions. Suitability of different alternative working fluids using water as refrigerant for open cycle absorption air-conditioning have been tested and both the climatic zones viz-hot and dry and hot and humid climates have been considered in the present study. It is found that open and forced flow solar regenerators are suitable for hot and dry climates while a brine still solar regenerator is most suitable in hot and humid climate. However, the forced flow solar regenerator may afford to work even in humid climate while an inexpensive open surface solar regenerator may compete well in arid zones.

In addition, thermodynamic assessment, thermal modelling and thermal design of the complete open cycle absorption cooling system have also been undertaken and a comparative study with a closed cycle and the performance of the system with a new working fluid have also been reported. It is found that an open cycle absorption system is thermodynamically and technically feasible, less expensive, more viable and better in performance than the closed cycle absorption cooling system.

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