
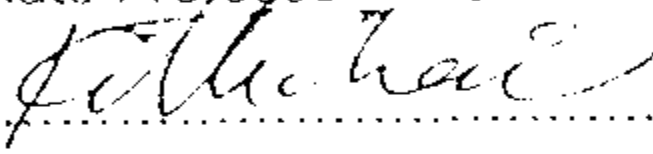



THESIS TITLE : A STUDY OF HEAT RECOVERY FROM CHILLED WATER AIR
CONDITIONING SYSTEM FOR GENERATING HOT WATER
BY USING HEAT PUMPS

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ABSTRACT

A mathematical model of R-22 heat pump was developed and subsequently used for simulating a 3736-kW heat pump used to generate hot water for a 320-room hotel. The heat source for the heat pump was assumed to be the heat rejected from the existing chilled water air conditioning system. The heat pump model was developed from thermodynamic relations of the heat pump's equipment and equations of thermodynamic properties of R-22.

Actual data of cooling water of the existing air conditioning system which are inputs for the heat pump model were collected from the hotel over the period of one year.

Simulation results of the model indicated that the temperature of hot water generated by using the heat pump ranged between 45.2-47.3 °C with a flow rate of 40 kg/s which is adequate for the hotel hot water demand. It was also found that the heat pump's coefficient of performance was in the range of 3.286-3.406.

An economic analysis was conducted to compare the electric heat pump and the existing fuel oil boiler used to generate hot water to meet the actual demand of the hotel. It was found that the rate of return of the heat pump hot water system was 16.00% if the existing fuel oil boiler facility was replaced by the heat pump system. The heat pump and the fuel oil systems were also compared in the case of new investment. In such a case it was found that the rate of return of the heat pump system was 17.02% as compared with the fuel oil system.