# SOME EXPERIMENTAL AND THEORETICAL STUDIES ON SOLAR STILL SYSTEMS

*By*

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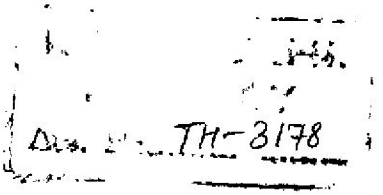
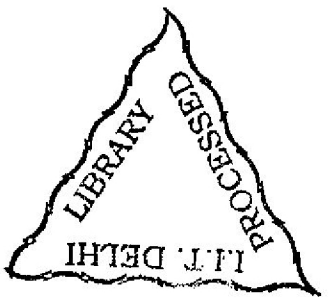
Solar Still - Heat & mass transfer





# Certificate

It is certified that the thesis entitled "SOME EXPERIMENTAL AND THEORETICAL STUDIES ON SOLAR STILL SYSTEMS" submitted by *Shailendra Kumar Shukla* is worthy of consideration for the award of the degree of 'Doctor of Philosophy' and is a record of the original bonafide research work carried out by him. The results contained in the thesis have not been submitted in part or full to any other university or institute for the award of any degree or diploma to the best of our knowledge. We have just reviewed the thesis and it is in order for submission to I.I.T. Delhi.

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## Abstract

There are some common methods, which are used on the basis of the requirements of source water quality, for purifying polluted water with varying degrees of effectiveness. Biological contaminants can be eliminated to a large extent by heating and / or boiling the water. It requires either significant amount of energy for the purpose of boiling the water or the commercial chemicals for the purpose of chlorination. Contrarily, the chemical contaminants and dissolved salts/ solids are more difficult to eliminate. The most popular methods for removing such contaminants are Reverse Osmosis (RO) and Distillation processes. To a limited extent, Electro-dialysis is also used but it is also energy intensive process. However, the importance of the water distillation process lies in the fact that it completely purifies the water, irrespective of the source water quality. Thus, in order to capture this very advantage of distillation process, cost effective Solar Stills have been designed and developed. And they have proved their performance and cost effectiveness.

In the present study, intense experimentation has been carried out to analyse the heat and mass transfer to obtain the correlation coefficients through thermal and computer models using the experimental values of water and glass temperatures and distillate output for single and double slope conventional solar stills, multiwick solar stills and active solar still. When hot water is fed in to the basin of passive solar still through flat plate collector, it is referred as active solar still. Further, thermal and computer models for each type of solar still have been developed with a new approach and using new values of correlation coefficients,

their performance have been predicted. Also, parametric studies on various types of solar stills have been carried out using new values of correlation coefficients of heat and mass transfer and values proposed by Dunkle. The cost calculations have also been carried out for solar still systems using uniform methods of cost analysis. The multiwick double slope solar still is found most economical.

# CONTENTS