

Plate Recovery Heat Exchanger and its suitability to Work in a Desiccant Evaporative Cooling Cycle¹

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Abstract

During the last decades, demand has increased for electrical energy for the purposes of air conditioning in Syria . The Desiccant Evaporative Cooling cycles (DEC) could be used to overcome this problem due to the following reasons : 1- These cycles are not in need of electrical energy except in restricted limits 2- The possibility of using solar energy. 3- The non-necessity to high temperatures for the moving heat source, and this negates the previous negatives when using the solar energy for conditioning purposes by absorptive cooling cycles 4- There is a direct proportion between the availability of the solar energy and its need for the purposes of air conditioning in summer. the current research is a contribution in the field of spreading and circulating these techniques in Syria through the study of some of the elements of DEC cycle, its designing, testing and suitability to work as a part of the cycle.

The research is composed of two main parts : the first part includes the techniques of the desiccant evaporative cooling, and the second part includes the designing of the plate recovery heat exchanger; the results of the tests, discussion of the results and the conclusions. The plate recovery heat exchanger was manufactured at the laboratories of the Mechanical and Electrical Engineering faculty at Damascus University. The trials were performed to test the performance of the exchanger with DEC cycle; also the performance of the heat exchanger during its work within air conditioning cycle and calculating the quantity of saving in the required capacity of air conditioning unit.

¹ For the paper in Arabic see pages (209-228).

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The research revealed that the effectiveness of the heat exchanger affects greatly each of the specific cooling productivity, the regeneration heat of the desiccant and the coefficient of performance of DEC cycle; so the increasing of the effectiveness of the heat exchanger leads to the noticeable increase of the coefficient of performance of DEC cycle. The required cooling capacity of the air conditioning unit with the use of a recovery heat exchanger is less than half of the required capacity of the air conditioning unit in which it is not use of with it a recovery heat exchanger.