

## Field study of various air based photovoltaic/thermal hybrid solar collectors

In the present work a comparative study for thermal and electrical performance of different hybrid photovoltaic/thermal collectors designs for Iraq climate conditions have been carried out. Four different types of air based hybrid PV/T collectors have been manufactured and tested. Three collectors consist of four main parts namely, channel duct, glass cover, axial fan to circulate air and two PV panels in parallel connection. The measured parameters are, the temperature of the upper and the lower surfaces of the PV panels, air temperature along the collector, air flow rate, pressure drop, power produced by solar cell, and climate conditions such as wind speed, solar radiation and ambient temperature. The thermal and hydraulic performances of PV/T collector model IV have been analyzed theoretically based on energy balance. A Matlab computer program has been developed to solve the proposed mathematical model.

The obtained results show that the combined efficiency of collector model III (double duct, single pass) is higher than that of model II (single duct double pass) and model IV (single duct single pass). Model IV has the better electrical efficiency. The pressure drop of model III is lower than that of models II and IV. The root mean square of percentage deviations for PV outlet temperature, and thermal efficiency of model IV are found to be 3.22%, and 18.04% respectively. The calculated linear coefficients of correlation ( $r$ ) are 0.977, 0.965 respectively.