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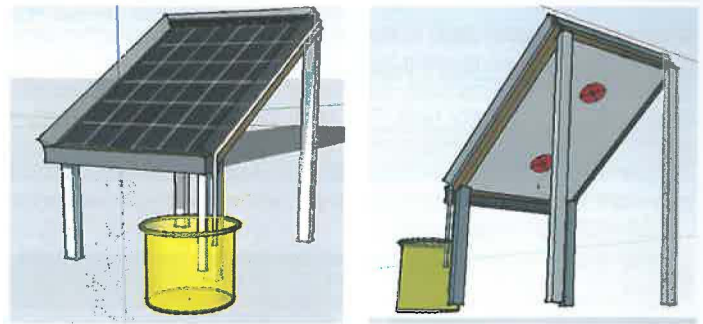
AUTOMATIC COOLING SYSTEM USING PIC 16F877A FOR SOLAR PANEL



INTRODUCTION

Solar photovoltaic (PV) power generation is an attractive technique to reduce consumption of fossil fuels and as a renewable energy. The temperature of PV module increases when it absorbs solar radiation, causing a decrease in efficiency. The power and efficiency of PV module usually falls at the rate of ~0.5%/°C and ~0.05%/°C respectively as increase of ambient temperature. To actively cool the PV module, an automatic solar cooling system is designed by using DC brushless fan and DC water pump with inlet/outlet manifold. PIC 16F877A was used to control the DC brushless fan and water pump for switch ON and OFF depending on temperature PV module. The open-circuit voltage (Voc), short circuit current (Isc) and every change temperature on PV module were shown to compare the performance with and without cooling system. The results showed that the PV module with cooling system is higher in term of output power and efficiency compare to without cooling system. The higher efficiency of PV cell, the payback period of the system can be shorted and the lifespan of PV module can also be longer.

Experimental Setup



(a) DC water pump

(b) DC brushless fan

Figure 2 The DC brushless fan and DC water pump of PV module cooling system

Block Diagram of Overall System

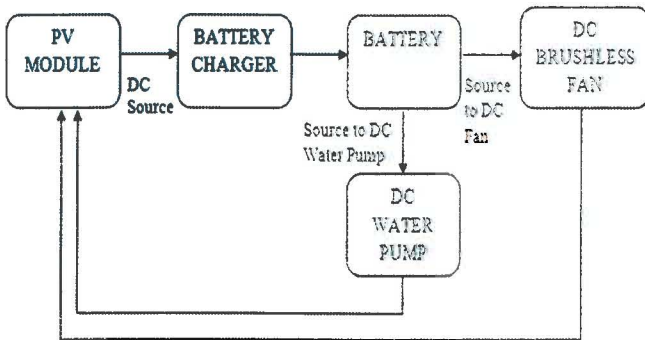


Figure 1 Block diagram of automatic solar panel cooling system

Comparison between with and without cooling system

Table with 4 columns: TYPE, POWER GENERATED (1 Unit, 1000 Units), and PERCENTAGE SAVING. Rows include WITHOUT COOLING and WITH COOLING.

Table 1 Power generated by PV module for with and without cooling system

NOVELTIES

Novelties of the proposed topology are:

- 1. Used microcontroller PIC 16F877 as a controller system to switch on and off the DC water pump and DC fan
2. Used the temperature detector for detecting the surface temperature of PV module
3. Can prolong the life span of the PV module
4. The payback period of the PV application system can be shorted

RESULTS AND DISCUSSION

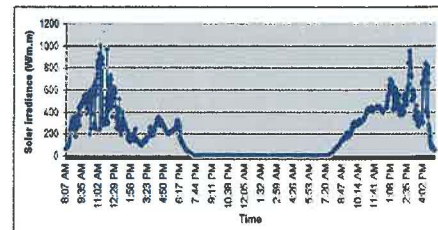


Figure 3 The weather condition of solar irradiance

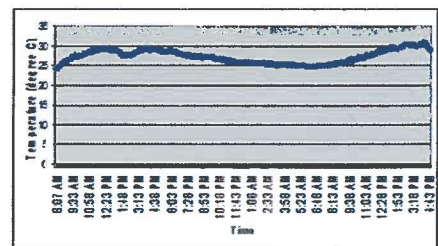


Figure 4 The weather condition of temperature

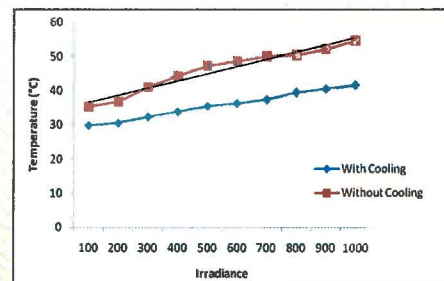


Figure 5 The temperature of solar panel for with and without cooling system