СЕКЦІЯ: ЕЛЕКТРОТЕХНІКА ТА ЕНЕРГОЗБЕРЕЖЕННЯ
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Ayah Nsikak Ime, Ph.D. V.P.Koval
Ternopil Ivan Pul'uj National Technical University, Ukraine

INCREASE OF EFFICIENCY FOR SOLAR PANELS USING WATER

Аях Нсікак Іме, к.т.н. В.П. Коваль

ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ СОНЯЧНИХ ПАНЕЛЕЙ ШЛЯХОМ ВИКОРИСТАННЯ ВОДЯНОГО ОХОЛОДЖЕННЯ

The photovoltaic effect is the development of electric voltage in a system exposed to solar radiation. With the immersion of photons, charge carriers are excited into the conduction band. The mechanism of light-induced electron transition to a higher energy state is similar to that of the photoelectric effect. A photon carrying a sufficient amount of energy frees an electron from the surface of a metal. Albert Einstein explained the photoelectric effect in 1905. Converting solar radiation into electrical energy is called photovoltaics (PV). Devices exploiting the PV effect are called solar cells, also photovoltaic cells, or photovoltaic devices. The problem we now face is, however, the very high cost of PV, particularly crystalline silicon solar cells, which currently have the highest known efficiency and the inefficiency of the solar panel as a result of excess heat that the panels acquire due to exposure to intense ultraviolet rays from the sun.

Water is very effective owing to the fact that water specific heat is higher than the specific heat of air, low viscosity and cost. The solar panel temperature is determined by measuring the temperature between sunrise and a particular time into the day. Solar irradiance, ambient air temperature, and temperature of the panel were recorded on a day in July 2020 between sunrise and sunset. The temperature of the module was measured and calculated; the result is similar. The temperature of the module, as determined and analyzed, is shown in Figure 1. The discrepancy between the recorded and estimated temperature of the module does not surpass 5%. $T_m = T_{amb} + (NOCT - 20)\, E / 800$.

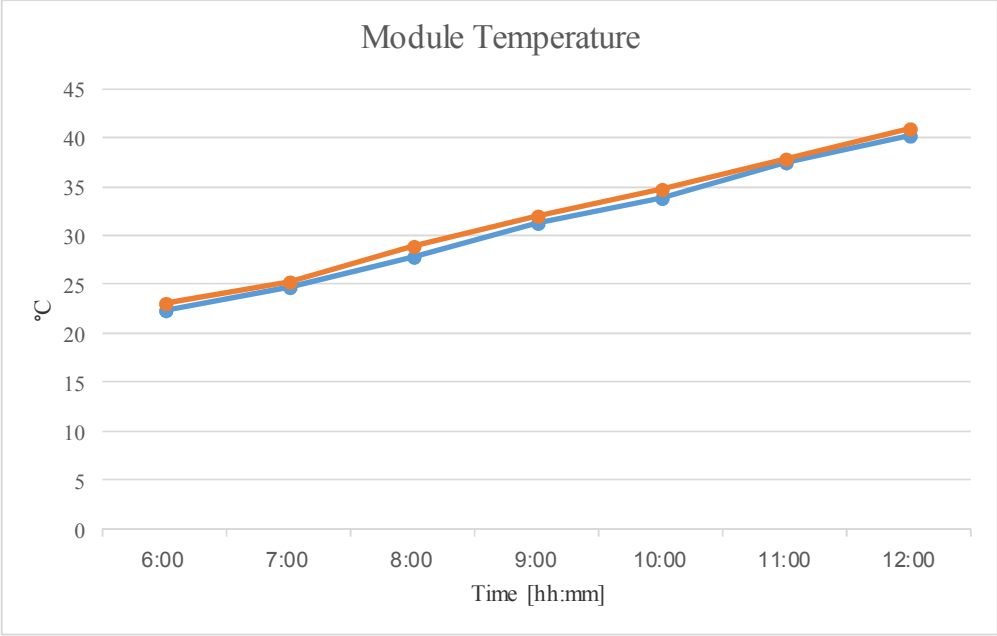

Figure 1. The temperature of the module as estimated and analyzed

The period of cooling is determined by the energy balance of the system, $\Delta E_{system} = \Delta E_{final} - \Delta E_{initial}$, the amount of heat energy gained by the cooling water – the heat energy gained during exposure of panels to the sunlight. The temperature of water leaving the panel is assumed to be the same as the temperature after cooling the panel. Therefore ΔT_w is the change in the temperature of the cooling water before and after cooling of the panel. Therefore it can be seen that water takes away the built up heat from the panel away.

Automated System as the name state is any system being operated automatically, efficiency is the end goal with the measuring and monitoring device aids in operating the pump automatically to spray water on the panel which will yield optimum efficiency.

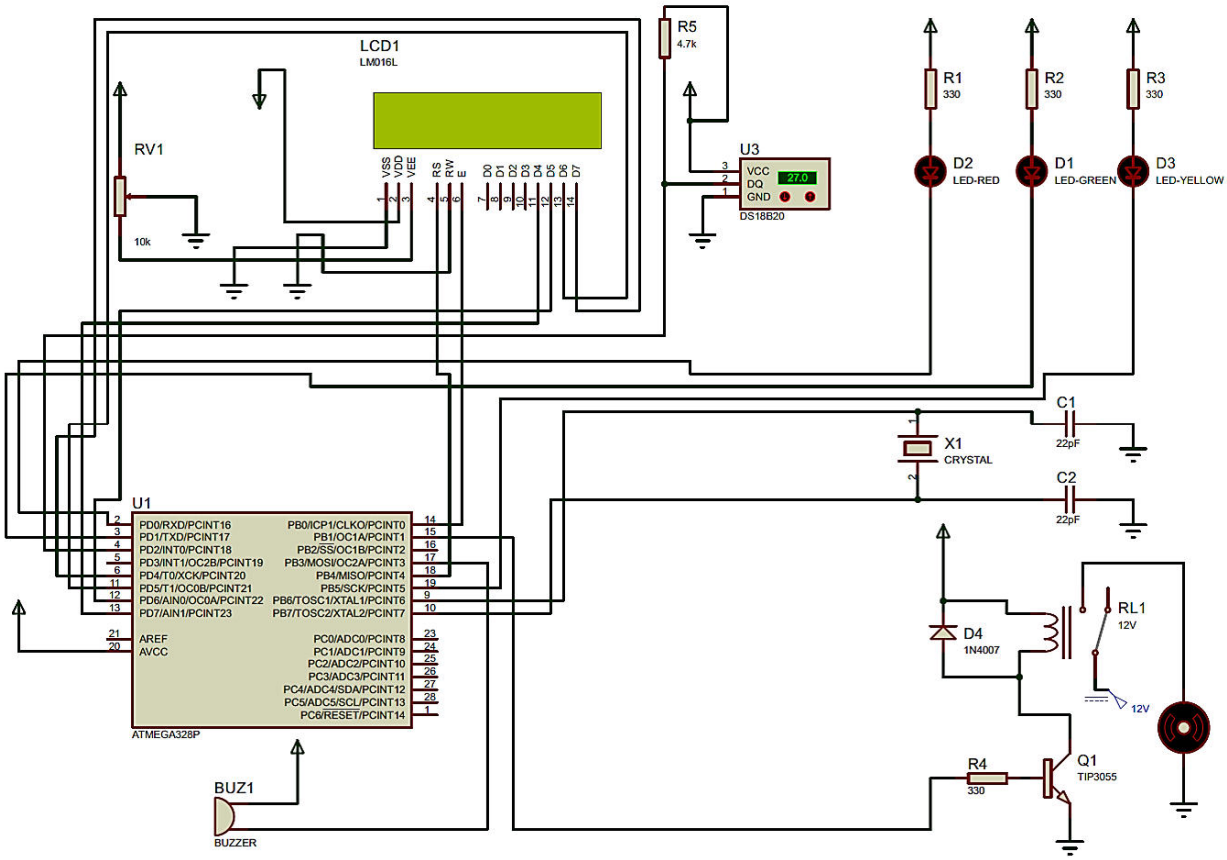

Figure 2. Circuit Diagram for water cooling system for solar panel

When the temperature is above the set degree, the pump turns on until it is below the set temperature. In effect it increases operation performance and effectiveness, making cooling of the system easier.