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A thermal model for polycrystalline solar modules

Polikristályos napelem modulok hőtechnikai modellje

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Silicium based crystalline solar modules are the most widespread worldwide. Under Hungarian climatic conditions the temperature of crystalline solar modules can reach 60–70 °C on warm days. Due to its high temperature the energy production of crystalline solar modules decreases. In the case of silicium based crystalline solar modules, efficiency decreases by 0.5% with 1 °C of temperature increase.

We examined in this study a polycrystalline solar module (SL50TU-18P, 50W) under real climatic conditions on July 19th (09:00 am – 17:40 pm), installed on dual axis solar tracking system in Hungary, Keszthely. We determined by the help of this module the components of heat transfer.

According to our measurements on July 19th from 09:00 am to 17:40 pm the percentage of daily energies were the following: Q_{Rem} : 38%, Q_{Rad} : 19%, Q_{Conv} : 29% and Q_{PV} : 14%. Clearly visible that the Q_{Rem} was the highest value which caused the high PV module temperature.

* long-wave radiative heat exchange (Q_{Rad}), convective heat exchange (Q_{Conv}), electricity output of module (Q_{PV}), remaining heat energy (Q_{Rem})