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Abstract

In this paper, a study was carried out for the effect of local atmospheric condition and tilt angle on the energy yields of solar collectors at selected latitudes. A computer program was developed for that purpose to find the daily average, monthly, seasonal and annual energy profiles based on Klein model and Erbs correlation. Using generic system of solar collector at due south, hybrid energy yields: electric, heating and cooling were obtained. As a case study, the results were presented for latitudes 30° - 37° N. Optimum tilt angles were found to be within 0° to 66° which nonlinearly depends on the relevant time period of the year and atmospheric condition. Two important findings were concluded. First, optimum angles would be larger for better atmospheric conditions with greater shifts during winter period while summer months are of less sensitivity. This shift was 10° - 14° for winter monthly energy, 0° - 8° for summer monthly energy, 11° - 13° for total annual and heating energy and 1° - 3° for total cooling energy. Second, deviations in the angles of commonly used empirical formulas were noticed to be larger in summer period and higher latitudes. These deviations were in the range of -10° to +20° as compared to the corresponding values of present study. Finally, average energy values

were 6055, 1700 and 2370 MJ/m² for annual, heating and cooling yields respectively.

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Index Terms

Computer Science

Power Systems

Keywords

solar collector, energy profile, electric heating cooling yields, atmospheric condition, optimum tilt angle.