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Abstract

Design and simulation of solar energy installations need hourly data of diffuse and beam radiation components for assessing the dynamic behavior of those systems. However, the most widely available data is the global solar radiation. Whereas, diffuse and beam data are not readily affordable. Thus, numerous empirical models of correlations were developed at different sites in the world to predict the required radiation components. In the present paper, an hourly correlation expressed in a third-degree polynomial relating the diffuse fraction with the clearness index was developed based on field measurements of global and diffuse solar radiations in Baghdad city (33.33o N), Iraq. The validation and accuracy of the developed correlation was evaluated using six widely used statistical parameters. Among these parameters, the values of linear coefficient of correlation, mean percentage error and root mean square error were found to be 0.885, 6.24% and 8.0% respectively which indicates good performance. In addition, eight different empirical diffuse models for various sites were chosen from the literature for statistical comparison with the developed correlation in this study. The best model was that of South America at site latitude 23.56o S with mean percentage error 16% and root mean square error

11.5% which shows the largest agreement. A computer program was established for generating the necessary data for developing the required correlation and also for calculating the essential statistical evaluations and comparisons in the present work.

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Index Terms

Computer Science Artificial Intelligence

Keywords

hourly diffuse fraction, clearness index, empirical models, statistical parameters, Baghdad

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