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Linke Turbidity Modelling for Braşov Urban Area

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Key words

Solar radiation, Linke turbidity factor, RES-systems.

The use of the empirical models (offered by the branch literature) to simulate the global, direct and diffuse solar radiations, for Braşov urban area, does not lead to a real and satisfactory approximation in comparison with the diagrams of the real solar radiation. To obtain a radiation simulation according to reality, it is necessary the accurate determination of the Linke turbidity factor.

The data sets, used in calculations and simulations, have been recorded by a Delta-T local weather station, which is positioned on the roof of the ''Transilvania'' University of Braşov (Romania), according to the standard mounting conditions. Braşov area, latitude 45.39^{o}, is a medium size town with a high pollution level. The basin area is characterised by a continental temperate climate more precisely a transition type between oceanic and temperate climate of the temperate continental.

The Linke turbidity factor is depending on the Rayleigh optical thickness and the relative optical air mass. For the calculation of these two parameters, the present paper will use two models: the relations of Kasten and Young [1] and the relations of Remund-Page [2]. All the data simulations and calculations were made in consideration of clear sky conditions.

In the first stage, there were calculated the monthly mean values of the Linke factor but, also the monthly means of the hourly minimum values recorded during a month. These values, for the two models proposed, are tabular presented. It was ascertained, the use of some constant values during a month for the turbidity factor is reflected in the radiation diagrams as follows:

- ✓ around the noontime, lower values of the theoretical radiations were obtained, compared to those real;
- ✓ similarly, at the sunset time, the recorded radiation measurements have higher values than those theoretical.

Considering the aspects above mentioned, the study of the variation of Linke turbidity factor during a day (depending on the solar time) is proposed. In this way for every month of the year there were extracted the minimum hourly values and these were plotted depending on the solar time. The diagrams were plotted for both models proposed before there are presented the diagrams specific to three months, namely March, June and September. For every month the turbidity factor functions depending on solar time were determined (these are tabular systematised). The paper also presents the superimposed diagrams of the direct solar radiation simulated with the turbidity factor functions proposed and the real values.

The paper ends with the wording of some important conclusions, a few of them being presented below:

- more precise theoretical radiation simulation requires the accurate mathematical modelling of all climatological parameters that intervene in the beam relation; the geographical and climatic features of every site as well the influence of the urban conditions on some climatological parameters must be taken into consideration;
- the turbidity factor values, recommended by the technical literature for the Braşov area do not correspond to the real values calculated on the basis of the recorded meteorological data.

References

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