

# Dynamic Modeling of the Solar System Depending on the Change in the Tilt Angle of the Solar Collector

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## Abstract

This paper presents the modeling of the solar system depending on the change in the tilt angle of the collector to the horizontal plane, using the TRNSYS software package. TRNSYS is a software package suitable for simulating energy systems with time-varying parameters, with an open source code architecture that enables modeling and simulation of various systems. Modeling of the solar system was performed using a modified standard function of current thermal efficiency, determined in accordance with the European standard EN ISO 9806 : 2017, in relation to the tilt angle of the collector to the horizontal plane. The obtained model was tested for hot water preparation services for a hotel, located in the city of Sarajevo, Bosnia and Herzegovina for a period of one year. The obtained results were compared with the results given by the standard efficiency function, and with the results obtained using the f-chart method. It is shown that the deviation of the results for the dynamic model obtained according to the modified efficiency function, depending on the tilt angle of the collector, compared to the results given by the standard efficiency function ranges between 5 - 13%. The smallest deviation is for the collector tilt angle  $30^\circ$  and is 5%, while the largest deviation for the collector tilt angle is  $0^\circ$  and is 13%. Deviations in relation to the results given by the f-chart method are more significant, which is understandable since the f-chart method is significantly more inert to the oscillation of the values of time-varying variables essential for designing solar systems compared to dynamic models.

**Keywords:** *solar thermal collector, collector tilt angle, efficiency function, dynamic modeling, solar system*