

Analysis on Heat Transfer in Solar Parabolic Trough Collectors

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Abstract : Solar power has a huge potential to be employed in the fields of electricity production, water desalination, and multi-generation. There are various types of solar collectors, and parabolic trough collectors (PTCs) are common among these types. In PTCs, a mirror is used to direct the incident radiation on an absorber tube to utilize the heat in power generation. In this work, a PTC covered with a glass tube is presented and analyzed. Results showed that temperatures of 510°C for steam can be reached for certain parameters. The work also showed the viability of using Benzene as the working fluid in the absorber tube. Also, some analysis regarding changing the absorber's tube diameter and the efficiency of the solar collector was demonstrated in this work. The effect of changing the heat transfer correlations for the convection phenomena of the working fluid was illustrated. In fact, two heat transfer correlations, the Dittus-Boelter and Gnielinski correlations, were used, and the outcomes showed a resemblance in the results for the maximum attainable temperature in the working fluid.

Keywords : absorber tube, glass tube, incident radiation, parabolic trough collector

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