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Performance Analysis of LPG Vaporization System Using Solar Assisted Heat Pump in Different Climate Zones in China

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In this paper, a novel LPG vaporization system utilizing direct-expansion solar assisted heat pump (DX-SAHPV) is presented to reduce the conventional energy consumption of LPG vaporization as well as to broaden various applications of solar assisted heat pump technology. Six operation modes of the DX-SAHPV system were introduced according to the particular character of LPG spontaneous vaporization, variational gas loads and different meteorological parameters. Dynamic models for solar assisted heat pump, thermal storage water tank, LPG vaporizer and auxiliary gas burner were developed and used for the evaluation of the system performance.

The thermal performance of the DX-SAHPV system was investigated in three different climate zones (Beijing, Shanghai and Lhasa) using a simulation program. The simulation results show that the system can operate stably and the variation of operation performance has a similar trend under different weather conditions. The annual coefficients of performance of this system are 3.10 in Beijing, 3.09 in Shanghai and 3.25 in Lhasa, while the corresponding annual collector efficiencies are 1.19, 1.47 and 1.04, respectively. The higher both solar radiations and ambient temperatures are, the better the thermal performances become.

Biography:

Guo-Hua Shi obtained his Ph.D. from the North China Electric Power University. Dr Guo-Hua Shi serves as an Associate Professor at the North China Electric Power University and is an academic visiting scholar at the University of Melbourne. He has extensive experience in the utilization of clean or renewable energy. His research interests involve utilization of natural gas and liquefied petroleum gas, solar thermal energy, renewable energy with specialization in distributed energy system, and energy efficiency. Now his research focus on the vaporization of LPG and LNG by use of solar assisted heat pump.