

## Experimental Study on a Solar Heat Concentrating Steam Generator

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**Abstract :** Replacing of complex solar concentrating unit, this paper designs a solar heat-concentrating medium-temperature steam-generating system. Solar radiation is collected by using a large solar collecting and heat concentrating plate and is converged to the metal evaporating pipe with high efficient heat transfer. In the meantime, the heat loss is reduced by employing a double-glazed cover and other heat insulating structures. Thus, a high temperature is reached in the metal evaporating pipe. The influences of the system's structure parameters on system performance are analyzed. The steam production rate and the steam production under different solar irradiance, solar collecting and heat concentrating plate area, solar collecting and heat concentrating plate temperature and heat loss are obtained. The results show that when solar irradiance is higher than  $600 \text{ W/m}^2$ , the effective heat collecting area is  $7.6 \text{ m}^2$  and the double-glazing cover is adopted, the system heat loss amount is lower than the solar irradiance value. The stable steam is produced in the metal evaporating pipe at  $100 \text{ }^\circ\text{C}$ ,  $110 \text{ }^\circ\text{C}$ , and  $120 \text{ }^\circ\text{C}$ , respectively. When the average solar irradiance is about  $896 \text{ W/m}^2$ , and the steaming cumulative time is about 5 hours, the daily steam production of the system is about 6.174 kg. In a single day, the solar irradiance is larger at noon, thus the steam production rate is large at that time. Before 9:00 and after 16:00, the solar irradiance is smaller, and the steam production rate is almost 0.

**Keywords :** heat concentrating, heat loss, medium temperature, solar steam production

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