

# Optimization Study of Solar Energy Generation System

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## Abstract

This work experimentally investigated the effects of the shelter, the solar-energy-panel temperature and the sunlight angle on the generating electric power of the solar energy electro-optical transformation system. Halogen lamps were employed to replace the sunlight. Changing the modes of Halogen lamps, including total ten modes such as full lamps, double lamps and single lamp, to simulate the shelter effect. Adjusting the lamp-to-panel distance ( $L=500\text{mm}\sim 2000\text{mm}$ ) to change the solar-energy-panel temperature. The lamp-light angle was also changeable ( $\theta=0^\circ\sim 40^\circ$ ). The measured results indicated that the generating electric power ( $Q$ ) and the generating electric efficiency ( $\eta$ ) of the system without any shelter (i.e. full lamps mode) were higher than those of the system with shelter. Besides, for the systems with shelter, The  $Q$  and  $\eta$  of the light locating at the middle position of the solar energy panel were higher than those of the light at the sides. Increasing the lamp-to-panel distance would have higher  $\eta$ , consisting with that lower solar-energy-panel temperature results in higher  $\eta$ . Furthermore, for the single lamp mode, the maximum generating electric power ( $Q$ ) happened at  $L=1000\text{mm}$ . However, for the full lamps mode, the maximum generating electric power ( $Q$ ) happened at  $L=500\text{mm}$ . Finally, the  $Q$  and  $\eta$  generally declined with increasing the lamp-light angle ( $\theta$ ), especially for  $\theta>10^\circ$ .

**Keywords:** electric power, solar energy, electro-optical transformation system.