

Study on Eco-Feedback of Thermal Comfort and Cost Efficiency for Low Energy Residence

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Abstract : China with annual increasing 0.5-0.6 billion squares city residence has brought in enormous energy consumption by HVAC facilities and other appliances. In this regard, governments and researchers are encouraging renewable energy like solar energy, geothermal energy using in houses. However, high cost of equipment and low energy conversion result in a very low acceptable to residents. So what's the equilibrium point of eco-feedback to reach economic benefit and thermal comfort? That is the main question should be answered. In this paper, the objective is an on-site solar PV and heater house, which has been evaluated as a low energy building. Since HVAC system is considered as main energy consumption equipment, the residence with 24-hour monitoring system set to measure temperature, wind velocity and energy in-out value with no HVAC system for one month of summer and winter. Thermal comfort time period will be analyzed and confirmed; then the air-conditioner will be started within thermal discomfort time for the following one summer and winter month. The same data will be recorded to calculate the average energy consumption monthly for a purpose of whole day thermal comfort. Finally, two analysis work will be done: 1) Original building thermal simulation by computer at design stage with actual measured temperature after construction will be contrastive analyzed; 2) The cost of renewable energy facilities and power consumption converted to cost efficient rate to assess the feasibility of renewable energy input for residence. The results of the experiment showed that a certain deviation exists between actual measured data and simulated one for human thermal comfort, especially in summer period. Moreover, the cost-effectiveness is high for a house in targeting city Guilin now with at least 11 years of cost-covering. The conclusion proves that an eco-feedback of a low energy residence is never only consideration of its energy net value, but also the cost efficiency that is the critical factor to push renewable energy acceptable by the public.

Keywords : cost efficiency, eco-feedback, low energy residence, thermal comfort

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