Hybrid Structural Systems of An Active Building Envelope System(ABE)

蔡博章,黃國修,李建和
Mechanical Engineering
Engineering
bjtsai@chu.edu.tw

Abstract

Abstract--This study takes the ventilation into consideration, making the active building envelope (ABE) system more close to the realistic application conditions. The ABE system is comprised of a photovoltaic unit (PV unit) and a thermoelectric heat pump unit (TE unit). The PV unit consists of photovoltaic cells, which convert solar radiation energy into electrical energy. The TE unit consists of thermoelectric heaters/coolers (referred to here onwards as TE coolers), which convert electrical energy into thermal energy, or the reverse. The PV and the TE units are integrated within the overall ABE enclosure. The new mechanism of a hybrid system was proposed. A ducted wind turine will be integrated with the ABE system becoming dual core. Then the analytic model of original ABE system has to be revised and analytic solution will be resulted and verified by the numerical solution of CFD. The ducted wind mill will provide air conditioning and power the ABE system, to higher the thermal efficiency of the heat sinks of TE system. Numerical and experimental works will be investigated. a building installed the ABE system wind, solar driven, bypass the windmill flow as a air flow, ambient temperature, To is equal to 35 oC and indoor temperature, Ti is 28 oC. Numerical results show the Ti will decrease 2 oC when the ABE operating with heat sinks, without fan. As fan is opened, strong convective heat transfer, Ti will decrease approximately 4 to 5 oC. We hope findings of this study can make the dream of healthy living、comfortable room come true。

Keyword：Active building envelope system、Thermoelectric、Solar energy、Wind mill、Photovoltaic