

Feasibility Study on the Use of HEMS for Thermal Comfort and Energy Saving in Japanese Residential Buildings

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Abstract : The electricity consumption in the Japanese household sector has increased with higher rate than that of other sectors. This may be because of aging and information oriented society that requires more electrical appliances to make the life better and easier, under this circumstances, energy saving is one of the essential necessity in Japanese society. To understand the way of energy use and demand response of the residential occupants, it is important to understand the structure of energy used. Home Energy Management System (HEMS) may be used for understanding the pattern and the structure of energy used. HEMS is a visualization system of the energy usage by connecting the electrical equipment in the home and thereby automatically control the energy use in each device, so that the energy saving is achieved. Therefore, the HEMS can provide with the easiest way to understand the structure of energy use. The HEMS has entered the mainstream of the Japanese market. The objective of this study is to understand the pattern of energy saving and cost saving in different regions including Japan during HEMS use. To observe thermal comfort level of HEMS managed residential buildings in Japan, the field survey was made and altogether, 1534 votes from 37 occupants related to thermal comfort, occupants' behaviors and clothing insulation were collected and analyzed. According to the result obtained, approximately 17.9% energy saving and 8.9% cost saving is possible if HEMS is applied effectively. We found the thermal sensation and overall comfort level of the occupants is high in the studied buildings. The occupants residing in those HEMS buildings are satisfied with the thermal environment and they have accepted it. Our study concluded that the significant reduction in Japanese residential energy use can be achieved by the proper utilization of the HEMS. Better thermal comfort is also possible with the use of HEMS if energy use is managed in a rationally effective manner.

Keywords : energy reduction, thermal comfort, HEMS utility, thermal environment

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