Energy management Systems

Summary

Energy management system was learned and implemented using a computer and a simulator. Total energy demand for 24 hrs was determined using this system with different values of the ambient temperature. Also adaptive optimum start control and adaptive maximum demand control were implemented using this energy system. It has been found that this system works well in managing the demand of the two offices and a workshop, leading to significant savings in energy consumption.

Introduction

Electricity saved is equal to electricity produced. Until a couple of decades ago this statement was of economical significance only. However, in the present day when the harmful effects of green house gases and global warming have become so obvious and are also some of the most serious challenges facing the humanity today, this statement is of great significance from environmental consideration.

Needless to say that today there is a great thrust on electricity conservation from economical as well as conservationist and environmental considerations. Fortunately, advancement in technology has provided us with great tools to manage the consumption of energy in a much better manner than that in earlier days. If such energy management systems are optimally used, then wastage of energy can be minimized to a great extent resulting in significant savings in energy consumption.

Instead of the conventional approach to turn on and off lighting, heating and other energy consuming devices as per a set pattern, one can implement an energy management system in the premises (residential / office / industrial). Such an energy system turns on and off the energy

consuming devices as per the demand management. Such a system remotely acquires data from the field into the central computer, displays the relevant data so and sets values and has even alarm to help the manager intervene if required and turns on / off the energy consuming devices as per the actual demand by sending suitable signals from the central computer itself to the relevant energy consuming devices as per the algorithm of the energy management system.

In this manner energy management system works to optimize the consumption of energy and save the energy by cutting down on wastage of the same. Energy management systems can also be utilized for effective exploitation of natural energy resources like solar energy in Arabian countries. Islam et al (511) have carried out measurement of solar radiation in UAE so that this resource can be utilized in an optimum manner. They have reported existence of very high solar energy flux and clear sky condition in UAE throughout the year. This means solar energy can be effectively harnessed in UAE.

Energy management systems can be either dedicated or comprehensive. A dedicated energy management system is suitable for one particular building or plant items. However the comprehensive energy management system manages a collection of dedicated energy management systems.

An energy management system can incorporate one or many of the following functionalities:

Temperature:	Heating, ventilation, hot water, burner controls etc.
Electrical power:	Machinery, office equipment, heating, fans etc.
Lighting controls:	Timer, ambient light level sensor monitors
Plant operation:	combustion efficiency, process control…

…Results

Results from Simulation – 2, about energy consumption in 24 hrs cycle for different values of external temperature in 0 ^{o}C to 20 ^{o}C under different circumstances of insulation and solar gains is presented below in Table 1. From this table it can be seen that the value of total energy consumption in 24 hr cycle decreases with increasing external temperature. The value of total energy consumed in 24 hr cycle also decreases if proper insulation is there. Gains from solar energy are also considered.

Table 1: Energy Consumption in 24 hrs Cycle

	Energy Consumption (kWh)		
External Temperature (^{o}C)	Without Insulation or solar gain or wind and other losses	With Wall and Ceiling Insulation but without Solar Gain and Wind and Other Losses	With Wall and Ceiling Insulation and Solar Gain and Wind and Other Losses
0	36	30	27
5	33	27	24
10	27	22	19
15	20	18	17
20	15	12	12

The plot showing variation of total energy consumption in 24 hrs cycle with external temperature under different circumstances is shown in Fig. 1, below…

…References

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M.D. Islam, I. Kubo, M. Ohadi, A.A. Alili, "Measurement of solar energy radiation in Abu Dhabi, UAE", Applied Energy 86 (2009) 511–515