

Successful Implementation – Energy Conservation Measure

Measure
Optimization of operation of centralized air conditioning units during pre-office and post-office hours
Equipment
Air Conditioning
Industry / Sector
IT
Year of Implementation
2001
Cost Benefit Analysis
⊖ Type of Measure: Short term
⊖ Annual Energy Savings: 0.56 lakh kWh
⊖ Actual cost savings: Rs. 2.92 lakh
⊖ Actual investment : Marginal
⊖ Payback: Immediate
Implementation Highlights
<ul style="list-style-type: none"> ☞ Can be implemented in all types of air conditioning units ☞ Very simple measure. ☞ Can be implemented with out the help of external expertise. ☞ Timer based microprocessor controllers will sustain the energy savings. ☞ Reduction in operating time by 20% there by reduction in wear and tear of the equipment. ☞ The trial was carried out during the summer months (May –June) and there was no complaint from the occupants regarding discomfort.

Summary

Rational use of the air conditioning units based on load and occupancy resulted in energy savings to the tune of 15% with out any investment

Background

In a leading IT company, the office building having three floors uses individual centralized air conditioning units. Different number of split air conditioning units serves each centralized unit; i.e. the refrigerant circuit of the all split units is connected to a common header.

Location	Number of Units connected	TR of each unit	No of units operated	Operating TR
Third Floor CAC	5	15	5	75
Second Floor CAC	9	7	7 or 8	49-56
First Floor CAC	8	7	6 or 7	49-56
Ground Floor CAC	8	7	6 or 7	42-49

Office occupancy is between 9:30 AM & 6:30 PM on weekdays & 9:30 AM to 1:30 PM on Saturdays.

During weekdays (Monday to Friday) all the units were switched on at 8:15 AM and switched off at 6:15 PM. During Saturday the units are operated from 8:15 AM to 1:15 PM.

The power consumption pattern of CAC units during weekdays and Saturday is:

Particulars	Value
Energy consumption during weekday, kWh day	1546
Hours of operation during weekday, h per day	10
Average hourly load, kW	154.6
Energy consumption during Saturday & Sunday , kWh	960
Hours of operation during Saturday, h per day	5

The units installed on third floor have microprocessor-based controller where the unit "on and off times" can also be programmed along with the other parameters. The other split type package units installed for the centralised air conditioning (CAC) application in first, second and ground floors are provided with ordinary thermostats.

A detailed review of the air conditioning unit indicated that the air conditioning system was operating much earlier than required and thereby resulting in more energy consumption. After careful observation of the air conditioning units operation was rescheduled to reduce the operating time of the units without sacrificing the comfort levels.

Revised Schedule of the units:

Location	Proposed operation of units
Third Floor	<p>Weekdays</p> <p>a. Operated only 2 package units during 8:45AM to 9:15 AM and start other 3 units at 9:15 AM.</p> <p>b. Switch off 2 package units at 4:45 PM and operate only 3 units up to 5:45 PM (During Saturday switch off 3 units at 12:15 PM)</p>
Second Floor	<p>a. Operated only 3 package units during 8:45AM to 9:15 AM and start other 4 units at 9:15 AM.</p> <p>b. Switch off 4 package units at 4:45 PM and operate only 3 units up to 5:45 PM (During Saturday switch off 4 units at 12:15 PM)</p>
First Floor	<p>c. Operated only 3 package units during 8:45AM to 9:15 AM and start other 3 units at 9:15 AM.</p> <p>a. Switch off 3 package units at 4:45 PM and operate only 3 units up to 5:45 PM (During Saturday switch off 3 units at 12:15 PM)</p>
Ground Floor	<p>d. Operate only 3 package units during 8:45AM to 9:15 AM and start other 3 units at 9:15 AM.</p> <p>b. Switch off 3 package units at 4:45 PM and operate only 3 units up to 5:45 PM (During Saturday switch off 3 units at 12:15 PM)</p>

After rescheduling the operating schedule of the package units in the centralised systems about one and half-hour operation of units can be avoided.

Details of techno-economics:

Energy consumption per day after implementation	: 1390 kWh
Energy savings per day	: 150 kWh
Annual energy savings	: 56250 kWh
Value of savings	: Rs. 2.92 lakh
Investment	: Nil
Simple Payback Period	: Immediate

Principle

Air-conditioning, in this case, is for providing human comfort. Maintaining the comfort temperatures even without human occupancy consumes energy due to unavoidable losses in the system. Switching-on & off of air-conditioning systems are to closely co-related with occupancy levels & this will avoid unnecessary consumption of energy.

Implementation issues

- ☞ Initially there was resistance from the operators. They were convinced after agreeing to a trial initially for a week. The operating schedule was reduced day after day over a month till it reached the final settings without the knowledge of the office-users.
- ☞ In this case, most of the units in the centralized units are compatible to enhance to microprocessor controllers and hence the cost of the implementation was marginal. In case of manual operation of unit the measure may not result in constant savings unless automated.