

## Successful Implementation – Energy Conservation Measure

<b>Measure</b>
Use of cold outdoor air for cooling during night and early mornings
<b>Equipment</b>
Building air conditioning
<b>Industry / Sector</b>
Software Development office
<b>Year of Implementation</b>
2000
<b>Cost Benefit Analysis</b>
o Type of Measure: Short term
o Annual Energy Savings: 1.13 lakh kWh
o Actual cost savings: Rs. 5.64 lakh
o Actual investment : Rs. 2.50 lakh
o Payback: 6 months
<b>Implementation Highlights</b>
<ul style="list-style-type: none"> <li>☞ Energy savings of 20% envisaged.</li> <li>☞ Can be implemented in air conditioning systems where outdoor night and early morning temperatures are lower than 24 °C.</li> <li>☞ Initially implementation of the measure was carried out by manual operation. After seeing the results, the company went for automatic control, which are simple.</li> <li>☞ Reduces the compressor operating hours thereby increases the life of the equipment and refrigerant.</li> <li>☞ Since 100% fresh air is circulated the volatiles and formaldehydes were flushed off fully and make the space fresh.</li> </ul>

### Summary

Use of cool fresh air during the night and early morning resulted in annual energy cost saving of 20% by reducing the operation of compressors and chilled water pumps used in centralized air conditioning units

**Background**

Eight floors of a software development office has one centralized air conditioning unit (220 TR) which is served by two chillers of 110 TR each. The chiller units have reciprocating compressors and air cooled condensers. Normally one unit will be in operation.

The chillers generate chilled water, where the water is used in the AHUs (each floor has two AHUs) to provide the comfort conditions in the workspace.

The major heating loads in the air conditioning are the occupants, lighting, computers and other office equipment such as photo copiers, coffee vending machines, water coolers, printers, etc apart from solar heat gain. These constantly generate heat, which has to be rejected to the supply of AHU air.

The chillers were switched on at 5.00 AM and switched off at 9.00 PM. Before starting the chillers the temperature in the office was as high as 27 °C due to the heat generated by lighting, servers, UPS battery packs, etc. Hence the chillers were operated early to bring down the temperature below 23 °C.

Most of the time in a year in Bangalore, during the early mornings ( 5.00 AM – 8.00 AM) and late evenings (6.00 PM- 8.00 PM) the ambient temperatures will be below 23°C.

**Measure:****Use of the Bangalore climatic conditions to reduce the operation of chillers and to improve the office working conditions**

- ☰ When the ambient temperature is less than 23°C, only AHUs are operated with 100% fresh air. This measure was implemented by replacing the multi dampers for fresh air inlet with single damper having motorized control.
- ☰ During 5.00 AM – 8.00 AM only AHU fans were operated by delivering 100% fresh air. This resulted in flushing off heat generated during the night. This has reduced the operation compressor and chilled water pump for 3 hours in the early mornings.
- ☰ During 6.00 PM –8.00 PM only AHU fans are operated with 100% fresh air damper open. This avoided operation of compressors and chillers for two hours in a day.
- ☰ The above schedule was altered as and when required based on the climate conditions.
- ☰ The measure has resulted in the getting the fresh air to the occupants and flushing off volatiles and formaldehydes.

The implementation the measure has resulted in avoiding chiller and chilled water pump operation for about 5 hours in day.

**Details of techno-economics:**

Average energy consumption of the chiller unit is	81 kW
Reduction in operating time of chiller unit	: 1400 hours in a year
Annual Energy savings	: 1.13 Lakh kWh
Annual energy savings	: Rs. 5.64 Lakh
Investment	: Rs. 2.50 lakh
Payback period	: 6 months

**Principle**

This energy conservation measure makes use of out side temperatures.

When night time and day time out side temperatures are below indoor temperature by 1°C or more, shutting off the compressors and chilled water pumps and using out door air for night cooling will save energy in most of the areas of the country. The opportunity to use outdoor air for cooling during occupied period depends upon the outdoor temperatures (DBT and WBT).

**Implementation issues**

- ☞ Initially there was resistance from the plant personnel with regard to heat load.
- ☞ After trials of few days this measure was implemented.