

## **HEATING, VENTILATION, AND AIR CONDITIONING ENHANCEMENTS**

Many municipal utilities can reduce building energy requirements by operating heating, ventilation, and air conditioning equipment more effectively or by replacing older units with new, high-efficiency systems. Heating, ventilation, and air conditioning enhancements can provide immediate energy savings while improving indoor air quality and general workplace comfort. These heating, ventilation, and air conditioning strategies, to be described in greater detail, can also extend equipment life and reduce maintenance costs.

### **USE IN THE WATER/WASTEWATER TREATMENT PROCESS**

- **High-Efficiency Heating, Ventilation, and Air Conditioning Systems:**

The latest heating, ventilation, and air conditioning systems can dramatically reduce energy use compared to typical 10-20 year old systems. New air conditioners have high efficiencies—as high as 11.5 energy efficiency ratio—and can reduce cooling energy use about 30-40%. Air-source heat pumps are also very efficient (10.5 energy efficiency ratio) and can reduce heating energy use by about 20-35%. Water-source heat pumps also have superior ratings (15.2 energy efficiency ratio) and can use heat from treated effluent to supply space heating. These systems can be significantly more efficient than air-to-air heat pumps, especially when outside air temperatures drop below 20 degrees Fahrenheit—when air-to-air units are more than 30% less efficient than at 50 degrees Fahrenheit.

Facilities using large, older chillers can optimize energy use by replacing those units with several small package models or by using an oversized cooling tower. Converting to small electric chillers improves efficiency and enables users to sequence units to meet load demand, reducing energy use as much as 0.4 kilowatts/ton, or about 40%. Over-sizing the cooling tower can improve chiller efficiency by about 10%.

A cogeneration system, which can burn facility by-product gases to generate electricity and heat for process use, can also provide space heating in office buildings or plant workspaces, in some cases completely eliminating the traditional heating system. Absorption chillers, which use heat as an energy source, can draw that heat from an on-site cogeneration system.

- **Controls:**

A variety of controllers can improve the performance of new and existing heating, ventilation, and air conditioning systems. Timers and electronic time clocks can stop equipment operation when the building is unoccupied, to reduce energy use during periods of low occupancy. Alternatively, electronic thermostats can automatically reduce temperature set points during unoccupied periods, effectively turning equipment off. A computerized energy management system can manage energy use throughout a building on the basis of weather conditions, building use patterns, and a host of other variables, potentially reducing building energy use by 10-20%.

- **Ventilation:**

Buildings require a certain amount of outside air to remove odor and contaminants, yet excessive flows increase heating and cooling costs most of the time. Installing an outside air economizer that automatically controls air flow will minimize energy consumption and improve indoor air quality. For systems with manually controlled dampers, setting air flow levels to match ventilation needs will minimize heating and cooling energy needs. In laboratories, careful control of exhaust hoods can help prevent air loss. In addition, variable-frequency drives can modulate laboratory exhaust fans to minimize energy use.

- **General Operation and Maintenance:**

For older space conditioning systems, replacing the pilot light with an electronic intermittent ignition device will eliminate unnecessary energy use. To prevent energy losses caused by dirt, maintenance routines should include regular cleaning of the condenser, evaporator coils, and intake louvers. Regular cleaning of air filters alone can lower energy use as much as 20% and extend equipment life. Outside air economizers should be cleaned regularly and checked to ensure that they are functioning properly.

## **DEMONSTRATED SUCCESS**

Wide experience has confirmed that heating, ventilation, and air conditioning improvements can lead to significant energy savings. Actual savings will vary from site to site, depending on such factors as climate, energy rates, and systems being used.

## **REFERENCES**

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- [Commercial Unitary HVAC Equipment: High-Efficiency Units](#), MI-105198, EPRI, May 1995.
- [Improving the Energy Efficiency of Wastewater Treatment Facilities](#), WSEO-192, Washington State Energy Office, June 1993.
- [Power Electronics and Controls Program: Projects and Products](#), 1978-1989, EPRI CU-6854SR, May 1990.
- CFCs and Electric Chillers, TR-100537, EPRI, March 1992.

## **OTHER RESOURCES**

- [1995 ASHRAE Handbook: HVAC Applications](#).