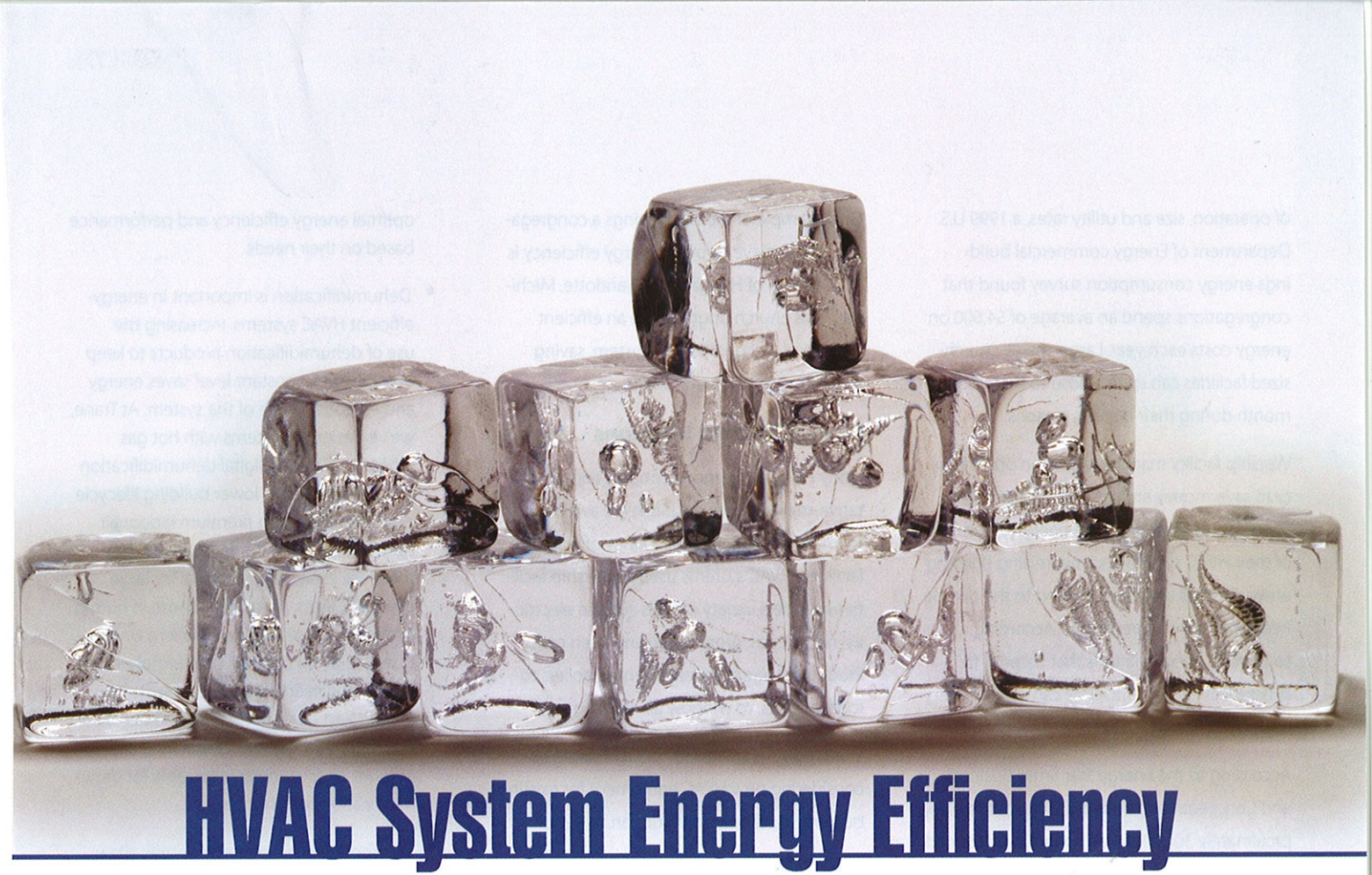

# HVAC System Energy Efficiency

## [ Environmental and Bottom-Line Benefits ]

*by Robert Johnson*

Good stewardship of resources is always on the minds of church management and staff. Saving money in one area means those resources are available for other needs in the church. Improving the efficiency of a heating, ventilation, and air conditioning (HVAC) system is one of the easiest ways for worship facility managers to increase building energy efficiency, save money and be environmentally responsible.

**Energy Usage and Loss**

energy conservation. Vaulted ceilings and poorly insulated stained glass windows – while beautiful – are two examples of design elements that contribute to energy loss.

Worship facilities present unique HVAC challenges when designing new buildings and renovating existing facilities, but these challenges are not necessarily due to the common belief that worship facilities have relatively low hours of occupancy compared to other non-residential facilities.

Today's worship facilities also serve a variety of purposes beyond being houses of worship. Often, church facilities serve as the cornerstone of many communities where their buildings are used for social functions, schools, community centers and shelters. "Many worship facilities often exceed 80 hours of operation in one week," explains Jerry Lawson, national manager of the Energy Star Small Business and Congregations Network, U.S. Environmental Protection Agency (EPA),

of operation, size and utility rates, a 1999 U.S. Department of Energy commercial buildings energy consumption survey found that congregations spend an average of $4,600 on energy costs each year. Large, mega-church-sized facilities can spend close to that each month during their harsher seasons.

Worship facility managers have an opportunity to save money and be environmentally responsible by improving the energy efficiency of their HVAC system and minimizing building energy use, all while responding to the diverse needs of their congregations. According to Lawson, congregations that commit to substantial energy efficiency can reduce utility costs by 25 to 30 percent.

According to the Energy Star Small Business and Congregations Network, if the nation's approximately 307,000 worship facilities reduced their energy use by 25 percent, congregations would save nearly $500 million in utility costs, more than 13,500,000,000 kilowatt-hours (kWh) of electricity would be available without the need for new power plants, and more than five million tons of carbon dioxide ($CO_2$) emissions would be prevented. "This is the equivalent of removing one million cars from roadways or planting nearly 1.4 million acres of trees, in addition to providing congregations financial savings that can be applied to youth activities, mission outreach or other stewardship priorities," Lawson adds.

While higher initial costs involved in buying an HVAC system are often a concern, worship facility managers must also consider the total cost of ownership over a system's complete lifecycle. If energy-efficient HVAC systems are well-maintained and energy is properly conserved, the total cost of ownership may be less than the energy and maintenance costs associated with inefficient systems.

One example of the cost savings a congregation can achieve through energy efficiency is St. Elizabeth of Hungary in Wyandotte, Michigan. This church upgraded to an efficient boiler and air conditioning system, saving $11,000 annually in utility bills.

## Energy-Efficient Solutions

Many HVAC equipment, controls and preventative-maintenance solutions are available to improve the energy efficiency of worship facilities. HVAC systems used in worship facilities include a variety of fuels such as electricity, natural gas, propane, oil and even coal. Products range from large central boilers to rooftop units, to window air conditioners.

The following are tips for facility managers considering new HVAC equipment for existing buildings and new construction projects.

- Enlist the advice and service of a trained HVAC professional. Facility managers should engage an expert HVAC professional with experience in energy efficiency to evaluate a building's HVAC system for cost and performance improvements – especially for systems greater than 10 years old. A trained HVAC professional will work closely with the worship facility manager to determine the unique needs of the congregation and its buildings in order to select the most appropriate HVAC system.
- Use building modeling software. Design is critical, particularly if new construction is planned. Facility managers should work with a trained HVAC professional and consider building modeling software that complies with the United State's Green Building Council's standards to help establish the peak heating and cooling loads based on the varying uses of the worship facility. Trane's TRACE 700 chiller plant analyzer, DOE-2, and BLAST are examples of such modeling software. Building modeling ensures congregations minimize capital costs related to a new system and achieve optimal energy efficiency and performance based on their needs.
- Dehumidification is important in energy-efficient HVAC systems. Increasing the use of dehumidification products to keep humidity at a constant level saves energy and extends the life of the system. At Trane, we've designed systems with hot gas reheat with direct digital dehumidification controls in order to lower building lifecycle costs and providing premium indoor air quality in any climate. Solutions such as these are especially beneficial for large internal spaces, particularly those in humid climates such as the southeastern United States. Look for systems that comply with the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 90.1 guidelines that limit the amount of new energy allowable for dehumidification using reheat.
- Incorporating automated controls allow HVAC systems to be optimized relative to the operational characteristics of the facility to improve energy efficiency. Programmable thermostats enable air conditioning and/or heating to be set back for certain times of the day, days of the week, or longer periods of "down time," when those parts of the worship facility are not in use. Programmable thermostats generally are a low-cost and convenient option. For example, the Islamic Education Center (IEC) of Potomac, Maryland, uses programmable thermostats throughout the facility to save up to 20 percent on heating and air conditioning costs by providing more accurate control of building temperature and allowing automatic setback.
- Maintenance is vital. Quality maintenance will protect a congregation's investment and sustain building energy efficiency. Maintenance contracts with seasonal tune-ups should be considered for all major HVAC systems to ensure high levels of reliability, longer service life and improved efficiency. Retrofit and replacement equip-

ment can upgrade and enhance a worship facility's HVAC system while providing increased safety, productivity and efficiency.

## Environmental Benefits of Energy Efficiency

Energy efficiency provides several benefits to congregations, including improved environmental responsibility due to improved energy conservation, utility cost savings due to reduced energy use, reduced power plant production, reduced demand for fossil fuels, and lower emissions of pollutants in the atmosphere.

In recognition of their environmental stewardship, congregations can achieve the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) certification by working with design and construction teams experienced with U.S. green building specifications. The EPA's Energy Star Small Business and Congregations Network (www.energystar.gov/congregations) offers information and resources to assist congregations in making decisions to improve the energy efficiency of their worship facilities.

It is certain that energy costs will continue to rise in the future, making energy conservation increasingly important. As more and more congregations commit to environmental stewardship, their interest in "high performance" or "sustainable" buildings that incorporate energy conservation and environmentally sound principles in their design will continue to grow. Environmentally responsible HVAC solutions are available to meet the growing needs of congregations dedicated to environmental stewardship.

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