AFCESA

TECH DATA BULLETIN

ENERGY SAVINGS IN MWR CLUB FACILITIES JULY 1997

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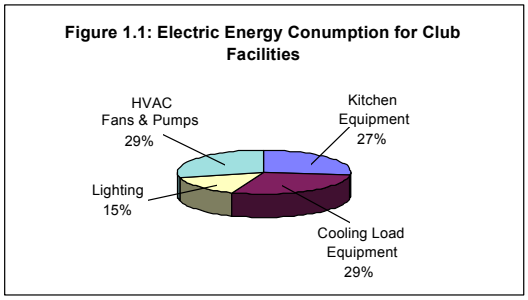
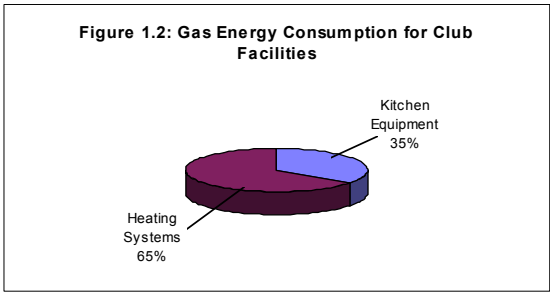
SYNOPSIS

This report will address energy conservation opportunities (ECOs) present in club facilities and items to evaluate when performing an energy audit.

INTRODUCTION

Due to the nature of their operation, many ECOs exist at club facilities. These facilities have a high energy use per square foot. The following figures illustrate the approximate breakdown in energy consumption by system for club facilities. The amount of savings will vary by club, by region of the country, and actual system configuration.





LIGHTING SYSTEMS

Most club facilities contain abundant amounts of lighting from a variety of sources. Each different type of lighting system contains ECOs which can be evaluated for energy savings. This bulletin will describe and evaluate general ECOs as well as each lighting type.

Simple Turnoffs

Simple turnoffs are the easiest way to save energy. The club's staff should be aware of the high cost of energy and be required to turn off lights when they are not necessary. Incandescent lights should be immediately turned off. Fluorescent lights require a slightly different approach. Each time a fluorescent fixture is turned on or off, the life of the lamps and the ballast is decreased so that a tradeoff exists. If the fluorescent lit area is or will be unoccupied for approximately 10 minutes or longer, the lights should be turned off. Otherwise it is not cost effective to turn fluorescent lights off due to the decreased life of the fixture.

Delamping

Delamping can be performed in areas that are either overlit or simply have unnecessary lights. When performing an energy audit, pay close attention to light levels in all areas of the club to identify delamping opportunities. Unnecessary light fixtures may also exist and present delamping opportunities. Observe whether wall washing or spot fixtures are present and may be delamped. Stairs or handrails may contain small strip lights which can be delamped.

Incandescent Lighting Systems

Club facilities typically utilize a majority of the lighting energy consumed by incandescent lighting systems. These systems should be evaluated in two categories: dimming systems and non-dimming systems.

Dimming Systems. Incandescent lamps operating on a dimmer switch can be replaced with high efficiency lamps. Higher efficiency chandelier bulbs are not yet available in the commercial market. These bulbs would allow the standard 40-watt lamp to be replaced with a 15 to 25-watt lamp. When commercially available, these lamps will become a significant savings opportunity in club facilities.

Recessed incandescent lamps operating on dimmers can be replaced with halogen lamps or a complete compact fluorescent fixture rated to operate on a dimmer switch. When using a halogen replacement, no retrofit to the fixture is required. A one-for-one lamp replacement can be performed. When using a compact fluorescent replacement, a special compact fluorescent fixture rated to operate on a dimmer must be installed. While this option is obviously higher in cost, the compact fluorescent system will realize more energy savings than the halogen replacement. Compact fluorescents consume approximately 75% less energy than incandescents while maintaining the same light levels.

Non-Dimming Systems. Incandescents not operating on dimmers should be evaluated for replacement with compact fluorescents. Two replacement options exist. A direct replacement can be performed utilizing a compact fluorescent with a screw-in ballast adapter. The second option is a fixture replacement utilizing a hard-wired fixture. A variety of sizes and shapes of compact fluorescent bulbs are available to meet most fixture requirements.

Fluorescent Lighting Systems

When evaluating ECOs in general fluorescent lighting systems, be sure the most efficient fluorescent lamp is used. The standard T12 (1½ inch diameter), 4-foot fluorescent tube is rated at 40-watts. Energy saving, 34-watt lamps are available and should be used in place of the 40-watt lamps. One step further in fluorescent technology efficiency is the T8 (1 inch diameter) lamp with an electronic ballast. When performing fixture retrofits or replacements, the T8 fluorescent system should be used in place of the T12 technology. Reflectors can also be installed in existing fixtures, or as part of a new fixture, to allow for a lamp reduction when retrofits are performed.

Exit Signs

The current standard technology for exit sign lighting is incandescent. Each sign contains two (2) 15- or 20-watt incandescent bulbs with a rated life of 1,000 hours. Fluorescent exit sign retrofit kits are available which retrofit existing incandescent signs to fluorescent technology utilizing two (2) 7-watt fluorescent bulbs with a rated life of 10,000 hours. However, the premium technology is the light emitting diode (LED) technology. Retrofit kits are available

for incandescent signs which utilize 1.8 to 3.0 watts per sign with a rated life of 25 years. The LED lights can reduce by 80% the amount of energy used by incandescent lights. In the Air Force, the required installation is LED lights per Air Force Engineering Technical Letters (ETL) 94-5, *Fire Protection Engineering Criteria and Technical Guidance - Emergency Lighting and Marking of Exits*, dated 8 Nov 94, and 95-4, *Mandatory Energy/Water Performance Standards for Replaced or Modified Equipment*, dated 31 Oct 95. Coordinate with the base Fire Department before making a wholesale replacement of exit sign lighting.

Controls

Evaluate locations for the installation of occupancy sensors. Occupancy sensors work well in areas such as restrooms or administrative areas where lights tend to be left on unnecessarily for long periods of time. Dual source occupancy sensors are available utilizing both ultrasonic and passive infrared technologies.

If an energy management control system (EMCS) is available, consider connecting lighting systems. Lighting could be scheduled according to the operating hours in the various areas of the club. Exterior lights can also be connected to the system which would provide more reliable control than time clocks (if this technology is in use).

COOLING SYSTEMS

Scheduling

Evaluate the operating schedules of the building's air conditioning and heating equipment. Equipment should be scheduled to operate as close as possible to the actual operating hours of the club. Equipment operation can be controlled with an EMCS or time clocks.

Controls

If multiple chillers or pieces of air conditioning equipment are present, the units should be controlled so that only one (1) unit is in operation, if it can meet the load requirements. If multiple units are required to meet the cooling load, the load should be equally divided between the units, if possible, to provide the optimum operating efficiency.

If a chilled water system is in use, pump controls should be interlocked with the chiller controls. The chilled water pump should only be in operation if the chiller is on.

Consider the use of variable speed drives on secondary pumping systems, if present. The use of a variable speed drive can save significant amounts of energy over the more traditional throttling method used for flow control.

Equipment Type

Due to the CFC issue, many facilities must consider the replacement or retrofit of existing air conditioning equipment. When faced with replacement opportunities, the use of

natural gas should be considered. Natural gas cooling can be accomplished through the use of several different types of equipment such as natural gas engine drive chillers, direct fired absorption chillers, and desiccant cooling. The use of natural gas for cooling can, in some areas, represent a significant reduction in operating costs when the natural gas rate is much less than the electric rate. Whatever system you choose for replacement or new construction insure that it complies with ETL 95-4, dated 31 Oct 95.

HEATING SYSTEMS

Scheduling

As previously discussed, heating systems should be scheduled to operate as closely as possible to the operating schedule of the club. Due to freezing concerns in some areas, shutting the system down at night may not be a viable option. However, consider nighttime thermostat setback to reduce the space temperature.

Controls and Maintenance

Only the heating units required to meet the heating and/or steam requirements should be in use. Significant energy savings can be obtained through the correct sequencing of equipment operation.

When auditing a club, a combustion efficiency test should be performed on the existing boiler. Maintenance is very important in all heating and cooling systems, but especially so for boilers. Due to the combustion process and water quality, boilers need routine maintenance. Depending on the hours of operation, boilers require at least an annual tube cleaning and boiler tune-up. If the boiler is operated year round for steam and domestic hot water requirements, a more frequent maintenance schedule should be implemented.

Equipment Type

Fuel source and equipment efficiency should be important factors in determining the type of equipment installed, especially in retrofit cases. For boiler systems, consider using multiple, small boilers more so than one larger boiler. This can prevent or reduce the amount of low load losses experienced in the spring and fall when heating loads are low. This may also be an important consideration if the boiler is used during the summer months for domestic hot water or steam requirements. Whatever system you choose for replacement or new construction insure that it complies with ETL 95-4, dated 31 Oct 95.

AIR HANDLING SYSTEMS

Maintenance

The primary maintenance consideration for air handling systems is air filters. Ensure that the filters are clean and installed properly. Dirty air filters cause an increase in energy consumption as well as poor indoor air quality.

Space Temperature

Check the space temperatures of the areas surveyed within the club. Air handling units should have proper controls to regulate space temperature properly. Over-cooling or over-heating spaces can result in significant energy waste (approximately 4% to 5% per ^{0}F).

Often clubs are over-cooled in the attempt to control humidity. Reducing space temperatures will not control humidity levels. When areas are unoccupied or have low occupation, reducing the amount of outside air by closing the outside air dampers is the most effective means of humidity control.

An EMCS is recommended. The EMCS can properly adjust space temperatures at night or during holidays when the club is not in use. If problems exist with increasing or decreasing space temperatures at night, outside air should still be significantly reduced or eliminated. One important thing to remember is that EMCS's are only as good as the equipment they control. For example, if the boiler, outside air dampers, and/or air handlers are not functioning properly a good EMCS will be ineffective.

MOTORS

The primary element to evaluate for motors is the efficiency. The use of high or premium efficiency motors can produce significant energy savings, especially if the motor is used year round. Review ETL 95-4, dated 31 Oct 95 for mandatory Air Force criteria.

KITCHEN EQUIPMENT

Kitchen equipment not in use should be in the off position. Often ovens, stoves, and other equipment are left operating in anticipation of their next use.

The proper use of kitchen equipment can provide significant energy savings. During an energy audit, check to see that the dishwashing equipment is equipped with a booster heater. If a booster heater is present, check the hot water temperature at a tap. The temperature should be approximately 120^0F or lower. The booster heater should be capable of elevating the temperature to the required 160^0F - 180^0F required for rinsing.

Coils on freezers and refrigeration equipment need to be kept clean. Dirty coils reduce heat rejection and can increase the energy consumption of equipment by 10% to 15%.

Investigate installing or expanding the use of natural gas or steam appliances in place of electric units. Since clubs are generally in full use during the peak demand part of the day, electric demand charges can make electric appliances very expensive to operate and fully justify replacement with natural gas or steam units.

Investigate the use of microwave ovens in place of electric or natural gas appliances. Microwaves are more efficient and reject much less heat to the surroundings.

ENERGY AUDITS

An energy audit is a study to identify how energy is currently used in a facility. The primary purpose is to determine how to reduce energy use and cost. "Energy survey," "energy analysis," and "energy conservation study" are similar terms that may refer to the same type study. An energy audit should answer the following four questions:

How much energy of each type is being used?
How much does the energy cost?
What is the energy being used for?
What opportunities exist for reducing energy use or cost?

Federal regulations identify several levels of energy audits, which were offered to support specific energy conservation programs. As the energy conservation field has matured, "energy audit" has become the standard term for a site-specific energy analysis.

CONCLUSION

Many ECOs are present in club facilities. A close inspection can reveal opportunities for no cost/low cost energy savings that will bring energy consumption and cost down without affecting the quality of service provided the customer. For more details check with the base energy manager who can help perform an energy audit and develop a training program for the club's staff in energy saving techniques.

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