

Cost-Effective Energy Savings

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Technology: Energy Management and Control

Background

Energy costs continue to rise 3-5% per year as more electrical appliances and instruments are incorporated into our daily lives. The cost of energy in this country has, for the most part, been inexpensive when compared with other necessities such as education, food, clothing, housing, and health care. Consequently its consumption has been mismanaged in that significant amounts of energy are routinely wasted due to a variety of reasons. In order to understand how to save energy one must understand how it is being wasted. The US Government already understands and has passed the *Energy Policy Act of 1992* which requires government facilities to reduce baseline energy consumption 10% by 1995, 20% by 2000, and 30% by 2005. Since **most buildings** currently waste upwards of 50% of the energy consumed, it is most timely to address how to reduce energy consumption.

Typical Examples of Energy Waste

- ✦ Running exhaust fans continuously rather than only when required. Whether the building is being cooled or heated the lost air has to be replaced and either cooled or heated. While not significant in itself, the job of saving energy is a combination of tasks which, when considered cumulatively, become significant.
- ✦ Using low efficiency motors, pumps, and lighting fixtures.
- ✦ Inadequate insulation and solar screen window protection.
- ✦ Air leaks in HVAC (heating, ventilation, and air conditioning) system.
- ✦ Improper settings on boilers, chillers, and other equipment.
- ✦ Non-occupancy lighting, heating, and cooling.
- ✦ Widespread failure to use outside (make-up) air to advantage.

Energy Audit

In order to establish or quantify the degree of energy savings that can be achieved, a thorough examination of the building and its mechanical and electrical equipment is absolutely necessary. This audit will indicate:

1. The total savings possible and,
2. The associated costs to accomplish the savings in each of several categories.

The cost of energy savings is not the same for all categories. This is why it is prudent to pursue those savings that can be accomplished at least cost on a priority basis with

other savings to follow. A general breakdown of the energy savings falls into several categories (please refer to the chart, next page).

Very few companies have the expertise to conduct a thorough energy audit. An energy audit represents:

1. The starting point to achieving a reduction in energy costs, and
2. The benchmark to track one's energy reduction efforts.

At WaterSmart Environmental the Energy and Power Management Division uses a proprietary energy analysis computer program to accurately predict energy savings. This program was developed in-house using 250 buildings as the database.

All Buildings Are Unique

Every building requires a customized approach to saving energy. It all begins with an energy audit to quantify the potential for savings. Some of the savings are clearly objective such as changing the lighting equipment and/or insulation which then results in the savings projected. Other activities, such as employee training, are subjective. The savings are far more difficult to measure but are, nonetheless, just as real. In every such instance, however, the actual savings per sq. ft. of building area are easy to estimate. Not to be forgotten is that the return on investment differs relative to each energy saving procedure or step. Changing out lighting equipment may have a 2-3 year payback whereas an employee training program may pay for itself in 2-3 months. When one then applies the energy savings available with each above procedure, the decision on what to do first generally becomes easy to make.

Energy Savings vs. Control Equipment

There is a common belief that companies that sell energy management control systems (EMCS) are exclusively interested in saving energy. This is not necessarily true, as there is a built-in sales incentive to sell but the control equipment. If the seller of the energy management system is also a manufacturer of the control equipment, the buyer ought to closely examine the seller's true motivation. A full service EMCS company will offer an exhaustive energy audit to quantify the problem as well as employee training as an integral component of the complete energy saving program.

Total Savings

Direct energy savings account for only 1/3 of the total actual savings. An additional 1/3 savings occur as a result of lesser mechanical equipment replacement and repair. The last 1/3 is tougher to quantify but just as real. These savings are attributable to employee or worker productivity

and greater job satisfaction due to the optimization of the work place environment. Therefore, the total savings far exceed the actual energy savings and quickly show up on the bottom line. An energy audit represents the first step

in saving energy and this service is available from the Energy and Power Management Division, a full service EMCS company.

Potential Energy Savings		
Category	Description	Savings Potential
Preventative Maintenance	Preventative maintenance (PM) includes routine typical tasks such as lubricating motors and bearings on a regular basis, changing belts when necessary, and replacing filters before they become plugged. A good PM program can easily double the life expectancy of the mechanical equipment and therefore easily pays for itself.	5%
High Efficiency Motors and Pumps	Modern pumps and motors are far more efficient than the older components they replace. It may well be cost-effective to change out some of these components before waiting for them to become obsolete or inoperative.	5%
Window Solar Screen, Building Insulation	The use of insulation and window solar screens impact positively on energy savings. What is somewhat surprising is that these two building upgrades have not been widely adopted to date.	4-8%
Lighting	Traditional fluorescent light ballasts are extremely inefficient. A ballast for a 4 lamp fixture may consume 40 watts of energy whereas the replacement solid state ballast consumes less than 4 watts for a 90% reduction. In addition, old style ballasts add to the heat load which helps in winter but hurts during the summer months. Lastly, motion detectors can automatically turn lights off when the building/room is unoccupied.	8-10%
Employee Training	Top management must support the concept of saving wasted energy if past building operation and maintenance practices are to be modified. In a power plant, for example, an employee will almost certainly undergo serious questioning, and perhaps may be terminated, if a 3/4 HP motor is used on an application where a 1/2 HP motor is adequate. Power plant employees are continually told that the purpose of the power plant is to sell, rather than consume, electricity. Building maintenance employees likewise must learn to support the notions of turning off lights when not needed, using timers on exhaust fans, adjusting boilers and chillers at proper rather than excessive set points, closing outside doors and windows when not in use, and the list goes on.	10-15%
Computer Control System	A computer control system can keep track of routine maintenance, automatically mix outside air with inside air when cost-effective to do so, throttle rate-of-flow valves in order to optimize air flow, and a variety of other routine tasks such as turning down the thermostat at night, detecting the future failure of a pump or motor based on operating trends, scheduling preventative maintenance, and calling selected people in the event of an improper (outside of limits) operating condition.	15-20%

