

Automated On/Off

A Pacific Energy Center Factsheet

How This Technology Saves Energy

Automatic on/off lighting controls are either programmed or event-initiated to turn off lights when a building space is either unoccupied or occupied by workers performing tasks that do not require full light levels (e.g. cleaning after normal building operation hours). For off-hours lighting needs, these systems require overrides so lighting control can be regained by building users.

Energy-Efficiency Measures

Door Jamb Controls

Door jamb controls, used primarily for closets and walk-in freezers, are spring-loaded on/off switches located in the door jamb. They turn lights on when the door is open and off when it is closed.



Elapsed-time switches

Elapsed-time switches typically fit into or over a standard wall switch box and allow occupants to turn lights on for a period set either by the occupant or the installer. Lights go off at the end of the period, unless the time cycle has been restarted by the occupant.



Clock switches

Clock switches turn lights on and off at preset times, regardless of occupancy. They can be mechanical or electronic. There are several varieties, such as 24-hour and 7-day time switches. Some clock switches have an astronomical feature that automatically compensates for changing ambient light.

Photosensors

Photosensors respond to changes in light. They turn on lights when the ambient light level falls below a preset level and turns them off when that level is exceeded. Like time switches, they have been used for many years to control outdoor lighting. They can respond to overcast conditions during the day and provide safety and security when more lighting is needed unexpectedly. Some have time-delay devices to help prevent rapid off-on cycling on partly cloudy days.



Occupancy Sensors

Occupancy sensors are switching devices that respond to the presence and absence of people in their field of view. A motion detector senses motion and sends a signal to either close or open the relay that controls power to the lights. Passive infrared sensors (PIR) are the most common type of occupancy sensor. Triggering occurs when a change in infrared levels is detected, such as when a warm object (usually a person) moves in or out of view of one of the

sensor's "eyes".

Ultrasonic sensors emit a high-frequency sound, above human and animal audibility, and listen for a change in frequency of the reflected sound. Hybrid sensors are offered by several manufacturers. They use infrared and ultrasonic technologies simultaneously, combining the sensitivity of ultrasonics and the resistance of PIR's to false triggering.

Radio-Controlled HPS Ballast Systems

Radio-controlled HPS ballast systems switch lights on and off with radio-frequency signals. They are available for 400-watt high pressure sodium industrial lighting. Very flexible, the system can help assure adequate lighting despite changing task or workstation layouts.

Microprocessor-based centralized load programmers

These are time-oriented programmable devices that control a number of loads from a central source. Users can schedule on/off periods for selected loads for a year at a time, accounting for changing ambient light, weekends, holidays, even leap years. In office buildings, for example, the lights would typically be programmed to switch off after workers had left for the day. Most units also have a duty-cycle capacity, battery backup and an entry code to help prevent tampering.

Benefits and Pitfalls

Significant energy savings can be achieved by automated on/off controls if they are applied correctly. Both benefits and pitfalls of various options should be considered before selecting the best one.

Benefits

- Energy savings from lighting controls are very dependent on baseline (i.e., before the retrofit) conditions. Savings of 10 to 45 percent of baseline lighting consumption are possible.
- Door jamb controls can be effective energy savers in closets and walk-in freezers.
- Time-based controls are most appropriate when occupancy is predictable and lights can be off (or at low levels) without adversely affecting productivity, safety, or security.
- Most time switches are available with a back-up in case of power outage.
- Photosensors are a good choice when daylighting can offset portions of the lighting load.
- Occupancy sensors are best where occupancy cannot be well predicted or is intermittent.
- Radio-controlled ballasts can save up to 45 percent of baseline energy use in 400-watt HPS industrial lighting by turning off unnecessary lights.
- Microprocessor-based centralized load programmers should be used when it would be beneficial to control many loads with varying start and stop operations from a central source.

Pitfalls

- A retrofit must be installed easily to be cost-effective. Major hidden costs, such as wiring access, rewiring and labor can have a very negative impact.
- Consideration must be given to issues such as power quality before specifying a control strategy.
- To be effective most automated on/off controls must have an override so that lighting control can be regained by building users.
- The daylighting use of photocells should be limited to fixtures within about 12 feet of outside walls.
- Proper installation and follow-up adjustment are essential parts of any sensor program.
- Occupancy sensors are quite visible and can be improperly adjusted, stolen, vandalized, or fooled into perceiving human motion in an unoccupied space.

For More Information

Contact your PG&E representative or call 1-800-468-4743 for more information about PG&E's energy efficiency programs and other services.

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