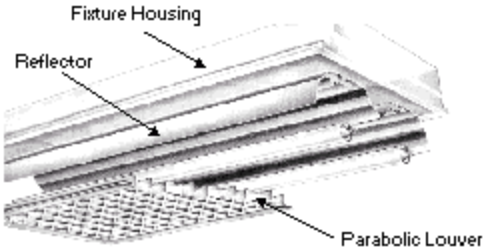
Full Size Fluorescent Lamps & Fixtures

A Pacific Energy Center Factsheet



How this Technology Saves Energy

Fluorescent lighting is the preferred system for general lighting in many commercial and industrial facilities. The energy consumption of full-sized fluorescent systems can be reduced by: (a) removing lamps in overlit areas; (b) improving fixtures so that light is distributed efficiently; (c) selecting the best lamp-ballast combination; and (d) applying control technologies such as occupancy sensors and dimming.

Types of Efficiency Strategies of Full-Size Fluorescent Lighting

Savings from Reducing Over-lighting

Many spaces simply have too much electric lighting, and substantial energy can be saved by reducing it. This can be done by removing lamps, converting 3- or 4-lamp fixtures to 1-, 2-, or 3-lamp fixtures, retrofitting with lower output lamp-ballast systems, or using dimming or other control systems. Such retrofits typically provide large energy savings and rapid paybacks. Reducing light output should be done with attention to the quality of the resulting light, its distribution, surface brightness, and glare potential.

Improving Fixture Efficiency

Distributing light effectively is as important as generating it efficiently, and can dramatically affect visual comfort.

Reflector Retrofits

Reflectors are specially shaped metal sheets which improve light distribution from conventional ceiling-mounted fluorescent fixtures. They can significantly decrease the internal losses of fixtures and widen or narrow their light distribution, often allowing significant energy savings from delamping.

Lenses and Louvers

Lenses are thin plastic sheets that redirect light from fluorescent fixtures. They are substantially more efficient than standard diffusers, whose translucent plastic construction absorbs a great deal of light. Louvers are used to control glare from ceiling-mounted

downlight fixtures. The most common type is the parabolic louver, which uses carefully curved reflective surfaces that direct light downward and reduce any view of the lamp from other angles. Fixtures with well-designed parabolic louvers may allow reducing the number of fixtures providing light to a space.

High-Efficiency Lamp-Ballast Systems
Improved lamps and ballasts offer many choices and are particularly cost-effective when replacing existing systems which use T12 lamps and magnetic ballasts.

?? *"Energy-Saving" (ES) Lamps:* In the 1970s, manufacturers found that adding krypton to the standard argon gas fill reduced both energy consumption and light output. Lamps using the two gases are now commonly available under trade names like WattMiser(r), SuperSaver(r) and WattSaver(r). A typical ES lamp-only retrofit costs about $7 per lamp including labor, produces 15 percent energy savings with only 10 percent loss of light output, and has a simple payback of about two years.

?? *Electronic Ballasts:* Fluorescent technology took a major leap forward with the electronic ballast. These ballasts use solid-state electronics to produce the high-frequency alternating current required by the lamp. Other components minimize harmonic distortion, maintain a high power factor, and shape the power waveform. Electronic ballasts typically cut internal power losses 3 to 8 watts per ballast (from about 16 watts per ballast), operate lamps 10 percent more efficiently, cut losses by driving more lamps per ballast, are less affected by temperature and voltage variations, automatically de-energize failed lamps, improve lamp efficiency, and eliminate visual flicker. These improvements can combine to create very large energy savings.

?? *Hybrid Ballasts:* These 60-Hz devices use magnetic technology to power the lamp and solid-state electronics to control power to the cathodes. They are very popular for energy savings, since they power T8 or T12 lamps with some of the efficiency gains of electronic ballasts while costing significantly less.

?? *Electronic Ballasts and T8 Lamps:* A typical electronic-ballast/T8 lamp retrofit using 2-lamp ballasts costs about $30 per lamp (including all materials and labor), saves 35 percent of energy while boosting light output by 7 percent, and has a payback of 4 to 5 years. Using four-lamp ballasts cuts costs further and payback drops to under 3 years.

Control Strategies

Controls should be considered after establishing the correct lighting level, improving fixture efficiency, and using high-efficiency lamps and ballasts. Like other systems, fluorescents can take advantage of a multitude of control systems to create energy savings. Control strategies include simple manual on-off systems, occupancy sensors, elapsed-time switches, clock switches, scheduling through a building energy management system, and step-dimming or continuous dimming using manual or automatic photocells.

Benefits and Pitfalls

Several energy-efficient fluorescent options exist for retrofits and new construction. However, designers must be careful to choose the most appropriate lighting option for each space. The following benefits and pitfalls should be considered when deciding on improvements to a lighting system.

Benefits

?? With good design, lighting energy use in most buildings can be cut 50 to 80 percent, compared to a conventional, inefficient system 10 to 30 years old.
?? Lighting levels can be reduced in overlit spaces, providing better visual comfort, reduced maintenance costs, and lower energy use.
?? T8 lamps with non-dimming high- frequency electronic ballasts have excellent energy efficiency and well-established performance.
?? Lighting controls save energy by turning lights off when not needed or dimming lights when appropriate.
?? Instant-start ballasts provide the best lighting efficiency. When lights are typically on less three hours, rapid-start ballasts are a good alternative.
?? Replacing standard diffusers with louvers or lenses can improve light distribution and substantially improve fixture efficiency.

Pitfalls

?? Lamp life may be reduced by 25 to 50 percent when operated with low-ballast-factor electronic instant-start ballasts.
?? Delamping to reduce over-lighting, without improving light distribution or quality, will reduce visual comfort.
?? "Energy-Saver" lamps have a higher rate of lumen depreciation than standard lamps, provide 10 percent less light, are very sensitive to operating current, and cannot be deeply dimmed or run on low-ballast-factor ballasts.
?? Highly efficient reflectors often require relocating existing lamps to avoid glare and give optimal light distribution.
?? No single retrofit reflector kit will work well in all situations. Even in a building with one type of fixture, several reflectors may be needed.

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.