

# THE ENERGY OBSERVER

Energy Efficiency Information for the  
Facility Manager

Quarterly Issue – December 2006

## Outdoor Lighting

*The Energy Observer* summarizes published material on proven energy technologies and practices, and encourages users to share experiences with generic energy products and services. This quarterly bulletin also identifies informational sources and energy training for facility managers and staff. *The Energy Observer* is a service of the Energy Office, Michigan Department of Labor & Economic Growth.

This issue focuses on outdoor lighting technologies that are commonly used and the most energy efficient options.

There are many valid reasons to light the outdoors. Applications including safety, security, aesthetics, and economic development opportunities. However, it is important to understand how much outdoor lighting is needed and how to balance the amount of lighting used while minimizing pollution and energy costs.

### TYPES OF OUTDOOR LIGHTING

**Mercury Vapor** was commonly used for a number of outdoor applications such as security lighting, decorative lighting and some indoor applications. It has a relatively long life compared to most other lamps, especially incandescent. These lamps consist of a quartz tube filled with pressurized mercury gas. Light is produced when an electrical current passes through the mercury vapor. Like all such high intensity discharge (HID) lamps, a "ballast" is required to start and to

operate the lamps at the correct voltage levels.

For savings, one can and should use the lowest possible wattage for the application. Mercury Vapor is the least efficient HID Lamp. When replacements are indicated, you should replace the entire fixture. Use a more efficient light source, such as Metal Halide (MH), High Pressure Sodium (HPS), or Low Pressure Sodium (LPS), and use a high quality fixture, one that directs the light output only to the areas needed. A cost analysis study will show remarkable energy saving potential for replacing mercury vapor fixtures.

**Fluorescent** lamps are about four times more efficient than incandescent lighting. They are commonly used for indoor applications but can also be used in low level outdoor areas such as overhangs, entrances and other decorative applications. The fluorescent tube contains a vapor that gives off ultraviolet light when ionized. The ultraviolet light makes particles that coat the inside of the tube, and these particles glow or fluoresce. Be sure to specify cold weather lamps when using fluorescent lamps in outdoor applications to ensure the highest quality light and lamp life.

**Metal Halide (MH)** lamps are used for both outdoor and indoor applications. Currently, they are the most efficient of the "white light" HID sources. They produce light when an electric current flows through the gas within the lamp envelope. They are about twice as efficient as mercury vapor lamps. Use this light source when it is necessary to render colors closely to what they would appear in

natural sun light. As with all light sources, you should not use more wattage than is necessary for the application.

**High Pressure Sodium (HPS)** is mainly used outdoors, for street lighting, parking lot lighting and other such applications. It is more energy efficient than metal halide and is good choice when true color is not critical. The light output is an orange-gold color. HPS is commonly used throughout the U.S.

**Low Pressure Sodium (LPS):** This light source is the most energy efficient of all, and it is an attractive option when used with a quality fixture that controls the light output. The light is produced from glowing sodium gas within a tube, and so the LPS fixtures, are larger in size. This makes the LPS fixture an attractive option for street lighting, parking lots, and security lighting. However, there is no color rendering at all.

Outdoor Lamp Comparison Table

Lamp Type	Lamp Watt	Lamp CRI	Lamp Lumens	Lamp life (Hr)
Fluorescent	32	85	3,050	24,000
Mercury Vapor	175	15	7,900	24,000
Metal Halide	100	65	9,500	10,000
High Pressure Sodium	100	202	9,500	24,000
Low Pressure Sodium	55	0	8,000	18,000

1. These are only example lamps, each lamp type is available in different wattages  
2. Color Rendering Index (CRI) is a measure of how closely light renders colors compared to natural light scale of 0-100 (100 being sunlight)

For an example of equivalent fixtures (ones that offer good light control), a 175 watt mercury vapor fixture could be replaced by a 100 HPS or a 55 watt LPS. If color rendering is not required, considerable energy savings is possible.

More light is not always better. In many applications, such overkill is counterproductive to visibility, especially if it is also producing added glare.

## OUTDOOR LIGHTING CONTROLS

Lighting controls should be used to control the length of time outdoor lights are on, the level of lighting that is used and to reduce light pollution. There are four common types of lighting controls used: timers, photocells, occupancy sensors and computer controlled systems.

Timers can be installed to turn lights on and off automatically at set times each day. Simple timers allow set times that are the same from day to day; more complex timers allow for 7-day schedules to adjust for weekends and holidays.

Photocells turn lights on and off in response to natural light levels. Photocells switch outdoor lights on at dusk and off at dawn, for example. Photocells will also switch lights on if the sky is dark or overcast. Photocells can also be paired with timers to turn

lights off in the late night hours that buildings are not occupied.

Occupancy sensors activate lights when motion is sensed in the area and turn them off after the motion has stopped. They are popular for areas such as building entry areas, low traffic areas and high security areas.

Building automation systems, often used to control HVAC systems, can also be connected to outdoor lighting to control the times of day that lighting is used right from your desktop computer. This is convenient because when you are adjusting HVAC schedules for holidays, weekends etc. you can modify lighting at the same time.

## LIGHT POLLUTION

Outdoor lighting has become a necessary part of urban development. Light pollution, the illumination of the night sky caused by artificial light sources on the ground, is a by-product of outdoor lighting. Light pollution can be reduced by lighting only what is actually needed, when it is needed, and to the appropriate level.

There are a number of ways that light pollution can be reduced, the four rules of thumb are:

1. Light only what needs to be lit.
2. Light only when you need it.
3. Use only the amount of light required for the application. (too much can cause glare)

4. Use only full cut-off fixtures that direct the light onto the surface or application that needs to be lit.

Use of any lighting control method mentioned in the previous section would help to reduce light pollution.

## MAINTENANCE CONCERNS

Keeping all light fixtures clean will ensure quality light levels. Group Relamping can save your facility cost by reducing staff time required to change individual lamps and also, by reducing the number of times special equipment must be rented, such as a high lift.

Choosing fixtures based on their life expectancy may also help to reduce maintenance costs. The longer the rated lamp life the fewer replacement lamps will need to be purchased and frequency of changes requiring rental equipment and staff time will be less.

## INFORMATION SOURCES

Information used from the Lighting Research Center ([www.lrc.rpi.edu](http://www.lrc.rpi.edu)), International Dark Sky Association ([www.darksky.org](http://www.darksky.org)) and the US Dept of Energy ([www.energy.gov](http://www.energy.gov)).

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