THE ENERGY OBSERVER

Energy Efficiency Information for the Facility Manager

Quarterly Issue – April 2003

T-5 Fluorescent Lighting in High Ceiling Areas

The Energy Observer summarizes published material about proven energy technologies and practices, and encourages users to exchange 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 Consumer & Industry Services.**

New lighting technologies are constantly emerging and proving themselves effective. The newest trend in lighting applications is replacing HID lighting in high ceiling areas with new T-5 high output fluorescent lamps. This measure applies to libraries, atriums, gymnasiums, cafeterias, warehouse spaces, and high bay workshops. In addition to the lighting energy savings (as high as 50% vs. metal halide), T-5 fluorescent lighting is "instant on" and can be controlled with occupancy sensors and dimming controls to produce even more savings. All of this can be accomplished while maintaining recommended light levels and increasing the quality of light.

High Intensity Discharge (HID) Lighting

HID lighting systems are being used more often for: longer bulb life and greater energy efficiency. Longer bulb life results in lower maintenance (relamping) costs. Among HID lighting types are high and low pressure sodium, metal halide and mercury vapor.

The old "rules of thumb" for lighting design were: for areas with ceilings below 15-20 ft., fluorescent lighting made the most sense and for higher ceilings, HID lighting was best. Conventional metal halide lamps have been the light source of choice for decades in high ceiling applications. Metal halide lamps are available in a variety of wattages and options. Most commonly, 250- and 400-watt metal halide lamps are used for high ceiling applications. Metal halide lamps are selected based on their intense light source, long lamp life and initial efficiency of 75-83 lumens per watt. However, there are disadvantages, such as poor lumen maintenance, poorly maintained efficacy, color shift, long re-strike time and noisy ballasts.

T-5 Fluorescent Lighting

T-5 fluorescent lamps are the new generation of fluorescent lighting products. The previous generation of fluorescent lighting was the T-8 lamp, which is now the most commonly used type of fluorescent lamp for office and classroom lighting applications. Fluorescent lamps are classified by the shape and diameter of the lamps. T-5 refers to a tubular fluorescent lamp that is five-eighths of an inch in diameter.

Compared with conventional metal halide systems, T-5s offer better lighting quality due to a higher color-rendering index (CRI), better light distribution and lumen maintenance. T-5HO lamps are a very intense light source, which makes them a good choice for high ceiling and indirect/direct lighting systems.

In addition to light quality, T-5 lighting systems with electronic ballasts can be controlled to best suit the area they are lighting. The lights can be put on a schedule to automatically turn on and off to accommodate the occupants or they can be automatically dimmed to utilize natural day lighting in an area. This capability will allow a reduction in power usage while still maintaining recommended lighting levels.

Basic Lighting Terms

A ***lumen*** is a measure of total light output from a lamp. ***Illumination*** is the distribution of light on a horizontal surface. Illumination is measured in ***footcandles*** (fc). One footcandle of illumination is a lumen of light distributed over a 1-square foot area. ***Efficacy*** is the ratio of light output of a lamp to the electric power it uses (lumens per watt). The ***ballast*** is an electrical device used in fluorescent and HID luminaries to regulate starting and operating characteristics of the lamp.

Pay-Back & Average Annual Cost Comparison

	Std. 400W HID	Ultra Bay Fluorescent	Ultra Bay Fluorescent With Controls
Qty of Fixtures:	100	100	100
Lamps per Fixture:	1	4	4
Lamp Type:	400W MH	54W HO	54W HO
Watts per Fixture:	465	234	234
Cost per Fixture:	$150	$300	$400
Cost per Lamp:	$25	$10	$10
Installation Time:	1 hour	1 hour	1 hour
Cost per KWH:	$0.10	$0.10	$0.10
Installation Labor Rate:	$35	$35	$35
Maintenance Labor Rate:	$25	$25	$25
Operating Hours per Day:	24	24	12
Operating Days per Week:	7	7	7
Operating Weeks per Year:	52	52	52
Expected Lamp Life:	20,000 hours	20,000 hours	20,000 hours
Re-lamp Time:	15 minutes	15 minutes	15 minutes
KWH per Year:	406,224	204,422	102,211
Energy Cost per Year:	$40,622.40	$20,442.24	$10,221.12
Avg. Lamp Changes per Year:	43.68	174.72	87.36
Avg. Maintenance Labor per Year:	$273	$1,092	$546
Avg. Lamp Cost per Year:	$1,092	$1,747.20	$873.60
Avg. Maintenance Total per Year:	$1,365	$2,839.20	$1,419.60
Installation Labor:	$3,500	$3,500	$3,500
Initial Fixture & Lamp Cost:	$17,500	$34,000	$44,000
Net System Installation Cost:	$21,000	$37,500	$47,500
Total Operating Cost per Year:	$41,987.40	$23,281.44	$11,640.72
Energy Savings per Year:	None	$20,180.16	$30,401.28
Maintenance Savings per Year:	None	-$1,474.20	-$54.60
Total Savings per Year:	None	$18,705.96	$30,346.68
Years Until Pay-Back:	None	0.88	0.87

Source: 1st Source Lighting
1730 Industrial Drive, Auburn, CA 95603

FOR MORE INFORMATION…

Visit the Energy Office website to view the Zeeland High School Case Study "A High Performance School for High Performance Students". T-5 high ceiling lighting has been a successful application in this building.
www.michigan.gov/energyoffice

Visit the Energy Office website for information on current programs, services, past issues of ***The Energy Observer*** and grant information.
www.michigan.gov/energyoffice

If you have experience or data that you would like to share on this topic, or if there is a topic that you would like to see discussed in a future issue of ***The Energy Observer,*** please contact Brandy Minikey (contact information below).

For more information on this issue or past issues of ***The Energy Observer***, please contact:
Brandy Minikey
Staff Engineer EO/DCIS
PO Box 30221
Lansing, MI 48909
e-mail: bjminik@michigan.gov
fax: (517) 241-6229
or call (517) 241-8235.

Subscription Form

Thank you for subscribing! Feel free to share this with your friends and co-workers. They can receive their own subscription by contacting us with the following information:

Company/ Department: _____

Name: _____

Address: _____

_____

Phone: _____

E-mail:

☐ I would like to START my free subscription to ***The Energy Observer***

☐ I would like my ***Energy Observer*** subscription delivered by e-mail

☐ I would like to DISCONTINUE my free subscription to ***The Energy Observer***

Return this information to Brandy Minikey Contact Information is listed above.