LIGHT READING™

The Newsletter of The Light Edge, Inc.

VOLUME 1 ISSUE 5 – JULY 2002

TECHNICAL DATA ISSUE:

T5 HO CHARACTERISTICS

19150 SW 119th Avenue, Tualatin, OR 97062
503.968.9968 phone 503.968.9747 fax

DON'T BE TRAPPED INTO COMPARING 'RAW' FOOTCANDLES!

The Light Edge, Inc. designs and manufactures state-of-the-art, energy efficient fluorescent luminaries for use in commercial and industrial environments. Our products use T5HO technology to provide excellent quality of illumination for far less energy than conventional lighting systems.

There are some common questions and concerns we hear when clients are considering the T5HO as an alternative to HID systems. The information below explains several of these issues.

Benchmark for High Bay Options:

Our new High Bay luminaires with F54T5HOs have distinct advantages over HID luminaires in most applications. F54T5HOs have enough punch for high mountings. They are thin enough to be considered almost a line source, so luminaire efficiency can be very high. F54T5HOs place far ahead of 400 watt MH in end-of-life task modified lumens per watt. Well designed high bays with F54T5HOs are the best total package regarding optical efficiency and other factors at 15 to 45 foot mounting heights.

With program start ballasts, the F54T5/HO rated lamp life exceeds 30,000 hours at 12 hours/start and only 30% mortality. This exceeds MH's life of 20,000 hours at 10 hours/start and 50% mortality. Installation labor is lower with our products because of the product's light weight and near tool-less design. T-5/HO High Bay Luminaires with F54T5HOs have improved color, instant 'on' and run much cooler than HID systems.

Vision and Perception Explained

The traditional method of measuring the amount of light produced by a source is based on the Photopic Lumen. This method provides the "raw" lumens listed in lamp catalogs. The Photopic Lumen method is based on the eye's 2 degree central field of vision, which is only 0.02% of the human total visual field.

There are two types of photoreceptors in the human eye: cones (with peak sensitivity in the green-yellow region of the color spectrum) and rods (with peak sensitivity in the blue-green region). Rods greatly outnumber cones in the eye (this explains why we see only grey tones in very low light conditions). However, in the aforementioned 2 degree central field of vision, cones are the predominant photoreceptors. Since photopic lumens are based on cone sensitivity, it is apparent that the better the color quality of light, the better the "see-ability". Both cones and rods contribute to how the eye perceives light for daytime tasks, but photopic lumens alone cannot reflect how well the eye will actually 'see'. Scotopic lumens, which are based on rod sensitivity, must also be considered when estimating the quality and quantity of illumination in a space. S/P (scotopic/photopic) ratios can be used as a tool to show how the human eye really sees.

Following are two examples.

1) Compare the 14,000 photopic lumen, 175 Watt, 65 CRI Metal Halide (MH) lamp with the 16,000 photopic lumen, 150 Watt, 22 CRI High Pressure Sodium (HPS) lamp, two of the most common types of HID. Although the MH has less photopic lumens, virtually everyone perceives that it is brighter than the higher output HPS. This is because the better color of the MH stimulates more of the cones in the central field of vision.
2) Another example is the various color temperature fluorescent T-5/HO lamps with identical CRI. When the 30K, 35K, 41K and 65K versions of this lamp are compared to each other, the 65K lamp

is perceived as the brightest, followed by the 41K, 35K and 30 K lamps, respectively. However, the 65K lamp actually provides 10% less lumen output (4,500) than the other three (5,000 lumens each).

With the substantial inconsistency between photopic lumens and general perception, we should not base lighting calculations on just photopic lumens (raw lumens) or light meter measurements. While traditional calculation methods will show 'apples-to-apples' comparisons of illumination levels, the human element must be considered when determining the quantity and quality of light in a space.

Task Modified Lumen Formula

There is a formula to help determine effective 'end of life' task modified lumens/Watt for a given source:

(Photopic Lumens) x (Scotopic lumens/Photopic lumens) = initial task modified lumens

The S/P ratios are from Philips Lighting's Lamp Specification and Application Guide, and reflect particular source type, color temperature and CRI. Some sources suffer a dramatic loss of efficiency as lamps age beyond 40% of rated life, so you should include lumen maintenance in the equation (published lumen maintenance factors typically reflect the difference between initial and mean lumens at 40% of rated life; read the footnotes associated with lamp manufacturer's catalogs to determine) at what point in the lamp life the 'mean' lumen reading is taken).

(Photopic Lumens) x (Scotopic lumens /Photopic lumens) x lumen maintenance = end-of-life task modified lumens.

This also applies when comparing old type (T-12HO and T-12/VHO) fluorescent with T-5/HO.

Lamp System Comparison Table

Source Type	CRI	System Watts	Initial Photopic Lumens	S/P Ratio	Task Modified Lumens	Rated Hours Life	Lumen Maintenance	End of Life Modified Lumens	End of Life Modified Lumens/Watt
400W MH	65	465	36000	1.49	53640	20000	60%	32184	69
4 x F54T5 HO	85	220	20000	1.62	32400	20000	96%	31104	141

• Lamps and ballasts are generic composites.
• The amount of usable light depends on a specific fixture's efficiency, coefficient of utilization, mounting height and other factors.

• From a design standpoint the two most important columns are EOL modified lumens/Watt and rated life.

DO NOT BE TRAPPED INTO COMPARING RAW FOOT-CANDLES.