



Understanding the right technology for lighting large interior spaces

Lighting trends and technologies tend to move like the swing of a pendulum. Rarely in the center, new or cutting-edge ideas swing from extreme to extreme. For readers who have been in this industry for a long period of time, they have probably witnessed several lighting concepts that have swung from their rightful center to the extremes and then back again.

The current hot topic in lighting large interior spaces is the new breed of linear fluorescent "highbays." Driven, in many cases, by the amount of energy savings they provide, the linear fluorescent highbays have become the fixture of choice for many large lighting applications.

For each lighting fixture trend that enters the pendulum picture, one thing remains constant: There are a number of different variables for which a customer needs to account when selecting appropriate fixtures for their interior spaces. Some factors to consider include the energy consumed, the environment they will be installed in and their overall life cycle costs.

Additionally, in the overall cost of the lighting system there are maintenance and service issues to review, which are determined by the choice of ballast, optic, lamp, and the impact of temperature, cumulative dirt and moisture levels within the workplace.

As lighting experts, the customer relies on us to recommend a fixture that will best fit their needs in every way, including solutions that provide more than just energy efficiency benefits.

We're in the business

Whenever I give presentations on the subject of lighting large spaces, I'll use the following example to illustrate one of the challenges we face in the industry.

I pick out a friendly looking audience member and tell him that we are going to open up a business together to manufacture linear fluorescent highbays. I assign him as the chief sales person, and tell him my role is chief engineer. Additionally, I mention that within 20 miles there are approximately 25 shops that can stamp out the sheet metal parts, and then we can assemble them in our garage. With just a little time and capital, we are in business.

The question I present to him, as chief sales person, is "What fixture do you recommend to our first potential customer?"

Sometimes the audience member asks which industry the customer is in, but most of the time they immediately recommend the new linear fluorescent fixtures we make at our new company.

Of course, I use this to illustrate that there are low barriers to entry to manufacture the fluorescent fixtures, and that many small companies are springing up to not only offer, but to also recommend them for applications that most of us experienced lighting guys would not dream of lighting with linear fluorescent fixture.

When fluorescent fixtures started as a trend, small companies had only this one thing to sell. But this doesn't mean it's the perfect lighting solution for every project moving forward. Unfortunately, some suppliers of linear fluorescent fixtures cannot be depended on to be as unbiased.



Comparing fluorescent highbays with HID

Since the customer has a voice in what fixture is purchased and installed in his facility, why would we recommend new fluorescent highbays? Compared to conventional 400w MH fixtures and the “old stand by” probe start Metal Halide (this technology is more than 45 years old), the fluorescent highbays are very efficient. In this day of extreme cost focus, energy efficiency is very attractive. However, when you compare the fluorescent highbays with state-of-the-art Hubbell electronic ballasted HID fixtures (E-HID), the story changes a lot. Consider the following lighting example:

- Room size: 100' x 200'.
- Fixture mounting height: 30'
- Target light level: 40 footcandles

The results were amazing:

- The electronic ballasted HID fixtures required 13 fewer fixtures than the nearest linear fluorescent, a T5 fixture with 6 lamps (32 E-HID fixtures vs 45 FL fixtures)
- The electronic ballasted HID fixture had the lowest watts per square foot at 0.69

	Fixture Count	Lumens per Watt	Watts per Sq Ft	Annual \$	Install	Re-lamp
Fluorescent Highbay 6 Lamp T5HO	45	62.2	0.77	\$9,261.00	\$10,350.00	\$916.67
Fluorescent Highbay 4 Lamp T5HO	66	63.4	0.74	\$8,870.40	\$14,190.00	\$966.67
Fluorescent Highbay 6 Lamp T8	77	74.0	0.85	\$10,256.40	\$15,400.00	\$887.22
HID Highbay Probe Start CWA	64	49.4	1.47	\$17,664.00	\$14,400.00	\$2,286.00
HID Highbay Pulse Start CWA	40	57.0	0.92	\$11,040.00	\$9,800.00	\$1,710.00
HID Highbay Pulse Start Electronic	32	81.0	0.69	\$8,256.00	\$12,160.00	\$759.00

As surprising as these results may be to the reader, it can be explained by understanding the performance of the lamp and ballast combination. The lamp was a 44,000 lm pulse start lamp driven by a 400 watt electronic ballast that only has 35 watts lost to inefficiencies. This results in over 100 lumens per watt (44,000 lm / 435 watts).

Of course all of you lighting savvy readers are shouting, “What about the maintained lumens per watt?!” In the past, this has been the bane of metal halide systems, which would lose as much as 35 percent of their light at mean hours, typically set at 40 percent of rated lamp life.

Due to a much-improved lamp starting routine that only the electronic HID ballasts have, the lumen maintenance values are as high as 0.86 to 0.90. Maintained lumens per watt of around 90 put electronic HID systems out in front of the current crop of linear fluorescent highbays. This – coupled with the high lumen package available on these systems and the variety of optical systems – gives the customer the correct lighting fixture for a wide number of applications.

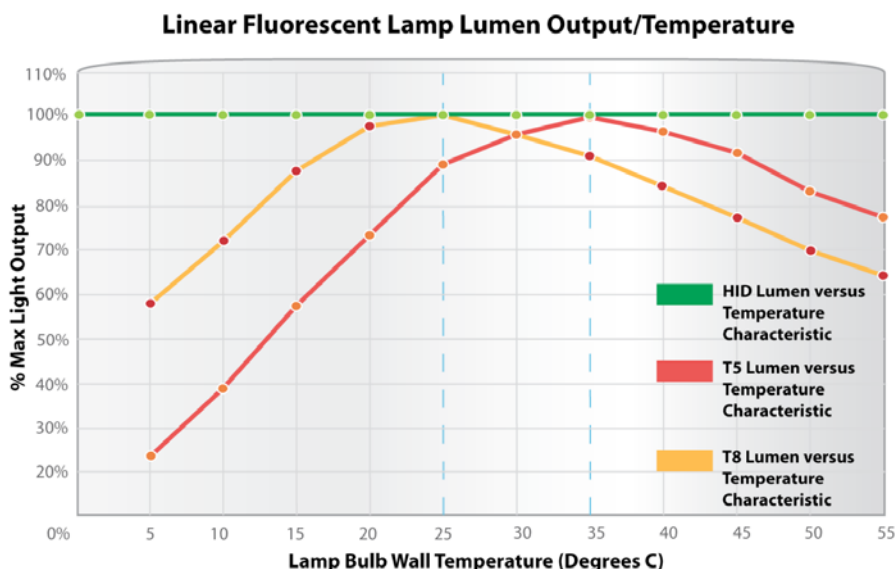
Now, if we go back to those other issues that the small manufacturers of linear fluorescent fixtures ignore, we can finish doing a responsible job of helping our customer make the right choice.

Issue #1 – Temperature

I think we have all put a fluorescent fixture in a cold environment for which it was not designed. (Mine was in an unheated garage in Naperville, IL. One winter it reached a record cold of -25° F. Of course it was not that cold in my attached garage, but it was cold enough that the fixtures only put out a dim blue glow.)

The fact is that all fluorescent lamps are affected by variations in temperature. The peak lumen output of a T8 lamp occurs when the bulb wall temperature at the center of the lamp is 77°F and the T5 performs best when the end cathode is at 95°F. Fixture design and airflow, among other things, affect bulb wall temperature. If it is above or below the ideal temperature, the light output will be less. How much less depends on many factors and will be unique for each fixture design. Do those small manufacturers of linear fluorescent factor this into their recommendations?

Bottom line: Light output for HID sources remains constant throughout their operating temperature range.



Issue #2 – Dirt accumulation

One of the ways that the new linear fluorescent fixtures get very high efficiencies is through their open designs. However, the open lamps and reflectors can allow dirt to accumulate on the fixtures.

On the reflector, this dirt layer will move a specular reflector to a diffuse reflector, hurting its ability to punch light down to the work surface. Since the linear fluorescent lamps are in a horizontal position – and since dirt tends to accumulate on horizontal surfaces – the top of the lamps are quickly covered in a layer of dirt. How fast and how thick depends on the environment but most warehouses have their share of dirt accumulating on all surfaces.

Bottom line: HID lamps perform well in tough, dirty environments.



Issue #3 – Maintenance

Going back to the example above, it took 45 linear fluorescent fixtures (at six lamps each) to match the light of 32 electronic HID fixtures. This is a total of 270 T5 lamps vs only 32 HID lamps.

No matter what re-lamping plan the customer wants to employ, he will pay more to maintain 270 lamps than 32 lamps.

With fewer fixtures needed to light the same space over standard MH, the Hubbell E-HID fixture can provide energy savings of more than 40 percent a year, as well as variable dimming to 50 percent of lamp power.

Bottom line: Electronic HID offers huge opportunities for operating cost reductions, both through energy savings and lower maintenance requirements.

As lighting experts it is our job to make sure that our customers get the right lighting solution for their space. We need to consider the energy, temperature, environment and overall life cycle costs. This way, wherever the pendulum is on the “hot” lighting technology, we can make sure that the customer understands all of the choices and help him make the optimal choice for his particular application.

Joe Engle

Product Manager,
Hubbell Industrial Lighting

