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- Dimming LFL Systems
- Metal Halide – Pulse Start vs. Probe Start
- HID – The Burning Question... Base Up, Base Down or Horizontal: What's the Deal with Orientation?

Dimming LFL Systems

There are many "myths" and misunderstandings regarding dimming linear fluorescent lamps (LFL). This article will discuss several of these, while providing a basic understanding of how components operate and their relationship to one another within a system.

Myths and Misunderstandings

Three of the most common myths and misunderstandings are listed below:

- Incandescent lamps work in all environments, so fluorescent lamps work in all environments.
- Dimming incandescent lamps saves energy, so dimming fluorescent lamps would save energy.
- Dimming incandescent lamps extends lamp life, so dimming fluorescent lamps would extend lamp life as well.

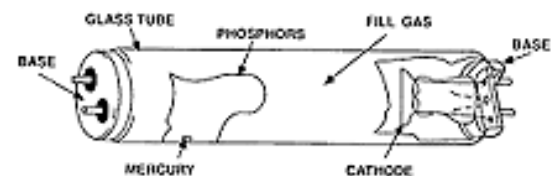
To understand why the above statements are not necessarily true, it is important to understand the different components within a dimming system. Further discussions of the "truths" of these myths are presented at the end of this article.

Components of a System Lamp

Lamp Operation Basics

The basic operation of a LFL is affected by many variables; therefore, it is essential to understand them and what is needed during the application of control methods.

The graphical depiction (right) demonstrates the basic principles of how a linear fluorescent lamp operates. There is a filament at each end of the lamp, also called an electrode, which functions both as a cathode and an anode. This coiled wire electrode, commonly called a cathode, has an oxide coating that is highly emissive. As AC voltage is applied, an arc is struck between the cathodes. The mercury pellet is converted into a low-pressure mercury vapor and when it mixes with the inert fill gasses, UV photons are produced. The phosphor coating on the inside of the glass tube absorbs UV photons and re-radiates the energy as visible light.



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Metal Halide – Pulse Start vs. Probe Start

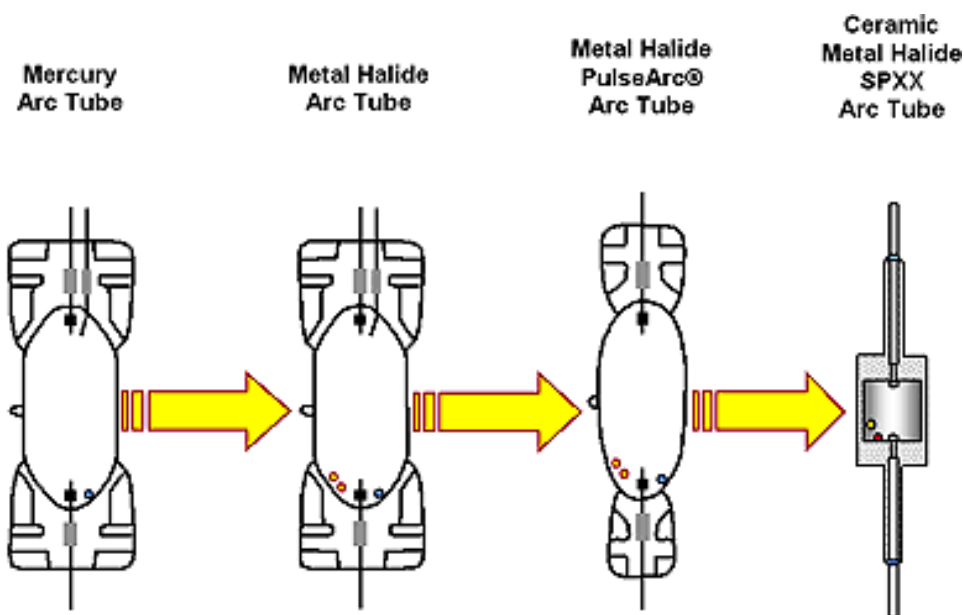
As we enter this new age of energy awareness, the lighting community has been at the forefront finding more and more ways to conserve energy. One of these ways is through the technology and construction of Metal Halide lamps, resulting in significant improvements to both energy savings and performance.

History

Before we review the operational characteristics, it is interesting to note the history behind this High Intensity Discharge (HID) light source. References to passing an electric arc through mercury gas to provide light goes back to the mid-19th century but around the turn of the century, Peter Cooper Hewitt developed mercury-filled tubes. In 1902, the Cooper Hewitt Vapor Lamp Company was established to make and market these lamps. Ultimately, these proved to be too cumbersome with heavy

ballasts and as much as a pound of mercury. In 1919, GE purchased the Cooper Hewitt Vapor Lamp Co. In 1933, GE began marketing a new mercury lamp followed by the High Pressure Sodium lamp in 1961, the Quartz Metal Halide lamp in 1962 and the Ceramic Metal Halide lamp in the mid-1990s.

Multi Vapor® Arc Tube Evolution



With the advent of each technology, new challenges were presented. Mercury lamps replaced incandescent in industrial and roadway applications and improved the economics by providing longer life and a more efficient light source. The downside was that the color quality was compromised to some degree. The invention of High Pressure Sodium (HPS) dramatically changed discharge lighting by providing much higher efficacy and life but still compromising color quality by having the golden white color. Then, along came Metal Halide, and color quality was significantly improved but lamp life and efficacy were not quite as good as HPS. To come up with a lamp that gave good color, efficacy and life became the challenge of lamp designers. The technical community met the challenge and the Metal Halide lamp was invented. Many things have to be considered in designing a discharge lamp. Design areas that need to be considered include arc tube thermal profile, gas fill pressures, arc tube body shape, arc tube material, chemistry, electrode characteristics and ballast design all to name a few. Making a compromise in one area may have ramifications in other areas; thus, affecting lamp performance and/or cost.

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HID – The Burning Question ...

Base Up, Base Down or Horizontal: What's the Deal with Orientation?



How many times have you wondered why a certain lamp is vertical base up or vertical base down, universal or horizontal? What does it matter and why should I need to know?

The reason for the concern, or at least something to be aware of, has more to do with color consistency, lumen output and life. So, let's explore these issues.

Unlike incandescent and fluorescent lamps where color variations are usually imperceptible, Metal Halide lamps have a normal expected color variation lamp-to-lamp and over life. To the casual observer, this color difference may be judged as improper lamp operation. Though all manufacturers of Quartz Metal Halide lamps attempt to control this variation, current science of the technology makes the total elimination of color variation a physical impossibility. However, understanding and adjusting certain factors over which the user has control can achieve some additional reduction of color variation.

GE standard Multi-Vapor® lamps are multi-component lamps. The lamp contains various metals, which reside in the arc tube in gaseous form. Applying a voltage to the arc tube electrodes produces light. That voltage excites the gaseous metals to the

point where they emit light - each metal emitting a different spectral color.

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