

# Xenon provides numerous advantages in video projector applications

By Rick Hamburger



## Introduction

The numerous benefits offered by Cermax<sup>®</sup> Xenon lamps from PerkinElmer Optoelectronics make them today's technology of choice for projection applications, such as rear-projection televisions (RPTVs) and mid-range to high-end home theater video projectors. Choosing Xenon-based products provides manufacturers a competitive edge in both manufacturing costs and time to market. By using longer-life, superior-quality Xenon lamps at prices comparable to lower-performing lamps, they can achieve excellent color, unparalleled DC operation, and eliminate potential environmental health risks.

## Color benefits

Xenon light provides excellent color due to a flat spectral output through the visible wavelengths. The spectral output achieved in other lamps usually contains spikes that require additional adjustment. For example, typical mercury lamps have relatively low red output and contain spikes in the yellow and blue outputs. Color balancing techniques are required to bring the other colors in line with the red spectral output to achieve the proper color and flesh tones.

Xenon, because of its even spectral output in all colors, requires little or no in-depth color balancing, enabling excellent color projection and high-quality flesh tones. Using Xenon lamps, the consumer sees better color contrast and a superior picture. The Xenon lamp has a color temperature of 6500 degrees K, while the color temperature of mercury lamps is about 8000 degrees K. Since the optimal color temperature is 6500 K (D65), the mercury lamp's spectral output must be filtered down to meet that metric.

The filtering process for lowering color temperature in a mercury lamp also results in a loss of luminous efficacy. Although mercury lamps have a much higher efficacy rating than Xenon lamps, the filtering process required makes Xenon nearly comparable in terms of luminous efficacy after filtering. Xenon's balanced color spectrum and true white light produces accurate, brilliant colors to the consumer.

Another important benefit to the customer is the instant on/off features of Xenon. Most ultra-high performance (UHP) lamps require about two minutes of warm-up time. During the warm-up, the light, or spectral output, is shifting significantly, causing the output colors to lose sharpness and contrast. A Xenon lamp delivers a sharp, high-quality color spectrum to the screen in less than 60 seconds. Xenon lamps can be turned off and back on again – known as a hot strike – with minimal effect on color projection.



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### DC operations

Because of its short arc gap (<1 millimeter), the PerkinElmer Xenon lamp improves the collimation of the light, thus improving the contrast ratio in chips when compared to mercury lamps. Better contrast ratio leads to an improved and more distinguishable picture for the consumer. Whites and blacks achieve much more depth and more of a three-dimensional imagery. With a one-millimeter arc gap, an AC-operated lamp has two hot spots – one at each end of the lamp. These two hot spots must be collimated onto the chip. On a DC lamp with an equal one-millimeter arc gap, there is only one real hot spot. Thus, even though the arc gap is the same, the true or relevant arc is only a percentage of the arc gap size. This equates to a shorter arc gap lamp and enables manufacturers and other sub-component companies to develop and manufacture smaller and lower-cost products.

Manufacturers are currently striving to develop single-chip products. In many of today's higher end video projectors, there is a three-chip set – and those chips are expensive. Getting the product down to a single chip, which involves using a color wheel, is essential. Here again, DC lamps have a distinct advantage over AC lamps.

When using a color wheel, the polarity of the AC lamp must be timed or sequenced with the color wheel to allow the proper color throughput. This is no easy task and requires complicated – and expensive – electronic components. Because there is no polarity switch, DC operation is much simpler and the constant is on one arc. Therefore, sequencing procedures can be eliminated.

For designers, the number of chips can easily be reduced to one without potential sequencing problems, thus reducing the overall cost of the product. DC operation also enables designers to switch easily from a three-chip set to a single chip.

Another benefit of Xenon is its smaller footprint. Manufacturers can realize higher wattages in one PerkinElmer Cermax<sup>®</sup> lamp, as compared to a dual mercury set, to achieve particular screen lumens. Since Xenon achieves higher pressures, or wattages, in a one-lamp footprint, the OEM can eliminate any potential light-coupling design issues. The quartz body of a mercury set has pressure limits, preventing it from reaching the same wattages in a small footprint design. A single lamp design has further advantages over a dual lamp design, such as no color balancing, easier replacement, and reduced optics for coupling the light.

### Environmental issues

Many manufacturers are concerned that the primary alternative to Xenon is a mercury-based lamp. Mercury is highly toxic and potentially carcinogenic. These dangers, even in very small quantities, can eventually lead to neurological system and brain damage in humans. Along with other harmful elements, such as lead, cadmium, and hexavalent chromium, environmental groups worldwide are calling for limits on the use of mercury in electrical and electronic equipment.

In Europe, an outright ban has been proposed on the use of harmful elements, including mercury, in new electrical and electronic equipment placed on the market after January 2007. In Directive 2002/95/EC of the European Parliament and of the Council, it states that “the most effective way of ensuring the significant reduction of risks to health and the environment relating to those substances which can achieve the chosen level of protection in the Community is the substitution of those substances in electrical and electronic equipment by safe or safer materials.”

Although mercury lamps for use in projection may currently be exempted under a “special usage” clause, some forward-thinking manufacturers are interested in taking more of a lead role in keeping their businesses environmentally sound. By choosing to use Xenon lamps now – and taking advantage of all the benefits that accompany them – today's manufacturer can rest easy from any future environmental woes.

### Conclusion

PerkinElmer's Cermax<sup>®</sup> Xenon lamps are superior to any lamps on the market today. In addition to advantages such as excellent color and flesh tones, instant on/off, a uniform output spectral range, and sequencing elimination for single-chip development, Xenon lamps boast easy replacement, no coupling design issues, long life, and are environmentally safe. Once more, PerkinElmer Optoelectronics is working hard to achieve competitive advantages for its manufacturing customers by presenting a solution that reduces their design costs while accelerating their time to market.

For more information e-mail us at [opto@perkinelmer.com](mailto:opto@perkinelmer.com) or visit our website at [www.perkinelmer.com/optoelectronics](http://www.perkinelmer.com/optoelectronics)

All values are nominal; specifications subject to change without notice.

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