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## Choices, Not Compromises

Not too long ago, solid-state lighting was more of an intriguing possibility than a practical solution. The majority of SSL products on the market back then were all over the map in terms of performance, and those that could measure up to the incumbents were considered paragons of success. The technology has come a long way since then, to the point where today you can find competitive SSL products for most lighting applications. SSL products can outperform their conventional counterparts on many parameters — not just efficacy and total cost of ownership, but also color quality, light distribution, and new features such as engineered spectrum, connectivity, and novel form factors.

But in the flush of such rapid and still-growing success, the considerable array of choices offered by SSL is in danger of being overlooked. All other lighting technologies are more or less “monolithic,” in the sense that their characteristics are severely limited in scope by the very nature of the technologies themselves. For example, the ability to tune the spectral content of high-pressure sodium lighting is quite limited. But with semiconductor-based SSL, many of these historic limitations don’t apply, enabling an astonishingly versatile lighting technology that can be shaped in a multitude of different ways.

Those different ways are not always immediately apparent, however, because the majority of SSL products are designed as direct replacements for conventional incumbents. Also, these features may add cost — especially at this relatively early stage of the technology. As a result, manufacturers often intentionally sacrifice performance on one or more parameters, in favor of keeping prices low. But the choices are available and will continue to grow, as consumers come to appreciate features such as very high efficacy, extended lifetimes, tailored color, and connectivity.

To get an idea of the range of choices available in LED lighting products, one has only to look at the [LED Lighting Facts](#)<sup>®</sup> database. There, you’ll find products that run the entire CCT gamut, from below 2500K to over 7000K. In terms of color rendering, you’ll find several hundred listed products with a CRI  $\geq 95$ , for those applications that demand that kind of super-performance. LED products can also be tuned to optimize TM-30 fidelity and gamut combinations, depending on the demands of the application. And there are ranges of efficacies within product types, with the most efficient products exceeding 150 lm/W.

The point here is that LED lighting technology has become a platform that gives users a tremendous number of options. As the technology has improved, manufacturers have had more cost and design headroom to add features, characteristics, and capabilities that weren't possible before — either because they couldn't be achieved, or because they would have been inordinately expensive. A major factor in this development has been

continued improvements in efficiency, which make it possible to use fewer LEDs to get the same output, thus lowering the price and opening up physical space for the integration of other features.

Manufacturers can mix and match capabilities, in virtually any combination; e.g., one product can have high efficacy but only fair color rendering, while another can have excellent color rendering but lower efficacy. Products can even be engineered to have spectral power distributions that match specific applications, or that can be dynamically changed — whether to highlight merchandise, to enhance the production or nutritional value of crops, or to improve health and productivity. And products can also be designed so that light output and distribution can be dynamically changed.

In other words, the legacy of one-dimensional thinking about lighting was driven by the limitations of conventional technologies, and doesn't apply to SSL, which offers enormous flexibility and a wide array of choices. So those who assume that choosing an energy-saving lighting product means compromising on performance should wake up and smell the LEDs.

Best regards,  
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