



LEDs Magazine recognizes the SSL industry's best at Las Vegas Sapphire Gala (MAGAZINE)

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By Maury Wright

Editor in Chief, LEDs Magazine and Illumination in Focus

The stars, and LEDs, shone bright at the first LEDs Magazine Sapphire Awards Gala, reports Maury Wright, with recognition going to the top LED-centric enabling technologies and solid-state lighting products along with the inaugural pronouncement of the Illumineer of the Year.

The night of Feb. 25, 2015 marked the celebration of innovation in the LED and solid-state lighting (SSL) industry sectors with the naming of the inaugural *LEDs Magazine* Sapphire Award winners. The Sapphire Awards Gala, held in conjunction with the Strategies in Light conference in Las Vegas, featured top-notch entertainment, great food and drink, and an enthusiastic and packed house of industry stalwarts. Still, the stars of the night were the products and people winning recognition for innovations that are driving the technology forward, revolutionizing the lighting market, and ultimately impacting global society in a very positive way.

Companies working across the LED and SSL sectors nominated well over 100 products to the Sapphire program, along with people for the top Illumineer of the Year award. Sapphire judges ultimately considered products and people across 13 categories ranging from packaged LEDs and OLEDs to other enabling technologies to SSL lamps and luminaires. [Finalists were identified in late January](#). On Gala night, the best of the best took home the Sapphire trophies after the late-night celebration.



[Get the latest Sapphire Awards program and submission process details](#)

We asked the judges to consider each entry against what might be considered a virtual perfect product in the role at hand. Clearly, some categories included products that couldn't and shouldn't be compared to one another. Indeed, even in the application-specific breakdowns in the luminaires area, it would be an impossible task to directly compare most of the products. So the judges were asked to consider each product on its own merit and award a score between 0 and 5 Sapphires. Fractional scores were allowed to enable the fine granularity necessary in first sorting out finalists and then winners.

The judges collectively discussed and agreed to a methodology for arriving at individual scores. To achieve a level of 3 Sapphires, a product had to be judged to be of commercial grade. For enabling technologies such as LEDs, modular light engines, drivers, optics, and similar products, the judges were charged with deciding whether the products were worthy of use in commercial end products. For the SSL luminaire product categories, the judges were asked to decide if the product itself was worthy of deployment in a commercial application.

For a score in excess of 3 Sapphires, the judges were asked to consider to what degree the entry could deliver outstanding performance. For enabling technologies again, the judges concentrated on what the products could bring in the way of features to end products, while the lighting products were judged on the evident features and benefits. For a score in excess of 4 Sapphires, the products had to enable or deliver new capabilities not found in legacy lighting products. We also asked the judges to make comments about the entries and some of those will be anonymously shared later in this article.

Each judge worked on a subset of the categories that comprise the Sapphire Awards. We will not reveal the panel for any specific category. We did take great care in choosing the panels to ensure that there was no conflict of interest in the judging process. Moreover, the judges took the responsibility seriously and, as the comments will illustrate, participated with the goal that the Sapphire program can help move the SSL industry forward.

Illumineer of the Year

At the culminating moment of the Gala, *LEDs Magazine* announced the Illumineer of the Year award, which was intended to recognize a person or small team behind an innovation that can truly catalyze a segment in the SSL space. The judging process for the Illumineer of the Year included consideration of both the scores awarded for the innovation and the qualitative judgment of a small panel.

Our inaugural Illumineer of the Year crown went to Eric Senders, Bob Zona, Rene Helbing, Mushfeque Manzur, and Catherine Othick from Philips Lumileds for their work on the Luxeon COB (chip on board) LED with CrispWhite technology. [CrispWhite is a great example of how LED technology will take the lighting industry to new heights](#), delivering a feature set in SSL products that the industry could never achieve with incandescent, halogen, or ceramic-metal-halide (CMH) sources.



Eric Senders, Bob Zona, Rene Helbing, Mushfeque Manzur, and Catherine Othick of Philips Lumileds win Illumineer of the Year honors for the Luxeon COB LED with CrispWhite technology. Inset: Eric Senders, product line director for CrispWhite.



The Lumileds team developed an innovative mix of standard- and deep-blue emitters in CrispWhite arrays, along with a phosphor formulation, that can deliver the bright whites associated with optical brightening agents. At the same time, the LEDs render vivid colors. The result is lighting performance that exceeds the CMH gold standard that has long been the technology of choice in demanding applications in high-end retail, museum, and similar applications. Indeed, CrispWhite — and similar emerging technologies — have the potential to rapidly boost LED penetration into applications that have eschewed the energy-efficiency advantages of SSL technology in many cases.

Eric Senders is the product line director for CrispWhite. Bob Zona is the strategic marketing director. Rene Helbing is the technical project lead. Mushfeque Manzur is in charge of quality and reliability. And Catherine Othick handles characterization. Congratulations to the Lumileds team.

Packaged LEDs and OLED Panels

Moving to the product and technology categories, the first award of the night was in the category of Packaged LEDs and OLED Panels — a category dedicated to the basic light source. Cree was named the winner in the category, scoring 4.25 Sapphires for the family of [Xlamp High-Density LEDs announced over the course of 2014](#). Cree announced High-Density versions of COB LEDs, traditional LEDs and arrays in discrete ceramic packages with primary optics, and LEDs and arrays in packages designed specifically for surface-mount-device automated assembly techniques.



Cree Xlamp High-Density LEDs.

The XP-L was the first discrete LED in the family. It delivered a 20% boost in lumen output and efficacy relative to similarly sized LEDs, and hit the 200-lm/W mark in efficacy. COB products in the High Density family doubled the output of similarly sized LEDs, and discrete-packaged arrays enabled even larger gains.

Cree claims that the LEDs deliver advantages in optical control factor (OCF) and system-level cost. OCF is determined by the flux output divided by the area

occupied by the LED, and a higher OCF results in better beam control in directional lamps and smaller form factors. In turn, the high OCF results in less-expensive optics, printed circuit boards (PCBs), and heat sinks. One judge said, "Cree has raised the bar in providing a broad solution set based around the idea of high-density solutions. What differentiates Cree from the other LED companies who have similar products is the breadth and positioning of their offering." Clearly, baseline lumen output and efficacy performance remain king in the LED space, although characteristics such as color quality are also becoming far more important.

Modular SSL Light Engines

LED Engin won the Modular SSL Light Engines category, with its LuxiTune Generation 3.0 product family scoring 4.25 Sapphires. The category featured a number of worthy options, but LuxiTune was recognized based on its ability to exactly mimic the operation of cherished legacy light sources while delivering outstanding advantages in energy efficiency and product lifetime. A judge described the product as "a very elegant and sophisticated color-tunable light engine that is also well documented." Another added, "It's a solution people are asking for in a form factor that works for most customers." Still, one judge warned, "Efficacy is low, but that is not the main focus of the product."



LED Engin LuxiTune Generation 3.0 dimmable light engine.

Indeed, the LED Engin product is designed for applications such as hospitality where many lighting designers have refused to give up halogen lamps and the dimming performance where the CCT level warms as the light level drops — a technology often referred to as dim-to-warm. The LuxiTune product can deliver CCTs down to 1600K and dim down to 0.5% of full-scale output.

There are a host of dim-to-warm products on the market. But [many miss the halogen target both based on the actual color dimming curve](#) and in output that looks more red than warm white. LED Engin says many of the products focus on low cost and use only a mix of two LED channels to deliver the CCT variation. The company hasn't revealed exactly how its multi-channel design operates, but the result is 90-CRI light at higher output levels and excellent color rendering throughout the range. Moreover, the light engine supports controls such as DALI (digital addressable lighting interface), DMX, and 0–10V analog.

LED Drivers

The LED Drivers category covered finished driver products that can be bought off the shelf to either integrate in a luminaire or for installation outside one or more luminaires while still supplying the required DC power. eldoLED, an Acuity Brand, won the driver category with the SOLOdrive 360 family of products with a score of 4 Sapphires.



SOLOdrive 360 drivers from eldoLED/Acuity Brands.

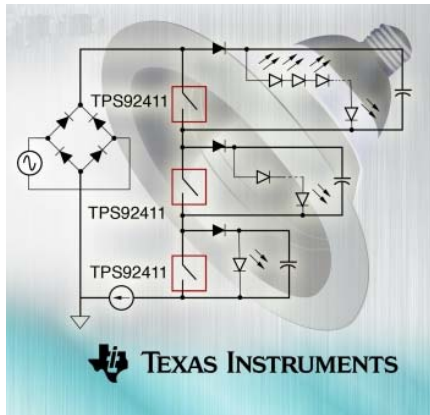
The focus in the driver category was on dimmability features for most of the entrants. The driver manufacturers have largely solved the problems of reliability and precise current control, but issues remain in terms of how smooth the driver dims, the granularity of the dimming, and to what extremes the driver can support in terms of light level. Acuity claims that the SOLOdrive 360 family can dim smoothly to dark. The company explained that while 1% output sounds low, such a level would still be far too bright in an application such as a darkened theater.

A judge commented. "Dim to zero is excellent and the product offers good programmability." In terms of programmability, the driver design supports customization at the end of the SSL luminaire production line. Manufacturers can use that capability to set the driver precisely for the luminaire specs, thereby ensuring maximum energy savings. Moreover, tools such as Acuity's FluxTool allow manufacturers to tune fixtures for precise lumen and color output from fixture to fixture while also customizing the dimming curve and other features.

ICs and Electronic Components

The ICs and Electronic Components category featured entrants ranging from driver ICs from the semiconductor industry to a range-sensing module based on a

digital-signal-processor (DSP) IC integrated with LEDs and sensors. Texas Instruments (TI) came out on top for its [AC-LED floating switch architecture and the TPS92411 IC](#) that scored 4.25 Sapphires.



Texas Instruments' AC-LED floating switch architecture/TPS92411.

AC-LED driver topologies are increasingly popular in the SSL sector because the electronics are far simpler than the AC-DC driver topologies that have been most common in the space. The result can be much lower system cost in an SSL lamp or luminaire. But AC-LED technology has come with disadvantages such as flicker and dimming performance that trails the best AC-DC implementations. About the TI architecture, a judge said, "An innovative floating linear driver architecture that provides low ripple performance and no inductive components reducing system size and cost."

The TI approach presumably solves a number of issues with AC-LED drivers. The floating-switch means that product developers can apply a low-cost capacitor across each segment of LEDs so that all of the LEDs generate light continuously, even during the low-voltage and zero-crossing portions of the AC input. The design also enables flexibility in how LEDs are segmented. The combined architecture minimizes or eliminates flicker while delivering better LED utilization.

Enabling Technologies

The Enabling Technologies category was perhaps the most multifaceted of the Sapphire Awards with entries spanning the optics, thermal, interconnect, and material domains. The products were indeed tough to score, but the judges did a remarkable job discerning features that would truly pay off at the SSL system level. Khatod Optoelectronic won the category with its SIO3 Silicone Lens family scoring 4.25 Sapphires.



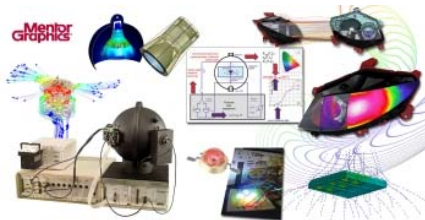
Khatod Optoelectronic's SIO3 Silicone Lens family for COB LEDs.

The SIO3 is a story of intense research and development both in the material science and optics areas. [The lenses are designed specifically for COB applications with a relatively larger light-emitting surface \(LES\)](#) compared to LEDs in discrete packages. COB products can be far simpler to use because the components require the developer to deal with single electrical, optical, and thermal interfaces while producing the light output of many discrete packages. But traditionally total internal reflection (TIR) lenses grew too large and expensive for practical use with a larger LES. So COB LEDs have primarily been used in reflector-based designs whereas TIR-based designs can deliver better beam control.

Khatod, however, has delivered lenses for COB LEDs using moldable silicone. A judge said, "It's a new take on the molding process. Solves some of the optical issues for using COBs in outdoor lighting at low cost." Outdoor area lighting has more often used discrete packages with TIR lenses but now will be able to leverage the high flux output of COB LEDs and maintain beam control. About the research process, another judge said the company delivered "an innovative solution with lots of work and testing behind these lenses."

Tools and Test

The Tools and Test category was also a bit different from most of the others in the Sapphire program. But development tools such as software simulators and optimized LED- and SSL-centric test equipment are vital in allowing product developers to deliver superior performance and fully leverage the LED sources. Mentor Graphics won the category with its T3Ster, TeraLED, and FloEFD test and simulation tool suite with a score of 4 Sapphires.



Mentor Graphics' T3Ster, TeraLED, and FloEFD simulation tools.

Mentor covered a typical use case for the suite in an [LEDs Magazine contributed feature](#). The simulation enabled a development team working on a street light design to quickly deliver a heat sink optimized for performance specific to the luminaire design and for minimal cost. And time-to-market is a critical aspect of success in the SSL space. A product with superior performance today may be surpassed in days or months with the pace of change in the industry.

A judge noted that the suite comprises an "excellent complete temperature analysis and simulation system." Developers can use the FloEFD simulation software to virtually prototype a system. The T3Ster and TeraLED test systems allow thermal measurement and characterization of components that might be used in product development and verification of prototypes built after the simulation phase of a project.

SSL Lamp Design

Now we will transition to the lighting products categories including lamps and luminaires. We asked the judges to specifically focus on innovation in the design of the products along with the performance specifications. The first category was SSL Lamp Design and Soraa won for its PAR30 LED lamp with a score of 4 Sapphires. Moreover, the company's AR111 LED lamp was one of the three finalists in the category.



Soraa's PAR30 LED lamp.

About both lamps, a judge said, "Modest efficacy (lm/W) rating is all that holds this back from a 5 Sapphire rating." But much as with the low efficacy concern for the LED Engin modular product, Soraa targeted the light quality needed for demanding applications such as retail and hospitality. The excellence in color rendering, as always, comes with an efficacy penalty. The products have a CRI of 95 and also a measure of 95 for the R9 saturated red color sample.

Indeed, Soraa preceded others such as Philips Lumileds in developing LEDs that can render vivid colors while also making whites treated with optical brightening agents pop. [The company has developed its own LEDs that among other things use violet emitters](#) to excite the brightening agents and a three-phosphor mix for excellent color rendering. For now, Soraa primarily uses the LEDs in its own retrofit lamp products. The company also developed an innovative optical accessory scheme for lenses, filters, and diffusers called Snap that magnetically snap and lock into position.

Indoor SSL Luminaire Design

The mainstream Indoor SSL Luminaire Design category was perhaps the most contentious in the Sapphire Awards and was one of a few in which we named four finalists — and even that took great effort. Litecontrol, a Hubbell brand, won the category with the Liteweave Linear product earning 4.25 Sapphires.



Litecontrol Liteweave linear indirect/direct from Litecontrol/Hubbell Lighting.

About Liteweave, a judge said, "I appreciate the use of a flexible circuit board, high-efficacy optic (who says utility fixtures have to be opal white?), and the use of

large quantities of mid-power packages to keep efficacy high and lifetime very high." Indeed, the flexible circuit board enabled the low-profile height and width of the luminaire. And another judge remarked, "I like the small size and the upright, which is like a fluorescent wrap."

In fact, Litecontrol designed the luminaire to deliver both direct and indirect light. The design accomplishes the indirect delivery again through the use of the flexible circuit board that literally wraps around the internal luminaire structure and places 30% of the LEDs oriented upward. Meanwhile, the diffuser delivers direct illumination via integrated optical elements that both precisely shape the beam and provide an intriguing textured look.

Industrial SSL Luminaire Design

We also included a second indoor Sapphire category specifically focused on industrial-target luminaires given the large number of indoor entries and the vast differences in the product design goal for an industrial fixture. Ironically, a product that utilizes light-guide technology that would more generally be associated with indoor architectural fixtures won. The judges clearly appreciated the design elegance of the Metalux SkyBar high-bay luminaire from Eaton's Cooper Lighting that scored 4 Sapphires.



Metalux SkyBar high-bay luminaire from Eaton's Cooper Lighting.

The SkyBar product uses the [WaveStream technology that combines LED edge lighting and a light guide with miniature optical elements](#) to deliver planar diffuse light. Cooper said the WaveStream technology and AccuAim optics allowed the product developers to deliver beam patterns that match the application requirements even in a high-bay setting. Moreover, the light guides can deliver light on both sides of the planar structure and the company offers models that deliver as much as 11% indirect light. Cooper said the result is elimination of what they call a "cave-like effect" in spaces lit with high-bay fixtures.

One judge said, "This luminaire is specifiable for finished spaces with high ceilings." However, the judge also warned that the product may be prone to dirt and dust in typical use. Another added, "I liked the freedom of light distribution featured in this product," also noting that it delivers light where needed.

Outdoor SSL Luminaire Design

Moving to the outdoor sector, we had a broad set of entries that targeted roadway, parking, landscape, architectural, and sports-venue applications. Kim Lighting, a Hubbell brand, took Outdoor SSL Luminaire Design top honors with the Lightvault 8 Bluetooth in-grade luminaire that scored 4 Sapphires. The wireless Bluetooth interconnect is used for configuration and commissioning of the products that can be installed in tough-to-access locations.



Kim Lighting/Hubbell Lighting's Lightvault 8 Bluetooth in-grade luminaire.

The inclusion of Bluetooth in the design of the in-grade luminaire delivers surprising benefits beyond commissioning using smartphones or tablets. The wireless link enabled Kim to completely seal the light engine against water, dust, mud, and other debris that would be a problem in in-grade products that require manual adjustments. The sealed design can be installed in minutes once the pour housings are completed. One of the Sapphire judges lauded the product for "robust construction and connectivity."

And the Bluetooth communications do enable significant flexibility in the customization of installed fixtures. The direction of the light engine can be moved 15° in any direction. Moreover, the design supports dimming down to 20% of full output in 1% increments. Both dimming and aiming are handled wirelessly. Kim also offers a broad range of accessories and the luminaire delivers as much as 2500 lm.

Specialty SSL Design

The Sapphire program also received entries that didn't cleanly fit in any of the typical lighting product categories, leading to the creation of Specialty SSL Design.

Products considered in the category included emergency lighting, SSL products for life-science applications, fixtures for hazardous locations, and theater house lighting. Tempo Industries won the category with the Tempo T-Bar House Lighting System scoring 4.25 Sapphires.



Tempo T-Bar House Lighting system from Tempo Industries.

Flexibility is the hallmark of the Tempo product. Locations such as a cinema require lighting capable of a multitude of different lighting levels to enable movie screening, intermission, cleaning, and emergency egress. With legacy sources, a movie house might need to install multiple lighting systems to support the diverse needs, but LED sources enable one lighting system to handle everything.

One judge stated, "The T-Bar system is an outstanding example of the product developer fully understanding the application at hand and utilizing LEDs and control technology to fully serve that application." The product will also offer the low maintenance that cinema operators will cherish. The product is designed for 85,000 hours of usage — more than ten years of continuous operation. Even the low-voltage power distribution scheme places the driver electronics that could require service in an accessible location. Disruption of the cinema's business will be minimized in terms of lighting maintenance.

Smart Lighting Technology

The final product and technology category awarded was Smart Lighting Technology. The category was another example in which we had a broad range of entries and numbers that mandated the selection of four finalists. Arborlight won the category with its LightWell 16 luminaire that emulates daylight and that scored 4.25 Sapphires. Moreover, the team behind the innovation was shortlisted as one of the finalists for Illumineer of the Year.



Arborlight LightWell 16 SSL daylight emulator.

The LightWell 16 SSL daylight emulator crosses the boundaries of smart lighting and human-centric lighting (HCL). The luminaire simulates natural daylight in terms of color, intensity, and directionality throughout the day, including adjustments for the time of year. Such a product could prove beneficial for the wellbeing and productivity of workforces that are indoors all day.

One Sapphire judge said, "This is cool. It adds another dimension to lighting." Another cited "the color tone changing and CRI are very good." The only negative comments on the product were focused on when it would be broadly available on a commercial basis and at what price. Still, it earned some of the highest scores in the competition. The design uses 400 LEDs spread across seven color channels.

Final notes on judging process

While the category winners in the inaugural Sapphire Awards clearly stood apart, the other finalists and many entries that didn't make the finalist cut were outstanding in their own right. We knew going into the first year of the program that there would be very close calls with fractions of a Sapphire determining the winners.

The expected close calls led us to take a different tack than other awards programs in the technology industry. We pledged from the start to publish a list of all the entries that received a score of 3.5 Sapphires or above. You will find that complete list, organized by category and score, in an article on our website. Moreover, all entrants received a score and the individual companies are free to publish their scores in literature and on their own websites.

