

Case Study



Case Study: Historic Theater Chandelier

World's Largest LED Fixture Shines with 160 LUXEON K2s

When the historic Stanley Center for the Arts in Utica, NY, reopened in April 2008 after a \$20 million renovation, the star of the show was a massive new Tiffany-style chandelier suspended above the lavishly decorated theater. At 35 feet wide, 17 feet tall and 6,500 pounds, the fixture is the largest LED chandelier in the world and a striking example of the innovations made possible by LUXEON® solid-state lighting technology.

Custom-designed and manufactured by Meyda Lighting (www.meyda.com) to replicate various decorative elements of the Stanley's ornate interior, the chandelier is illuminated by 160 LUXEON K2 LEDs from Philips Lumileds Lighting (www.philipslumileds.com).

The LUXEON K2s cumulatively generate as much light as the 75, 65-Watt halogen flood lamps originally specified, but use 75% less electricity—less, in fact, than a commercial coffee maker. They also generate a fraction of the halogens' heat, reducing the theater's air conditioning needs in summer months, and will need replacement only once every five decades instead of every few years at expected usage levels.

The complex LED lighting solution concealed above the chandelier's super-sized shade was engineered by ARAD (www.arad.us), a developer of specialty lighting, with the support of Future Lighting Solutions, the exclusive distributor of LUXEON LEDs. ARAD founder and chief engineer Tullio Dell Aquila selected LUXEON K2s for the job because of their industry-leading light output, reliable performance, and robust thermal and electrical capabilities.

"I've tested and sampled every LED on the market, and there's nothing that compares to LUXEON products in terms of light output, reliability, packaging, heat management and color consistency."

- Tullio Dell Aquila
Founder, ARAD



“Meyda Lighting was surprised and delighted that a fixture of this size could be lit with 160 LEDs regardless of what brand they were, and I wouldn’t have even attempted it without LUXEON and Future Lighting Solutions,” Dell Aquila said. “I’ve tested and sampled every LED on the market, and there’s nothing that compares to LUXEON products in terms of light output, reliability, packaging, heat management and color consistency. Future Lighting Solutions backed me up with design assistance and provided the LUXEON LEDs we needed on very short notice. Together, we got it done.”

Abandoning Halogen

The Stanley (www.stanleytheatre.net) opened in 1928 as a 2,945-seat movie palace. The theater gradually fell into disrepair and was headed for the wrecking ball when it was purchased by the Central New York Community Arts Council in 1974. Multiple renovation projects have restored the building to its former grandeur, capped by the 2008 upgrades that included the new \$130,000 chandelier.

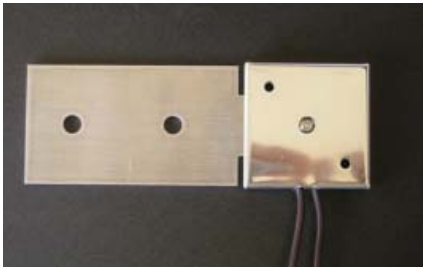
The Luxeon K2s cumulatively pump out as much light as the 75, 65-watt halogen flood lamps originally specified, but use 75% less electricity—less, in fact, than a commercial coffee maker.

Meyda Lighting, a division of Yorkville, New York-based Tiffany lamp and decorative lighting manufacturer Meyda Tiffany, was awarded the chandelier contract because the company uses styles and materials resembling the Stanley’s original fixtures. Meyda’s artisans spent nearly a year designing and producing the elaborate shade, but with the actual installation less than a month away, they were still grappling with the challenges of lighting what would be the world’s largest chandelier hanging from one ceiling fixture.

The designers realized that their initial plan to use 75, 65-watt halogen flood lamps would be electrically costly and might be perceived as environmentally insensitive because of the energy demand. They also faced logistical obstacles related to the theater layout in bringing in the four 20-amp electrical lines required to feed a halogen fixture of that size. In addition, there was a concern that halogen lighting would create unacceptable shadows and hot spots, in part because the chandelier trusswork would be visible through the translucent shade.

Never Before Possible

Meyda switched its lighting strategy after Future Lighting Solutions’ Mike Boynton, Regional Sales Manager, and Michael Quijano, Regional Technical Manager, explained that LUXEON technology could solve Meyda’s issues. They referred Meyda personnel to ARAD because of ARAD’s status as a long-time Certified LUXEON Luminaire Manufacturer and member of the LUXEON Lighting Network.



In just two weeks, ARAD designed, built and installed an intricate lighting system utilizing warm white LUXEON K2 Stars. They bonded and encased each LED in a custom aluminum module equipped with a small hole to expose the LUXEON K2 lens. The module backplate doubles as a heat sink and reflector, as well as accommodating a clip that allows the module to be snapped onto the trusses that hold the chandelier together.



Once the modules were built, ARAD assembled groups of five modules into strings attached by wires and carefully plotted the placement of each string around the fixture to assure proper light distribution. The modules were mounted about three feet from the chandelier surface and individually angled in an overlapping pattern to create an even spread of light without hot





spots or shadows from the fixture's trusswork. This approach eliminated the need for optics by relying on module placement as well as the LUXEON K2's 160-degree radiation pattern for proper light dispersal.

Additional light diffusion was achieved by gently texturing the inside surface of the chandelier's white glass panels through sand-blasting and thereby allowing the

glass to act as its own diffuser. When lit, the chandelier fills the white ceiling dome from which it hangs with an even circle of light—precisely the effect requested by the Stanley team.

Major Energy Savings

Beyond the sheer feat of lighting a colossus like the Stanley chandelier with power LEDs, the combination of efficient LUXEON LEDs, ARAD's engineering acumen and Meyda's custom manufacturing capabilities dramatically reduced the fixture's electricity and bulb replacement requirements.

Thanks to LUXEON's energy efficiency, switching from halogen to LED lighting slashed the fixture's power requirements from 37.5 amps to just 9. This in turn reduced the Stanley's circuit wiring needs from four 20-amp lines to two—just one to power the chandelier, the other as a spare—yielding significant savings in the time, labor and expense of running wire over the 400-foot distance from the control room to the chandelier.



The LED design is also delivering a remarkable 93% savings on the cost of the electricity required to light the chandelier by consuming 75% less energy, and by reducing peak demand, which is the basis on which electrical rates are set in that area. Instead of paying \$264 a month to run 75, 65-watt halogen lamps at \$3.52 apiece, the Stanley is paying roughly \$17.76 a month to light the entire chandelier.

The theater will also reap the financial and maintenance benefits of long LED life. Rather than lowering the fixture with a hoist every few years to replace halogen bulbs, managers expect the chandelier to operate for 50 years without worrying about burned-out lamps.

Custom Dimming Design

While the energy efficiency and longevity benefits of LUXEON LEDs were clear from the start, there was one final challenge in fitting solid-state technology to the needs of the Stanley project: the chandelier had to be magnetically dimmable to fade with the theater's house lights. With no commercial LED driver offering magnetic dimmability for such a large LED array and with the need to piggyback on the Stanley's existing AC dimmer instead of using LED-friendly



Harnessing the Power of LUXEON K2

The success of the solid-state lighting system of the Stanley Center for the Arts chandelier is rooted in the industry-leading luminous flux, temperature tolerance and drive current capabilities of LUXEON K2 power LEDs.

The warm white LUXEON K2 Stars used in the fixture deliver more usable light than any other LEDs, and can be run at a choice of drive currents up to 1500 mA. In this case, the lighting designer elected to run the fixture's 160 LUXEON K2s at 1A to generate the light levels needed to illuminate the historic theater.

Even at that high drive current, the LEDs operate significantly below the maximum 150°C junction temperature for which LUXEON K2s are rated, and the aluminum modules built to house the LEDs for precise placement inside the chandelier don't even get hot to the touch. This could not be achieved with any LED outside the LUXEON product family.

DC current, ARAD had to design a custom solution.

To that end, ARAD purchased an off-the-shelf AC/DC dimmable Class 2 transformer from Texas-based Justin Inc. (www.justininc.com), used it as an LED driver, and tied it into the theater's main controller system to allow the chandelier to be dimmed on the same AC circuit as the rest of the lights in the hall.

Since the Justin unit is not technically an LED driver and was therefore unable to regulate the power running to the LED strings, ARAD also designed a special current-limiting circuit using NEC one-watt resistors to limit the current drawn by each LED string to one amp. The resistors were attached like dongles to the light system to prevent the LUXEON K2s from tripping the circuit supplying electricity to the chandelier.



LUXEON K2 Benefits for Stanley Project

- Energy-efficient alternative to halogen lighting
- #1 in LED light output
- Drivable at 1A without overheating
- Fewer electrical circuits
- 75% less power needed for lighting
- 93% lower electric bills
- Less heat load on theater A/C
- Expected 50-year LED lifetime
- Mercury-free/eco-friendly

The Unveiling

Shortly after 6 pm on April 2, 2008, hundreds of donors to the Stanley renovation stood in the darkened aisles of the theater waiting for the new chandelier to take a bow. The audience burst into applause as local VIPs pulled a ceremonial switch and the fixture lit up a venue that had been closed for more than a year. A star chandelier was born.

“The success of this project gives me the confidence to move forward with LEDs in general and LUXEON in particular for other fixtures,” said Robert Cohen, owner and President of Meyda Lighting. “This chandelier is not just a showcase for our work but also an icon for a new world of light that is being made possible by solid-state technology.”

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