



Powercore

Power made simple

Technical Overview



Photography: John Brandon Miller
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Powercore

Powercore® technology represents a holistic approach to digital power processing that surpasses traditional low-voltage power supply technology.

Powercore integrates a microprocessor-controlled power conversion and regulation stage into luminaires, efficiently and accurately controlling output directly from line voltage.

Power options for luminaires

Low-voltage power distribution and inboard power integration (Powercore) are two power options that Color Kinetics uses.

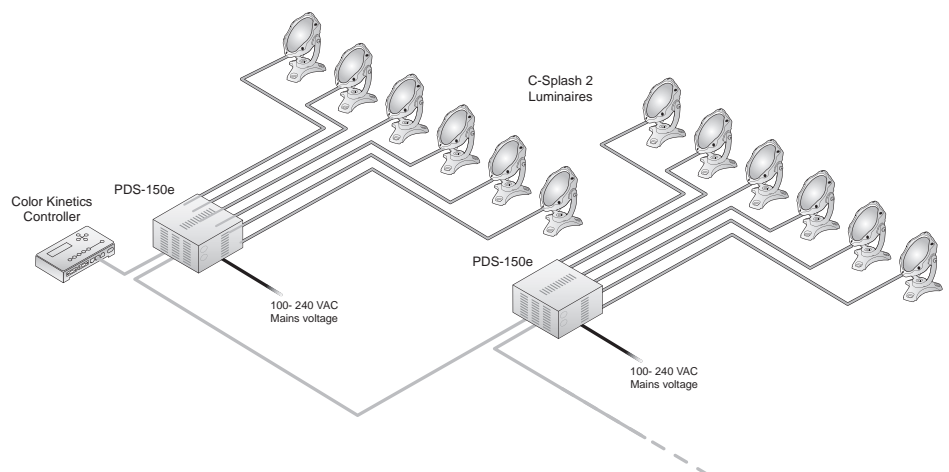
Powercore increases system efficiency, and lowers cost and complexity of installation, operation, and maintenance.

Comparing Low-voltage and Powercore

Low-voltage LED luminaires require low-voltage power supplies or transformers and special cabling to convert line voltage into low voltage. A low-voltage power supply is essentially a “brick” in the power cord, like a laptop computer’s power supply, and it usually produces direct current (DC).

A typical low-voltage configuration is a “star” configuration, where each luminaire or series of luminaires connects directly to a low-voltage power supply through a unified power cable, often a proprietary leader cable designed to work with a specific luminaire. The power supply, in turn, is connected to a power source. The number of luminaires that can be attached to each power supply is limited by such factors as the luminaires’ power consumption, the distance between the luminaires and the power supply, and the number of available power supply ports.

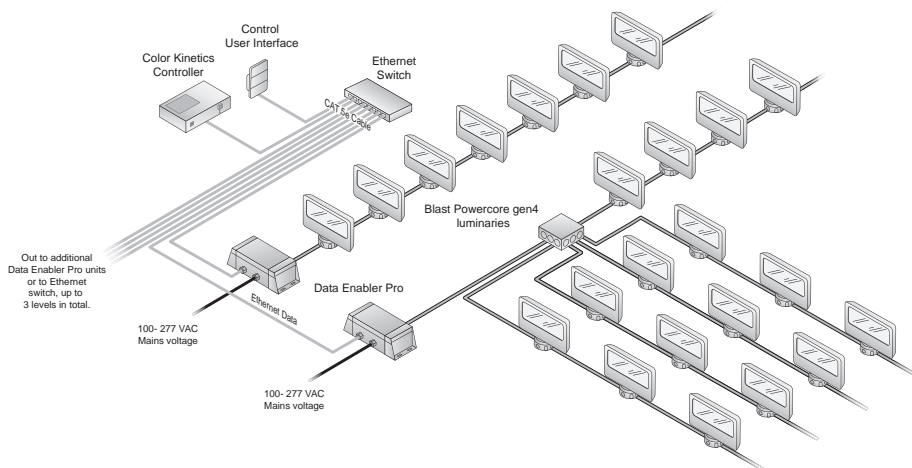
C-Splash 2 is a color-changing, low-voltage luminaire from Color Kinetics. Up to six luminaires can be connected to a single power supply. Installations requiring many luminaires use multiple power supplies, each positioned appropriately in relation to the luminaires, and each connected to a power source.



A typical low-voltage configuration consists of one or more power supplies providing power and control to one or more luminaires. Here, PDS-150e power supplies connect six C-Splash 2 luminaires each.

Powercore

Powercore (inboard power integration) represents an entirely different approach to power management. Powercore incorporates the power supply directly into the luminaire's circuitry to create an efficient power stage that consolidates line voltage conversion and LED current regulation. By integrating a single, efficient power stage into the luminaire itself, Powercore can eliminate a significant percentage of the power losses associated with low-voltage configurations with multiple power stages.



Significantly longer runs of luminaires with fewer power supplies is one advantage of a Powercore configuration compared to a low-voltage installation.

Powercore advantages

Lower the cost and complexity of installation and maintenance

By eliminating the need for external power supplies and special cabling, Powercore lowers the cost and complexity of installations.

Electrical contractors and installers can easily install Powercore-based systems using familiar methods and tools.

Powercore also lowers cost and eases installation by reducing a system's total parts count, minimizing the size and weight of the power management components required to run a lighting system, and extending luminaire and cable runs.

For example, Blast Powercore gen4 can be connected in runs of 30 to 50 luminaires per circuit, depending on the configuration. Similarly, individual run lengths can extend to 175 ft, as opposed to much shorter low-power run lengths, further simplifying installation and adding flexibility in luminaire positioning. (See Configuration Calculator to determine the number of luminaires each circuit in your installation can support, based on type of luminaire, power source, line voltage, circuit load, and cable lengths.)

By minimizing the number of required power supplies and eliminating the need for special cabling in a lighting system, Powercore simplifies and lowers the cost of maintenance in much the same way that it simplifies and lowers the cost of installation.

And unlike conventional lighting, dimming LED luminaires improves efficacy (lumens per watt) and increases lumen maintenance.





Photography: FG Trade - Getty Images

Powercore minimizes operational power losses

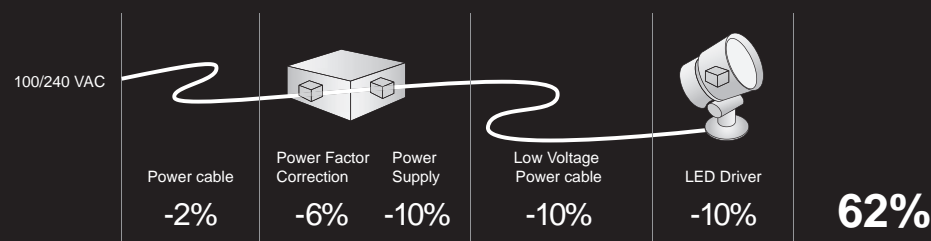
Powercore can eliminate a significant percentage of the power losses associated with external low-voltage power supplies and cabling. For color-changing luminaires, Powercore eliminates approximately 18% of the power losses incurred in low-voltage power distribution systems. For eW (Essential White) luminaires, which feature integration of power factor correction and LED driver circuitry into a single power management stage, Powercore can achieve up to 90% power efficiency from end to end.

Powercore maximizes efficiency through active power factor correction

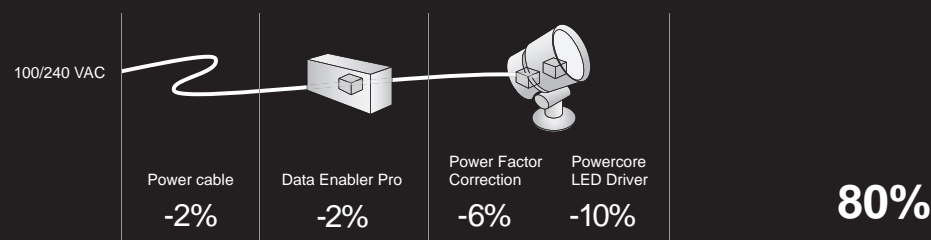
Powercore incorporates active power factor correction circuitry into each circuit to mitigate the effects of low power factor and maximize operational efficiency.

Power factor is a measure of how effectively a device converts electric current to useful power output. Low power factor results in higher currents for a given amount of power. Low power factor loads can pollute the electricity supply by tying up more grid capacity than

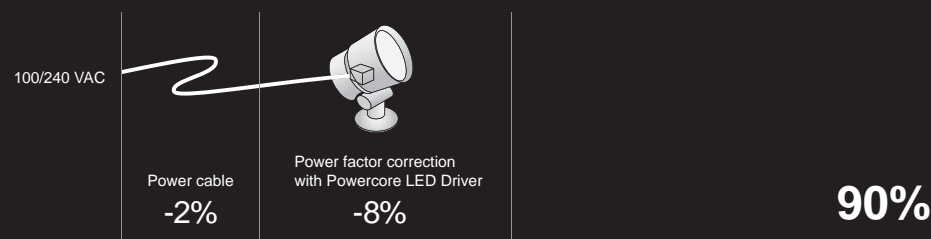
Low-voltage power distribution



Inboard power integration for color-changing Powercore luminaires



Inboard power integration for eW (single color) Powercore luminaires



customers actually require to run their electrical devices. That means that power companies must either generate more energy than is necessary or increase the size of the components in their transmission systems (wiring, generators, conductors, transformers, etc.) to handle the higher currents. In either case, low power factor results in higher costs for generation and transmission, and in greater energy losses.

Motors, transformers, lighting ballasts, and low-quality power supplies for computers and consumer electronics often have low power factor. Power factor correction (PFC) uses a system of inductors, capacitors, or voltage converters to adjust the power factor of electronic

devices toward the ideal power factor of 1.0. Because PFC results in cleaner main power with less loss in power distribution systems, more devices can run more efficiently on a circuit with PFC.

Power factor in Color Kinetics lighting systems typically measures above 0.995, very close to the ideal power factor of 1.0.



Photography: Trevor Palin

Powercore increases the useful life and reliability of LED sources in luminaires

Line power supplied to LED lighting systems ranges from 100 to 277 volts, depending on region, while LEDs typically consume only two to three volts each. Power conversion and regulation, therefore, is especially important in systems — not only to step voltages down to appropriate and efficient levels, but also to minimize current fluctuations, power surges, and short circuits that can shorten LED lifetimes, cause inconsistencies in color output and intensity, or disrupt operation.

An LED driver is an electronic circuit responsible for converting input power into a current source — a source in which current remains constant despite fluctuations in voltage. Powercore incorporates both an integrated LED driver and a pulse-width modulation (PWM) switch controller to fix current levels, ensuring consistent LED source operation and maximizing useful life.

A closed-loop control system provides accurate tracking of loads and current control, ensures high efficiency even at low loads, and can eliminate OFF state power consumption, a hidden energy cost in some traditional low-voltage systems.

Powercore enables universal power input

Because Powercore integrates the power supply directly into the luminaire, and the voltage required to run the luminaire is known, Powercore supports universal power input. As a result, some Powercore luminaires can receive input voltages in the range of 100 – 277 VAC, and reliably and efficiently supply the required wattage to run the luminaire. This means that Powercore luminaires can be installed and operated in the same way in any part of the world, regardless of local line voltage — an especially useful feature for touring productions and lighting designers with clients in multiple countries.



Photography: MargaretClavell - Getty Images

A Proven Technology

Color Kinetics was the first lighting company to develop high-performance solid-state lighting systems with integrated control technology, beginning in 2004. Since then, Color Kinetics has incorporated Powercore

technology into many of its products and Powercore is featured in some of the most iconic installations around the world today.

Photography credits:

T-Mobile Arena – Signify

444 Madison Avenue – Frederick Charles

Galleries Royales Saint-Hubert – Signify Belgium

Belfast City Hall – Redshift Photography

The London Eye – David Morrell, courtesy Lighting Technology Projects

Vegas Mall – Signify

The Forum Shops at Caesar's Palace – Nick Mays

Corpus Christi Harbor Bridge – Tumlinson Photography

15 July Martyrs Bridge – Kaan Verdioglu

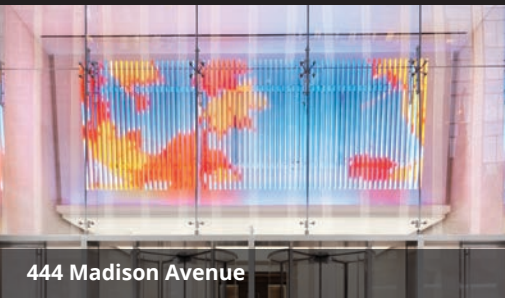
Fox Theatre: 2004-present – David Grill

Northwest Airlines Passenger Tunnel – Justin Maconochie Photography

Dragon Bridge – Sean Kruger – Getty Images



T-Mobile Arena



444 Madison Avenue



Galleries Royales Saint-Hubert



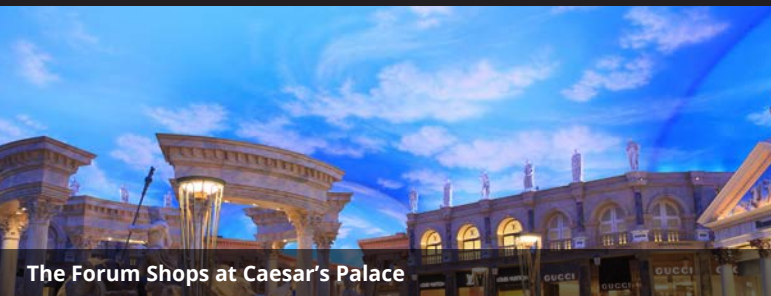
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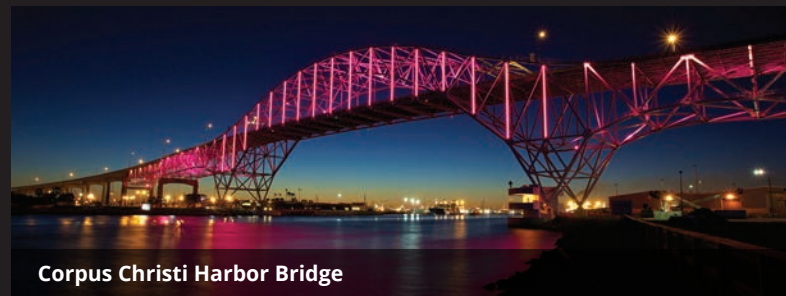
The London Eye



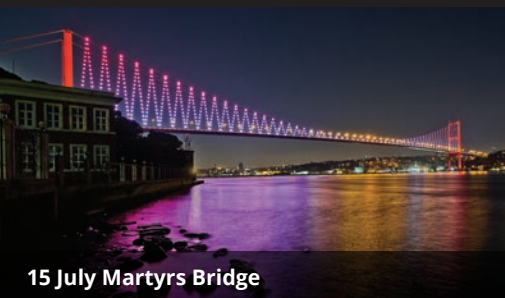
Vegas Mall



The Forum Shops at Caesar's Palace



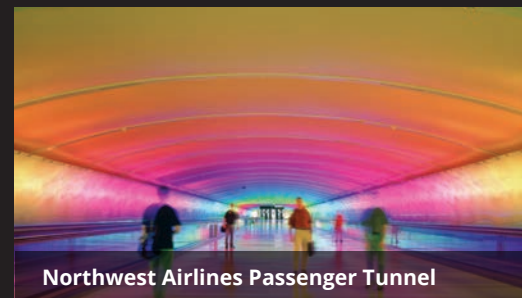
Corpus Christi Harbor Bridge



15 July Martyrs Bridge



Fox Theatre: 2004-present



Northwest Airlines Passenger Tunnel



Dragon Bridge

Color Kinetics technology portfolio

We continually explore your challenges, invest in research and development, and make the significant commitment required to develop and perfect breakthrough technologies. The result of decades of work, our unequaled portfolio of

proprietary, quality-enhancing technologies helps you achieve the best possible results. These technologies increase quality by ensuring sustainability, consistency, raising uniformity, providing precision control, and more.



Optibin

Where consistency begins.

Our LED optimization technology begins the color consistency process by grouping (or binning) LEDs by flux as well as center wavelength. This proprietary binning optimization process uses an advanced bin selection formula that exceeds industry standards for chromaticity. The result? Higher uniformity and consistency of hue and color temperature for all our luminaires.



Chromasync

Optimize output & color consistency.

Our advanced output optimization technology controls and boosts output while ensuring color consistency. When enabled, Chromasync ensures excellent color consistency between luminaires, without manually adjusting color points on each luminaire.



IntelliHue

The smart way to deliver white & color light.

Our advanced approach to color mixing produces high-quality white light, subtle pastels, and fully saturated colors in the same precisely controllable luminaire. All with unrivaled color accuracy across the entire range of color temperatures.



OptiField

Uniformity never looked this good.

OptiField's freeform optic creates a breakthrough rectangular beam that covers large surfaces with full, bright, even light. And OptiField can cover more surface area with fewer luminaires — simplifying installation while lowering energy use.



Powercore

Power made simple.

Our patented approach to power output proves that simple is better. As well as faster, more efficient, and accurate. Powercore® controls power output to luminaires directly from line voltage. It merges line voltage with control data and delivers both over a single standard cable—dramatically simplifying installation and lowering total system cost.



IntelliPower

Retrofit made easier.

IntelliPower is a groundbreaking implementation of proven power line carrier technology (PLC), a system for carrying data on the same conductors used for transmitting electrical power. By applying the principles of PLC, IntelliPower lets you install and digitally control intelligent Powercore luminaires using existing electrical branches, 2 + ground wiring, and luminaire mounting points.

What matters in professional lighting?

Our series of guides explores key topics in professional lighting—Color Science, Light Matters, Quality Matters, Optics Matter, and more. It's part of our commitment to passing on our deep technical knowledge and decades of expertise to help you achieve your vision.



Color Science

Color science serves as an underlying technical foundation for the entire lighting industry. It establishes a consistent way of thinking about light—how it is created, controlled, and delivered in real-world implementations. A core understanding of the science of color is critical to lighting professionals, who must be able to specify the right light—color, technology, luminaire, and more—clearly and accurately.



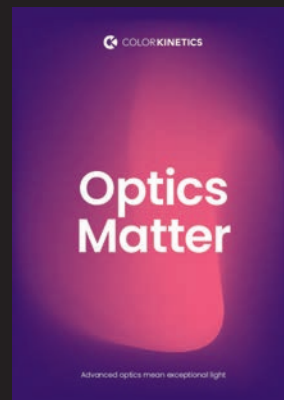
Light Matters

Traditional methods of evaluating light focused on lumen output, which was defined by the output capabilities of a light source, such as an incandescent lamp. The advent of LED lighting changed all that, since lumens were no longer the best measurement of a luminaire's capabilities. We explore some of the new ways lighting can be evaluated in the age of LED.



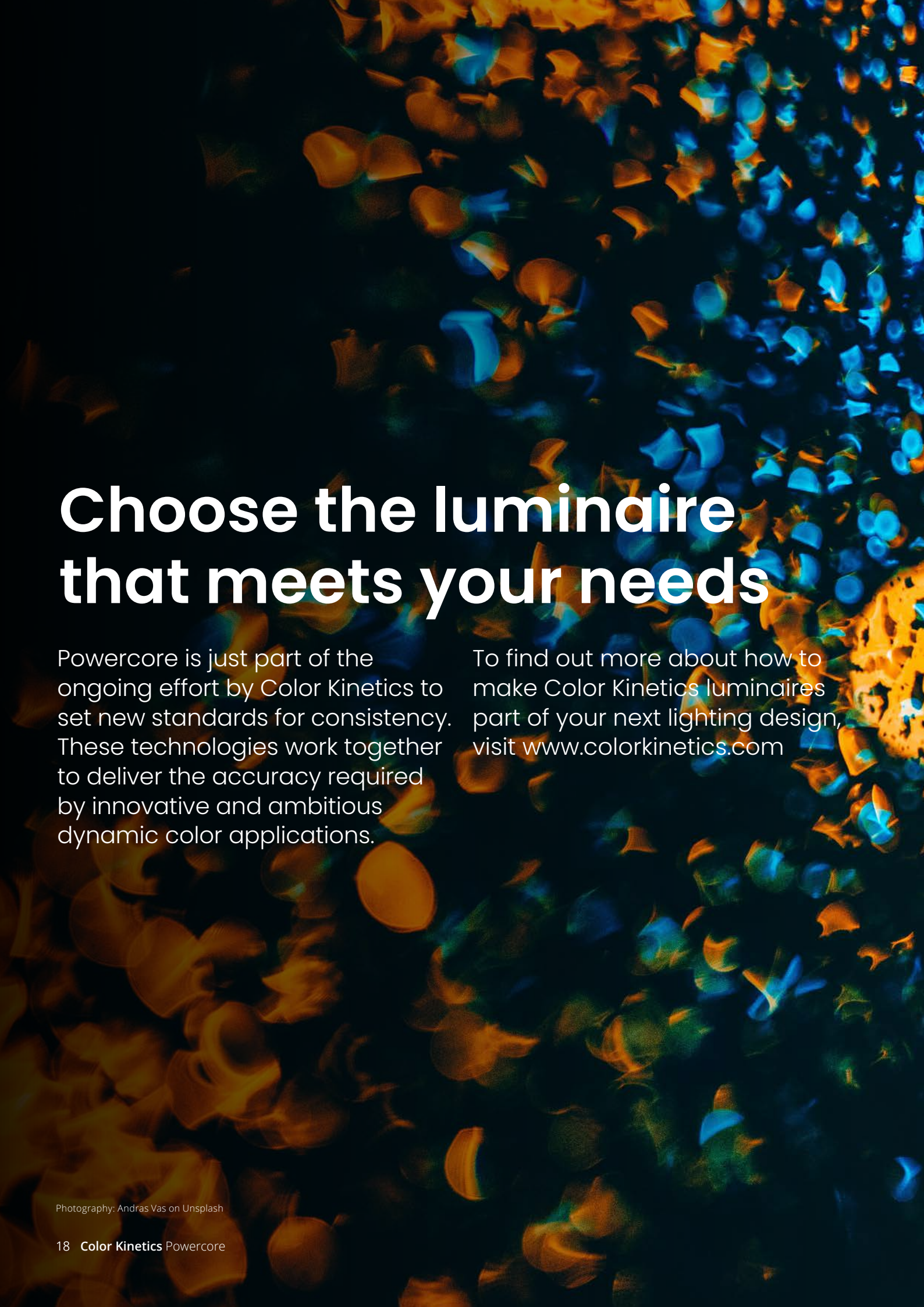
Quality Matters

What does quality mean to you? The answer depends on what you do within the lighting industry. Quality has different meanings for building and site owners/managers, lighting designers, and installers. We delve into the needs of each of these groups as we take a holistic approach to quality, one that begins and ends with the customer.



Optics Matter

It's safe to say that few lighting designers, building owners/managers, or other lighting professionals have ever seen the optical system housed inside an LED luminaire. But the optical system, or optics, play a vital, but often hidden role in performance, efficiency, and more. The right optics within a luminaire make a big difference in the final results—for both interior and exterior applications.



Choose the luminaire that meets your needs

Powercore is just part of the ongoing effort by Color Kinetics to set new standards for consistency. These technologies work together to deliver the accuracy required by innovative and ambitious dynamic color applications.

To find out more about how to make Color Kinetics luminaires part of your next lighting design, visit www.colorkinetics.com



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