LED Systems

The ability to create dramatic lighting effects in pools and spas has made this technology a hot commodity

by David Barnsley

Imagine being able to illuminate pool and spa water in virtually any colour, with a range of special lighting effects. With LEDs (light-emitting diodes), it is now possible. First developed for the electronics industry as indicator lights for VCRs and cell phones, LEDs are compact, thermally efficient and produce high intensity light – making them ideal for underwater illumination of pools and spas.

Felicia Spagnoli, senior corporate communications specialist with Color Kinetics Inc., of Boston, Massachusetts, which develops and licenses Chromacore™ LED technology to pool and spa manufacturers, explains how LEDs use microprocessors and semiconductors to produce colourful lighting effects.

"LED-based lights, which convert electrical energy directly into visible light, produce colours through additive colour-mixing of red, green and blue LEDs," explains Spagnoli. "This process is the heart of our patented Chromacore technology, which combines the digital nature of semiconductor-based LEDs with the intelligence of a microprocessor to control all aspects of illumination – including colour, brightness and special effects in both stand-alone and networked environments.

"The LEDs are assembled on a circuit board along with a microprocessor, and data, communication and power components, which require precise thermal placement and optics considerations. The circuit board is then enclosed within the appropriate fixture for the intended application."

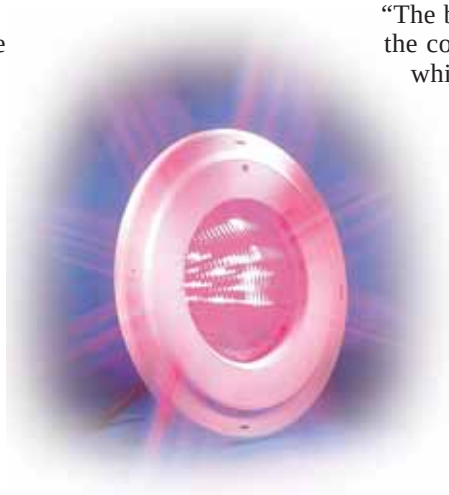
Specific Type Of LED Required For Pool/Spa Applications

Louis Teran, product manager for lights for Pentair Pool Products, which offers the CAL® Color AquaLuminator® colour changing light for above-ground pools, explains why pool and spa applications require a specific type of LED lighting system that differs from other applications.

"LEDs are designed for indicating purposes or for illumination," he states. "Many traffic lights and vehicle tail lights (except headlights) use LEDs as indicating lights that go on and off. They are inexpensive and can be clearly seen during the day as well as at night, but in order to avoid blinding other drivers, they do not provide much illumination. LEDs used in swimming pool and spa applications, on the other hand, are illuminating lights that are designed to provide as much high intensity light as possible."

The kaleidoscope of lighting effects created by LEDs are achieved by changing the number of times they are turned on and off and by the length of time that each 'on/off' cycle lasts, Teran says.

"The brain of the LED fixture is the controller, which determines which LEDs to turn on and at



Clockwise from top left:
The ColorLogic® LED lighting system from Hayward Pool Products Canada Inc. incorporates the latest in semiconductor technology.

A kaleidoscope of lighting effects can be achieved with Pentair Pool Product's CAL® Color AquaLuminator®.

Pool owners with an Aqua/Lamp light from Consolidated Pool & Spa Industries can easily upgrade to colour with the RainbowRays™ LED bulb.

Left: Waterway Plastics' 'Color Dynamics 14' system for spas offers a variety of standard colour options.

Below: Balboa Instruments' MoodEFX™ LED variable intensity lights for spas and hot tubs.

which intensity level and for how long," he says. "For example, a single 'on-off' for Pentair's 'CAL' light will start a 'standard' cycle; a second 'on-off' will activate the 'rapid' cycle; a third will activate the 'party' cycle'; the fourth will activate the 'slow' cycle and the fifth will begin the 'Caribbean cycle'. The length of time each on/off cycle lasts also affects the type of lighting produced. A single 15 second 'off' cycle, for example, will allow the pool owner to stop at any point in the transition of a colour – not just at blue or green colours – but even at a unique teal colour."

More Is Not Always Better

More is not always better when it comes to LED lighting, Teran adds.

"There is a major misconception that the more LEDs that are used in a light, the better it will illuminate the pool. But it's not a question of the number of LEDs used – but the type of LEDs being used," he states. "A single intensity 'illuminating' LED will produce more light than a cluster of 30 low-end indicating LEDs. These low-end lights do what they are supposed to do – provide light showing that they are turned on, such as in a traffic light – but the light from these fixtures is concentrated and does not spread over long distances. In a pool, you can tell that these lights are turned on even during the day – but the pool will not be illuminated – even at night."

Above: The ColorGlo™ Radiance™ light, from J & J Electronics Inc.

Right: The Galaxy™ series of LED lights for pools and spas from Super Vision International.

Although LED technology may be standardized, there is a remarkable degree of distinctiveness and individuality among manufacturers when is comes to designing colour transitions and underwater lighting effects.

The Jacuzzi division of Cantar Pool Products in Toronto Ontario, for example, offers 'FullMoon' LED lighting for swimming pools with a choice of five light options: 'Crystal' mode for natural white light; 'Rainbow' mode for a transition from blue to aquamarine; 'Solo' mode for individual colour choices; 'Lagoon' mode for a transition through blues and greens; and 'Showtime' mode for an array of flashing colours.

Other LED systems, such as the 'Color Dynamics 14' system for spas from Waterway Plastics of Oxnard, California, offer a variety of standard colour options using a three-colour, analog-driven RGB array that produces white light as well as a choice of fixed colours (aqua, purple, blue, green and red) that are produced in a soothing, random colour transition.

The Galaxy™ series of LED lights for pools and spas from Super Vision International in Orlando, Florida, offers another variation of LED colour mixing and transition.

"The Galaxy lightbulb offers a choice of seven modes, each producing a different effect – such as a solid colour change or a gradual colour change through greens and blues," says Richard Heiner, marketing director for Super Vision International.

The Galaxy system offers a 'solitude' blue colour display; a 'healing' green colour display; a 'tranquility' pale blue display; a 'serenity' blue-green fade display; a 'romance' magenta hue and a 'party' display of rapidly changing colours.

A sophisticated LED lighting system is also offered by for Balboa Instruments in Tustin, California, which offers MoodEFX™ LED variable intensity lights for spas and hot tubs.

"Depending on the installation, different colours can be chosen by pressing the on/off switch a certain number of times to choose a specific colour or to show effects such as a colour wash, random colour change and fading," says Bob Spillar, vice-president of marketing for Balboa Instruments.

In the MoodEFX system, a 'slow colour wash' takes approximately three minutes to cycle through a gentle transition from colour to colour. In the 'fast colour wash', the colour transition cycle takes one minute. In the 'slow random colour' mode, colours change randomly with each colour lasting approximately 15 seconds, while in the 'fast random colour' mode, colours change every five seconds. Mood EFX also offers a 'high speed random colour' mode for a rapid series of intense coloured light; a one minute 'cross fade' that allows blue and green colours to cycle back and forth and a 'fixed colour' mode for a fixed display of one colour.

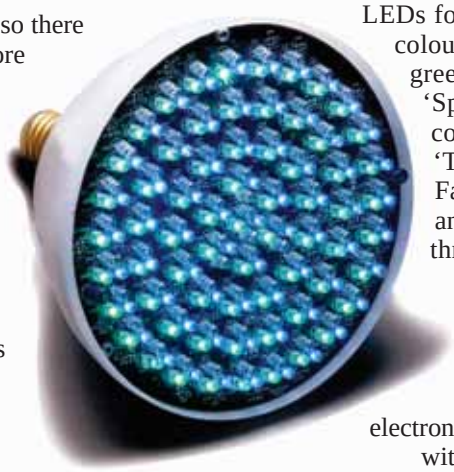
continued on page 12

continued from page 10

Longevity One Of The Main Benefits Of LEDs

Most manufacturers agree that one of the main benefits of LED lighting in pool applications is their longevity, with most systems lasting up to 100,000 hours or 11.4 years of continuous, 24-hour usage, depending on the operating temperature, operating voltage and current and thermal dissipation.

"LEDs are sealed in a unit – so there are no bulbs to replace and therefore no need for service calls," says Kevin McKee of Hayward Pool products Canada Inc., in Oakville, Ontario, which offers the ColorLogic® LED lighting system for inground pools.



"Our ColorLogic lights incorporate the latest in semiconductor technology with a thermoconductor pad and a stainless steel back pad," he says. "These components divert heat away from LEDs – reducing the impact of heat on the longevity of the light."

Ann Spires of Essentials, a spa accessory distributor that offers Starburst™ LED lights in several different versions, also says that one of the key selling features of this type of lighting system is its durability.

"Unlike ordinary incandescent bulbs, LEDs don't have a filament that will burn out and they don't become extremely hot," she explains. "They create light through the movement of electrons in a semiconductor material, so they can last just as long as a standard transistor, while only using 1/10th the power consumption of regular light bulbs."

Top Left: Above: Essentials offers their Starburst™ lights in several different versions.

Above: Gecko Electronics Inc. offers their 12-LED 'CoolRays' lights specifically for spas.

Spires says it is this durability that has made LEDs perfect for a variety of backyard lighting applications.

"There are now more applications for LED lighting outside the water than underwater, with LEDs now being used in place of fiber-optic lighting around spa skirts and on pool railings," she says. "One manufacturer is about to introduce an LED lighting system for use inside the home."

Another manufacturer that has not overlooked the potential for LEDs in spa applications is Gecko Electronics Inc., in Quebec City, Quebec, which offers their 12-LED 'CoolRays' lights specifically for spas.

"CoolRays are very easy for the spa owner to use," says Michel Authier, president of Gecko Electronics. "With just three presses on a Gecko remote control or on the 'light' key of the spa's keypad, the spa owner can select a specific colour or let the system create an assortment of colour variations and underwater light shows."

User-Defined Colours Can Be Freeze-Framed

Gecko's CoolRays system features a 'programmed' mode, where user-defined colours can be freeze-framed. By pressing the 'forward' key, the system memorizes the current colour and switches to a new colour. In the 'scan' mode, the colours change every three seconds, while in the 'hold' mode, the system will stop scanning colours and keep the last colour selected. The LEDs will blink twice when the system switches from 'scan' to 'hold'.

Another manufacturer specializing in LED systems for spas is J & J Electronics Inc., in Irvine, California. Their ColorGlo™ Radiance™ light contains 24 LEDs for larger spas, while their Sparkler™ light contains nine LEDs for smaller spas, with both models offering 10 colour lighting modes: white; standard red, blue and green; 'Sunburst' (yellow and orange glow); 'Spectrum Slow Dance' (a gradual fade through all colours); 'Magenta' (pink, blue and red glow); 'Tidal Fade' (blue and green fade); 'Afterburner Fade' (red, orange, pink, yellow and purple fade); and 'Color Burst' (a strobe effect transition through all colours).

LED Systems Can Compete With Standard Lightbulbs

Stephanie Jeffers, marketing manager for J & J electronics, explains how newer LED systems can compete with standard lightbulbs.

"The products we currently offer are designed to fit into an existing light fixture and are as easy to replace as changing a lightbulb. They offer an array of colour choices that other lighting systems (halogen, fiber-optic and incandescent) can't offer, they operate on 12-volts, have a low operational cost, are compact and synchronizable, and produce less heat than other spa lighting systems. The brilliant light produced by LEDs in a variety of colours also allows the spa owner to benefit from chromatherapy (the use of colour to change someone's mood) without using a colour wheel," says Jeffers.

According to Jason Sorokin of Consolidated Pool & Spa Industries in Woodbridge, Ontario, which offers RainbowRays™ LED pool lights, swimming pool owners are very enthusiastic about LED technology.

"Consumers love the fact that they can create so many colour options by simply turning the pool light on and off. Whenever this is done, combinations of red, green and blue are altered – creating a new colour," he says. "In addition to solid colours, LEDs can produce transition modes where combinations of colours change very slowly – with the final mode creating a flash or strobe-like lighting effect using solid colours."

Because they are easy to install, without built-in motors, moving parts, or a light source box to worry about – LEDs are also very popular as an after-market purchase for existing pools.

"The brains of the LED bulb exist inside the unit, so any pool owner with an Aqua/Lamp light can easily upgrade to colour simply by changing their existing light bulb to the RainbowRays LED bulb using the existing niche," says Sorokin. □