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## EYE ON LIGHTING

# A Bright Idea: LED Lighting

by Bob Kovacs

In case you haven't noticed, light is not particularly smart.

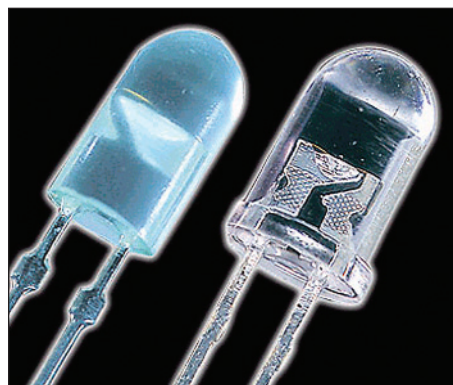
Light comes in a lot of different forms and can be created in many different ways, but the light itself doesn't know that it should have any particular characteristics to satisfy the needs of humans. Electrons get excited and light photons are emitted, and that is that as far as the photons are concerned.

However, if you look around, you will quickly notice that there are dozens of different shapes and configurations of lighting products to make light conform to our requirements. One of the most interesting of light technologies to bend itself to the needs of humanity is the light emitting diode.

LEDs have several features that make them interesting candidates for use in the television industry, including high theoretical efficiency, small size, long life and the ability to be manufactured with a consistent color temperature. Recent advances in the luminosity of LEDs have made them viable for television lighting and products are now reaching the market that can be used for on-camera and fill lights during a video shoot.

The semiconductor used for LEDs is aluminum gallium arsenide that has been "doped" to form N-type and P-type materials. A diode has one N-type and one P-type layer, in a configuration that permits current to flow in only one direction through the diode.

When current excites electrons in the semiconductor material, some electrons are pushed to higher energy states; when the electrons fall back to their initial energy state, photons of light are emitted. Since the ener-



*LEDs are efficient and durable, two features that make them useful as field lights.*

gy states that the electrons reach are always consistent, the photons of light are always the same energy and wavelength. Thus a red LED is always the same shade of red, regardless of how much current you feed through it.

For years, anything other than infrared and red LEDs were laboratory curiosities but the past 15 years has seen major progress, to the point where there are now several colors of LEDs, including white. Some television equipment manufacturers are now using white LEDs for television lights.

As technology used in LEDs improved to produce higher wavelengths of light, the efficiency of LEDs has also improved. In addition, each LED can be manufactured with a built-in lens that can focus the beam to provide a brighter spot or diffuse glow. Since this lense is part of the LED's packaging, it does not affect the overall weight of the device.

### THE PERFECT LIGHT?

In some ways, LEDs are perfect for television field lighting. They consume little power and happily run from batteries. They make

little heat and are lightweight, durable and small. In terms of efficiency, incandescent lights use about eight times more power than an LED light of equivalent luminosity and anything that uses less power is a friend to the aching backs of camera operators.

On the other hand, a single LED is simply not bright enough to be an effective television light, so an LED fixture must use an array of LEDs in order to output enough light. Spreading LEDs out over the surface of an array makes the fixture more difficult to focus and adds bulk.

Although LEDs are far more rugged than a lamp with a filament, they are not impervious to damage. One of the biggest factors in LED longevity is heat; the little heat that LEDs make must be carried away before it damages the semiconductor and makes the fixture worthless. On the other hand, losing one or two LEDs in an array of 140 has little effect on the overall brightness of the fixture; having LEDs in an array gives you a certain fail-safe capability.

An LED can make light that is daylight balanced, but the frequency range of the light is relatively narrow. A white LED will not be as "warm" as an incandescent light and this may render flesh tones that are unnatural to some producers. Fiddling with gels may help this but gels reduce light output and become another issue that must be addressed.

The benefits and liabilities of LED lighting are yet another factor to be stirred into the witches brew in the kitchen of lighting directors. LED television lights are now with us and they are sure to get more common and more capable in the next couple of years. ■