LED there be light

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Q: How many LED engineers does it take to change a light bulb?

A: Why on Earth would you ever need to change a light bulb?

While LED (light-emitting diode) costs are still high, this type of lighting is extremely long-lasting. And as prices come down, its efficiency could lead to huge energy savings.

The first consumer LED products lit up in the 1970s, with red light numbers on pocket calculators and push-button displays on big, geeky Pulsar watches. Then came those centered, high-mounted brake lights in the rear windows of cars. Now LEDs are found in everything from traffic lights to operating rooms to greenhouses.

An LED is a device that produces light when an electrical current flows through it. The color it emits depends on the materials used to make the diode.

"It won't be long before LED lighting technology has a space on your desk, has a space on your ceiling, certainly has a space on your car," says Russell Dupuis, an electro-optics professor at the Georgia Institute of Technology. Dupuis was awarded the 2002 National Medal of Technology for his work on LEDs.

"Most cars today have a whole lot of LED, certainly the instrument cluster," he says.

And some cities are also investing in LED for their roads. Dupuis says LED traffic signals would pay for themselves in about three months because of energy savings. And how long do they last? "Until somebody knocks the pole down!" he laughs.

Here are some numbers from the U.S. Department of Energy comparing lifetimes of LEDs to traditional lighting:

• Incandescent bulbs (750-2,000 hours): These bulbs haven't changed much in 120-plus years; they give off 80-percent heat and only 20-percent light.

• Compact fluorescent bulbs (8,000-10,000 hours): CFLs are more efficient than incandescent, but do contain small amounts of mercury.

• High-power white LEDs (35,000-50,000 hours): The Department of Energy estimates a quarter of the electricity in the United States is used for lighting, costing $50 billion per year. The agency says new technology could reduce lighting energy use by 50 percent.

For some big companies, the transition already makes sense. "Walmart decided to replace the lighting in all of its refrigerated cases with LED lights," Dupuis says. "Every store is going to save enough in six months to pay for this change."

There's also a niche for special lighting needs. Some surgical teams are using LED headlamps and operating-room lighting. LEDs also light up the words of the Constitution and Declaration of Independence at the Jefferson Memorial. And at the British Museum they illuminate the Beatles' "Sergeant Pepper's Lonely Hearts Club Band" uniforms so the fabric doesn't decay.

OLEDs, or organic light-emitting diodes, have other intriguing potential. They can be created on paper-thin plastics, and made into wallpaper, window blinds, even clothing.

But it will be several years before consumers can pick up a pack of LEDs at the hardware store. "Designing lights with LED has inherent challenges," says Michelle Murray, a spokeswoman for LED lighting manufacturer Cree Inc.

Those challenges prompted the Department of Energy to launch the L-Prize, a competition offering millions in cash prizes for the creation of a "high-quality, high-efficiency solid-state lighting products to replace the common light bulb."

The Department of Energy admits major consumer confusion when it first started promoting the efficiency of compact fluorescent lights. It says the United States cannot afford to squander the enormous energy-saving potential of LEDs, so it wants to make sure the products are ready for prime time when they do hit the market.

The Department of Energy is setting 2012 as a target for large-volume production and replacement of incandescent lighting.

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