Fluorescent bulbs out-green tungsten rivals

By JOE SCHWARCZ, The GazetteJanuary 25, 2009

The typewriter's gone. So is the record player. Photographic film is on its way out. All have been replaced by superior technologies.

Could the incandescent light bulb be the next to go? Maybe.

Compact fluorescent lights (CFLs) seem ready to take over with a promise of significant energy savings, but - and it seems there is always a "but" - already there are murmurings about hidden costs, possibly to our health.

The origins of fluorescent lighting can be traced back to a most unusual source. In 1676, French astronomer Jean Picard noted a faint glow emanating from his mercury barometer whenever he moved the instrument. Picard duly recorded this curious effect, but was unable to explain it.

Forty years later, English scientific-instrument-maker Francis Hauksbee finally solved the mystery. Hauksbee showed that when liquid mercury rubs against glass, it produces a static electrical charge which in turn can cause mercury vapour to glow. Indeed, the discharge of energy by electrically excited mercury atoms is the basis of modern fluorescent lighting.

But the journey from Hauksbee's experiments to today's fluorescent tubes and light bulbs would take some three centuries.

If a bit of static electricity could excite a gas, then surely a high-voltage electric current would be even more effective, figured German glass-blower Heinrich Geissler.

By the mid-19th century, batteries and electrical generators had become available, allowing Geissler to put his notion to a test.

In 1858, with the help of physicist Julius Plucker, Geissler managed to produce an eerie glow by passing an electric current through sealed glass tubes containing small amounts of various gases. These "Geissler tubes" really were no more than electrical toys, but they did arouse the curiosity of Daniel MacFarlan Moore, an electrical engineer. Moore began

his career working for Thomas Edison, but tinkering with discharge tubes did not please the boss who, of course, owed a large part of his fame to the incandescent light bulb.

When Edison asked him what he had against the light bulb, Moore, perhaps a little thoughtlessly, replied: "It's too small, too hot and too red."

That wasn't an answer to Edison's liking. The two inventors parted company and Moore started up a business manufacturing fluorescent tubes containing carbon dioxide as the light-producing gas. Unfortunately, these tubes were saddled with technical problems, but Moore deserves credit for introducing the first commercially marketed fluorescent lights.

And then came a turning point, one that harks back to Picard's original observation.

American electrical engineer P. Cooper Hewitt demonstrated that mercury vapour was superior to other gases for producing light and thereby laid the foundation for all future fluorescent lighting. Hewitt's tubes were energy efficient, but produced an uncomfortable blue-green light.

Jacques Risler in France solved that problem in 1926 by patenting a coating that, when applied to the inside of fluorescent tubes, absorbed the ultraviolet light produced by electrically excited mercury atoms and re-emitted it as pleasing visible light.

A glowing exhibit of fluorescents at the 1939 New York World's Fair primed the public for the large-scale introduction of tube lighting and by the 1950s more light was produced in North America by fluorescents than by incandescent bulbs.

Compact fluorescent bulbs were developed by General Electric's Ed Hammer in response to the energy crisis provoked by the 1973 Mideast war, but did not become popular until the new century ushered in the "green" movement.

Compact fluorescents are, indeed, "green." They require 75-per-cent less energy than incandescent bulbs and can last 10 times as long. This amounts to roughly a $30 saving per bulb and, perhaps more important, a significant saving in carbon dioxide emissions. If every home in North America replaced only one tungsten bulb with a fluorescent one, the carbon-dioxide saving would be equal to taking a million cars off the road. While it is true that the small amount of mercury in these bulbs is a possible source of pollution, it is more than compensated for by the reduced energy requirement. Coal-fired power plants spew mercury into the air, and if less coal is burned, less mercury is released.

Many current compact fluorescents contain as little as 1 mg of mercury, which is hardly significant.

As far as environmental effects are concerned, CFLs trump tungsten bulbs. That much is certain, but questions have been raised about the possible health consequences of the energy-saving bulbs.

First, fluorescents can flicker and flickering lights can cause migraines and eye strain. Then there is the possibility that electromagnetic radiation generated by the electronic circuitry built into compact fluorescents may trigger "electrosensitivity," symptoms of which supposedly range from general malaise to joint and muscle pain. And finally, the ultraviolet light emitted by compact fluorescents can cause skin sensitivities. With the drive to modify climate change by eventually replacing all tungsten bulbs with fluorescent ones, these concerns need to be addressed.

Britain's Health Protection Agency undertook the investigation of ultraviolet radiation produced by single- and double-envelope bulbs.

Single-envelope bulbs are the ones made with clearly visible coils, while double-envelope bulbs look like regular light bulbs. The latter were found to emit essentially no ultraviolet light, while single-envelope bulbs did radiate enough UV to cause skin reddening, but only when exposure was continuous, and only when the source was at a distance of less than 25 centimetres from the skin.

UV exposure that otherwise would have no effect can cause rashes and serious skin lesions in people afflicted with lupus. In this instance, compact fluorescents can be a problem and patient groups have expressed concern about any total phase-out of regular light bulbs.

And lupus patients are not the only ones concerned. Some people believe that the flickering of CFLs can cause migraines and may even provoke symptoms of "electrosensitivity" ranging from malaise to joint pain.

We'll examine the validity of these allegations next week.