

## How Innovation Killed the Lights



Workers make fluorescent light bulbs on an assembly line at a Technical Consumer Products, Inc (TCP) factory in Zhengjiang, China, on 30 August, 2010. TCP is one of the major exporters of fluorescent bulbs to the United States, which has made the bulbs the standard light source in the country. (Qilai Shen For The Washington Post)

**By Peter Whoriskey**

**Wednesday, September 8, 2010**

**IN WINCHESTER, VA. The last major GE factory making ordinary incandescent light bulbs in the United States is closing this month, marking a small, sad exit for a product and company that can trace their roots to Thomas Alva Edison's innovations in the 1870s.**

**The remaining 200 workers at the plant here will lose their jobs.**

"Now what're we going to do?" said Toby Savolainen, 49, who like many others worked for decades at the factory, making bulbs now deemed wasteful.

During the recession, political and business leaders have held out the promise that American advances, particularly in green technology, might stem the decades-long decline in U.S. manufacturing jobs. But as the lighting industry shows, even when the government pushes companies toward environmental innovations and Americans come up with them, the manufacture of the next generation technology can still end up overseas.

**What made the plant here vulnerable is, in part, a 2007 energy conservation measure passed by Congress that set standards essentially banning ordinary incandescents by 2014. The law will force millions of American households to switch to more efficient bulbs.**

The resulting savings in energy and greenhouse-gas emissions are expected to be immense. But the move also had unintended consequences.

**Rather than setting off a boom in the U.S. manufacture of replacement lights, the leading replacement lights are compact fluorescents, or CFLs, which are made almost entirely overseas, mostly in China.**

Consisting of glass tubes twisted into a spiral, they require more hand labor, which is cheaper there. So though they were first developed by American engineers in the 1970s, none of the major brands make CFLs in the United States.

"Everybody's jumping on the green bandwagon," said Pat Doyle, 54, who has worked at the plant for 26 years. But "we've been sold out. First sold out by the government. Then sold out by GE."

Doyle was speaking after a shift last month surrounded by several co-workers around a picnic table near the punch clock. Many of the workers have been at the plant for decades, and most appeared to be in their 40s and 50s. Several worried aloud about finding another job.

"When you're 50 years old, no one wants you," Savolainen said. It was meant half in jest, but some of the men nod grimly.

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If there is a green bandwagon, as Doyle says, much of the Obama administration is on board. As a means of creating U.S. jobs, the administration has been promoting the nation's "green economy" - solar power, electric cars, wind turbines - with the idea that U.S. innovations in those fields may translate into U.S. factories. President Obama said last month that he expects the government's commitment to clean energy to lead to more than 800,000 jobs by 2012, one step in a larger journey planned to restore U.S. manufacturing.

**But officials are working against a daunting trend. Under the pressures of globalization, the number of manufacturing jobs in the United States has been shrinking for decades, from 19.5 million in 1979 to 11.6 million this year, a decline of 40 percent.**

**At textile mills in North Carolina, at auto parts plants in Ohio, at other assorted manufacturing plants around the country, the closures have pushed workers out, often leaving them to face an onslaught of personal defeats: lower wages, community college retraining and unemployment checks.**

In Obama's vision, the nation's mastery of new technology will create American manufacturing jobs.

"See, when folks lift up the hoods on the cars of the future, I want them to see engines stamped "Made in America," Obama said in an Aug. 16 speech at a Wisconsin plant. "When new batteries to store solar power come off the line, I want to see printed on the side, "Made in America." When new technologies are developed and new industries are formed, I want them made right here in America. That's what we're fighting for."

But a closer look at the lighting industry reveals that isn't going to be easy.

At one time, the United States was ahead of the game in CFLs.

Following the 1973 energy crisis, a GE engineer named Ed Hammer and others at the company's famed Nela Park research laboratories were tinkering with different methods of saving electricity with fluorescent lights.

In a standard incandescent bulb, in which the filament is electrified until it glows, only about 10 percent of the electricity is transformed into light; the rest generates heat as a side effect. A typical fluorescent uses about 75 percent less electricity than an incandescent to produce the same amount of light. (Fluorescent Cost More to Manufacture & Requires Hazardous Waste Disposal)

The trouble facing Hammer was that fluorescents are most efficient in long tubes. But long, linear tubes don't fit into the same lamp fixtures that the standard incandescent bulbs do.

Working with a team of talented glass blowers, though, Hammer twisted the tubes into a spiral. The new lamps had length, but were also more compact.

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"I knew it was a good lamp design," he recalled recently. In retrospect, in fact, it was a key innovation. The Smithsonian houses Hammer's original spiral CFL prototype.

At the time, however, the design had one big problem. Bending all that glass into the required shape was slow and required lots of manual labor.

"I used to say you would need 40,000 glass blowers to make the parts," Hammer said. "Without automation, it was economically unfeasible. It was a lamp before its time."

The company decided to make investments in other types of lighting then being developed.

Years passed. The next major innovator to try his hand at CFLs was Ellis Yan, a Chinese immigrant to the United States, who had started his own lighting business in China and then in the early '90s turned his attention to the possibilities of CFLs.

To make CFLs, he had workers in China sit beside furnaces and bend the glass by hand. Even with the low-wages there, the first attempts were very expensive, clunky and flickered when turned on, he said. But he persisted.

"Everybody [in the industry] stayed back and was watching me," he recalled. "No one else wanted to make the big investment for the next generation of technology."

**The business prospered and Yan's factories in China employed as many as 14,000 - not so far off from the 40,000 glass blowers that Hammer had once imagined would be necessary. With new automation techniques, Yan is seeking to cut the number of his employees in China, where wages are rising, to 5,000 by year's end.**

Today, about a quarter of the lights sold in the United States are CFLs, according to NEMA, an industry association. Of those, Yan says, he manufactures more than half.

Someday soon, Yan says, he hopes to build a U.S. factory, though he so far has been unable to secure \$12.5 million in government funding for the project.

Manufacturing in the United States would add 10 percent or more to the cost of building a standard CFL, he said, but retailers have indicated that there is a demand for products manufactured domestically.

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"Retailers tell me people ask for 'Made in the USA' " Yan said. "I tell them the product will cost 45 to 50 cents more. They say people will pay for it."

Sales of the CFLs began slowly, but they spiked in 2006 and 2007, when federal and state government efforts promoted their use.

The Energy Department teamed with Disney to develop a public service announcement based on the Disney Pixar film "Ratatouille" to encourage the adoption of technologies such as CFLs. It was shown on CNN, HGTV and the Food Network.

Lawmakers in California and Nevada drafted legislation calling for higher efficiency standards for light bulbs. And in December 2007, Congress passed its new energy standards.

**GE balked at the standards at first, knowing that they could impact their U.S. manufacturing. But the company also saw that with restrictions gaining momentum in more states and other countries, some kind of legislation was unavoidable. They decided to support the bill as long as it didn't amount to a ban on traditional incandescents, but instead simply set energy standards.**

"We obviously pointed out to legislators that the impact of an outright ban would be an elimination of some manufacturing operations," said Earl Jones, senior counsel in government relations and regulatory compliance at the company. "But it was inevitable that some kind of legislation would be coming to the U.S."

**As expected, the new standards hurt the business in traditional incandescents.**

The company developed a plan to see what it would take to retrofit a plant that makes traditional incandescents into one that makes CFLs. Even with a \$40 million investment and automation, the disparity in wages and other factors made it uneconomical. The new plant's CFLs would have cost about 50 percent more than those from China, GE officials said.

The company also makes halogen light bulbs, which are an innovative type of incandescent, and Sylvania is transforming its incandescent light bulb factory in St. Marys, Pa. to halogen as well.

But the era of traditional incandescents built in the United States was coming to an end.

**In announcing the plant closure here, GE said in a news release that "a variety of energy regulations," including those in the United States, "will soon make the familiar lighting products produced at the Winchester Plant obsolete."**

"For those who make incandescent bulbs the law was bad for business," Yan said. "For people like us, it was very good."

Temperatures at the traditional incandescent plant here can be sweltering because of the heat coming from the machines that melt the glass. It's noisy, too, and workers wear ear plugs and safety glasses. And the pace of the work demands constant hustle, an atmosphere created by managers over the years who set up competitions among teams of workers striving to meet production goals. The winning line could post a black-and-white checkered flag on their machinery.

Jobs at the plant have been prized locally for years: They pay about \$30 an hour.

One day after punching out recently, the workers gathered around the picnic tables by the employee entrance.

**Some expressed grievances with the plant managers, who they note will get new jobs elsewhere, or with Congress for passing the energy legislation. Several took aim at the new new technology itself, noting that CFLs have mercury in them.**

Some at the plant will be able to retire off their severance packages. Those with less time on the job, or those who are younger, have braced themselves for whatever comes next.

Some are taking classes at the Lord Fairfax Community College, hoping that familiarity with solar panels or HVAC might land them a job. Others scan the want-ads but don't see how they will replace what they were making at the factory.

This small town has not been terribly hurt by the recession; local unemployment is running at 7.5 percent, well below the national average.

But good-paying jobs in manufacturing, they said, have become difficult to find.

Beverly Carter, 50, who feeds cardboard sleeves into a machine and makes sure it doesn't jam, has worked at the plant for 32 years.

"It's very hard to find a job like that around here," she said.

Moreover, because many of the workers are in their 40s and 50s, some were nagged by worries that other employers would see them as washed up.

"We gave GE the best years of our lives," Savolainen said.

Matt Madigan, 40, and his twin brothers, Wayne and Dwayne, also work at the plant.

"We've always had a lot of industry here in the valley, I've never had a problem finding a job," he said. "A person really wanted to work, you could go from one factory to another. Everything nowadays is tougher."