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Recyclers Craft End-Of-Life Solutions for EV Batteries

By PHIL TAYLOR of [Greenwire](#)

In the race to put 1 million plug-in hybrid electric vehicles on U.S. roads by 2015, another challenge awaits on the other side of the finish line: recycling all of those batteries.

The Department of Energy recently awarded \$9.5 million to a California-based recycling company to boost capacity for lithium-ion batteries, the kind used to power most of the new hybrid and plug-in electric vehicles entering the world market.

Toxco Inc. -- currently the only U.S.-based company able to recycle all sizes and models of lithium-ion batteries -- will use the grant to expand its recycling facility in Lancaster, Ohio, to process vehicle-grade batteries.

The facility currently processes large-format lead-acid batteries, as well as nickel-metal hydride batteries used in the current population of hybrid and electric vehicles.

The grant is part of \$2.4 billion in stimulus funds awarded last month to jump-start the manufacturing and deployment of a domestic crop of vehicle batteries, part of President Obama's pledge to transition the country away from a dependency on foreign oil and foreign-made batteries.

"As the U.S. hybrid vehicle market continues to grow, Toxco will provide end-of-life management and recycling of these advanced batteries in a safe and environmentally sound manner," said Todd Coy, executive vice president of Kinsbursky Brothers Inc., Toxco's parent company.

That means batteries that power cars like Nissan Motor Co.'s Leaf, unveiled last month, or General Motors Co.'s Chevrolet Volt, due out in 2010, will likely find their way to Toxco's plant in Lancaster, where they will be transformed into scrap commodities like cobalt, copper, nickel and lithium carbonate.

Toxco's Canadian recycling facility in Trail, British Columbia, already recycles lithium-ion batteries from devices like laptop computers, industrial plants and Tesla Motors Inc.'s all-electric Roadster vehicle. The batteries are frozen to -325 degrees Fahrenheit to defuse the lithium before being sheared, shredded and separated into their constituent parts for resale.

Though lithium currently fetches very little on the open market, other components in lithium-ion batteries, such as nickel and cobalt, will make the batteries far too valuable to send to the landfill. Coy said the Lancaster plant would also be able to reclaim lithium carbonate for reuse in vehicle batteries if a market develops for the material.

Other recyclers preparing for EV revolution

As demand grows for electric vehicles, so, too, will demand for the nickel, cobalt and manganese metals that power their batteries, said Tim Weekes, spokesman for the Belgium-based materials group Umicore, which applied for U.S. stimulus funds to recycle vehicle batteries but was not awarded a grant.

"We're certainly convinced the electrification of vehicle drivetrains will happen," said Weekes, whose company expects hybrid and electric vehicles to make up about 5 percent of the world market by 2015, a volume that would offer significant new opportunities for recyclers.

Umicore is among several recycling firms looking to position themselves for what could be a major expansion in electric vehicle sales.

Carlos Ghosn, CEO of Nissan, whose electric Leaf was unveiled this month, has said electric vehicle sales will make up 10 percent of the market by 2020, a figure equal to about 65 million units last year.

That may be overly optimistic, according to Ashvin Chotai, managing director of Intelligence Automotive Asia Ltd. in London. Even with competitive pricing, higher gasoline prices and adequate vehicle charging infrastructure, demand for electric vehicles may reach only a few million units by 2020, he said. Auto consulting company CSM Worldwide predicts global electric car production will reach 289,000 units by 2015.

Umicore already recycles a limited number of lithium-ion batteries at its pilot plant in Sweden, recovering the lithium carbonate for use as a residue in the construction industry. But as the market for lithium grows, the company said it hopes to eventually supply lithium from its recycling plants in the United States to battery manufacturers, Weekes said.

Though lithium is among the least valuable materials to recover, lithium-ion batteries could become just as valuable to recycling firms as the nickel-metal hydride batteries found in Toyota's hybrid Prius. "In the case of lithium-ion batteries, the economics are as compelling, if not more so," Weekes said.

And from an environmental perspective, it makes sense to reuse battery materials, as well. Though lithium-ion batteries contain none of the caustic chemicals found in lead-acid batteries, dumping them in landfills would be wasteful and could potentially pollute area groundwater, Weekes said.

Coy, of Toxco, said it is too early to tell what kind of value recyclers will get out of lithium-ion vehicle batteries because developers and automakers are very secretive about what components they will use. The few batteries the company has recycled have been available through only a limited release, he said, adding that he does not know much more than the public about what materials the next wave of lithium-ion batteries will contain.

Plenty of lithium to go around

With most of the world's lithium production centered in Bolivia, Chile and China, some say having a recycling infrastructure in place for vehicle batteries could help save the United States from trading "peak oil" for "peak

lithium."

Demand for lithium is currently restrained by the global recession but is expected to catch back up with the world supply by 2013, according to TRU Group Inc. Rising demand for electric vehicles could cause a lithium production crunch as early as 2017 and beyond, the Toronto-based industry research firm said.

However, those fears may be premature, said Linda Gaines, an analyst at Argonne National Laboratory near Chicago who is conducting a four-year study into whether the world's supply of lithium can fuel the U.S. transition to battery-driven vehicles.

"Even if we have a very, very energetic program of putting in electric vehicles, we're still not going to use up all the lithium," said Gaines, whose research found that lithium demand could be met through at least 2050. Those calculations assumed the United States would have roughly half a billion electric vehicles on the road by midcentury, with annual sales at about 21 million.

If people should be worried about the supplies of any material, it should be cobalt, a material many times more valuable than lithium but likely to be phased out of vehicle batteries over the coming years, Gaines said. Some battery manufacturers may even be leery about buying recycled lithium compounds from recyclers for fear of contamination, Gaines said.

But most of the lithium used in the United States is imported, according to the U.S. Geological Survey.

Currently, lithium is mined by only one company in the United States from a brine operation in the Nevada desert, and USGS data show that more than 85 percent of the world's lithium reserves is in Bolivia, Chile and China.

Gaines' research found that the amount of lithium needed for some types of lithium-ion batteries could be cut in half if those batteries are effectively recycled.

"If we had a careful recycling program in the U.S., we could conceivably be self-sufficient," Gaines said. "The ideal would be to take the whole battery apart, clean up the material and recycle them back to battery-grade."

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