Battery Recycling and EPR

Billions of used batteries are generated annually through a variety of processes in households, businesses and manufacturing facilities. In manufacturing facilities, common sources of used batteries include power tools, cellular phones, electronics, and emergency lighting. In 1990, 88 percent of all mercury discarded in the U.S. came from batteries. Mercury has been phased out of the battery manufacturing process since 1996 so that most single-use battery are now mercury free. Batteries now account for 50 percent of all cadmium disposal. This number has increased in recent years because of the explosion in the use of wireless communication devices.

There are three broad categories of batteries manufactured:

1. Lead-acid batteries
   Lead acid batteries are primarily used in vehicles. They are recycled at a very high rate with some estimates of 90-95 percent of all lead acid batteries being recycled.

2. Rechargeable batteries
   Rechargeable batteries include Nickel Cadmium, Nickel Metal Halide and Lithium Ion. They are very recyclable with good markets for recycling.

3. Single Use or Primary Cell batteries
   Single-use batteries include Alkaline Manganese, Zinc Carbon, Zinc Air, Lithium, Mercuric Oxide and Silver Oxide. They have a single use and cannot be recharged. They are the most common form of battery.

Battery Recycling Processes

The following is a brief discussion about how batteries of different chemistries are physically recycled at the end-site recycling plant.

Lead Acid Battery Recycling

The battery is broken apart in a hammer mill; a machine that hammers the battery into pieces. The broken battery pieces are then placed into a vat, where the lead and heavy materials fall to the bottom and the plastic floats. At this point, the polypropylene pieces are scooped away and the liquids are drawn off, leaving the lead and heavy metals. Each of the materials goes into a different recycling “stream”.

Plastic

Polypropylene pieces are washed, blown dry, and sent to a plastic recycler where the pieces are melted together into an almost liquid state. The molten plastic is put through an extruder that produces small plastic pellets of a uniform size. The pellets are sold to a manufacturer of battery cases and the process begins again.

Lead

Lead grids, lead oxide, and other lead parts are cleaned and heated within smelting furnaces. The molten melted lead is then poured into ingot molds. After a few minutes, the impurities float to the top of the still molten lead in the ingot molds. These impurities are scraped away and the ingots are left to cool. When the ingots are cool, they’re removed from the molds and sent to battery manufacturers, where they’re re-melted and used in the production of new batteries.

Sulfuric Acid

Old battery acid can be handled in two ways: 1) The acid is neutralized with an industrial compound similar to household baking soda. Neutralization turns the acid into water. The water is then treated, cleaned, tested in a waste water treatment plant to be sure it meets clean water standards. 2) The acid is processed and converted to sodium sulfate, an odorless white powder that’s used in laundry detergent, glass, and textile manufacturing.

Alkaline/Zinc Carbon/Zinc Air Batteries

These batteries are recycled in a specialized “room temperature,” mechanical separation process where the battery components are separated into 3 end products. These items are a) Zinc & Manganese Concentrate, b) Steel, c) Paper &
Plastic. All of these products are put back into the market place for reuse in new products. These batteries are 100% recycled.

**Lithium Ion Batteries**

Prior to the smelting process, plastics are separated from the metal components. The metals are then recycled via a High-Temperature Metal Reclamation (HTMR) process during which all of the high temperature metals contained within the battery feedstock (i.e. nickel, iron, manganese, and chromium) report to the molten-metal bath within the furnace, amalgamate, then solidify during the casting operation. The low-melt metals (i.e. zinc and cadmium) separate during the melting. The metals and plastic are then returned to be reused in new products. These batteries are 100% recycled.

**Nickel-Cadmium, Nickel Metal Hydride Batteries**

Prior to the smelting process, plastics are separated from the metal components. The metals are then recycled via a High-Temperature Metal Reclamation (HTMR) process during which all of the high temperature metals contained within the battery feedstock (i.e. nickel, iron, manganese, and chromium) report to the molten-metal bath within the furnace, amalgamate, then solidify during the casting operation. The low-melt metals (i.e. zinc and cadmium) separate during the melting. The metals and plastic are then returned to be reused in new products. These batteries are 100% recycled.

**Lithium Batteries**

The contents of the batteries are exposed using a shredder or a high-speed hammer depending on battery size. The contents are then submerged in caustic (basic not acidic) water. This caustic solution neutralizes the electrolytes, and ferrous and non-ferrous metals are recovered. The clean scrap metal is then sold to metal recyclers. The solution is then filtered. The carbon is recovered and pressed into moist sheets of carbon cake. Some of the carbon is recycled with cobalt. The lithium in the solution (lithium hydroxide) is converted to lithium carbonate, a fine white powder. What results is technical grade lithium carbonate, which is used to make lithium ingot metal and foil for batteries. It also provides lithium metal for resale and for the manufacture of sulfur dioxide batteries.

**Mercury Batteries**

The batteries and heavy metals are recovered through a controlled-temperature process. It’s important to note: the percentage of mercuric oxide batteries is decreasing since the passage of the Mercury-Containing Rechargeable Battery Management Act (The Battery Act) of 1996. This act prohibits, or otherwise conditions, the sale of certain types of mercury-containing batteries (i.e., alkaline-manganese, zinc-carbon, button-cell mercuric-oxide and other mercuric-oxide batteries) in the United States.
Battery Recyclers in Wisconsin

Lamp Recyclers Inc.


All batteries handled by Lamp Recyclers are recycled.

Documentation

Lamp Recyclers Inc. keeps on file a Certificate of Recycling for all batteries.

Battery Types

- Rechargeable
  - Nickel Cadmium
  - Nickel Metal Halide
  - Lithium Ion
  - Lead

- Primary Cells
  - Alkaline Manganese
  - Zinc Carbon
  - Zinc Air
  - Lithium
  - Mercuric Oxide
  - Silver Oxide

Call2Recycle

Founded in 1994, Call2Recycle—North America’s first and largest battery stewardship program—is a non-profit organization that collects and recycles batteries at no cost for municipalities, businesses and consumers. 2014 commemorates Call2Recycle’s 20th anniversary in battery collection and recycling. Since 1996, Call2Recycle has diverted more than 85 million pounds (39 million kilograms) of batteries and cellphones from the solid waste stream and established over 34,000 collection sites throughout the U.S. and Canada. It is the first program of its kind to receive the Responsible Recycling Practices Standard (R2) certification. - See more at: http://www.call2recycle.org/who-is-call2recycle/#sthash.YXs6dRae.dpuf

Battery Types

- Nickel Cadmium (Ni-Cd)
- Lithium Ion (Li-Ion)
- Small Sealed Lead Acid (SSLA/Pb)
- Nickel Metal Hydride (Ni-MH)
- Nickel Zinc (Ni-ZN)

Batteries Plus Bulbs

Batteries Plus Bulbs opened in 1988 in Green Bay, Wisconsin. They are now the nation’s largest, fastest-growing battery and light bulb franchise. They have over 600 locations in 46 states and Puerto Rico. Batteries Plus Bulbs recycles the majority of the batteries they sell focusing on rechargeable batteries.

Battery Types

- Lead acid (Pb) Batteries
- Nickel Cadmium (NiCd) Batteries
- Nickel Metal Hydride (NiMH) Batteries
- Lithium Ion (Li Ion) & Lithium Polymer (Li Poly)
Battery EPR Laws

Vermont is first to usher in battery EPR
By Bobby Elliott, E-Scrap News
May 14, 2014

Vermont has become the first state in the country to require producers to foot the bill, at least in theory, for the collection and recycling of alkaline batteries.

Despite industry opposition, the bill gained the approval of Vermont legislators May 9 and now awaits Gov. Peter Shumlin's signature before it becomes law.

Under House Bill 695, battery manufacturers, including Energizer, Panasonic and Rayovac, are mandated to coordinate collection and recycling of alkaline, or single-use, batteries in the Green Mountain State. Consumers will most likely see a slight hike in battery costs to offset anticipated expenses in rolling out and maintaining the program.

To ensure the program runs smoothly, producers will be tasked with creating a nonprofit group to oversee and manage efforts.

Jennifer Holliday, chairperson for the Vermont Product Stewardship Council and president of the board at Product Stewardship Institute (PSI), says the idea behind the original bill was to "take the path of least resistance."

Early on, that path drew support from the industry’s three-company stewardship group, the Corporation for Battery Recycling (CBR), which strongly supported requiring producers of products containing batteries — toy makers, for instance — to also chip in on forming and funding the stewardship program.

When the bill’s language was eventually revised to define producers as solely battery makers, however, CBR balked at the measure and lobbied unsuccessfully for its defeat.

"Our goal was to have a bill that was fair and we didn't think it was too big of a lift for the device makers to help out," Marc Boolish, director of technology at CBR-member Energizer, told E-Scrap News.

As it stands, the law will be reviewed a year after its 2016 launch to "assess how much of an issue this is and how to fix it, if this is an issue," Holliday said. Holliday added that the amount of batteries entering the market in products is "not huge, but probably not insignificant" and battery makers "will be dealing with some orphan waste" until a change is made to the law.

Both Holliday and Boolish stated the battery industry and the state intend to work together in the future.

"We are really excited to have this law, but we’re also fully anticipating to work with the battery industry and address any potential issues in the future," Holliday said.

Boolish added the bill "gets us to almost what we consider a level playing field and we plan on being engaged with the state of Vermont going forward to work with them and even to fix the problems." One of the biggest victories of the legislation, Boolish noted, was getting all battery makers on board, including Rayovac, which had left CBR shortly after its founding.

While no strict collection goals have been set, producers will be required to provide at least two collection locations in each of Vermont’s 14 counties.

Going forward, Energizer and CBR’s two other members — Panasonic and Duracell — will work to promote stewardship laws in states throughout the country, Boolish said. Rechargeable batteries, currently collected by the industry’s Call2Recycle, could also be included in model legislation and that topic will be raised at this June’s meeting held by PSI.

Scott Cassel, PSI’s CEO, said the Vermont bill "is a step forward," but he said he hopes the June meeting will provide stakeholders with an opportunity to "come up with a refined model that can be implemented across the U.S. ... with the input and concurrence of both single-use and rechargeable battery industries."

Cassel noted the topic of producers of battery-containing devices will also be discussed in shaping the model framework.
Connecticut Prepares to Launch Battery EPR Bill

Connecticut is planning to introduce the nation’s first consensus-based extended producer responsibility bill for both rechargeable and single-use batteries during its 2015 legislative session.

Released June 11 at the Connecticut Department of Energy and Environmental Protection’s national battery stewardship dialogue meeting, the model bill was drafted by a group of battery trade organizations and is now at the heart of discussions and negotiations with state lawmakers throughout the US.

Under the new law, manufacturers would be required to collect and recycle all single-use and rechargeable batteries from consumers.

Although the model bill was created with the intent of being adopted by states nationwide, Connecticut will be the first to introduce it, and lawmakers there have until August to refine the bill’s language and tailor its provisions.

The two-day-long meeting in Connecticut included over 130 people, including representatives of 23 state and local agencies. It was designed and facilitated by the Product Stewardship Council. PSI’s government members, specifically those from Connecticut, Minnesota, Vermont, California and Washington, were key in laying the technical foundation and providing the meeting’s political fuel.

Vermont’s recently passed battery law, an active bill in California, the Connecticut battery meeting and various state bills were credited for providing the impetus for the model bill.

The four battery interest groups that created the model bill included the Corporation for Battery Recycling, The Rechargeable Battery Association, Call2Recycle, and Energizer, Duracell and Panasonic from the National Electrical Manufacturers Association.

Carl Smith, chief executive officer and president of Call2Recycle, said that the possibility of patchwork battery legislation around the country made it clear that the time had come for industry and government officials to come together to create a single, streamlined model EPR bill.