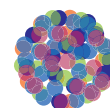


B9 BATTERIES

RECYCLING



**CHEMICAL
INDUSTRIES**
RESOURCE PACK

Recycling lead-acid batteries

Few people might be aware of one of the most exceptional environmental success stories of our time - the recycling of the lead-acid battery. In the USA, for instance, lead-acid batteries top the list of the most highly recycled consumer products at 93% compared to the 42% of newspapers, 55% of aluminium soft drink and beer cans, and 40% of plastic soft drink bottles.

This success story is due, in part, to the closed loop life cycle of the lead-acid battery which is 98% recyclable. Initially the battery is broken apart in a hammermill. The broken pieces go into a vat or flotation pond where the lead and heavy materials sink to the bottom while the plastic remains afloat. At this stage of the process, the polypropylene pieces are scooped away and the liquids are drawn off leaving the lead and heavy metals behind.

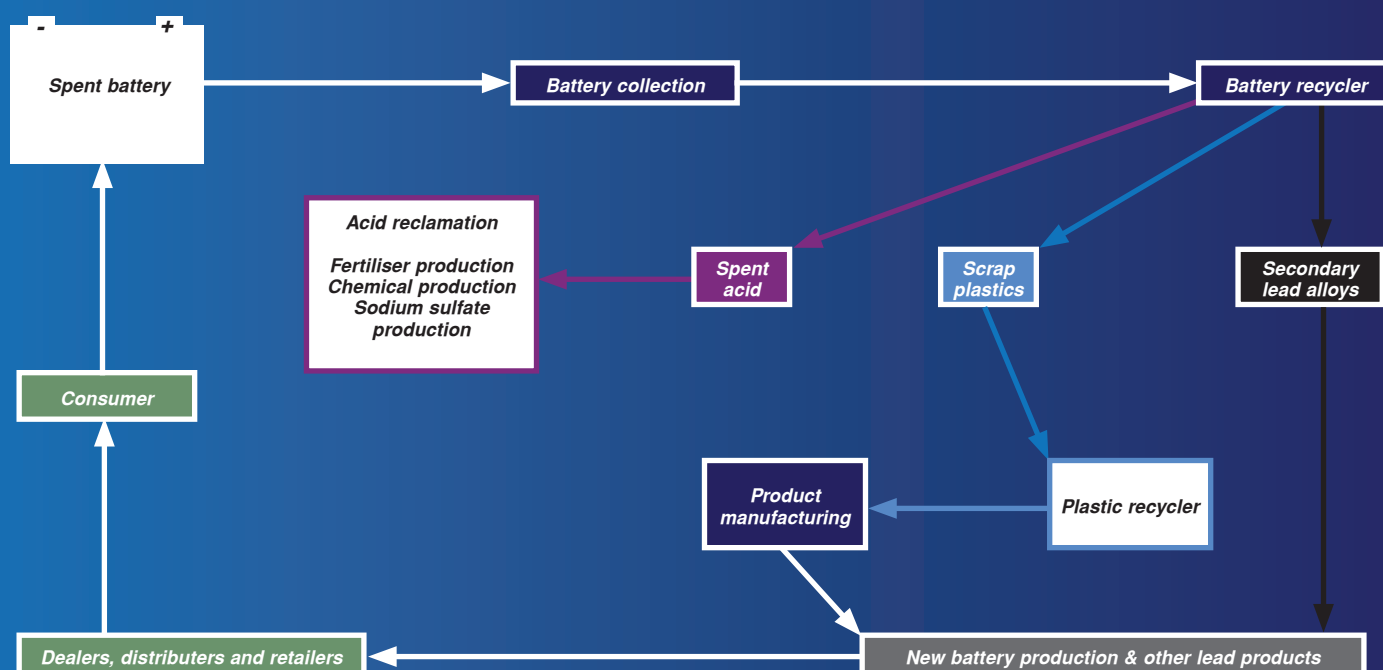
The polypropylene, or plastic pieces are washed, air dried and then melted together into an almost liquid state. The molten plastic is then put through an extruder that produces small uniform plastic pellets. These pellets are then used to manufacture new battery cases.

The lead grids, lead oxide and other lead parts are cleaned and melted together in a smelting furnace along with additives used to help in the removal of impurities. The molten lead is poured into ingot moulds. After a couple of minutes, the impurities, or dross, float to the top of the still molten lead in the moulds and are scraped away. The ingots are then left to cool. Once they have cooled, they are removed and are then ready to be resmelted to produce new lead plates and other parts for new batteries.

Old battery acid is handled in two ways. The acid is neutralised with an industrial compound similar to household baking soda. The water that is formed is treated, cleaned and tested to ensure that it meets clean water standards. It is then released into the public sewerage system. The sodium sulfate that is formed is used in laundry detergent, glass and textile manufacturing. Thus a potentially noxious substance is transformed into a useful reusable product.

This material was obtained from Willard Batteries. Learners - if you use any part of it you need to write it in your own words and include the following in your reference list: Willard Batteries. 2010. Bringing Indigenous Trees to Africa. [Online]. Available: <http://www.willard.co.za/recycle.html>. [27 July 2010].

Flowchart: Lead-acid battery recycling process



Source: Gravita Exim Ltd

Recycling 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 solution. This caustic solution neutralises 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.

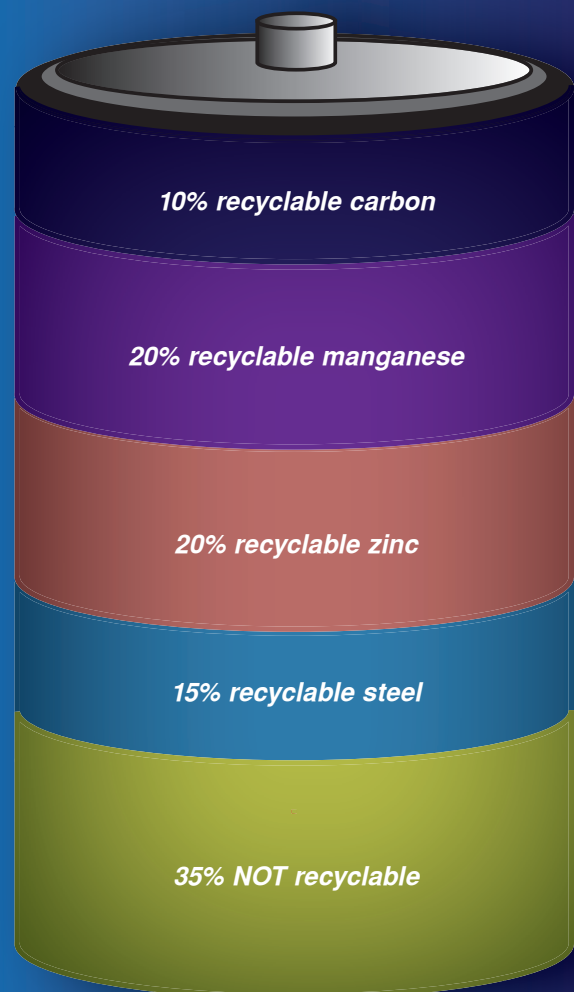
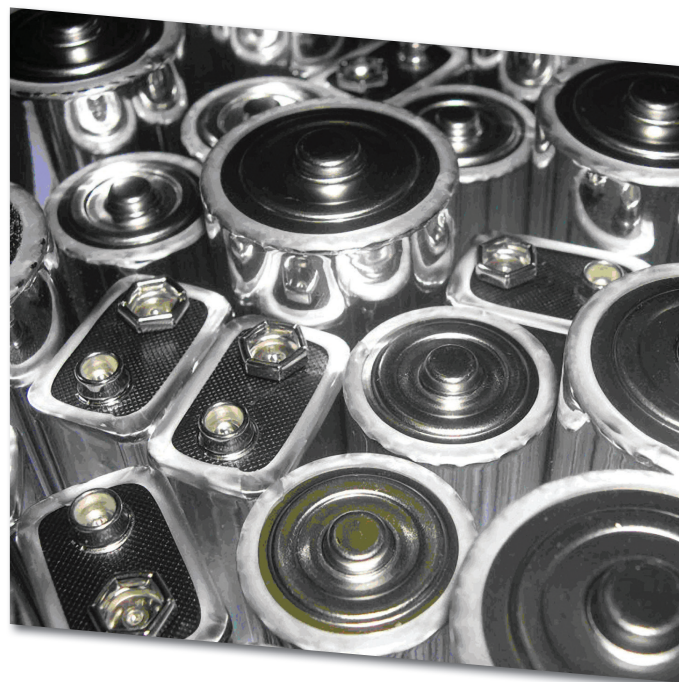
Recycling mercury batteries

The batteries and heavy metals are recovered through a controlled-temperature process. It's important to note that 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 (alkaline-manganese, zinc-carbon, button-cell mercuric oxide and other mercuric oxide batteries) in the United States.

Hearing aid batteries



Various household batteries



Average composition of a primary zinc-carbon battery and how much of it can be recycled

Source: EPBA Battery Handbook

Recycling alkaline batteries

These batteries are recycled during steel making processes, where they are placed in molten mill furnaces as a feedstock. The zinc from the batteries is fumed off into a vacuum baghouse for recovery, while the end metal product is used to make low-grade steel called rebar.

Recycling nickel batteries

These batteries are recycled via a High-Temperature Metal Reclamation (HTMR) process, during which all of the high temperature metals contained within the battery feedstock (nickel, iron, cobalt, manganese, and chromium) report to the molten-metal bath within the furnace, amalgamate, then solidify during the casting operation. The low-melt metals (zinc, lithium, and cadmium) separate during the melting operation and are collected as a metal-oxide.