

Fact Sheet

How are batteries recycled?

Why recycle batteries?

Batteries are the most common form of hazardous household waste in Australiaⁱ. But 95% of their components are recyclableⁱⁱ.

When batteries are put into household rubbish bins, they go into landfill, where they can leak toxic substances like lead, mercury, and cadmium into the environmentⁱⁱⁱ.

These can pollute soil and water, leading to adverse effects on the kidneys, skeletal systems and respiratory systems of humans and other animals.

If used batteries are kept and stored in homes or workplaces, they pose risks associated with leakage, fires and possible ingestion or insertion.

When batteries are taken to an accredited B-cycle Drop off point, they are collected and recycled by an accredited recycler. This protects human health and the environment. It also means that Earth's precious and finite resources are reused and remade into something new.

The battery recycling process

Batteries must first be sorted according to their chemistry, and then chopped and crushed. Depending on the battery type, either heat or liquid is used to extract valuable materials and metals. There are 3 distinct stages in this recycling process.

Stage 1: Sorting and mechanical processing

First, collected batteries are sorted into separate containers according to their chemistry^{iv}, e.g., nickel cadmium, lithium-ion, dry cell etc.

Batteries of each chemistry are then crushed and chopped up, beginning the process of separating the

individual components that make up each battery cell. Components include copper, foil, aluminium, plastic casing etc.^v

Some battery chemistries like lithium-ion begin with discharge and deactivation. This prevents any possible thermal runaway events (a chain reacting of heating) that could lead to fire^{vi}.



Figure 1. battery recycling

Stage 2: Pyrometallurgical processing

The batteries have now been sorted, crushed, and, where required, discharged. In some recycling facilities, the organic solvents within the battery electrolyte solutions are now evaporated, condensed, and collected.

Crushed batteries are then placed in a thermal oxidizer^{vii}. This is a type of incinerator/furnace that removes combustible material, whilst also decomposing hazardous gases to reduce air pollution.

After incineration, various metallic substances are left, which settle according to their weight. Black 'slag' is a by-product of the process, which is skimmed off and further processed. Slag can be reused in the construction sector or disposed of as hazardous waste^{viii}.

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Depending on the facility, the metallic substances are either collected separately on site, or are poured together into containers and transported elsewhere for further separation.

Stage 3: Hydrometallurgical processing

To recover Lithium and Aluminium, a third processing stage is required - hydrometallurgical processing.

This stage involves using aqueous (water based) solutions to leach the metals from any coating materials remaining. Metals are then extracted from the crystallization and precipitation of the aqueous solutions^{ix}.

Where are batteries recycled?

Used batteries should be taken to an accredited B-cycle Drop off point to be recycled through an accredited B-cycle Recycler.

A full list of accredited Drop off points and recyclers can be found at B-cycle.com.au. Several B-cycle accredited recyclers do not send materials overseas for processing, but instead recycle batteries onshore.

What happens to the recovered materials?

Markets for the materials recovered in the battery recycling process vary depending on economic conditions.

They are used in a range of industrial applications, including agricultural fertilisers, new batteries, steel making, concrete and construction^x.

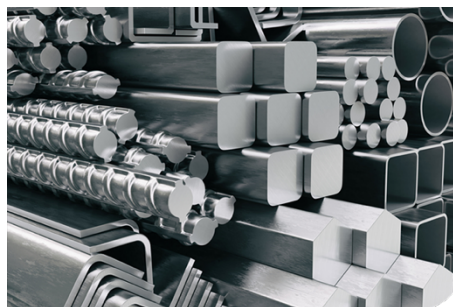


Figure 2. Steel Australian Battery Recycling

Australia has a long history of lead acid battery recycling, with around 96% of these battery components recycled.

A small number of recyclers for other battery chemistries (non-lead acid) existed within Australia prior to B-cycle. The commencement of the B-cycle Scheme is expected to encourage this industry to develop and grow.



This Scheme is authorised by the Australian Competition & Consumer Commission (ACCC), accredited by the Australian Government, and has received financial support from the Australian Government and industry.

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References

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- iii. Ibid, 1
- iv. Ibid, 2
- v. Isidor Buchmann 2017, BU-705: How to recycle batteries, Battery University, accessed: 22 January 2022, <<https://batteryuniversity.com/article/bu-705-how-to-recycle-batteries>>, last updated: 29 October 2021.
- vi. Ibid, 5
- vii. Ibid, 5
- viii. Ibid, 5
- ix. Ibid, 5
- x. Ibid, 2



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