

Battery recycling information sheet



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In 2001 we bought 680 million batteries in the UK, most of these (89%) were general purpose batteries.¹

Types of battery

There are a number of different types of household batteries used by householders for a variety of purposes. The three main types are:

Wet-cell: Lead acid batteries used to power vehicles and by industry.

Dry-cell non-rechargeable: These are the most common types of household battery.

General purpose disposable household batteries include

- **Zinc carbon** used in low drainage appliances such as torches, clocks, shavers and radios.
- **Zinc chloride** used in similar applications.
- **Alkaline manganese** used in personal stereos, radio-cassette players. These are less prone to leaking than the above two types and are longer lasting.
- Primary button cells:

Mercuric oxide used in batteries for hearing aids, pacemakers, photographic equipment.

Zinc air - an alternative to mercuric oxide button cells - used for hearing aids and radio pagers.

Silver oxide used for electronic watches and calculators.

Lithium used for watches and photographic equipment.

Dry-cell rechargeable - general purpose rechargeable batteries for the above uses, and also including Nickel cadmium, Nickel metal hydride and Lithium-Ion batteries used in power tools, cordless appliances, mobile phones etc.

- **Nickel cadmium (NiCd)** batteries represent one of the fastest growing sectors in the battery market. Used for cordless power tools, personal stereos, portable telephones, lap-top computers, shavers, motorised toys etc, with a life of 4-5 years.
- **Nickel metal hydride (NiMH)** batteries are a less environmentally harmful alternative to NiCd and tend to have a longer life.
- **Lithium ion (Li-Ion) batteries** have a greater energy storage capacity than NiCd and NiMH batteries.

Using rechargeable batteries reduces the number of batteries requiring disposal, but 80% of them contain nickel cadmium, a known human carcinogen, and therefore need to be disposed of safely.

¹ British Batteries Manufacturers Association, <http://www.bbma.co.uk/batterymarket.htm>

Why bother?

It is estimated that in 2000, almost 19,000 tonnes of waste general purpose batteries and 113,000 tonnes of waste automotive batteries required disposal in the UK.²

Currently, only a very small percentage of consumer disposable batteries are recycled (less than 2%)³ and most waste batteries are disposed of in landfill sites. The rate for recycling of consumer rechargeable batteries is estimated to be 5%.⁴

The average household uses 21 batteries a year.⁵

The UK generates 20,000 – 30,000 tonnes of waste general purpose batteries every year, but less than 1,000 tonnes are recycled.⁶

Automotive batteries, on the other hand, are more routinely recycled in the UK, with a current recycling rate of approximately 90%. They are collected at garages, scrap metal facilities and many civic amenity and recycling centres.

Whilst the exact chemical make-up varies from type to type (see below), most batteries contain heavy metals, which are the main cause for environmental concern. When disposed of incorrectly, these heavy metals may leak into the ground when the battery casing corrodes. This can contribute to soil and water pollution and endanger wildlife. Cadmium, for example, can be toxic to aquatic invertebrates and can bio-accumulate in fish, which damages ecosystems and also makes them unfit for human consumption. Some batteries, such as button cell batteries, also contain mercury, which has similarly hazardous properties. Mercury is no longer being used in the manufacture of non-rechargeable batteries, except button cells where it is a functional component, and the major European battery suppliers have been offering mercury-free disposable batteries since 1994.

How's, what's and where's of recycling batteries

Battery collection schemes

An increasing number of householders recognise the residual value of spent batteries and separate them from their general household waste for recycling. A number of local authorities now collect waste household batteries as part of multi-material kerbside collections, such as the well-publicised Bristol scheme (see below). If your local authority does not provide such a service, some regional based retailers have set up schemes, although these are admittedly few and far between. Businesses can contact RABBITT Recycling or G&P Batteries (see Useful Contacts below) for further information on collections for recycling.

Rechargeable batteries can also be recycled once they have reached the end of their useful lives. REBAT was set up in 1998 to manage and collect the main types of portable rechargeable batteries in the UK. Their website contains a list of company contact details and collection points (see Useful Contacts below).

Battery reprocessing

Batteries contain a range of metals which can be reused as a secondary raw material. There are well-established methods for the recycling of most batteries containing lead, nickel-cadmium, nickel hydride and mercury. For some, such as newer nickel-hydride and lithium systems, recycling is still in the early stages.⁷

There are a number of different recycling processes for batteries, which are aimed at recovering a variety of materials.⁸

- Lead can be recovered by either separating the different materials that make up the battery (lead, plastics, acid, etc.) prior to metallurgical processing. Alternatively, batteries can be processed as a whole through heat treatment in a particular type of furnace with metals being recovered at the end of this process.
- NiCd batteries can be reprocessed through a similar thermal technique, which recovers cadmium and iron-nickel for steel production.

² DTI, *Batteries – fact sheet*, August 2002

³ *ibid.*

⁴ ENDS, Volume 311, December 2000, p.19

⁵ British Battery Manufacturers Association

⁶ Resource Management and Recovery, Volume 22, 2/5/2003, p. 8

⁷ Dr J L Fricke and N Knudsen (GRS Batterien), *Disposal of Portable Batteries*, May 2002, p. 10

⁸ *ibid.*

- Batteries containing mercury (button cells) are most commonly processed using a vacuum-thermal treatment, in which the mercury vaporises. It condenses and eventually solidifies when temperatures are reduced and can then be reintroduced into the material cycle.
- NiMH batteries are reprocessed by mechanically separating the individual materials (plastic, hydrogen and nickel) within a vacuum chamber to prevent the escape of hydrogen. The output of this process is a product with high nickel content which can be used in the manufacture of stainless steel.
- Li-Ion batteries are currently reprocessed through pyrolysis (heat treatment) with the primary recovery being the metal content.
- Zinc-carbon/air and alkaline-manganese batteries can be reprocessed using a number of different methods, which include smelting and other thermal-metallurgical processes to recover the metal content (particularly zinc).

G&P Batteries (see contact details below) have recently opened the UK's first battery dedicated recycling plant for household batteries. It is estimated that the West Bromwich plant, which opened in March 2005, will be able to recycle up to 1800 tonnes per year⁹. It is anticipated that the opening of this plant will stimulate an increase in domestic battery recycling rates in the UK.

The majority of automotive and industrial lead-acid cells are processed by two UK lead smelters (Britannia Refined Metals in Kent and HJ Enthoven & Sons in Derbyshire). Button cell batteries containing mercury are reprocessed at two UK facilities (Odin Technology and Mercury Recycling).¹⁰

In September 2002, Britannia Zinc at Avonmouth and Bristol based Resource Saver launched a trial scheme, which piloted the collection and reprocessing of disposable household batteries in the area. However, the scheme's existence was threatened following the closure of Britannia Zinc, the only UK zinc reprocessing plant, in February 2003. The pilot scheme was concluded successfully and kerbside collection of batteries will continue in Bristol.

In October 2003, AEA Technology (AEAT) launched a £2 million research and development facility in Sutherland, north Scotland, for Li-Ion battery recycling. This new process employs a series of separation technologies to disassemble the battery systematically and focuses on maximising the recovery of cobalt and other metals such as copper from the battery for resale. All types of lithium-ion and lithium-ion polymer batteries will be treated.¹¹

Other European reprocessing facilities include:

Batrec AG in Switzerland – reprocessing of a wide range of batteries. Batrec was the first company in the world to recycle batteries commercially (up to 2,000 tonnes a year). Their reprocessing method is based on a Japanese system developed by Sumitomo Heavy Industries which allows 95% of the component parts to be re-used. Resultant products are ferromanganese, zinc, zinc oxides and mercury.

Citron in France – thermal-metallurgical reprocessing primarily of zinc-carbon/air and alkaline-manganese (including older ones containing mercury), but also NiMH, Li-Ion, NiCd and lead batteries.

Recupyl in France – recovery of metals through hydro-metallurgical recycling of all types of batteries

SAFT-NIFE in Sweden – reprocessing of industrial NiCd batteries

SNAM (Societe Nouvelle d'Affinage des Metaux) in France – mechanical recycling of rechargeable NiCd and Li-Ion batteries and nickel-hydride batteries

Valdi/Tredi in France – pyrolysis (heat treatment with recovery of metals such as zinc, cadmium and lead) of zinc-carbon, aluminium-manganese and NiCd batteries

What does the law say?

In 1991, the EU Directive on Batteries and Accumulators (91/157/EEC) was introduced. It requires that batteries containing more than 25mg of mercury (except alkaline manganese batteries), 0.025% of cadmium by weight and 0.4% lead by weight to be collected separately from household waste for recycling or special disposal. It also sets permissible limits for these heavy metals. The directive largely affects lead-acid, NiCd and mercuric oxide batteries.

The 1991 Directive was amended by a 1998 Directive (98/101/EEC) in order to adapt the original Directive to technical progress. The amendment further reduces the permissible heavy metal limits and prohibits the marketing of batteries

⁹ Letsrecycle.com news story <http://www.letsrecycle.com/news/archive/news.jsp?story=4302>

¹⁰ DTI, *Batteries – fact sheet*, August 2002

¹¹ Materials Recycling Week, Volume 182/16, 17/10/2003, p.4 and AEA Technology press release: http://www.aeat.co.uk/corporate/news/2003/oct_07.htm

and accumulators containing more than 0.0005% of mercury and button cells containing more than 2% of mercury by weight from the 1 January 2000.

A further EU Directive (93/86/EEC) requires the marking of button cells or batteries made of button cells:

- containing more than 5 ppm (parts per million) mercury per cell up to 2 % mercury, applying to silver oxide, zinc air and alkaline button cells
- containing more than 0.025% cadmium by weight, applying to nickel cadmium batteries
- containing more than 0.4% lead by weight, applying to lead acid batteries

The markings are as follows:



Hg

Batteries containing mercury



Cd

Batteries containing cadmium



Pb

Batteries containing lead

Currently, the EU and its Member States are negotiating a further amendment to the 1991 Directive. The draft Directive is expected to propose the following measures:¹²

- Member States will be expected to ensure that 90% of portable batteries enter a recycling process.
- A recycling weight-based efficiency target, i.e. this proportion of materials will have to be recovered during the recycling process. This is to be achieved within three years of the Directive coming into force.
- A mandatory weight-based collection target per head of population. This replaces earlier percentage targets.
- Mandatory collection targets of 80% and a recycling target of 75% (with 100% for the cadmium component) for NiCds.
- A ban on landfilling and incineration of all industrial and automotive batteries.
- Producers of all types of batteries will be responsible for treatment and disposal costs, except for small household batteries.

The Directive sets collection targets for portable batteries of 25% and 45% of the average annual sales over the past three years. These targets are to be achieved respectively four and eight years after the transposition of the Directive. The Directive now requires a further reading by the European Parliament and is expected to be formally adopted by mid-2006¹³.

What you can do

- Use the mains when possible.
- Use rechargeable batteries and a battery charger. This saves energy because the energy needed to manufacture a battery is on average 50 times greater than the energy it gives out. However, rechargeable batteries are not suitable for smoke alarms as they tend to run out suddenly, preventing the alarm from warning when battery power is low.
- Opt for appliances that can use power derived from the sun via solar panels or from a winding mechanism, e.g. radios, mobile phone wind-up chargers.
- Participate in local authority battery collection schemes where they are available. If your local Council does not provide one at the moment, contact them and find out if they are planning to do so in future.
- Seek guidance on how to dispose or recycle batteries from either the distributor who originally supplied the battery, the battery manufacturer or the appliance manufacturer.
- Send batteries back to manufacturers for recycling or reprocessing where such a scheme is available.

¹² ENDS Daily, Issue 1552, 13 November 2003

¹³ Letsrecycle.com battery recycling <http://www.letsrecycle.com/equipment/batteries.jsp#top>

Useful contacts

British Battery Manufacturers Association

26 Grosvenor Gardens, London SW1 0GT

Contact: Paul Duke

t 020 7838 4800

<http://www.bbma.co.uk>

Information on the current situation and impending legislation.

European Portable Battery Association (EPBA)

Avenue Marcel Thiry 204, B-1200 Brussels, Belgium

t +32 2 774 9602 f +32 2 774 9690

epba@eyam.be

<http://www.epbaeurope.net/>

European organisation of companies manufacturing, selling or distributing portable batteries.

Department of Trade and Industry.

Environment Unit

t 020 7215 1036

<http://www.dti.gov.uk/sustainability/ep/batteries.htm>

Useful source of information on current legislation.

Environmental Enquiry Point

t 0800 585 794.

Useful source of scientific information

REBAT

26 Grosvenor Gardens, London, SW1 0GT

t 020 7838 4800

<http://www.rebat.com>

This website is part of the British Battery Manufacturer Association, it provides a directory of where you can disposal of your batteries.

Commercial battery collectors & recyclers

RABBITT Recycling

Worktwice Marketing Ltd

The Cottages, 27-29 New Street, Gloucestershire, GL12 8ES

t 0800 1381988 f 01453 521330

info@rabbitrecycling.co.uk

<http://worktwice.co.uk/rabbit/>

Recycling batteries, mobile phones, IT equipment and more for businesses

G & P Batteries

Crescent Works Industrial Park, Willenhall Road

WS10 8JR

t 0121 568 3200 f 0121 568 3201

enquiries@g-pbatt.co.uk

<http://www.g-pbatt.co.uk/>

G&P Batteries owns the sole domestic battery recycling plant in the UK and is the largest nation-wide collector of waste batteries in the UK.

Envirogreen Special Waste Services

Regus House, 268 Bath Road, Slough, Berks, SL1 4DX

t 0845 712 5398 f 01753 537314

info@envirogreen.co.uk

<http://www.envirogreen.co.uk>

Publications

Batteries, Department of Trade and Industry (DTI), 2000. *To order call 0870 1502 500* (Free of charge)

The issues surrounding the identification and collection of post consumer batteries, National Household Hazardous Waste Forum, t 0113 246 7584 (£35 for members, £75 for non members)

Portable batteries: new technologies and environmental responsibilities - conference proceedings, AEA Technology report no: 98-0110. Call 01372 367425 (£92.10)

Updated: July 05

<http://www.wasteonline.org.uk>

<http://www.wastewatch.org.uk>

Due to changes in funding, we are no longer able to offer a public information service. Should you have further questions on waste and recycling, please contact one of these groups:

Householders and students should call the [Recycle Now](#) helpline on 0845 331 31 31 for further waste based information, and where to find your local recycling facilities.

Small to medium businesses should visit the [Envirowise](#) website, or call 0800 585 794, for further information on waste issues. Larger businesses should visit www.businesslink.gov.uk.

For industry based questions, please use the WRAP technical helpline on 0808 100 2040 for advice on markets and recycling company development, or visit www.letsrecycle.com for listings of recyclers and reprocessors.

If you find a mistake on this page, or have a technical question regarding the wasteonline website, please email info@wastewatch.org.uk.

Thank you, and apologies for any inconvenience.

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