



The Knowledge Network

RECYCLING OF BATTERIES

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Summary

This paper gives a brief overview of the issues relating to the disposal of batteries, a sample of the battery recycling initiatives which are in place in Continental Europe and the pilot scheme in the UK. A brief description of types of battery is also given. Discussion points are suggested for the further steps which could be taken in the UK.

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Introduction and Scope

From Volta's development of the dry cell in the late 18th century, batteries have become a ubiquitous part of everyday life in the developed world. The regrettable consequence of extensive use of hazardous substances over a long period has led to justifiable concerns over contamination of the environment and consequent effects on health.

This paper gives a brief overview of the issues, a sample of the initiatives which are in place in Continental Europe and the pilot scheme in the UK. A brief description of types of battery is also given. Discussion points are suggested for the further steps which could be taken in the UK

In the UK, 680 million batteries were purchased during 2001. Only 5%¹ of rechargeable batteries are recycled and even fewer disposable types are recycled. Most batteries in the UK end up in landfill sites. Some contain heavy metals which may leak out and pollute the environment. The UK generates 20,000-30,000 tonnes of waste household batteries every year, of which less than 1000 tonnes are recycled.

In an attempt to minimise such contamination, the EC has issued a number of Council Directives. Amongst these is Council Directive 91/157/EEC on Batteries and Accumulators containing certain dangerous substances. This was issued on 18 March 1991 and has subsequently been amended twice. These directives introduce measures on the treatment and disposal of waste batteries and restrictions on the sale of certain batteries in the EU.

The Directives require the UK to collect separately, wherever possible, batteries which contain more than 25mg mercury, 0.025% cadmium by weight and 0.4% lead. Some success has been achieved in that 98% of mercury has been eliminated from primary general-purpose batteries.

Types of Battery

Lead acid batteries are used in industry and in vehicles. They are routinely and efficiently recycled (being collected at garages, scrap metal facilities, civic centres and many recycling centres). The recycling rate is currently 90%.

Dry cell batteries make up the rest of the domestic market. They are numerous, varied and have a complex make-up. There are seven different categories:

- **Zinc carbon:** disposable and the cheapest to buy, used in appliances such as torches, clocks, shavers and radios.
- **Zinc chloride:** disposable batteries
- **Alkaline manganese:** general-purpose batteries - the most expensive of disposables. These are said to be leak-proof and longer lasting than the zinc types. They are used in personal stereos, radio-cassette players (e.g. Duracell Ultra, Duracell Coppertop, and Panasonic Alkaline).
- **Nickel cadmium (NiCad):** Used for cordless power tools, personal stereos, portable telephones, laptop computers, shavers, motorised toys etc, with a life of 4-5 years. This type of battery is being phased out
- **Nickel metal hydride:** these last longer and are an environmentally friendlier alternative to Nickel Cadmium. Rechargeable
- **Lithium Ion:** have a higher energy content than NiCad and Nickel metal hydride batteries. Rechargeable
- **Primary button cells:**
 - **Mercuric oxide:** for hearing aids, pacemakers, and photographic equipment. Hearing aid batteries can be exchanged in hospitals and are sent to Holland for reprocessing.
 - **Zinc air:** for hearing aids and radio pagers.
 - **Silver oxide:** for electronic watches and calculators.
 - **Lithium:** for watches and photographic equipment. High powered disposable.

Recycling in Europe

A number of schemes are currently operating in EU countries. For example, BEBAT in Belgium, is an organisation which collects used batteries and accumulators.

The table² below gives collection statistics for Austria, Belgium, Germany and the Netherlands for the year 2000, with comparisons for 1998 and 1999.

Table 1. Collection Statistics

Name and Creation Date	Country	Sales (t) 2000	Collection 2000	Collection % of Sales	Population (million)	Collection g/per inhabitant 2000	Collection g/per inhabitant 1998	Collection g/per inhabitant 1999
UFB (1989)	Austria	2300	1441	53%	8.15	177	155	158
Bebat (1995)	Belgium	3878	2100	54%	10.26	205	153	179
GRS (1998)	Germany	29284	9322	32%	83.03	114	–	101
Silbat (1994)	Netherlands	5808	1856	32%	15.98	116	161	117

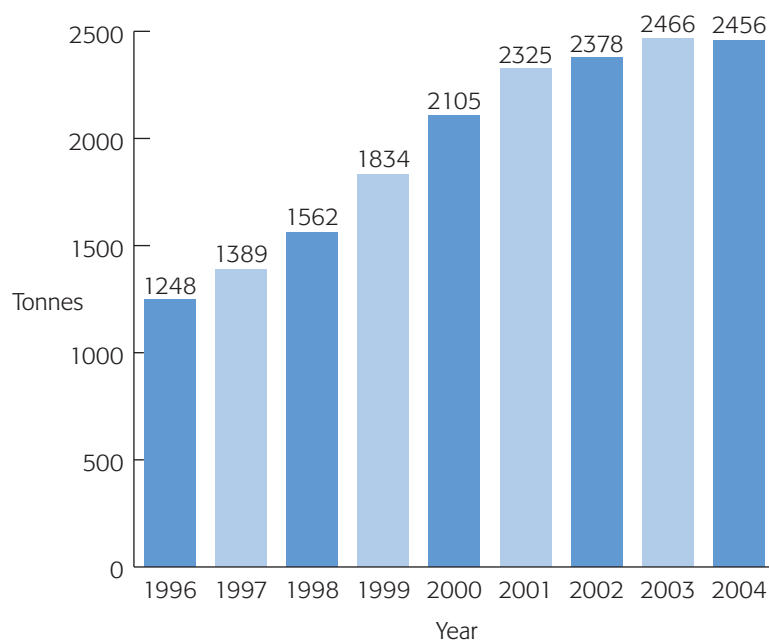
A sample of the recycling methods in Europe is given below.

Belgium

BEBAT, a non-profit organization founded by the battery industry is responsible for the collection and recycling of used batteries sold in Belgium. There are over 20,000 collection points for batteries and used accumulators. These free collection points are in supermarkets, electrical shops, photo shops, jewellers, schools and various public institutions. The BEBAT association has been operational since 1995/1996. Numbers of used batteries collected continues to increase. The table below indicates a considerable increase from 441 tonnes (estimated) in 1995 to 2500 tonnes in 2003.

Before the voluntary collection system commenced, only a small percentage of batteries were recycled. During the first year of operation, BEBAT started an awareness campaign to inform consumers and distributors about the new system. There is an Internet facility to find the appropriate collection point. Batteries are then processed to recover metals.

Table 2³. Batteries collected in Belgium from 1996 to 2004



The Netherlands

Manufacturers and importers of batteries and products that contain batteries are responsible for their collection and recycling. IBM and a number of other companies participate in the Stibat (Stichting Batterijen) program which carries out the implementation of IBM's battery collection and recycling obligations. Stibat works in conjunction with municipal collections, together providing numerous drop-off sites. In addition to the utilisation of municipal-run small chemical waste (scw) depots and "chemocar" (scw collection vehicle), batteries may also be dropped off at many retail stores and supermarkets. It is possible to locate your nearest collection point using the Internet. You type in your postcode and your closest collection points will be shown on a local map. These collection points may be located in a local electronics shop, e.g. Dixons.

A percentage of bottle-recycling containers, located in supermarket car parks, have separate sections not only for the different colours of glass, but a battery depository.



Battery collection point integrated into bottle bank in Bussum, Netherlands

In the Netherlands a project is being trialed to extract spent batteries from mixed household waste using magnets.

Sweden

In Sweden, battery collection boxes are attached to paper collection containers. The same transporters which collect the paper collect the batteries as well. A similar approach is under evaluation in Germany and Portugal.

The Swedish Environmental Protection Agency is to invite tenders from companies able to process all the mercury batteries that have been collected and stored since 1987. The agency will be inviting Swedish and European waste processing operators to submit tenders.

The public has handed in some 2,000 tonnes of batteries to date, representing 20–35 tonnes of pure mercury. Prior to 1995 these batteries were not sorted. Now, however, it is the responsibility of every municipality to deliver mercury batteries separately to the SAKAB storage facility, where they are kept pending sentencing.

The ultimate aim, according to the Swedish EPA is that all use of mercury batteries should cease. Until that happens, all consumers are encouraged to adopt a responsible approach and return batteries for safe disposal.

If the Swedish EPA chooses a European processing plant outside Sweden, the Swedish regulations governing hazardous waste management dictate that the mercury extracted during the process must be returned to Sweden. A Swedish government white paper proposes that the extracted mercury should be safely stored in a deep bedrock repository.

The tendering procedure was concluded in 2003; the Swedish EPA expected processing to start in 2004. The cost, which it is estimated will run into tens of millions of kronor, will be covered by money from the "Battery Fund", set up for this purpose. Importers of mercury batteries pay charges that are deposited in the fund.⁴

Returbatt AB/ Boliden Bergsoe, a co-operative system between the Swedish EPA and various manufacturers associations, handles battery collection and recycling in Sweden. Collection points can be found at most retail outlets.

Switzerland

IBM participates in the Recycling Guarantee program sponsored by the Swiss Economic Association of Information, Communication and Organisation Technology (SWICO). It is a comprehensive program for the take-back, recycling and disposal of electronic equipment in Switzerland.

Finland

Collection centres and drop-off points are provided by local municipalities in retail areas. IBM has a take-back scheme. This includes many countries of Europe, Scandinavia and USA.

France

Rechargeable batteries can be sent to Societe Nouvelle d’Affinage des Metaux (SNAM) for reprocessing. See SCRELEC for details of recycling schemes. (see www.screlec.fr and www.corepile.fr)

Austria

Austria is one of the most advanced European Nations for battery recycling procedure. Collections were started on a national scale in 1992 and had a recycling rate across the country of 40%. By 2001 this level had increased to 60%. (Rates are based on sales levels within Austria).

Battery recycling operations in Austria are overseen by an independent organisation called ‘Umweltforum Batterien’. It was founded in July 2001, and consists of all the Austrian Importers and producers. The members are charged a fee, which is used to fund the collection and recycling systems within the country. The fee the company is charged is dependent on the battery type and weight. It is calculated from the manufacturers’ sales reports, which have to be provided on a monthly/half-yearly basis depending on the size of the company. The cost of this service is passed on to the consumer at point of sale. Since the organisation’s launch, its actions have been supported at National Government level by the Environmental Affairs and Economic Affairs Departments. The Campaign has been very high profile with continual Public Relations work in order to generate high interest and involvement in the Campaign. Over the last 10 years they have developed a comprehensive collection network. The country currently has 7,000 collection points based in stores that sell batteries and at hazardous waste collection sites. Therefore there is one collection point per 1,100 inhabitants. As well as this extended collection point network a National

kerbside collection scheme is run every 6 months. Householders receive a paper collection bag in which to store their batteries. Publicity ensured that the system is well known and supported.

Competitions have been run annually in schools, with prizes (sponsored by electrical manufacturing companies and ecological forum batteries, UFB) being awarded. Three- hundred and fifty- eight schools participated in 2003, collecting 107 tonnes of used batteries.

Pilot Scheme in the UK⁵

Battery recycling schemes are operating in limited areas only. An example is the Bristol City pilot scheme. This was run from September 2002-September 2003. The campaign’s financial backing came from the DTI, SITA Environmental Trust, South West Regional Development Centre and Bristol City Council. There was also support from local companies, BZL, G&P Ltd. and Grayling PR.

The Campaign planned to use two principal methods of collection; existing ‘bring banks’ and kerbside collection systems in the city.

1. Bring Banks

Bristol City Council runs two Civic Amenity sites in the City. Both of these sites would hold collection bins for the consumer batteries. This service would allow the households that do not have access to the kerbside ‘black box’ scheme (e.g. blocks of flats) to have access to a point where they could recycle their batteries.

2. Kerbside Collection

Bristol consists of approximately 175,000 households with over 150,000 being able to use the kerbside ‘black box’ scheme. At this time approximately 40% of these households chose to utilise the kerbside recycling. Within this box the household can deposit a variety of items for recycling and these items are then collected weekly. During the trial consumer batteries were added to the already comprehensive list of items. Lead acid batteries were already included as an item that could be recycled through the black box. In order to inform the residents of this addition, all households were provided with a paper storage bag for the spent batteries. These bags were issued through an initial city-wide postal drop at the start of the pilot period.

Reprocessing Facilities

It was intended at the beginning of the campaign to use Britannia Zinc Ltd (BZL), which was the only lead and zinc smelter in the country. It used the Imperial Smelting Process (ISF) and was able to deal with many potentially harmful substances, e.g. mercury, cadmium, lead and sulphur. However, BZL's parent company sold the plant and in February 2003, the plant ceased operating. It is now undergoing de-commissioning. This was obviously unfortunate in many ways and meant that the planned reprocessing could not take place.

The Bristol campaign appears to have worked well in informing the public and getting school children involved and enthusiastic. Press coverage is thought to have reached 4.9 million people, and 12 tonnes of consumer batteries were collected during the pilot year, 20% over target.

It had been planned to set up collection points within local branches of national retail chains and in schools, as has been done in other European countries. However, this idea was abandoned due to the existing hazardous waste legislation in the UK. It is worth noting that the stores, e.g. Dixons and many of the supermarket chains, were keen to be involved. The campaign had been in consultation with DEFRA on the subject of special waste regulations.

The conclusions from this campaign indicate that it is certainly possible to raise public awareness and to engage their enthusiasm and support by means of publicity. The target collection quota was exceeded. The negative aspects include the closing of the zinc smelting plant – consideration must be given to transportation environmental costs where there is no local plant- and some uncertainty on the legislative position in the UK.

Table 3. Recoverable metals from various battery types.

Battery Type	Recycling
Alkaline and Zinc-Carbon	Recycled in the metal industry to recover steel, zinc, ferromanganese
NiCd/NiMH	Recycled to recover Cadmium and Nickel, with a positive market value
Li-Ion	Recycled to recover Cobalt with a positive market value
Lead-Acid	Recycled in the Lead industry with a positive market value
Button cells	Silver is recovered and has a positive market value; Mercury is recovered from by a vacuum-thermal process.

Reprocessing Facilities

In spite of various nickel cadmium battery recycling laws in Sweden and Switzerland, and collection schemes in Germany, Holland and parts of the USA, there are still very few reprocessing facilities. The major ones are:

SNAM (Societe Nouvelle d’Affinage des Metaux)

in France. This accepts spent batteries from the States and elsewhere.

SAFT-NIFE in Sweden.

BATREC-AG is the first company in the world to recycle batteries commercially (up to 2,000 tonnes a year). It is based on a Japanese system developed by Sumitomo Heavy Industries which allows 95% of the component parts to be re-used.

G & P Batteries is the largest nation-wide collector of waste lead acid batteries in the UK.

Sorting of Batteries

To recycle batteries they must initially be sorted according to their chemistries in order that subsequent recovery of metals and other material may take place.

In the 1990s the Battery Industry developed sorting technology to enable automatic and cost efficient sorting. Several automatic and semi-automatic sorting facilities are now operating in Europe.

To enable automatic sorting technology, primary batteries (Alkaline and Zinc carbon round cells) have been coded, since 1997, with invisible UV marking.

Key Areas for Discussion

The issues of hazardous waste caused by the use of batteries can be considered as follows:

Avoidance

- Avoid any sort of portable battery – use mains power adapters or try buying solar powered or wind-up appliances.
- Use rechargeable batteries whenever possible but avoid those containing nickel cadmium (NiCad) as these are believed to be especially damaging to the environment.
- Look for manufacturers who operate take back schemes whenever possible e.g. power tools and mobile phones. Check battery or product packaging for details.

Collection

- Co-operation between EPAs, local councils, manufacturers
- Easily available collection points, e.g. schools, supermarkets, municipal buildings, electrical shops, and hospitals.
- Exchange, e.g. hearing aid batteries

Sorting

- Easiest at source; various other methods e.g. UV marking, magnetic sorting

Transportation

- May be environmentally bad news

Reprocessing

- Availability of reprocessing plants.
- toxic by-products e.g. lithium, dioxins

Disposal

- final hazardous waste that cannot be re-used, e.g. Landfill

Future Steps

In July 2006 the European Parliament agreed to a compromise on the draft Batteries Directive, laying down minimum standards for the collection, treatment and recycling of spent batteries and accumulators. The Directive is scheduled to pass into EU law in late 2006.

The Directive will need to be transposed into national law; this is expected to take place in 2008. In this case, the first Directive collection target for consumer batteries will have to be met by 2012, and recycling efficiency targets by 2011.

The European Parliament has given preliminary approval to a new programme for the collection and recycling of batteries with the aim of limiting pollution. The legislation will require all of the 25 EU countries to begin, by 2008, programmes to collect spent batteries. Some countries, including Austria, Belgium, Germany, France, the Netherlands, and Sweden already have suitable systems in place.

The law also bans some portable cadmium batteries and prohibits the dumping in landfills or burning of automotive and industrial batteries, most of which are already collected.

Distributors will be required to take back used batteries at no charge. The methods of collection and recycling will also be defined. By 2012, 25% all batteries sold must be collected once they are spent. This target will rise to 45% by 2016. Battery manufacturers and distributors will have to foot the bill for implementing recycling programmes and educating the public on the collection systems. It is calculated that this will cost between €200 million and €400 million.

In the UK, a household battery collection trial is to be rolled out from March 2006. This is under the auspices of WRAP (the Waste & Resources Action Programme) partially supported by DEFRA and Business Efficiency and Waste (BREW). The trial will initially cover over 350,000 households covering a diverse range of housing types within urban and rural areas and the leafy suburbs. Results from this trial will help determine the most cost-effective and efficient way of meeting the requirements of the Directive. Kerbside collection schemes with weekly or fortnightly collections have been arranged in conjunction with local councils. Formal assessment of the scheme cannot yet be made, but generally very positive feedback has been received from householders and the partner organisations. Drop-off and take-back schemes have also commenced and the outcome will be monitored. WRAP have other projects which they will be assessing, including postal collections for extremely rural areas, WEEE research and producer study.

Endnotes

¹ Waste Watch: www.wastewatch.org.uk/

² European Portable Battery Association

³ BEBAT: www.bebat.be/pages/fr/main.html

⁴ Swedish Environmental Protection Agency, Stockholm, Press release dated February 10 2003.

⁵ Battery Recycling Campaign in Bristol: Report on Pilot Campaign in Preparation for Forthcoming European Directive. Isobel Downey, November 2003.

⁶ For current status see the Legislation Observatory of the European Parliament (www.europarl.eu.int/oeil)

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Further Information

Country	Organisation	Website	Contact Information	Notes
UK	British Battery Manufacturers Association	www.bbma.co.uk	BBMA 3 London Wall Buildings, London Wall, London EC2M 5SY Tel: 020 7826 2690 Fax: 020 7826 2601	Information on the current situation and impending legislation
UK	Department of Trade and Industry, Environment Unit	www.dti.gov.uk	Environmental Enquiry Point Tel: 0800 585 794	
UK	Department of Environment, Food and Rural Affairs (DEFRA)	www.defra.gov.uk/	Department for Environment, Food & Rural Affairs, Nobel House, 17 Smith Square, London SW1P 3JR Tel: 020 7238 6000	
UK	REBAT	www.rebat.com	26 Grosvenor Gardens, London SW1 0GT Tel: 020 7838 4800	This website is part of the British Battery Manufacturer Association
UK	WRAP	www.wrap.org.uk	The Old Academy, 21 Horse Fair, Banbury, Oxon OX16 0AH Tel: 0808 100 20 40 Fax: +44 (0) 1295 819 911	WRAP (the Waste & Resources Action Programme) was established in 2001 in response to the UK Government's Waste Strategy 2000 to promote sustainable waste management
UK	Waste Watch	www.wastewatch.org.uk	Waste Watch, 56-64 Leonard Street, London EC2A 4JX. Tel: 020 7549 0300 Fax: 020 7549 0301	General information on waste and recycling

Country	Organisation	Website	Contact Information	Notes
UK	Lets recycle	www.letsrecycle.com	letsrecycle.com, Capital Tower, 91 Waterloo Road, London SE1 8RT Tel: 020 7633 4500 Fax: 0207 633 4519	General recycling information, waste management companies and links
Austria	Umweltforum Batterien (UFB)	www.batteriensammeln.at/ sammeln.htm		UFB is an industry association of battery manufacturers and importers which conducts recycling of batteries
Belgium	European Portable Battery Association (EPBA)	www.styrax.com/demons/ EPBA-Europe/History/	EPBA Avenue Marcel Thiry 204, B-1200 Brussels, Belgium Tel: +32 2 774 9602 Fax: +32 2 774 9690 E-mail: epba@eyam.be	European organisation of companies manufacturing, selling or distributing portable batteries.
Denmark	EPA	www.mst.dk		
France	Fibat/Screlec	www.screlec.fr		
Germany	GRS	www.grs.de		
Netherlands	Stibat	www.stibat.nl		
Switzerland	Batrec	www.batrec.ch	Batrec Industrie AG, Postfach 20, Wimmis, Switzerland Tel: 00 41 33 657 25 55	

COMMERCIAL COLLECTORS:

G & P Batteries

Crescent Works Industrial Park,
Willenhall Road, WS10 8JR
Tel: 0121 568 3200 Fax: 0121 568 3201
E-mail: enquiries@g-pbatt.co.uk
Largest nation-wide collector of waste lead acid
batteries in the UK.

RABBITT Recycling Scheme

Worktwice Marketing Ltd
The Cottages, 27-29 New Street,
Gloucestershire, GL12 8ES
Tel: 0800 1381988 Fax: 01453 521330
E-mail: info@rabbitrecycling.co.uk
Website: <http://worktwice.co.uk/rabbitt/>
Recycling batteries, mobile phones, IT equipment and
more for business.

SAFT-NIFE

PO Box 515, S-26124 Landskrona, Sweden
Telephone: 00 46 41 8 16 280
Battery reprocessing.

SNAM (Societe Nouvelle d'Affinage des Metaux)

Rue de la Garenne, B.P.733,
F-38297 St Quentin Sallavier, France
Tel: 00 33 74 945 985
Battery reprocessing.

PUBLICATIONS:

Department of Trade and Industry (DTI) (2000)
Batteries.

Free publication.
To order call: 0845 015 0010.

National Hazardous Waste Forum.

*The issues surrounding the Identification and
collection of post consumer batteries.*

£35 (non-members)/£20 (members). Order directly
from: <http://www.nhwhf.org.uk/publications2>

*Portable batteries: new technologies and
environmental responsibilities.*

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