

BATTERIES

Battery Waste Arisings and Recycling Rates

There are numerous battery types used in consumer, commercial and industrial applications. The common battery technologies and applications are presented in the following table.

Battery Type	Technology	Typical Uses
Consumer (non-rechargeable)	¥ General Purpose (alkaline manganese and zinc carbon)	¥ Clocks, portable audio devices, torches, toys, cameras
	¥ Button cells (zinc air, silver oxide)	¥ Watches, hearing aids, calculators
Consumer (rechargeable)	¥ Nickel Cadmium (NiCd), Nickel Metal Hydride (NiMH) & Lithium Ion	¥ Cellular phones, power tools, cordless telephones, laptops, emergency lighting
	¥ Lead Acid	¥ Torches, laptops, telephones
Automotive	¥ Lead Acid	¥ Automotive/ Motorcycle Starter, Lighting and Ignition (SLI)
Industrial	¥ Lead Acid Standby	¥ Alarm systems, emergency back-up systems, e.g. rail and telecommunications applications
	¥ Lead Acid Traction	¥ Motive power sources, e.g. forklift trucks, milk floats
	¥ Nickel Cadmium (NiCd)	¥ Motive and standby applications, e.g. satellite and rail applications

More than 90% by weight of consumer batteries consumed in the UK are imported, principally from North America, Europe and Japan. Assembly of general purpose batteries is carried out at two plants within the UK (Multicell and EmPower) and assembly of rechargeable batteries is carried out by Sanyo and TDI within the UK. The majority of shares in the consumer market are held by Duracell, Energizer, Panasonic, Philips and Rayovac.

The market for consumer batteries has shown continued and marked growth during the last ten years. The UK market for consumer rechargeable batteries is estimated to have grown by 70% (sales by weight) between 1995 and 1999 (ERM estimate). In terms of expenditure, the total UK market for consumer batteries grew by 3.6% from 1998 to 1999.

The bulk of UK sales of automotive lead acid batteries are produced within the UK. There are some 40 suppliers of lead acid SLI batteries, of which approximately 20 are domestic manufacturers. The majority of UK sales of SLI batteries are supplied by the Exide Group, the Hawker Group, Hoppecke, Yuasa and Fiamm. *Eurobat* data indicates that sales of SLI batteries have declined approximately 3% between 1995 and 1999 and are anticipated to grow at less than one percent per year in the next five years.

By contrast, there is little UK manufacture of industrial NiCd batteries. The importers of industrial NiCd batteries supplying the bulk of the market include Saft, Hoppecke and the Exide Group. The market for industrial batteries has shown steady growth in recent years, of approximately 5% per annum.

The consumption of batteries within the UK has been estimated (ERM on behalf of the DTI) from sales data obtained from battery associations, battery and appliance manufacturers. These data are shown in the table below.

The time between the sale and disposal of batteries varies considerably between the battery types and individual applications. Estimates of battery waste arisings in the UK for 2000 have been calculated (ERM on behalf of the DTI) by assuming typical battery lifetimes. The assumed lifetimes vary between three years for general purpose batteries and 15 years for industrial nickel cadmium batteries. Hence, the 1999 sales estimates presented below are not directly related to the estimates of waste arisings in 2000.

UK Battery Consumption for 1999 and Estimated Waste Arisings for 2000

Category	Battery Type	1999 Sales by Weight tonnes	2000 Waste Arisings tonnes
Consumer	General Purpose	20 300	16 500
	Button cells	70	60
	Other non-rechargeable	130	70
	NiCd, NiMH, Li ion	3 260	1 990
	Lead Acid	250	300
	Total	24 010	18 900
Automotive	Total	108 500	112 600
Industrial	Lead Acid Standby	20 500	18 000
	Lead Acid Traction	29 200	22 400
	Nickel Cadmium	910	910
	Total	50 600	41 300
Total	All Battery Types	183 000	172 800

Battery Recycling Operations

There has been wide-spread recycling of automotive and industrial lead acid batteries in the UK for many years. By contrast, the majority of consumer batteries are disposed of to landfill. The level of recycling of industrial NiCd batteries is currently low, with the bulk being disposed of to landfill as special waste. The current status of UK battery recycling has been estimated from data obtained by consultation with battery manufacturers, collection and recycling organisations. These data are shown below:

Estimated UK Battery Recycling Rates, 1999

Battery Type	Estimated Rates of Recycling of UK Batteries in 1999 (%)
Consumer	< 2
Automotive	90
Industrial	90

There are more than 20 plants in Europe that accept spent batteries to recover components, including lead, cadmium, steel and plastics. These plants are located in countries throughout Europe, some are specialised battery recycling units, others accept batteries as one component of their feedstock. The majority of waste automotive and industrial lead acid batteries in the UK are recycled at one of two UK lead smelters, Britannia Refined Metals in Kent and H.J. Enthoven & Sons in Derbyshire. There are no UK facilities for recycling NiCd batteries and UK batteries separated for recycling are exported to the SNAM facility in France for processing.

The principal UK mercury processing facility that accepts button cells for treatment is Odin Technology, although Mercury Recycling also process spent button cells. The majority of spent silver oxide batteries are reprocessed by Engelhard Ltd. Currently, there is little recycling of general purpose batteries within the UK. However, trials using production wastes from Duracell have been undertaken by a UK steel plant with a view to accepting collected waste batteries for recycling, in the longer term.

Technical and Economic Barriers to Recycling Batteries

Whilst the level of recycling of automotive and industrial batteries is high, there are a number of barriers to increasing the levels of battery recycling, particularly consumer batteries, in the UK.

Collection Costs

Consumer battery collection is inhibited by the lack of collection infrastructure and the costs of collection. In the past, a number of small-scale collection schemes have been set up. However, a new larger-scale collection scheme, The Bristol Battery Recycling Campaign, was launched in September 2002. It aims to collect batteries from every household in the city.

Contamination of Feedstock

Whilst the opportunity to recycle general purpose batteries in the steel industry is likely to develop within the UK, steel plants will require a mercury free waste stream. This will require sorting of collected batteries to eliminate those sold prior to 2000, containing more than 0.0005% mercury. Existing legislation enables button cells with mercury levels higher than 0.0005% to be marketed. Hence these will be excluded from recycling by the steel industry.

Markets for Recyclate

The highest battery recycling levels occur with lead acid and silver-containing batteries, for which there is an intrinsic value in the waste batteries (e.g. lead acid SLI batteries contain approximately 65% by weight of lead). However, the value of lead on the London Metal Exchange fluctuates and this can impact on the lead-acid battery recycling. The lack of value of other waste batteries may inhibit achievement of overall high recovery rates (e.g. general purpose zinc carbon batteries contain roughly 50% metals by weight, including 16.8% iron and steel, 15% manganese, 19.4% zinc and less than 0.2% lead and silver).

Low Cost of Landfill

Recycling of cadmium-containing batteries is inhibited by the currently lower cost of landfill for NiCd batteries compared with the high costs of separate collection, transport/shipping and recycling in Europe (due to the lack of UK-based recycling facilities). However, there are various factors which aim to improve the collection and recycling rates of waste batteries, including proposals for a new Directive on batteries (see below).

Government Initiatives & Legislation

Existing Legislation

EC Directive 91/157/EEC requires batteries containing more than 25 milligrams of mercury (except alkaline manganese batteries), 0.025% of cadmium by weight and 0.4% lead by weight to be collected separately from the normal household waste for special disposal or recycling where possible. In practical terms, the Directive principally affects lead acid, nickel cadmium and mercuric oxide batteries.

The subsequent requirements of Directive 98/101/EEC, amending Directive 91/157/EEC, prohibit the marketing of batteries and accumulators containing more than 0.0005% of mercury from the 1 January 2000. However, button cells with a mercury content of more than 2% by weight are exempted from the prohibition.

Forthcoming Legislation

A revision of the existing battery legislation is anticipated, which is likely to require the separate collection of all types of batteries and accumulators and impose collection and recycling targets. It is likely to introduce the progressive phase out of cadmium, with limited exceptions. It is also likely to introduce marking provisions for all batteries and require that batteries incorporated into appliances can be removed easily.

The End-of-Life Vehicles (ELVs) Directive was adopted in September 2000. The Directive requires the UK to meet targets for the recovery and recycling of ELVs and requires hazardous components, including batteries, to be removed from ELVs before further treatment. The UK Government is currently considering what steps need to be taken to ensure that the UK meets the Directive's targets and a Government consultation paper was published in August 2001. The consultation paper invited views on all aspects of implementation.

The forthcoming legislation on Waste Electrical and Electronic Equipment (WEEE) is likely to impact the future collection and recycling of batteries. The draft WEEE Directive requires the separate collection of electrical equipment and the removal and separate treatment of the batteries contained in this equipment.

Government Programmes

The *Waste and Resources Action Programme (WRAP)* was established in 2001 to promote sustainable waste management. WRAP's particular focus is creating stable and efficient markets for recycled materials and products.

WRAP is focusing on the 100 million tonnes of waste of commercial, industrial and municipal waste. There are seven programmes - three focus on generic areas — financial mechanisms, procurement and standards and specification. It also focuses on four specific materials — paper, glass, wood and plastic.

Further Contacts

Further information and publications on these issues and initiatives are available from the following sources:

Government Contacts

Department of Trade and Industry
Recycling Policy Section
Sustainable Development Directorate
151 Buckingham Palace Road
London SW1W 9SS
Tel: 020 7215 1036 Fax: 020 7215 5835
Web Site: www.dti.gov.uk/sustainability

Department of the Environment, Food and Rural Affairs
Waste Strategy Division
Ashdown House
123 Victoria Street
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Tel: 020 7944 3000 Fax: 020 7944 6409
Web Site: www.defra.gov.uk

The Environment Agency
Head Office
Rio House
Waterside Drive, Aztec West
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Tel: 01454 624411 Fax: 01454 624409
Web Site: www.environment-agency.gov.uk

The Waste Resources Action Programme (WRAP)
The Old Academy
21 The Horse Fair
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Tel: 0808 100 20 40 Fax: 01295 819911
Web Site: www.wrap.org.uk

Industry Contacts

BBMA (British Battery Manufacturers Association)
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EPBA (European Portable Battery Association) and Eurobat
Avenue Marcel Thiry 204
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Web Site www.epba-europe.org
www.eurobat.org

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