

## Recycling efficiency for alkaline batteries

### What is it?

'Recycling efficiency' refers to the percentage of a battery's weight that is recovered for another use.

The European Union (EU) Battery Directive includes targets for recycling efficiency: 65% for lead-acid batteries; 75% for nickel cadmium batteries and 50% for 'other' waste batteries (including alkaline).

### Recycling efficiency of alkaline battery recycling

The EU's 50% target for alkaline batteries can be met using best available technologies.

The content of valuable metals (steel, zinc and manganese) is around 60% for zinc carbon batteries and up to 70% for alkaline batteries. Assuming some efficiency losses, the theoretical recycling potential has been estimated at between 57-62% for an average mix of the two battery types<sup>1</sup>. In Europe most recyclers consider 50-55% to be achievable<sup>2</sup>. A standard methodology to calculate recycling efficiency for alkaline batteries is still being developed by authorities in Europe, which is one reason why estimates vary.

The conventional recycling process for alkaline batteries is to first shred the batteries and magnetically separate the steel component from the remainder (the 'black mass'). The steel component is recovered in an electric arc steel mill. The black mass, which is rich in zinc and manganese, can be processed in several different ways:

- Through a Waelz kiln to recover the zinc oxide, which is supplied to the zinc industry. The slag containing manganese oxide and carbon is normally used as a raw material for road construction. If manganese is taken into account in the recycling efficiency calculation, then the efficiency is more than 50% (less than 50% if manganese is not included in the calculation)<sup>3</sup>.
- Through a hydrometallurgical process to recover the zinc and manganese<sup>4</sup>.
- Through an alternative process that recovers zinc, manganese and potassium as micro-nutrients for crops, and achieves a claimed recycling efficiency of 86%<sup>5</sup>. This process is undertaken in Canada but is currently not accepted in Europe.

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<sup>1</sup> Rombach, B Friedrich and M Berger (undated), *Recycling efficiency of the reprocessing of primary batteries*, [www.metallurgie.rwth-aachen.de/data/publications/text\\_interlaeke\\_id\\_1141.pdf](http://www.metallurgie.rwth-aachen.de/data/publications/text_interlaeke_id_1141.pdf)

<sup>2</sup> Corinne Faure-Rochu, Recupyl, personal communication, April 2014

<sup>3</sup> Corinne Faure-Rochu, Recupyl, ibid

<sup>4</sup> For example Recupyl, [www.recupyl.com/157-process.html](http://www.recupyl.com/157-process.html)

<sup>5</sup> Raw Materials Company, [www.rawmaterials.com/page/technology/](http://www.rawmaterials.com/page/technology/). Paper and plastics are sent to an Energy-from-waste facility