9.1. Collection & Recycling of Rechargeable batteries
ProSUM project

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1. The batteries technologies for rechargeable portable market in Europe.
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1. The batteries technologies in rechargeable portable batteries in EU: data availability

- Quantity of batteries placed POM as declared by the national Collection and Recycling Organizations (CRO): based on the declaration of the German and French CRO’s, completed with less detailed data from UK, Spain and Italy. It represents more than 66% by weight of the batteries placed on the market in Europe.

- Quantity calculated with the data from Avicenne: worldwide data with a 22% contribution attributed to the EU Market. They are based on an average of 175Wh/kg for Lithium-on batteries, 70Wh/kg for Ni-MH and 45 Wh/kg for Ni-Cd.

Global trend and values for Li-ion batteries POM coherent with 2 different origin
1. The batteries technologies in rechargeable portable batteries in EU

- Ni-Cd: trend of POM reducing
- Li-ion: increasing with new applications (IT equipments, CPT, others)
- Ni-MH: mainly rechargeable single cells, rather stable trend.

Tons of portable batteries Placed on the Market in Europe
Major difference in the Ni-Cd market trend: much faster reduction in Europe due to the ban.
2. The collection of portable batteries in EU:

- All collection quantities are year on year growing in 2015
- For Ni-Cd batteries, it is a very different trend compared to the POM trend

![Bar chart showing collection quantities of Li-Ion, Ni-MH, and Ni-Cd batteries from 2011 to 2015.](chart.png)
The Ni-Cd collection rate increase despite reducing POM: More batteries are collected than POM since 2013! => demonstration of the long life duration and customers hoarding effect: in the range of 10 years at least.
2. The collection of portable batteries in EU: how to compare to POM (rechargeable)

Comparison year on year for portable rechargeable batteries: very different trends

- Same users
- Same collection streams
- But large differences by technology
2. The collection of portable batteries in EU: how to compare to POM (primary)

Comparison year on year for portable primary batteries

Data from Perchards/EPBA report 2015
2. The collection of portable batteries in EU: how to compare to POM (primary)

Collection rate slowing progressing, but stable market

Data from Perchards/EPBA report 2015
2. The collection of portable batteries in EU: how to compare to POM (primary)

Collection rate absolute value often linked to the date of implementation of the collection targets in the country.

Data from Perchards/EPBA report 2015
3. The collection rate calculation: question

The collection rate calculated according the Battery Directive 2066/66 EC. It compares the quantity of waste batteries collected in a given year with the last 3 years average amount of batteries placed on the market, for the 3 technologies. It is a waste to sales comparison.

Why is Ni-MH collection rate lower than the primary batteries (same single cells market)?
Why is rechargeable batteries collection rate lower than primaries in general?
3. The collection rate calculation: fitting calculation

Based on the portable Ni-Cd and Ni-MH batteries collection rate:

- *life duration and hoarding effect have a very important effect on collection.*

A more realistic comparison could be based on the “available for collection” amount of batteries.

- **Portable Li-ion: Comparison of**
  - « Placing on the Market »
  - « Available for collection »

Data calculation by RECHARGE, based on BEBAT 2014 publication of Li-ion batteries usage+hoarding time.
4. The recycling requirements in EU legislation

In addition to the collection requirements, the Batteries Directive describes the “Recycling efficiency” requirements:

A minimum percentage in weight of the battery must be reach with the recycled materials:
- for lead acid batteries: 65%
- for Ni-Cd batteries: 75%
- all others: 50%

The calculation is based on the ratio of the recycled material weight (output) to the waste battery weight (input).

These requirements are applicable to all batteries categories (Portable, Industrial and Automotive).
4. The recycling requirements in EU legislation

Example of Recycling Efficiency reporting

The first battery recycler has the duty to report the RE to the Competent Authorities of the Member State.
4. The recycling requirements in EU legislation: First data

First data published by ADEME 2014 about recycling efficiency in France (weighted average of the results of French recycling companies):

<table>
<thead>
<tr>
<th>Batteries type</th>
<th>European target</th>
<th>Recycling efficiency (France 2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni-Cd</td>
<td>75%</td>
<td>77%</td>
</tr>
<tr>
<td>Lead acid</td>
<td>65%</td>
<td>&gt;70%</td>
</tr>
<tr>
<td>Others</td>
<td>50%</td>
<td>58%</td>
</tr>
</tbody>
</table>
4. The recycling requirements in EU legislation: Considerations

- "Other batteries" global objective: 50% may be difficult to reach for some Li-ion chemistries (or become an economic issue).

- Quality process certification may be useful.

Recharge supports the implementation of these new standards
5. Conclusion

The control of the health and environmental risks of batteries in Europe is achieved both with the reduction of the POM of the “heavy metals” containing batteries, and the collection increase. A revision of the Batteries Directive is announced in 2017, with new targets expected.

Ni-Cd portable batteries usage is decreasing in Europe much faster than in the rest of the world, partly due to the ban as of Jan 1, 2017.

The different trends in portable primary and rechargeable batteries collection have been analyzed. It is expected that proposals to improve the calculation of collection rates are discussed and proposed during the Batteries Directive review.

The recycling efficiency: first published results are online with the European objectives. Changes proposal are also expected for the Li batteries recycling efficiency.
Thank you for your kind attention!

The Advanced Rechargeable & Lithium Batteries Association

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