Used Lithium Batteries Collection
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the Batteries now

Types of batteries

• Portable batteries
• Industrial batteries
• Batteries from WEEE-scrap
Industrial batteries

- Ni-Cd/Ni-Mh batteries with KOH
- Lead acid batteries
- Lithium-Ion batteries
Sorting plant in the Netherlands
Nickel Metalhydride (power) types

• Successor of the NiCd batteries
  ➢ Same applications as NiCd batteries
  ➢ Better future because the ban on NiCd cells
  ➢ Used in new markets like hybride cars and bicycles
Standard Lithium types

- Consumer types
- Present situation regarding Lithium batteries
Standard Lithium types

- Industrial / military types
- Safety regulations are very important
Standard Lithium types

- Li-ion batteries from Laptops, etc.
- Li-polymer and Lithium power batteries
Standard Lithium types

- Standard technology
- Well identifiable battery types
- Proven recycling solutions are available
- Standard accepted logistic procedures/ADR/UNECE
Lithium power types

- Many different (new) types
- Great variety in substances and materials
Lithium power batteries contain:

<table>
<thead>
<tr>
<th>Cathode materials</th>
<th>System code Asia</th>
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</thead>
<tbody>
<tr>
<td>LiCoO$_2$</td>
<td>LCO</td>
</tr>
<tr>
<td>Li Ni$<em>{0.8}$ Co$</em>{0.15}$ Al$_{0.05}$ O$_2$</td>
<td>NCA</td>
</tr>
<tr>
<td>LiMn$_2$O$_4$</td>
<td>LMO</td>
</tr>
<tr>
<td>LiNi$<em>{1/3}$Mn$</em>{1/3}$Co$_{1/3}$O$_2$</td>
<td>NMC</td>
</tr>
<tr>
<td>LiFePO$_4$</td>
<td>LFP</td>
</tr>
</tbody>
</table>
Carriage of used batteries

- Transport of collected used mixed batteries (all ADR class 9)
- Transport of sorted fractions
  - Notifications (only for NiCd-, Pb-, and Hg containing batteries)
  - Regulations (ADR, UN, National, Local)
  - Lithium batteries (ADR class 9, package group II, max. 450 kg)
  - In the Netherlands use of drums (60/80/120/220 liter)
Carriage of used batteries

- Some pictures to explain the near past and the present time

- Past situation

- Present time

- Sorted Lithium batt.
Recommendation

- In conclusion, more cooperation between producers and recyclers of (power) batteries is absolutely necessary for handling used lithium batteries returned from e-mobility.