



# The Best Battery Recycling





# INTRODUCTION



- AkkuSer recycles hazardous batteries and accumulators in an environmentally friendly manner by using the Dry-Technology method developed by the company itself.
- AkkuSer and its recycling plant are located in Nivala, Finland.
- Certificates:
  - ISO 14001 – Eco Management
  - ISO 9001 – Quality Management



Responsible Care  
Vastuu Huomisesta



Member of  
**CLEANTECH**  
**FINLAND**





# THE PROCESS



- Reception, storage and sorting of Alkaline, Ni-Mh, Li-ion, and Ni-Cd accumulators and batteries
- Sorted Ni-Mh and Li-ion accumulators are crushed (Dry-Technology™)
- Separation of plastic, cardboard, and metals
  - plastic and cardboard are utilized in energy production; metals are delivered to smelting plants, and from there they are returned to production
- Sorted alkaline batteries and sorted lead and Ni-Cd accumulators are delivered to appropriate processing plants
- The process and results are environmentally friendly and safe





# ADVANTAGES OF DRY-TECHNOLOGY

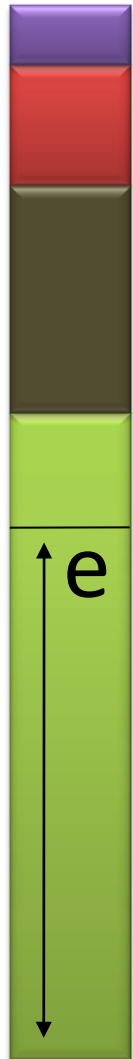


- AkkuSer's new recycling model follows true green values
  - Process is based on dry technology that does not need heating
  - Energy consumption is very low, 0,3 kWh/kg  
Result: EU award, Technology 2008
  - Recycling rate is very high, >90 %
  - CO<sub>2</sub> levels are remarkable lower than in the Foundry technology
    - No emissions during recycling process
    - Transport routes can be optimised
  - Safe processing of reactive materials



## Foundry Technology

## Dry Technology



- Less Green Values
  - Energy consumption high
  - Recycling rate not that high
  - Facilities based on thermal technology
- Process
  - Based on thermal technology
    - High energy consumption
    - Recycling rate meets the EU regulation level
- Energy Consumption
  - Heat up to 1200 C
    - High energy consumption
    - 10 k kWh/kg



- True Green Values
  - Lowest energy consumption
  - Recycling rate high, 98%
  - Dry technology used
- Process
  - Based on dry technology
  - Lowest achieved energy consumption
  - Recycling rate remarkable above EU regulation
- Energy Consumption
  - No heating – Room temp.
    - Lowest on the market
    - 0.3 kWh/Kg, 95% less



# COOPERATING PARTNERS AND MARKETS



- Collection and recovery of batteries and accumulators for Akkuser
  - Finland, Sweden, Norway and Estonia, Austria, Hungary, Slovakia and Poland.
  - Battery suppliers
    - importers, industrial plants, manufacturers, municipalities, government agencies, and large waste disposal companies
- Potential new markets
  - Countries of Eastern Europe, Asian and African market areas
- Customers
  - Steel, metal, battery and glass wool industries
  - metallurgical industry
    - recycled raw material delivery and positive environmental performance





# COOPERATING PARTNERS





# COOPERATING PARTNER: OMG KOKKOLA CHEMICALS OY



Subject: Recycling the Cathode Material of Lithium-Ion Batteries

Kokkola Chemicals Oy

The most valuable recyclable component of Lithium-Ion batteries is the lithium cobalt oxide cathode contained in the battery. OMG Kokkola Chemicals Oy has agreed to receive cathode material that is separated out from Akkuser Oy's Lithium-Ion batteries for use as raw material in its cobalt production. The key area of business in OMG's cobalt production is the cobalt products used in the production of the cathodes of Lithium-Ion batteries. Co-operation with Akkuser Oy makes it possible to recycle the cobalt content from Lithium-Ion batteries back to manufacturers of battery cathode materials. Thus the cobalt of batteries is recovered entirely.

OMG Kokkola Chemicals Oy is responsible for the chemical analysis and safe treatment of cathode material that is returned for recycling in the company's process.

Co-operation with Akkuser Oy is also supported by its close proximity in Nivala, about 100 km from Kokkola.

Kokkola 22 May 2007  
Dr. Joni Hautojärvi  
R&D Director  
OMG Kokkola Chemicals Oy







# COOPERATING PARTNER: NORILSK NICKEL HARJAVALTA OY



**NORILSK NICKEL HARJAVALTA Oy**

A Norilsk Nickel Company



**NORILSK NICKEL**

Norilsk Nickel Harjavalta Oy (NNH) and Akkuser Oy have an agreement, which is effective until further notice, on the recycling of nickel-bearing waste separated out in connection with the crushing of batteries. NNH processes the material in Boliden Harjavalta Oy's nickel smelting plant and NNH's nickel plant; the resulting final product is metallic nickel. Ni products are recycled through "Smelter Route", where the Ni - Mh utilization is over 90 %:

-The material from the crushed Ni - Mh batteries is placed in an oven together with other primary raw materials. The energy from plastic and organic products is partly used for smelting and the rest is utilized in a waste heat boiler for electricity and district heating. The Co fraction in the product is returned for Co processing to OMG Chemicals Kokkola.

A handwritten signature in blue ink, appearing to read "Teijo Södervall".

Teijo Södervall  
Manager – Raw materials  
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