

AkkuSer Oy

Mobile Phone and Battery Recycling Services



AkkuSer Oy - Technology

- AkkuSer has developed a recycling technology for batteries, accumulators and mobile phones aimed at preserving natural resources.
- AkkuSer offers environmentally friendly recycling services to supplier organisations of electronics industry.
- Ni-Mh and Li-ion accumulators and mobile phones are processed by using AkkuSer's own Dry-Technology[®]. This technology raises the recovery of materials to above 90%.
 - Valuable metals are recovered and sold to be reused.
 - Safe handling.
 - Low energy consumption.



Dry-Technology - Process

Dry-Technology is developed for the recycling of Li-ion/
Li-polymer and Ni-Mh batteries and mobile phones.

Proven Best Available Technique, BAT

Process in a nutshell:

- Two-phase crushing line
- Dusts and gases generated in a process are collected and returned into product
- Magnetic iron separation
- Same process for different products



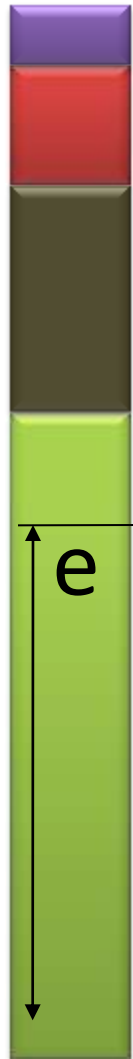
Advantages of Dry-Technology

- **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 %
 - CO2 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



- 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

AkkuSer - Dry Technology




- 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

 Air contamination

 Deficit

 Scum

 Achievement

 Energy consumption

AkkuSer Oy – Services for You

- Easy, economical and environmentally sustainable way to get rid of old mobile phones and their batteries.
- AkkuSer pays for these materials.
 - You get rid of the waste and get money from it!
- Akkuser has all required permits for its operations and its quality and environmental management systems are certified.
- Support for clients by providing documents needed for waste transfer notifications.
- Detailed reporting of receiving and sorting.



Co-operation with BRIC Countries

- Target is to initiate co-operation with companies in BRIC countries in order to deliver mobile phone scrap and battery waste to AkkuSer's facility in Finland
- Potential material suppliers
 - Tele operators (networks of shops)
 - Mobile phone repair shops
 - Waste management companies who dismantle WEEE
 - Big and well-known brands who may coordinate collection campaigns
 - Companies from ICT industry



Co-operating 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
Heikki Pihlaja
Raw material Manager
OMG Kokkola Chemicals Oy



Co-operating partner: Norilsk Nickel Harjavalta Oy

NORILSK NICKEL HARJAVALTA Oy
A Norilsk Nickel Company



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.


Teijo Södervall
Manager – Raw materials
Norilsk Nickel Harjavalta Oy



Mobile Phone Recycling

AkkuSer processes mobile phones with Dry-Technology. Before the treatment, batteries are removed from the phones and processed separately. The crucial issue is that the metals are processed in such a manner that the product can be easily and economically refined by metal producers.

AkkuSer together with its metal refinery partner achieve approx. 100 % recycling efficiency for mobile phones.

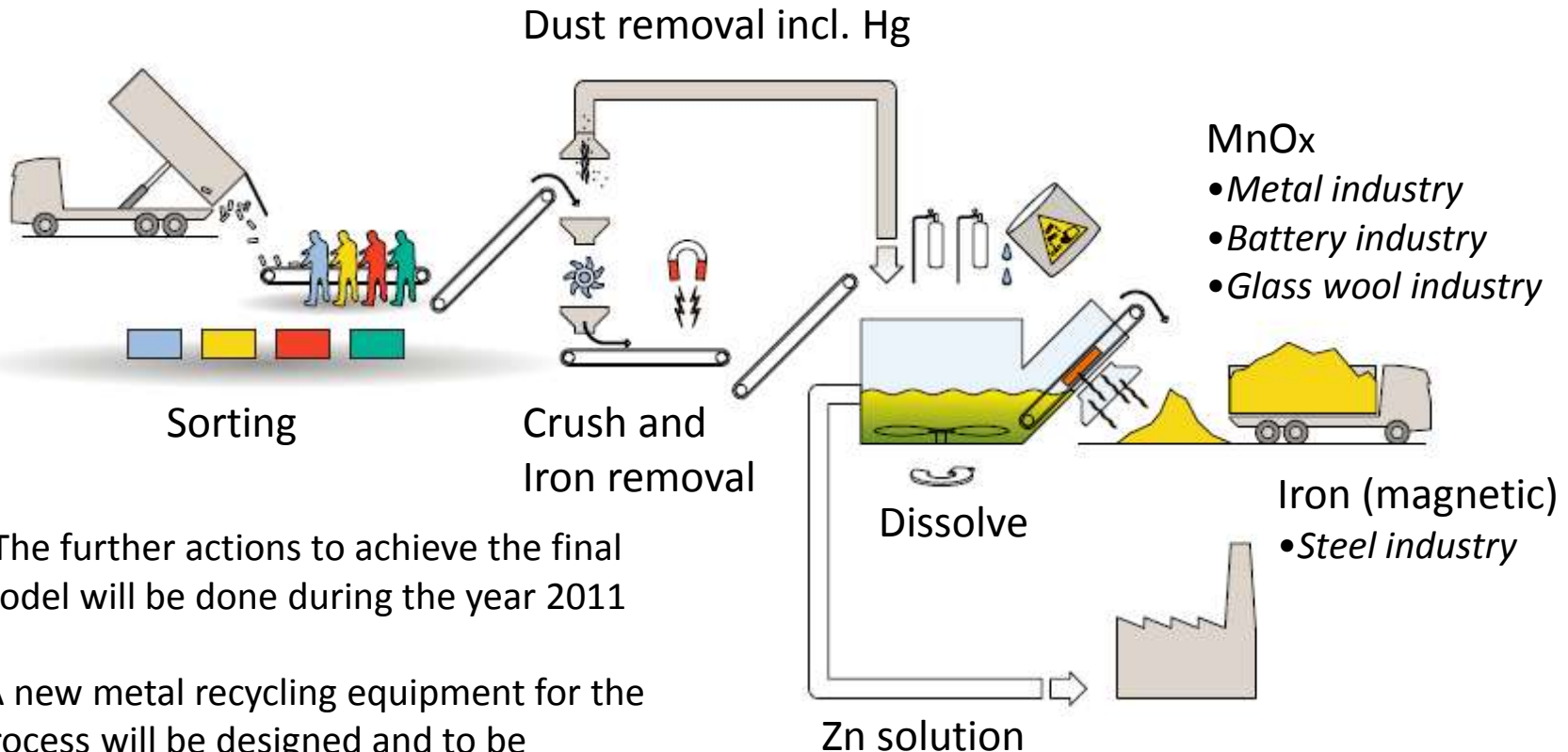


Alkaline Battery Recycling

- In Dry-Technology process it is not possible optimally recycle valuable materials of alkaline batteries. Today alkaline batteries are sent to smelters.
- The aim is to develop a recovery process that recovers nearly 100% of valuables from spent alkaline batteries and is economically sustainable.
- The most important metals (both in economic and technical viewpoint) in recovery were zinc, iron and manganese.



Recycling Process for Alkaline Batteries



• The further actions to achieve the final model will be done during the year 2011

• A new metal recycling equipment for the process will be designed and to be installed in Kokkola in the proximity of the potential customers during the years 2012-2014

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