Separation Technologies for Metal/Plastic Separation – hamos KWS

Worldwide market leader in electrostatic separation!
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About hamos

Worldwide #1 manufacturer of electrostatic separation machines & plants

1980
founded by
Harro Müller-
Stürcken in
Germany
Penzberg

1993
Start of
electrostatic
separation
technologies
with hamos
KWS

2000
Introduction of
electrostatic
separator
hamos EKS

Becoming experts in the field of:
- Metal/Plastic Separation
- Plastic/Plastic Separation
- PVC Window Recycling
- WEEE-Plastic Recycling
- PET Recycling
- Cable Recycling

2014
Worldwide market
leaders using
hamos
technologies
About hamos

hamos GmbH
Recycling- und Separationstechnik
82377 Penzberg / Germany

www.hamos.com
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Product range

Electrostatic Separators

Metal Separators/ Detectors

Turn-key-plants
Product range

Electrostatic Separators

Metal Separators/Detectors

Metal/PET Separators

Metal/Plastic Separators

Plastic/Plastic Separators

PET/PVC Separators

Mineral Separators

Rubber Separators

Free-fall-metal separators

Last-chance metal separators

Pneumatic metal separators

Turn-key-plants

Customized Turn-key plants

WEEE Plastic Recycling System

Window Recycling System
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</table>
Electrostatic metal/plastic separators

## Basics - Separation Technologies for metals

<table>
<thead>
<tr>
<th>Metal Content</th>
<th>Ferrous</th>
<th>Non-Ferrous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coarse</td>
<td>Coarse</td>
</tr>
<tr>
<td>Low</td>
<td>Magnets</td>
<td>Electronic Metal Separators</td>
</tr>
<tr>
<td>High</td>
<td>Magnets</td>
<td>Eddy Current Separators</td>
</tr>
<tr>
<td></td>
<td>Magnets</td>
<td>KWS Electrostatic Separators</td>
</tr>
</tbody>
</table>
# Electrostatic metal/plastic separators

## hamos KWS

### Material pre-treatment

- Shredded
- Grinded
- Dryed
- Etc.

### Material restrictions

- Wet and dusty products
- Compounds (not mechanically liberated)
- Oily/greasy/fibres/fuzz particles
- Coated conductors (i.e. oxidised metals like aluminium dross)
- Sticking material
### Main facts

- Separation of conductors from non-conductors,
- Very fine metallic particles, high percentages of metals, cleaning of plastics (non conductors)
- Versatile applications with one KWS
- Dry separation process (no fluids or chemicals necessary)
- Low sorting costs
- Throughput up to 1800 kg/hr

**The KWS is the ideal partner for**

- Shaker tables
- Eddy current separators
Electrostatic metal/plastic separators

- Electrode system approx. 25 kV DC
- Corona field charges metal & plastic
- Rotating steel drum
  - Metallic particles discharge quickly and fall off the drum
  - Plastic particles discharge slowly (stick on the drum by Coulomb forces)
- Splitter
- Metal/PVC separator

hamos KWS – Physics
Electrostatic metal/plastic separators

hamos KWS – Physics

- Only a single layer of particles can discharge on the surface of the drum
  - This limits the throughput
- Higher throughputs by increasing of the drum length (hamos KWS 1521-1: 2 x 1500 mm)
Electrostatic metal-plastic separators

hamos KWS – Internal De-dusting system – Delivered optional
Electrostatic metal/plastic separators

hamos KWS – Internal De-dusting system – Delivered optional

### Internal De-dusting

Internal de-dusting system on all drums is standard and part of the delivery

(to be connected to a filter system)
Electrostatic metal/plastic separators

hamos KWS – Technical specs of KWS 1521/1522/2521/2522

- 2 parallel drums in the first separation stage
- 1 or 2 drums in the second stage
- Two stage separation
  → Re-separation of mixture and/or plastic product
- Drum length 1.000 mm (KWS 10xx)
  1.500 mm (KWS 15xx)
  2.500 mm (KWS 25xx)
Electrostatic metal/plastic separators

hamos KWS – 1010-0 Single Drum
Electrostatic metal/plastic separators

hamos KWS – 1521-1
Electrostatic metal/plastic separators

hamos KWS – 2522-2
Electrostatic metal/plastic separators

hamos KWS – Water table is no alternative
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</tbody>
</table>
### Application examples

#### Metal-plastic separators – hamos KWS

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<thead>
<tr>
<th>PVC Cable Scrap</th>
<th>Aluminum Cable Scrap</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Input" /></td>
<td><img src="image2" alt="Input Alu/Plastic" /></td>
</tr>
<tr>
<td><img src="image3" alt="Clean copper" /></td>
<td><img src="image4" alt="Clean metal" /></td>
</tr>
<tr>
<td><img src="image5" alt="Plastic" /></td>
<td><img src="image6" alt="Plastic" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PC Boards</th>
<th>Joghurt scrap (skeleton waste)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image7" alt="Input" /></td>
<td><img src="image8" alt="Input" /></td>
</tr>
<tr>
<td><img src="image9" alt="Clean metal" /></td>
<td><img src="image10" alt="Clean Metal" /></td>
</tr>
<tr>
<td><img src="image11" alt="Plastic" /></td>
<td><img src="image12" alt="Plastic" /></td>
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#### Further applications

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<tr>
<th>Bottle caps</th>
<th>Alu-plastic tubes</th>
<th>Alu compounds</th>
<th>WEEE</th>
<th>Handys</th>
<th>PVC windows</th>
<th>And many more</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image13" alt="Alu/plastic" /></td>
<td><img src="image14" alt="Alu/plastic" /></td>
<td><img src="image15" alt="Alu/plastic" /></td>
<td><img src="image16" alt="Precious metals" /></td>
<td><img src="image17" alt="Precious metals" /></td>
<td><img src="image18" alt="PVC-metals" /></td>
<td><img src="image19" alt="And many more" /></td>
</tr>
</tbody>
</table>
Application examples

Cable recycling
Cable recycling – Average composition of cable

- 50-60 % Plastic
- 40-50 % Copper

Application examples
Application examples

Cable Recycling – Chopping line

- Shredding/Granulation for mechanical liberation of metals and plastics
- Sorting of metals and plastics with shaker table/air table
- Clean metal
- Metal containing wire tailings
- hamos KWS
Application examples

Cable Recycling – Chopping line
Cable Recycling – Shaker table for clean metal

Metal

Plastic - This is the infeed for KWS!
Application examples

Cable Recycling – PVC Cable

Input material
Typical input material mixture of PVC cable material

Metal fraction
Metal fraction after hamos KWS

Plastic fraction
Plastic fraction after hamos KWS
Application examples

Aluminum Cable

**Input material**
Typical input material mixture of aluminum cable material

**Metal fraction**
Metal fractions after hamos KWS

**Plastic fraction**
Plastic fraction after hamos KWS
Application examples

Mixed Cable

Input material
Typical input material mixture of mixed cable

Metal fraction
Metal fraction after hamos KWS

Plastic fraction
Plastic fraction after hamos KWS
Application examples

Cable Recycling – Filter lifetime increased by 800 %
Application examples

Recycling of PC board scrap & router dust I

**PRODUCT**
- Ground bare or populated PC boards (epoxy, fibre, copper, precious metal) particle size < 1mm
- Metal content approx. 20 %

**TARGET**
- 100 % metal recovery, clean epoxy

**SOLUTION**
- hamos KWS
Recycling of PC board scrap & router dust I

Plain PC board scrap

- No components
- No precious metals
- ~ 20% copper, tin, lead
- Single, double, multi-layer
- Thin copper layers
- Epoxy, glass fiber
Recycling of PC board scrap & router dust

- Digital components
- +10 different metals
- Single, double, multi-layer
- **Contains precious metals**
- Different non-metals
Application examples

Recycling of copper clad laminates

- Fine Conductors
- Mechanical liberation between metal and epoxy

![Diagram showing copper-clad laminate with copper, epoxy, and glass fiber layers.](image)
Application examples

Recycling of PC board - Principle

- Shredding for mechanical liberation
- Pulverisation for metal/non-metal liberation
- Separation of metal and non-metal with KWS
  - Clean metal
  - Non metallic
Application examples

PC Boards

**Input material**
Typical input material mixture of PC Boards
The ideal fraction size is 1,6 – 2,5 mm

**Metal fraction**
Metal fraction after hamos KWS

**Plastic fraction**
Plastic fraction after hamos KWS
Application examples

PC Boards

**Input material**
Typical input material mixture of PC Boards
The ideal fraction size is < 1.6 mm

**Metal fraction**
Metal fraction after hamos KWS

**Residues fraction**
Residues fraction after hamos KWS
WEEE Plastic cleaning

Input material
Typical input material mixture of WEEE plastic

Metal fraction
Metal fraction after hamos KWS

Non conductor fraction
Non conductor fraction after hamos KWS
Application examples

Router dust

**Input material**
Contains > 15% copper
- Phenolic or glass
- Fibre/epoxy can be re-used

**Metal fraction**
Copper fraction after hamos KWS. Impurities like rubber aso. are removed

**Non conductor fraction**
Phenolic or glass fibre/époxy
Recycling of skeleton waste – Principles

Principle I

Grinding (metal and plastic)

Extrusion with melt screen

PS

Loss: 100% Aluminum 10% PS

Principle II

Grinding (metal and plastic)

Electrostatic separator KWS

Clean Aluminum

Extrusion with melt screen

PS

Aluminum 1% PS loss
### Application examples

## Punch scrap / skeleton waste

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<th>Input material</th>
<th>Metal fraction</th>
<th>Plastic fraction</th>
</tr>
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<tbody>
<tr>
<td>Ground skeleton waste (PS and 10-20 % aluminum)</td>
<td>Aluminum recovery after hamos KWS</td>
<td>Clean plastic fraction PS for new products (plant containers etc.)</td>
</tr>
<tr>
<td>• Originated from dairy products production wastes (we are working on post consumer cups etc.)</td>
<td></td>
<td></td>
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Application examples

Bottle caps

Input material
Typical input material mixture of Bottle caps

Metal fraction
Aluminum recovery after hamos KWS

Plastic fraction
Plastic fraction after hamos KWS
Application examples

Aluminum/plastic pipes

- **Input material**: Typical input material mixture of Alu-plastic tubes
- **Metal fraction**: Metal fraction after hamos KWS
- **Plastic fraction**: Plastic fraction after hamos KWS
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References

hamos worldwide

And many more...
Installed hamos KWS 1521-1
Installed hamos KWS – 2521-1 and KWS 2521-1
Installed hamos KWS – 2522-2 and KWS 2521-1
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