X-SORT

EDDY CURRENT SEPARATOR

www.magquip.com +27 (0) 11 473 2521 info@magquip.com

MAGQUIP

MAGQUIP

MAGNETIC PROCESSING TECHNOLOGY

UIP • ECS • MAGQUIP • ECS • MAG

SORT

INDEX

EDDY CURRENT SEPARATORS - PRINCIPLE, OPERATION & APPLICATIONS

WHAT IS AN EDDY CURRENT SEPARATOR?

An Eddy Current Separator (ECS) is a machine designed to separate non-ferrous (i.e. non-magnetic conductive) metals — such as aluminium, copper, brass or zinc — from a mixed waste or slag stream. After ferrous (magnetic) metals are removed by conventional magnetic separation, the ECS recovers the remaining conductive metals that would otherwise be lost.

PRINCIPLE OF OPERATION

1. **Induction of Eddy Currents**
   When electrically conductive objects enter a rapidly changing magnetic field, circulating electric currents, known as eddy currents, are induced within them. These eddy currents, in turn, create their own magnetic field, in accordance with Faraday's Law and Lenz's Law.

2. **Magnetic Repulsion & Ejection**
   The induced magnetic field of the particle opposes the applied field from the rotor (i.e. "like poles repel"). This repulsion generates a force that acts on the conductive particle. Combined with the forward motion applied by the conveyor belt, this repulsive force causes the conductive particles to be "thrown" or flipped away from the rotor. The trajectory diverges from that of non-conductive particles.

3. **Separation Paths**

   - Non-conductive particles (e.g. glass, plastic, ceramics, stone) follow their natural ballistic trajectory and fall away unaffected, often called "drops"
   - Conductive non-ferrous metals are repelled and ejected into a dedicated collection chute or bin.
   - Ferrous (magnetic) metals, usually removed upstream, can also be recovered by eccentric rotor

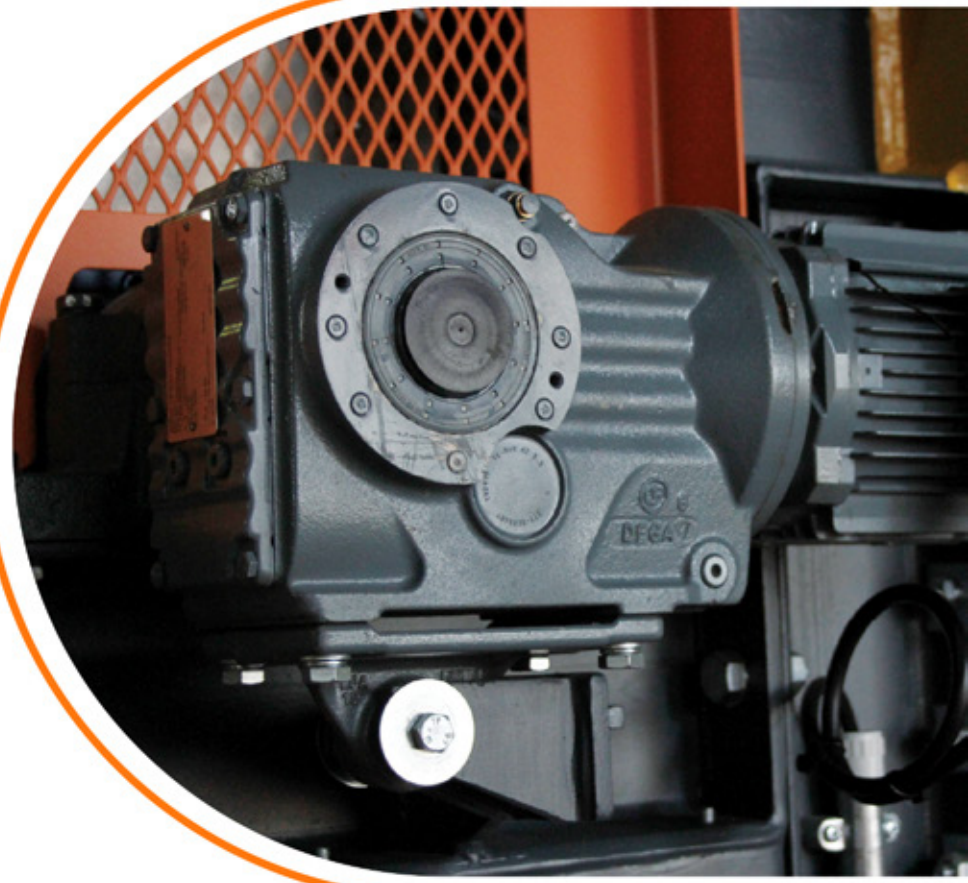
KEY OPERATING COMPONENTS

Permanent Magnet Rotor
The rotor contains high-strength permanent rare earth magnets (typically NdFeB). Its rapid rotation (commonly in the range of 2,500 to 4,000 RPM) produces rapidly changing magnetic fields. The rotor is mounted inside a non-metallic shell or drum, which supports the conveyor belt but does not interfere with the magnetic field.

Conveyor Belt System
Material is carried on a short conveyor belt towards the rotor. Ideally, the material is spread into a single layer (mono-layer) to maximise exposure to the magnetic field.

Product Splitter
An adjustable splitter is used to split between the trajectories of ejected non-ferrous metals and the remainder of the stream, directing each to the appropriate chute or bin.

Design Variants
While some competitors use **"concentric"** rotor designs, MAGQUIP standardises on the proven **"eccentric"** design (where the magnetic rotor is offset). Eccentric designs often concentrate the magnetic field closer to the point of separation and reduce unwanted interference earlier in the belt travel.



APPLICATIONS & MATERIAL TYPES

Eddy current separators are used in a wide variety of recycling and waste-processing applications. Typical use cases include:

- Shredder residues / MSR (mixed scrap residue)
- Metal recycling plants
- Glass cullet (removing metal contaminants)
- E-waste, electronic cable scrap
- Household refuse / municipal solid waste
- Incinerator bottom ash
- Metal slags and metallurgical by-products

They can recover metallic particles in the size range from approximately 5 mm up to 200 mm (in some "fines" rotor versions, from -5 mm) depending on system design and feed control.

WHY USE A MAGQUIP EDDY CURRENT SEPARATOR?

- **High recoveries of non-ferrous metal** that might otherwise be lost
- **Clean, sorted metal streams** improving downstream value
- **Compact and flexible designs,** suitable for retrofit or modular installation
- **Low maintenance,** especially when optimised for minimal interference and wear
- **Proven "Eccentric" X-SORT** rotor design and **X-SORT "FINES"** rotor version

MAGQUIP EDDY CURRENT SEPARATOR (ECS)
DESIGN FEATURES

SOLID ROTOR SHAFT CONSTRUCTION

Traditional ECS designs often rely on stub shafts that can deflect under heavy load. The MAGQUIP ECS features a precision-machined solid rotor shaft, providing superior mechanical stability and rigidity.

KEY BENEFITS:

- **Exceptional operational stability:** The solid shaft minimises vibration and mechanical stress, ensuring smoother and more reliable operation.
- **Extended service life:** Its robust construction reduces wear on bearings and couplings, lowering maintenance frequency and cost.
- **Consistent separation performance:** A more stable rotor ensures steady magnetic field conditions for improved non-ferrous recovery efficiency.

ENHANCED BEARING AND HOUSING DESIGN

Our ECS incorporates an upgraded bearing and housing system engineered for durability and precision alignment in demanding applications

ADVANTAGES INCLUDE:

- **Higher load capacity:** Designed to withstand greater dynamic and radial forces during continuous operation.
- **Improved heat dissipation:** Optimised housing geometry enhances cooling, preventing thermal stress and extending bearing life.
- **Reduced maintenance:** Long-life bearings and simplified access points minimise downtime and maintenance requirements.

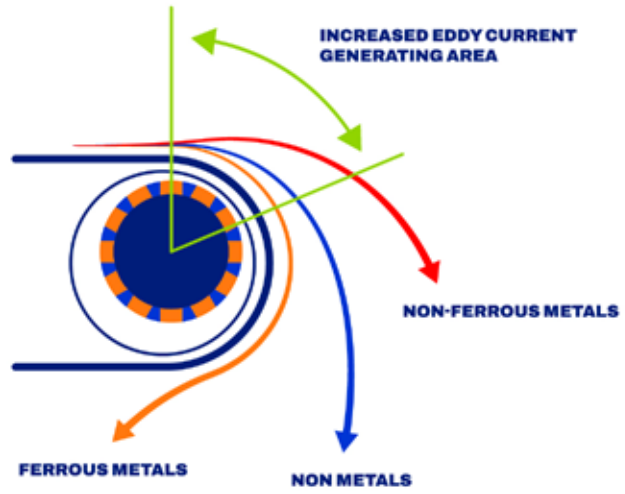
X-SORT ECCENTRIC ROTOR TECHNOLOGY

At the heart of the MAGQUIP ECS is the X-SORT eccentric rotor system, representing a significant advancement over conventional concentric designs.

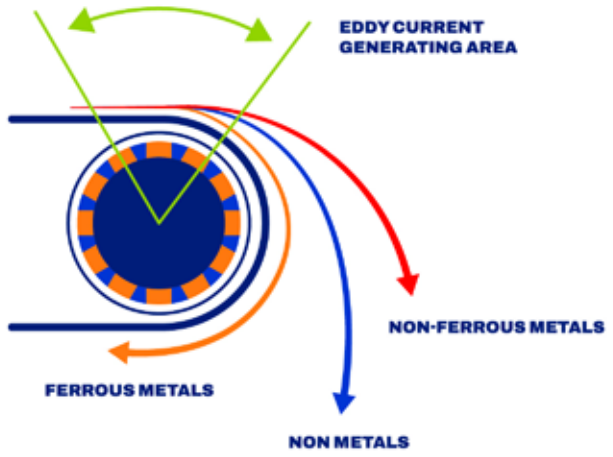
PERFORMANCE BENEFITS:

- **Superior ferrous discharge:** The eccentric configuration ensures rapid ejection of heated ferrous particles, protecting the rotor and belt from damage.
- **Higher separation force:** Enhanced magnetic field concentration produces greater repulsion on conductive particles, increasing non-ferrous recovery rates.
- **Enhanced reliability:** The offset pole arrangement maintains consistent performance even under variable feed conditions and challenging environments.

ECCENTRIC ROTOR



CONCENTRIC ROTOR

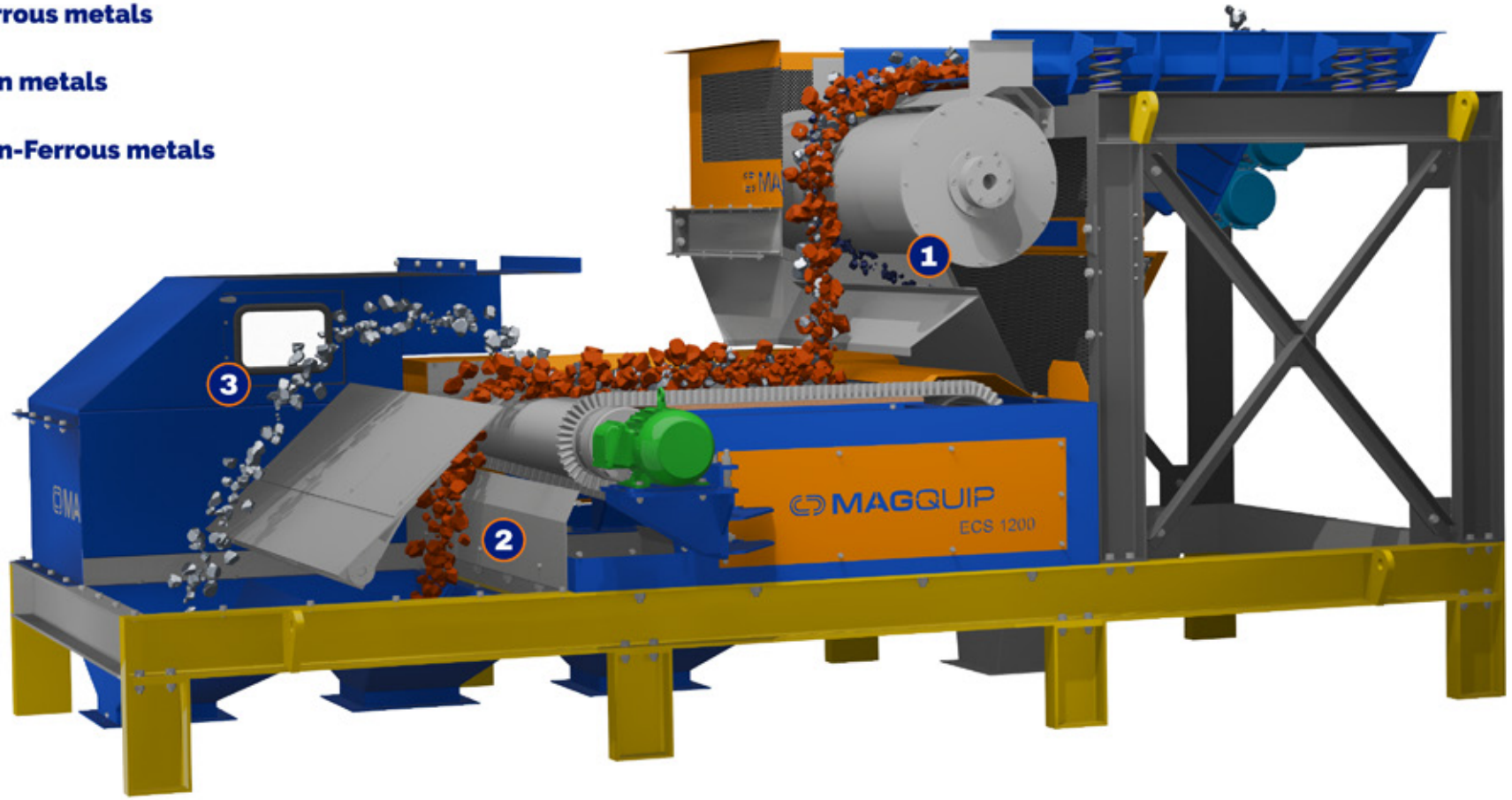


ADDITIONAL DESIGN FEATURES

- **Optimised Magnet Design:** High-grade Rare Earth (NdFeB) magnets deliver powerful and stable magnetic fields for maximum separation efficiency.
- **High-Purity Separation:** Engineered to achieve exceptional purity in non-ferrous metal recovery.
- **Durable, High-Performance Rotor:** Built for extended life and continuous duty in demanding recycling and mineral applications.
- **Motorised Belt Drive Pulley:** Compact, fully enclosed drive system offering enhanced safety and reliability.
- **Direct-Drive Rotor:** Motor is directly coupled to the rotor for precise speed control and reduced mechanical loss.
- **Adjustable Belt & Rotor Speeds:** Variable-speed drives allow on-the-fly adjustment to optimise performance for different material types.
- **Versatile Belt Widths:** Available in standard widths from 600 mm to 2000 mm to suit a wide range of process capacities.
- **High-Speed Belt Throughput:** Designed for superior material presentation and processing efficiency.
- **Ease of Maintenance:** Quick-change belt design, large inspection doors, and user-friendly layout simplify service access.
- **Simple Splitter Adjustment:** Enables accurate control of separation zones for optimum metal recovery.
- **Comprehensive Guarantee:** Supplied with a full 12-month factory warranty for complete peace of mind.

THE X- SORT EDDY CURRENT SEPARATOR

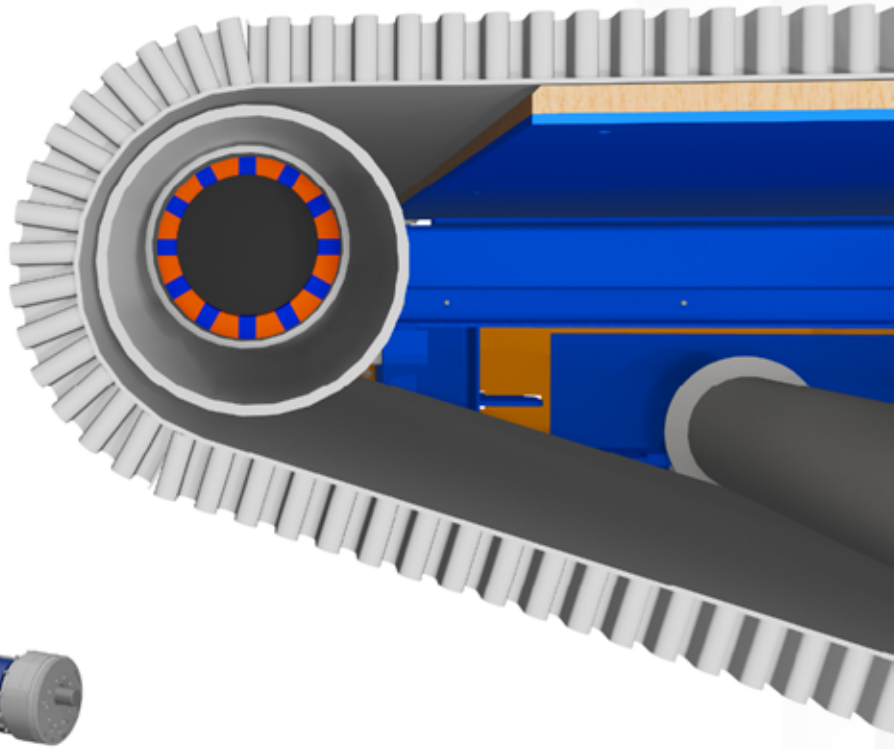
1. Ferrous metals
2. Non metals
3. Non-Ferrous metals



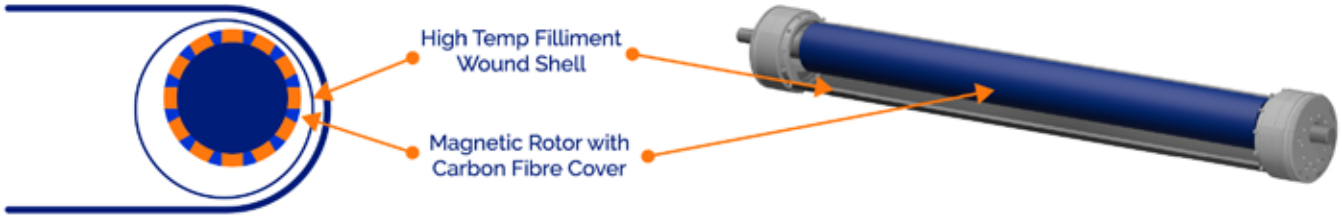
WHY ECCENTRIC OVER CONCENTRIC?

The eccentric rotor design in the MAGQUIP Eddy Current Separator, positions the magnetic pole system off-centre within the rotor shell, rather than concentrically. This deliberate offset concentrates the magnetic field closer to the point of material discharge, where separation actually occurs. As a result, non-ferrous metals experience a stronger, more focused repulsive force, improving recovery rates and purity.

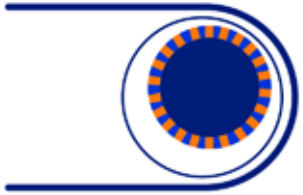
At the same time, the eccentric layout allows non-ferrous particles to be ejected more efficiently, reducing wear on the belt and rotor. In short, the eccentric design enhances both separation performance and equipment longevity by ensuring the magnetic energy is used precisely where it's most effective.

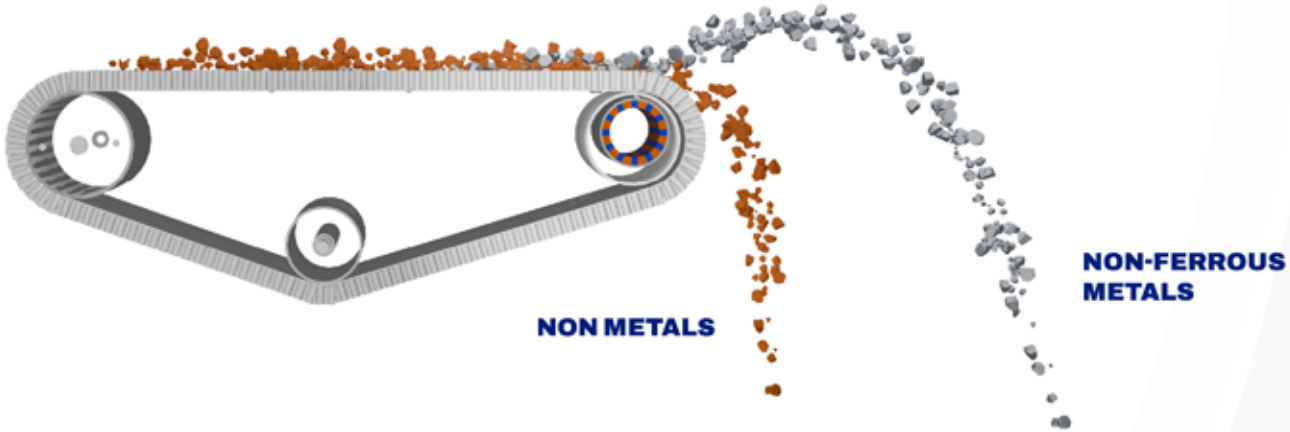


ECCENTRIC ROTOR



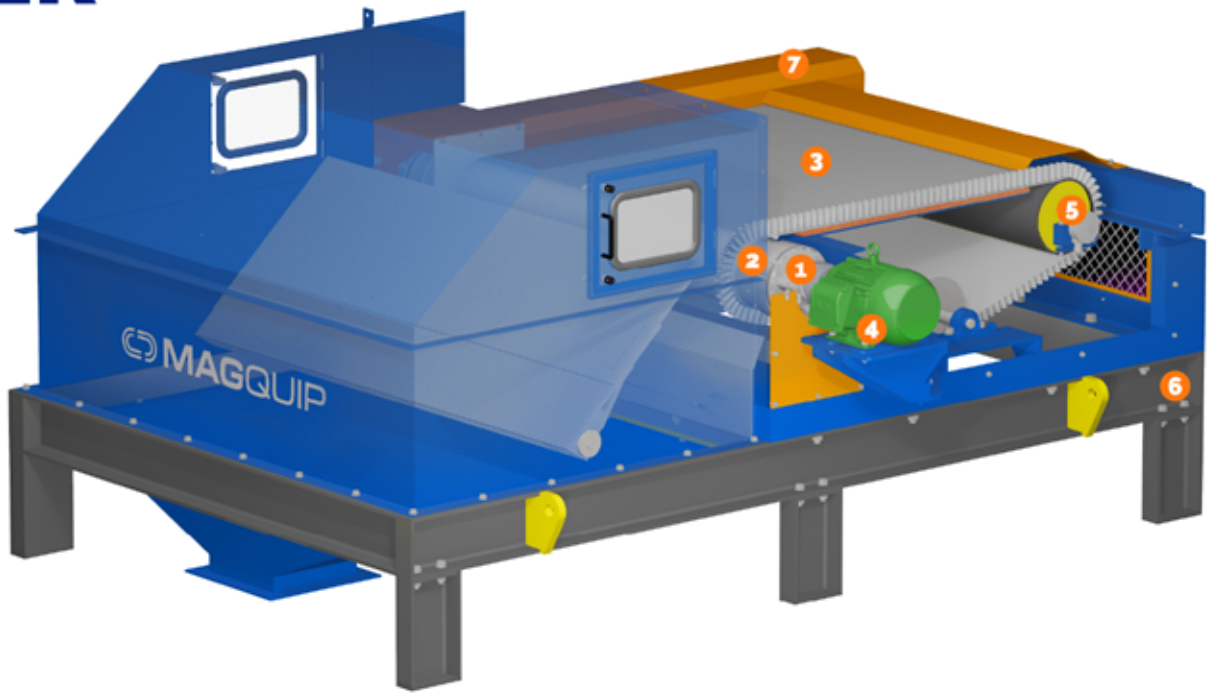
"FINES" ROTOR





ECS FINES version for high-precision fine grain sorting

ECS AND SPLITTER MODULES



1 ROTOR

A precision-machined, high-tensile carbon steel shaft fitted with high-strength rare-earth Neodymium-Iron-Boron (NdFeB) permanent magnets. This assembly provides a powerful and stable magnetic field essential for efficient separation.

2 DRUM

Constructed from high-strength 4 mm glass-fibre, the non-metallic drum ensures durability while allowing the magnetic field to pass through without interference.

3 BELT

A 2-ply, 1.3mm belt featuring a 0.4 mm polyester wear cover for excellent traction, flexibility, and abrasion resistance during continuous operation.

4 ROTOR DRIVE

Driven by a standard three-phase squirrel-cage induction motor, 2-pole, operating at 3000 r/min, providing consistent, high-speed rotor performance.

5 BELT DRIVE

Powered by a motorised pulley (such as the Joki type or equivalent) capable of achieving belt speeds up to 2.5 m/sec, ensuring efficient material throughput and presentation to the magnetic field.

6 SUPPORT FRAMEWORK

A robust carbon-steel fabricated frame, engineered for rigidity and stability.

7 GUARDS

Protective guards for safe, reliable operation in demanding industrial environments.

EDDY CURRENT SEPARATOR
MODULE CONFIGURATIONS

1. ECS + SPLITTER MODULE

2. VIBRATING FEEDER + ECS + SPLITTER

3. VIBRATING FEEDER + FERROUS DRUM SEPARATOR + ECS + SPLITTER

WHAT IS NEEDED FOR A SUCCESSFUL INSTALLATION?

- **Controlled, Even Feed:**
  A consistent and evenly distributed feed of material across the belt is essential for optimal separation efficiency. This is typically achieved using a vibrating feeder to maintain a uniform mono-layer of material.
- **Ferrous Metal Removal System:**
  Before the material reaches the Eddy Current Separator, ferrous (magnetic) metals must be extracted to prevent rotor damage and interference. This is commonly achieved using a rotary drum magnet or overband magnet positioned upstream of the ECS.
- **Discharge Chutes:**
  Appropriate waste and product discharge chutes must be provided to guide separated materials to heir respective collection points. Chutes may include adjustable splitters to fine-tune the separation line between non-ferrous and non-conductive fractions.
- **Support & Mounting:**
  A rigid, level support structure is required to ensure proper alignment and vibration-free operation. Adequate space should be provided for maintenance access, inspection doors, and belt replacement.
- **Power & Control:**
  A reliable three-phase power supply and control panel capable of adjusting belt and rotor speeds are needed for performance optimisation and safe operation.
- **Dust or Fume Management (if applicable):**
  In dusty or fine material applications, suitable dust extraction or containment should be included to maintain operator safety and equipment cleanliness.

APPLICATIONS

- Shredder residues / MSR (mixed scrap residue)
- Metal recycling plants
- Glass cullet (removing metal contaminants)
- E-waste, electronic cable scrap
- Household refuse / municipal solid waste
- Incinerator bottom ash
- Metal slags and metallurgical by-products

GET IN TOUCH

Get in touch with us to discuss your requirements and discover how our **X-SORT** can maximise your non-ferrous metal recovery efficiency.

www.magquip.com

+27 (0) 11 473 2521

info@magquip.com

MAGQUIP GLOBAL REACH

INTERNATIONAL PRESENCE

At Magquip, we pride ourselves on being a trusted supplier of magnetic separation and material handling equipment to clients around the world. Our commitment to engineering excellence, durability, and innovation has positioned us as a preferred partner for industries operating in demanding environments across Africa and beyond. Whether it's through our robust self air-cooled electromagnets or custom-engineered solutions, we consistently deliver internationally compliant products that meet the highest performance standards - ensuring reliability, efficiency, and long-term value wherever our equipment is used.

OUR BASE OF OPERATIONS

1202 Beitel Road, Robertville, Johannesburg.
Gauteng, South Africa
1700