PERMANET

PERmanent MAgnet Network for the European Transition

Innovative Bonded Magnets from Recycled NdFeB

Dr. Kaouther Zaara
Ingeniería Magnética Aplicada (IMA)

Precision in Magnetics

Funded by the European Union

Precision in Magnetics

www.imamagnets.com

Rely on the security of a leader with 35 years of experience and international presence.

Barcelona

Milan

Ningbo

Manufacturer and supplier of industrial magnets

Discover the difference of working with a global supplier, who controls all stages of magnetic product development, from raw material selection to quality verification.

R&D&i : International projects that define our experience

Mars Perseverance (NASA)

Neodymium magnets designed by IMA contribute to the rover's success on Mars.

Plooto

Solutions for the recovery and recycling of permanent magnets in circular value chains.

Minethic

Sustainable recovery of strategic minerals to assist with ecological transition.

Passenger

Innovation in rare earth recycling and sustainable electromobility.

Permanet

We contribute to the development of a sustainable network in Europe for the supply of rare earths.

Sicaperma

This recycling project aims to reduce import dependency, reduce CO_2 emissions and create jobs.

Innovation Radar

This EU recognition highlights our involvement in Passenger as a leader in sustainable solutions.

INNOVATIVE SME

Since 2018, we have renewed this label, which recognises our commitment to research and development.

IN QUALITY WE ARE...CERTIFIED

IATF 16949
Certification for the automotive industry
ISO 9100
Aerospace accreditation
ISO 9001
Quality management.

ISO 14001
Environmental Management

ENAC 17025
ESSAY
Magnetic Dipole Moment

ENAC 17025
CALIBRATION
Magnetic Induction Meters
Hall Effect Gaussmeters
Permanent Magnets

RoHS
Safety
in
Materials

REACH
Safety
in
Materials

Innovative
SME

WRAS
Safety
in
Materials

RESPONSIBLE
MINERALS
INITIATIVE

VOLUNTARY
AGREEMENT
SCHEME

ded by
European Union

R + D + i

Where the future becomes the present

We take part in international projects focusing on magnetic materials, recycling and new ways of manufacturing with reduced dependency.We study processes, validate materials and test their performance before applying them to real-world applications. Our R&D&I bridges the gap between innovation and industry to turn knowledge into viable processes.

PERMANET Project

HUB 3

Innovative magnet production and User-Driven Testing

Innovative Oxide reduction

Innovative PM manufacturing process

Flakes, pellets, powder preparation

Final integration and end-use

PERMANET

Funded by the European Union

IMA's Role and Target

Precision in Magnetics

THE GOAL

Demonstrate production pilot lines
leveraging novel bonding process technologies.

THE CHALLENGE

Processing Recycled NdFeB (MagREEsource C8B)

Targeting high-performance parts for industrial robotics (ETRA use case).

PERMANET

Funded by the European Union

Golden Samples Strategy

Precision in Magnetics

Extensive experimental work to define optimal formulations for Golden Samples.

Variables evaluated: Anisotropic /Isotropic/ recycled powders, PA12 binder (7-8%), and 6 different additive packages.

Criteria: Maximizing Remanence (Br) and /or Maximizing Coercivity (Hcj).

PERMANET

Funded by the European Union

Process Innovation: Compounding

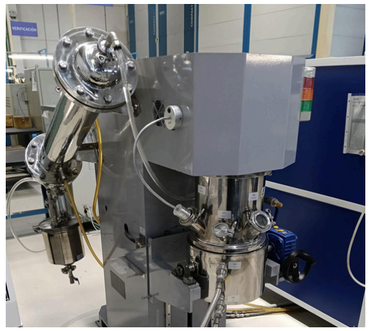
Precision in Magnetics

1. Protection

Powder handled in Glove Box (N2) No Oxidation

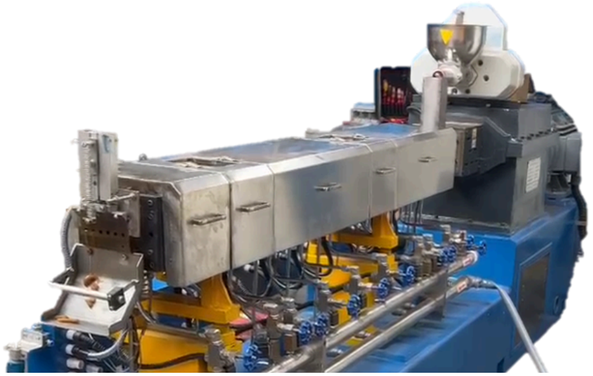
2. Formulation

57.6 vol% Recycled magnetic filler



3. Compounding and pelletization

Twin-Screw Extrusion Optimal Dispersion



4. Protection

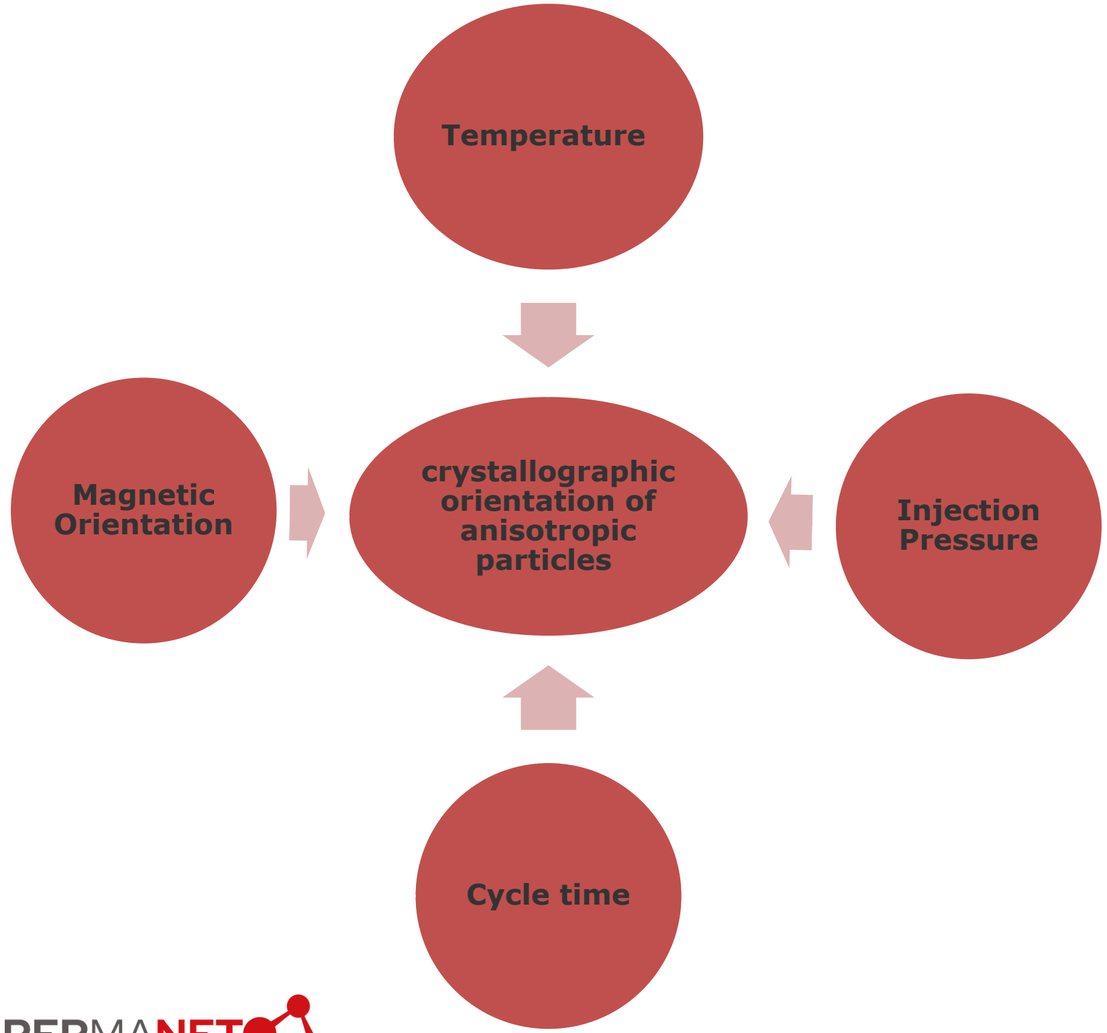
Pellets handled in Glove Box (N2)

PERMANET

Funded by the European Union

Process Innovation: Injection Molding

Precision in Magnetics



PERMANET

Funded by the European Union

IMA's Specific Industrial Uptake Conditions

Precision in Magnetics

The conditions being validated for industrial uptake of the bonded magnet pilot line are:

Condition	Status
Compound homogeneity (twin-screw extrusion)	Achieved :excellent dispersion
Controlled atmosphere handling (glove box)	Implemented :prevents NdFeB oxidation
Magnetic alignment during injection (1.1 T pulse)	Validated : induces anisotropic orientation
Magnetic performance (Br = 0.615 T, BHmax = 46.66 kJ/m³)	Good remanence results
Mechanical integrity	Adequate for different application
ETRA use case alignment (magnetic holders)	Ongoing
Next: C8C batch testing, higher-density formulations	➡ SOON Planned next reporting period

PERMANET

Funded by the European Union

Industrial Equipment and Automation Relevance

Precision in Magnetics

How IMA’s recycled NdFeB bonded magnets address key industrial automation needs

INDUSTRIAL ROBOTICS

ETRA use case (HUB 3) (to be validated by ETRA)

Magnetic holders and grippers for automated assembly.

Bonded magnets enable complex net-shape geometries, not achievable with sintered parts.

Br = 0.615 T | BHmax = 46.66 kJ/m³

ELECTRIC MOTORS and ACTUATORS

Servo motors, DC motors and linear actuators

Injection-moulded rotor rings and arc segments.

Anisotropic alignment maximises flux density. Lower eddy-current losses vs sintered

=> suited for high-frequency inverter drives.

SENSORS and ENCODERS

Magnetic position sensors and rotary encoders

Net-shape multipole rings via injection moulding.
Consistent field uniformity and high mechanical stiffness ensure reliable feedback in CNC and robotic systems.

AUTOMATION SYSTEMS

Pick-and-place, conveyor clamp and couplings

Customisable field patterns via anisotropic alignment.

Adequate flexural strength for embedded structural applications in machine frames and tooling fixtures.

Market Uptake Conditions (Industrial Perspective)

Precision in Magnetics

Three pillars enabling large-scale industrial adoption of recycled bonded NdFeB

TECHNICAL READINESS

Performance demonstrated
Br = 0.615 T and BHmax = 46.66 kJ/m³ achieved on 100% recycled MagREEsource feedstock.

Scalable process validated
Twin-screw extrusion + injection moulding pilot line operational. Glove-box N_2 handling prevents NdFeB oxidation at scale.

Next milestones
C8C batch testing and higher-density formulations to narrow gap with virgin NdFeB grades.

SUPPLY CHAIN and REGULATION

EU-sourced recycled feedstock
MagREEsource powder recovered from end-of-life devices, reducing import dependency on Chinese rare earths.

Regulatory alignment
Directly supports EU Critical Raw Materials Act (CRMA) targets and the EU Circular Economy Action Plan objectives for permanent magnets.

Circular value chain
IMA closes the loop: from EoL magnet collection to validated bonded magnet parts ready for industrial reuse.

ECONOMIC and BUSINESS CASE

Cost-competitive proposition
Recycled feedstock lowers raw-material cost vs virgin NdFeB. Secondary value from waste stream valorisation improves overall margin.

Addressable market
Robotics, e-mobility drives, industrial automation and sensing. Growing demand driven by electrification and Industry 4.0 investment across Europe.

Thank you

PERMANET

Funded by
the European Union

PERMANET

PERMANET Project

web: www.permanetproject.eu

email: info@permanetproject.eu

Funded by
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Health And Digital Executive Agency (HADEA). Neither the European Union nor HADEA can be held responsible for them.