SUSMAGPRO IN A NUTSHELL

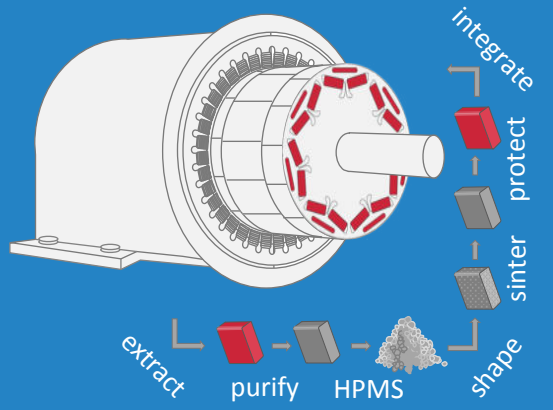
Rare Earths are critical raw materials with a high supply risk. They are used to make strong permanent magnets - essential components of products such as loudspeakers, laptops, e-cars, wind turbines, and more. As such, they are crucial to achieve the transition to a green and digital economy in Europe. Demand is expected to increase strongly, and material shortages are predicted for the future. Recycling is not just a possibility but has become a necessity.

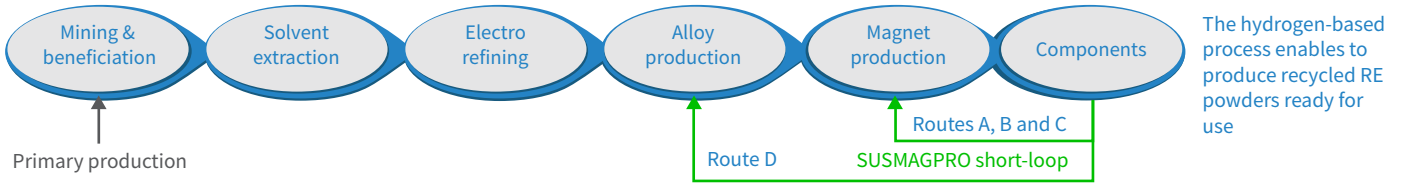
In the frame of the EU project SUSMAGPRO, 18 partners from academia and industry have demonstrated the sustainable recovery, reprocessing and reuse of Rare Earth Magnets based on neodymium-iron-boron (NdFeB) in a European circular economy.

Check out some of the project results!

DESIGN FOR RECYCLING AND REUSE

Recycling starts with the design: To facilitate magnet recovery, reuse and recycling, design of products is key. In SUSMAGPRO, the challenges of extracting magnets from end-of-life products have been identified. Recommendations have been developed to make it easier to quickly recycle magnets in a more sustainable way whilst minimising degradation of magnet properties.





The hydrogen-based process enables to produce recycled RE powders ready for use

Automated Identification and Dismantling

Automated pilot lines have been developed for extracting NdFeB magnets from end-of-life products. The current capacity in t per year of the pilot lines is:

- Hard disc drives (HDDs): 20
- TV speakers: 6
- Pro audio speakers: 7.5
- Pump motors: 3
- Electric vehicle traction motors: 15

To put these numbers into perspective, the EU imports 16.000 t of NdFeB per year and domestic EU magnet production is around 1.000 t. The European Critical Raw Materials Act proposal of 2023 sets the target that at least 15% of the EU's consumption of strategic raw materials should come from recycling, which currently corresponds to approximately 2.500 t of NdFeB. Hence, the capacity of one single HDD pilot is enough to provide 0.8 % of the target volume set by the EU.

Automated separation of NdFeB magnets from HDD in a transportable container unit
photo by INSERMA ANOIA

The recycled materials are processed into new alloys or magnets with four different routes

Upscaling of Recycling via Hydrogen Processing of Magnetic Scrap (HPMS)

The patented HPMS enables to break down magnets and further materials containing NdFeB into powder. Once separated from other elements and purified, the resulting NdFeB powder is ready for reprocessing into magnetic components. In SUSMAGPRO, the pilot plants hosted by the University of Birmingham and Magneti Ljubljana have each reached a capacity of 50 t of NdFeB powders per year, the pilot at MIMplus Technologies a capacity of 10 t / year.

Recycled Magnets

In the project, partners have produced high-quality magnetic products made of recycled material:

- Ingots for magnetic alloy production
- HDDR powder for bonding and hot pressing
- Anisotropic, polymer bonded magnets
- Fully dense anisotropic extruded sintered magnets
- Fully dense anisotropic MIM magnets (sintering with MIM net shaping, ideal for complex shapes)

These products have been benchmarked against primary materials and demonstrated in a variety of products, including loudspeakers, EV motors and water pumps.

Magnets and photo by MIMplus Technologies

Example of environmental impact of large-scale recycling compared to primary magnet production per 1 kg NdFeB from sintered loudspeaker magnets

65% less GHG emissions (28kg CO_2-eq)

70% less water use (322L)

59% less energy (412 MJ fossil fuels)

60-70% less toxic to humans and freshwater ecosystems

SUSMAGPRO
PARTNERS

HS PF · University of Birmingham · STENA · RISE · INSERMA Anoia, S.L. · LCM less common metals · mimplus · Magneti Ljubljana d.o.o. · KOLEKTOR · ZF · B&C SPEAKERS · GRUNDFOS · BUNTING · Universiteit Leiden · FOTEC · Montan Universität Leoben · Jožef Stefan Institute Ljubljana Slovenia · Steinbeis Europa Zentrum

MORE INFO AND WAYS TO GET IN TOUCH

For further information visit
www.susmagpro.eu

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https://susmagpro.eu/contact/

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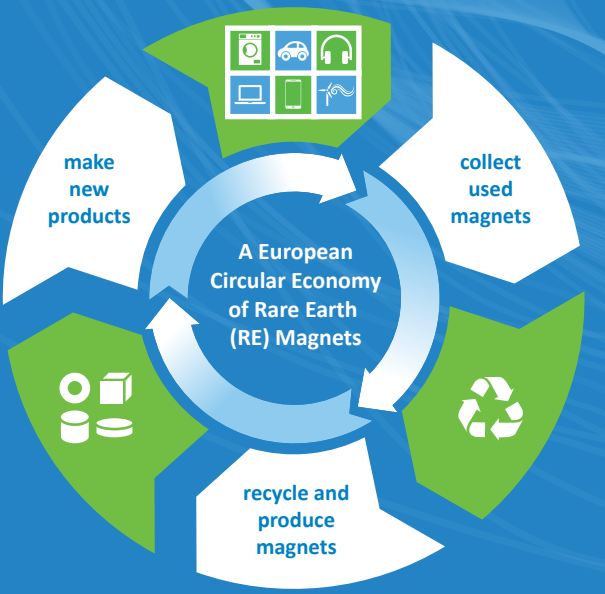
SUSMAGPRO

SUSTAINABLE RECOVERY, REPROCESSING AND REUSE OF RARE-EARTH MAGNETS IN THE CIRCULAR ECONOMY

Project Achievements



SUSMAGPRO has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821114.