



REE4EU PROJECT

RARE EARTH RECYCLING FOR EUROPE



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REE4EU – Rare Earth Recycling for Europe

The project, funded in the frame of Horizon 2020 TOPIC SPIRE-07-2015, will realize a breakthrough innovation in the field of Recovery Technologies for Metals and other Minerals. It will make available Rare Earth elements and Rare Earth alloys for magnet production by developing, for the first time at industrial scale, an efficient and cost effective method of extraction and a direct production route for Rare Earth Alloys which will be achieved through in-process and End-of-Life permanent magnets as well as Ni metal hydride battery waste.

The REE4EU consortium consists of 14 partners from 7 European countries, representing

stakeholder organisations with essential interest and expertise in Rare Earth Elements recovery. These Value Chain partners are complemented by top level research institutes that have developed the relevant technologies that will be piloted (SINTEF and TECNALIA), as well as complementary research partners that add scientific expertise on high temperature electrolysis (Laboratoire de Génie Chimique de Toulouse at the University Paul Sabatier) and hydrometallurgical pre-treatment as well as specific knowledge on logistic, organisational and economic implications of the re-use or recycling of magnets from products (CEA).

Which are the involved companies and what they will do?



LCM
less common metals

LCM is one of key producers of speciality materials and metals in Europe, collaborating with various (Rare Earth element) REE value chains, from permanent magnets to batteries production. LCM is moreover part of a mining company, as such extending the value chain upstream and opening-up future opportunities to evaluate REE4EU technology solutions to valorise mining waste (tailings). LCM is key to the REE4EU project as they will install the novel RE recovery processes, based on the novel HTE REA production process in combination with ILE or HM pre-treatment. LCM will demonstrate that the new HTE process can actually be integrated in their existing RE Alloy production process with HM pre-treatment.



VAC
VACUUMSCHMELZE

VAC is one of the world leading producers of high end metallic magnetic materials including sintered Rare Earth permanent magnets as well as melt spun amorphous or nanocrystalline soft magnetic alloys. VAC is the largest producer of sintered Nd-Fe-B and Sm-Co magnets in Europe. Consequently VAC has detailed competences regarding the powder metallurgical production of Rare Earth transition metal alloys and parts on an industrial scale. VAC will make its in-process waste as well as EoL PM waste available as feedstock for the new REA recovery processes and will use its pilot PM manufacturing facilities available to validate the outcome of the various novel HTE based RE recovery routes, in real PM manufacturing and test product quality.



ELKEM is one of the world's leading companies for environment-friendly production of metals and materials. The main products are silicon, solar grade silicon, special alloys for the foundry industry, microsilica and carbon. ELKEM is key to the REE4EU project as they will install (together with LCM) the novel RE recovery processes, based on the novel HTE REA production process in combination with ILE or HM pre-treatment. ELKEM will set-up in their facilities a fully new combined HTE and ILE pre-treatment, as such offering a pre-industrial scale benchmarking environment for the direct RE recovery routes from different waste streams.



IDENER is a private research SME company composed of a team of researchers with a sound scientific background in disciplines comprising the branch of systems engineering, such as electronics and computer, systems integration and control, and process engineering. IDENER investigates in the multidisciplinary field of Computational Science and its application to the optimization of systems and processes in key areas: Industrial Technologies; ICTs; Biotechnology; Secure, Clean and Efficient Energy; and Resource and Raw Materials Efficiency. IDENER will support Ionic Liquid Extraction, working in close cooperation with TECNALIA and providing further feedback for its scale-up in WP5. Moreover, the company will take special care of carrying out process optimized design (MDO) and introducing this methodology in the conceptual design and basic engineering of the proposed solution. Moreover, IDENER will produce a tailor MDO strategy in order to enhance market penetration of the proposed solution.



SNAM is a French company. It belongs to the Belgium Group «Floridienne» and employs around 100 people in two sites in France (Viviez and Saint Quentin Fallavier). Its core activity is the recycling of rechargeable batteries (Nickel cadmium, Nickel Metal Hydride, and lithium ion). SNAM has a wide experience in recovering metal with different processes. With an active collaboration in different projects, SNAM has developed knowledge and also a network for collecting the batteries and selling the material. SNAM will participate in the replication for NiMH Batteries. SNAM has legal authorization in order to deal with waste and with such a process.



STENA, STENA Metall AB, is a family owned recycling company operating mainly in the northern parts of EU with the majority of the businesses in Sweden, Denmark, Norway, Finland, Poland, Germany and Italy. STENA brings into the consortium the expertise and interest of the Waste Recycler into the in-process oriented REE4EU project. STENA will be responsible of dismantling of different types of magnets from (Waste Electrical and Electronic Equipment) WEEE like hard disk drives. Magnets need to be characterized and monitored in relation to content of REE, binder, corrosion protection, contaminants. STENA will also play a key role in (Permanent Magnet) PM and NiMH Batteries Value Chain and Market Analysis.



PNO INNOVATION, part of PNO INNOVATION B.V. is specialised in Innovation Management and funding, providing support services to private and public organizations in Innovation processes, Technology Transfer, IT solutions and funding for research, development and innovation. PNO will bring its international consulting experience into the consortium including extensive project and innovation management, exploitation and business planning expertise. A particular focus will be given to market analysis, value chain stakeholders analysis, business planning, communication, exploitation and dissemination (CED) strategies and part of their execution. PNO will also have a role in the consortium management activities.



A3I-INOVERTIS is a French engineering firm (SME – 35 people) whose mission is to bring all areas of industrial process together. Its services range from technical studies, expert mission, processes design-engineering and consultancy. A3i-INOVERTIS will (1) be in charge of the detailed engineering of the ILE in view to build it in the ELKEM facility (2) lead the Life Cycle Assessment of the REE recovery processes developed in the project: ILE, HTE as well as the HydroMetallurgical routes.

For more info about project visit the REE4EU website at: www.ree4eu.eu



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www.sintef.no



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www.lesscommonmetals.com



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