



Environmental Technologies

ShredderSort

The project, at a glance

Title: Selective Recovery of Non-Ferrous Metal Automotive Shredder By Combined Electromagnetic Tensor Spectroscopy And Laser-Induced Plasma Spectroscopy

Instrument: SP1 – Cooperation, Collaborative project

Total Cost: €4,476,092

EC Contribution: €3,378,159

Duration: 3 Years

Start Date: 1 January 2014

Project Coordinator:
Lenz Instruments, S.L.

Key Words: ELV, Metal waste, metal sorting, non-ferrous metal waste, automotive shredder, automotive industry, recycling, Laser Induced Breakdown Spectroscopy, Electromagnetic sensors

Project Web Site:
www.shreddersort.eu

The Challenge

End-of-life vehicles (ELV) generate around 10 million tonnes of waste per year in the EU. Around 75% of ELV materials are currently recycled or recovered by different processes, but this percentage falls well short of the 95% target for 2015 set by the ELV European directive 2000/53/EC.

The **non-ferrous metal** fraction in ELV scrap contains several metals/alloys; primarily aluminium, copper and magnesium (a critical metal in Europe) whose recovery is important for environmental, economic and resource conservation reasons. The separation of non-ferrous metals from ELV scrap is technically complex, and the inefficiency of existing waste separation technologies results in the use of labour-intensive handpicking separation, which is only viable in low labour cost countries, and results in the loss of important raw-materials for Europe.

Project Objectives

Current sorting technologies for non-ferrous fractions do not allow separation of materials with similar composition and properties (colour, density, etc). Existing technologies also suffer from poor cost effectiveness and/or throughput for the separation of aluminium and magnesium alloys. To overcome these limitations, the project will develop **a new sorting scheme** by:

- Developing a new sensing approach based on Electromagnetic Tensor Spectroscopy (EMTS) and Vision Image Analysis (VIA), to probe the electrical properties of heavy metal fraction and to identify and sort copper, zinc, brass, etc.;
- Establishing a two-step Laser Induced Breakdown Spectroscopy (LIBS) sorting technology, to separate Al/Mg cast and wrought type alloys (using high throughput LIBS) and to identify selected high value alloys (using high-performance LIBS).

Methodology

The project work plan is structured in three phases. In Phase 1, the proposed sorting technologies will be investigated at laboratory scale. This phase will include tasks which deal with the chemical, electrical, and optical characterization of metal scrap from different ELV industries; the modelling, design, development, and test of an Electromagnetic Tensor Spectroscopy prototype; and the development of two LIBS systems for scrap sorting, which will include customized laser sources. In Phase 2, the developed prototypes will be integrated into pilot lines, with target treatment capacities of up to 1 tonne per hour. In Phase 3, the pilots will be tested, and the performance of the developed sorting technologies will be assessed. These validation tasks will be performed with the industrial end-user partners in the project. Finally, the related environmental impact will be assessed using Life Cycle Analysis.

Expected Results

The aim of the *ShredderSort* project is to develop new technologies for the separation of the *heavy* and *light fractions* of non-ferrous ELV scrap. The project will contribute to:

- Efficient resource management by promoting metal recycling rates, avoiding Al/Mg downcycling and reducing metal recycling costs;
- Development of new business models and employment opportunities arising from these new recycling technologies;
- Reduced European dependence on raw-material imports, especially of critical metals (e.g. Mg);
- Promotion of energy efficiency in the metallurgical industry;
- Reduced environmental emissions and impacts.



Project Partners

LENZ INSTRUMENTS S.L. [ES]

Mechanical Engineering Department,
INSTITUTO SUPERIOR TECNICO (IST) [PT]

Istituto di Chimica dei Composti
Organometallici, CONSIGLIO NAZIONALE DELLE
RICERCHE (CNR) [IT]

REGULACION DE MOTORES, S.A.
(CETRISA) [ES]

Institute for Information and Communication
Technologies/Machine Vision Applications,
JOANNEUM RESEARCH,
FORSCHUNGSGESELLSCHAFT MBH [AT]

Laboratório Nacional de Energia e Geologia I.P.
(LNEG) [PT]

MARWAN TECHNOLOGY [IT]

MONOCROM S.L. [ES]

School of Electrical and Electronic Engineering,
THE UNIVERSITY OF MANCHESTER [UK]

HIERROS Y METALES DIEZ S.L. (DIEZ) [ES]

SAUBERMACHER DIENSTLEISTUNGS AG [AT]