



Sustainable Electrical & Electronic System for the Automotive Sector

[www.sees-project.net](http://www.sees-project.net)

# 2<sup>nd</sup> SEES Newsletter

July 2006



## Introduction

Welcome to the SEES Project 2<sup>nd</sup> Newsletter, which is disseminated in order to keep you informed about the progress and achievements of the project. The SEES project “**Sustainable Electrical & Electronic System for the Automotive Sector**” deals with the *electrical & electronic system (EES)* of automobiles in order to develop new design concepts and end-of-life treatment technologies for a sustainable, clean, cost- and eco-effective EES.

The SEES consortium involves 10 partners (four SME) from 5 EU member states covering all the life cycle of the EES products from design and manufacturing, assembly, use phase and recycling. The figure below gives an overview of the project approach.

In our [1<sup>st</sup> Newsletter](#) last October we informed about interim results including the integrative assessment of automotive EES, assembly studies and environmental and economic studies on selected EES components. For more information on these topics see the **SEES Homepage** ([www.sees-project.net](http://www.sees-project.net)).

This second edition of the SEES newsletter presents an update on the activities and achievements of the ongoing project (disassembly and shredding studies, eco-design guidelines, new EES design concepts, SEES Software, etc.), followed by a brief outlook on the further work and upcoming events.

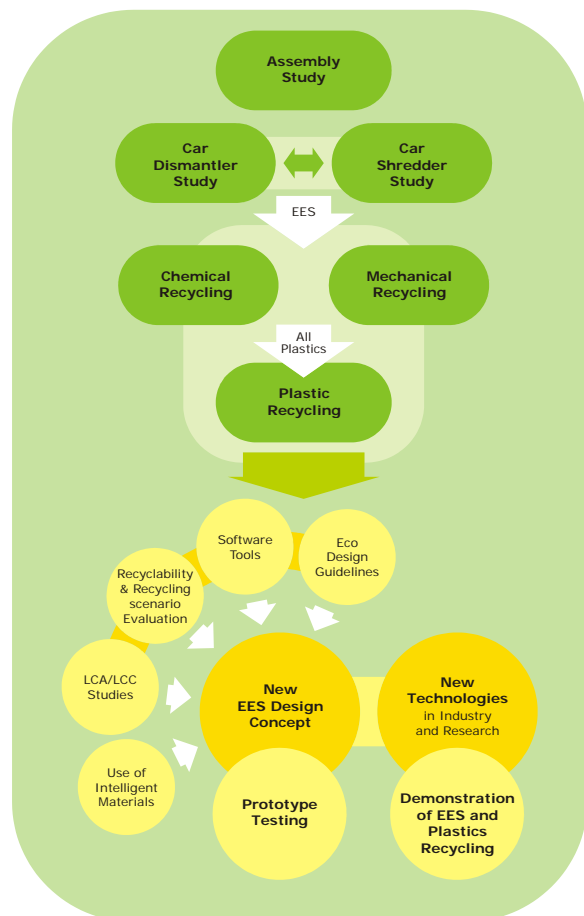
The project consortium would appreciate your feedback on our research. Please find contact information at the end of this newsletter.

Enjoy reading!

The SEES consortium



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## Current Results of the SEES project

### Disassembly Study (WP 3)

Workpackage 3 “Disassembly Study” of the SEES project aimed to analyse and detect the problems associated to the disassembly of the present electrical & electronic systems used in cars, including logistic aspects in order to optimise dismantling processes and to give feedback to product design.

The research included destructive and non-destructive disassembly tests at Ford, Müller-Guttenbrunn and LEAR on several components (starter motor, alternator, lambda control sensors, wire harnesses, junction boxes, electronic control units (ECU), etc.) from new and end-of-life vehicles in order to assess the disassembly time and improve the dismantling process of car EES. The influence of design aspects and use of different tools on the actual disassembly times were studied.

Measured disassembly times show large variations depending e.g. on age, type and condition of the car as well as inter-personal differences. There is no significant correlation identified between design features / Design for Disassembly and an increase/decrease of actual disassembly time beyond the number of previous parts as well as the chosen dismantling tool. However, the selection of dismantling tools is mainly influenced by personal preferences and work organisation rather than eco-design. It was concluded that under current conditions, disassembly for material recycling is currently not cost-efficient for studied components. Only for lambda control sensors and ECUs there could be an economic solution if the precious metal content is high enough – which is studied in WP4 “EES Recycling” of the project.

Results are presented in the public report D3 available from our website.

**Link:** [Results of WP 3 – Dismantling Manuals for EES \(Deliverable D3\)](#)



### Shredding Study (WP 6)

Workpackage 6 “Shredding Study” analysed the shredding process of end-of-life vehicles with a special view on the parts of the electrical and electronic system (EES) that remain in the car. It was investigated how these materials are distributed between the output fractions of the shredder in order to evaluate their recovery potential and to optimise the shredding process to increase quality and recoverability of the fractions.

The activities included the quantification and characterisation of the different fractions obtained in the shredding process at Müller-Guttenbrunn, the definition of the quantity of the

material from the EES in each fraction as well as investigation in optimal dismantling level before shredding and logistic requirements.

Tests showed that the potential for shredding optimisation is mainly in the education of personnel and their performed work. Further potential for optimisation is in the separation of the steel and copper fractions as well as the increased recovery from ASR which is pursued in current technology development and further studied in WP5 "Plastic Recycling". In order to ensure high quality steel fraction, separation of remaining copper pieces from the steel by handpicking at the shredder output is more cost-efficient than copper dismantling from the vehicle before shredding.

For more details on WP6 results please check the public report D6 on our homepage:

**Link:** [Results of WP 6 – Car Shredding Manuals \(Deliverable D6\)](#)

### **Development of Ecodesign Guidelines (WP8)**

The objective of this workpackage was to develop Eco-Design Guidelines that support all actors along the life cycle of Automotive Electrical and Electronic Systems (EES) - but foremost designers - to improve the environmental profile of future EES designs. These Eco-Design Guidelines are not limited to end-of-life aspects but cover the whole life cycle of the EES because particularly the use and production phase proved to be much more relevant.

A qualitative methodology was developed by LEAR, Ford and TU Berlin in order to determine which environmental aspects are relevant for the selected devices and to prioritise the different life cycle phases based on product characteristics, and to evaluate different redesign options. Guidelines are provided to improve environmental aspects of the identified life cycle phases with highest improvement potential as well as recommended actions to other life cycle stakeholders, e.g. the car user.

The method has been applied on a number of different EES products. It still needs to be validated against more case studies. Using this method should support the EES designer in finding the right redesign options to improve the environmental profile of the product. But it needs to be supplemented with quantitative tools for more detailed analysis.

For more information please take a look at the public report D8 available on our homepage:

**Link:** [Results of WP 8 – Generic Eco-Design Guidelines \(Deliverable D8\)](#)

## **Ongoing Research within the SEES project**

### **EES Recycling (WP 4)**

The aim of this study is to analyse the recycling options for the automotive EES and to develop recycling approaches to increase recovery rate. Identification and evaluation of new and emerging mechanical and chemical recycling technologies for the treatment of EES components previously identified has been accomplished. The analysis includes the identification of valued-added end-use applications and define market acceptance of the recovered fractions.

Mechanical recycling tests have been performed at Indumetal Recycling SA with disassembled components, e.g. junction boxes and wire harnesses, EES production scrap

as well as mixed EES fractions from the shredder to optimise the separation of valuable recyclable fractions.

The recycling study also included the development of a laboratory-scale leaching-electrowinning reactor by Rohm & Haas for the recovery of precious metals from selected components. The results of these activities were presented during a “Joint WEEE-Tech and SEES Dissemination and Demonstration Event” at Imperial College in London in April this year.

Final results of WP4 will be presented in public Deliverable D4 which is currently drafted.

### **Plastic Recycling (WP 5)**

This workpackage aims to optimise the recycling of the plastic fraction obtained during the recycling process – both from mechanical recycling of EES components and mixed plastics from automotive shredding residues. On one hand, the different methods of plastic separation are tested at Müller-Guttenbrunn and GAIKER and new proposals for both kinds of input material to be developed to obtain recycled plastics of high quality. On the other hand, the obtained plastic mixtures will be evaluated for their quality to define the grade and application possibilities of the recycled polymeric fractions and their compounding needs.

First plastic separation tests have been accomplished and current work focuses on the quality and compounding needs of the obtained materials. Results will be available by the end of this year.

### **Development of a New E&E System Concept (WP 9)**

This workpackage focuses on the application of the developed eco-design guidelines and previous SEES findings for development of a new EES concept which will be partially prototyped. During the project definition it was expected that this new concept would focus on improving the end-of-life aspects (e.g. design for disassembly, design for recycling) of the EES. However, based on the LCA/LCC studies from WP7 and the methodology from WP8 as well as the questionable improvement of dismantling times by design changes as proven in WP3 it can be seen that in most cases a much higher environmental improvement potential can be identified in the production and use phase of components.

Intelligent materials have been studied whether they could be applied to automotive EES to facilitate disassembly taking into account the specific requirements that the materials have to comply with, such as reliability, temperature, etc. Further work includes the development of an energy management system to optimise the energy consumption of the whole EES in order to decrease fuel consumption and emissions during driving. Also several concepts on component level have been identified: natural fibre reinforced plastic housings, wire harness technologies that significantly can reduce the amount of material that is needed and several new technologies that reduce or even eliminate the use of certain hazardous substances.

Later on the new EES concepts will be tested and evaluated with regard to benefits or drawbacks on functionality, assembly/disassembly, environmental & economic profile and recyclability potential (WP 10).

### **Software Development (WP 11)**

Objective of this workpackage is the development of a user-friendly software tool that could be used by small and medium enterprises to help them in their day-to-day decisions (simulation of recycling scenarios) and to support EES designers (product recyclability

assessment). It bases on methods previously developed within SEES by Universitat Rovira i Virgili.

Using the software, a model of a product can be created and aspects relevant for the end-of-life situation can be analysed, e.g. material recyclability and disassembly effort. Products or materials can be linked to process chains to simulate materials, costs and emissions of different recycling scenarios. Product and process data contained in the software have been collected during the course of the project in the disassembly, shredding and recycling studies. The current activities include testing and further development of the software prototype at CIMA Kft.

## SEES Presentations and Publications

The **SEES project flyer** ([PDF-Download](#)) contains a quick overview on the SEES project objectives and approach.

SEES partners actively participated in several conferences. Please find below some of the conferences where the SEES project members presented project results. The papers are available for download on our project homepage ([SEES publications](#)):

- Electronics Goes Green 2004+ Conference, Berlin (September 6-8, 2004)
- Eco-X Conference, Vienna (June 8-10, 2005)
- Ökobilanz-Werkstatt, Bad Urach, Germany (June, 15-16, 2005)
- SusRec & Green Electronics, Praha (June 20-22, 2005)
- Life Cycle Management (LCM) 2005 Conference, Barcelona (September 5-7, 2005)
- Life Cycle Engineering (LCE) 2006 Conference, Leuven (May 31 - June 2, 2006)
- Transport Research Arena Europe 2006 (TRA 2006), Gothenburg (June 12-16, 2006)
- 26<sup>th</sup> Automotive Electronics Conference - HdT Automotive Electronics, Dresden (June 27-28, 2006)

## Planned SEES Dissemination Events

The SEES consortium intends to further disseminate results at the following upcoming events:

- Care Innovation Congress, Vienna (November 13-16, 2006)  
(<http://www.care-electronics.net/ci06>)

**SEES Workshop planned including presentation and discussion of project results.** This includes the developed processes for recycling of automotive electronics, disassembly and shredding analyses, results of environmental and economic studies, the SEES software tool as well as new EES concepts. Date and time are not fixed yet, but will be announced through our website. If you are interested in more information on the workshop please send an email to us (contact details at the end of this newsletter).

- International Conference Car Recycling in Europe, Munich (October, 18-19, 2006)  
(<http://www.hdt-essen.de/pdf/W-H030-09-299-6.pdf>)

*Greif, André (TU Berlin): Recycling and Design for Environment of Automotive Electrical and Electronic Systems*

Please watch out at our SEES homepage for more announcements of upcoming SEES activities and presentations.

## Next Newsletter

Our next newsletter is scheduled for autumn this year, with more project results, e.g. from EES and plastics recycling and new design concepts, and more information on upcoming dissemination events.

## Contact

For all questions concerning the SEES project and if you are interested in continuous information about SEES please visit our homepage (<http://www.sees-project.net>) or contact directly:

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