Publishable executive summary

Each year in Europe about 9 million cars are discarded producing more than 2 million tons of non-metallic waste composed, in majority, of plastics/composites and glazing. The European Union fixed strict targets regarding the reuse, recovery and recycling of materials in End-of-Life Vehicles (Directive EC/2000/53). In order to reach these objectives, the automotive industry needs to integrate, at the design stage, process and methodologies facilitating dismantling of vehicle parts and materials recycling. ECODISM project takes part in the development of such innovative processes by investigating the use of reversible adhesives (integration of active elements into adhesive systems) for different types of bonding assembly.

Project objectives:

ECODISM project will propose to car manufacturers and automotive suppliers innovative technologies and methodologies based on smart bonding and de-bonding techniques that will be integrated at design stage of new vehicles in order to facilitate maintenance and dismantling operations for materials as plastic, composites, glazing metals and aluminium bonded parts in vehicles. Developed systems will have a duration life and chemical stability over 15 years, which guarantee that they could be activated all along the life of the vehicle. In this goal, ECODISM consortium has defined the following sub-objectives:

- Design active systems (thermo-expandable elements) that can be integrated in adhesive systems for the several applications (composites, plastics, glazing, metals and aluminium).
- Formulation of the chemicals (adhesives, cleaners, primers) according to the type of active systems, the elements to bond (and later to de-bond) and the targeted stability and durability.
- Assembly line compatibility of the adhesives at the industrial scale.
- Selection and optimisation of the suitable energy source and methods to bring the energy to the bonded assembly. Different energy sources will be considered: IR, Induction, UV ...
- Computer modelling and optimisation of the debonding process.
- Definition of a dismantling protocol for further maintenance, reuse or recycling of vehicle parts; Verification of the relevance of the investigated solutions.

Final objectives of the project:

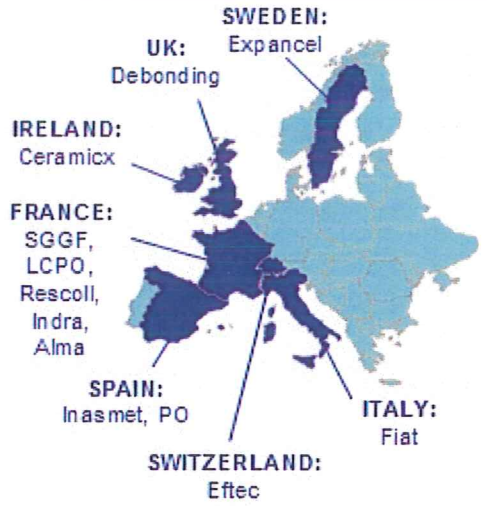
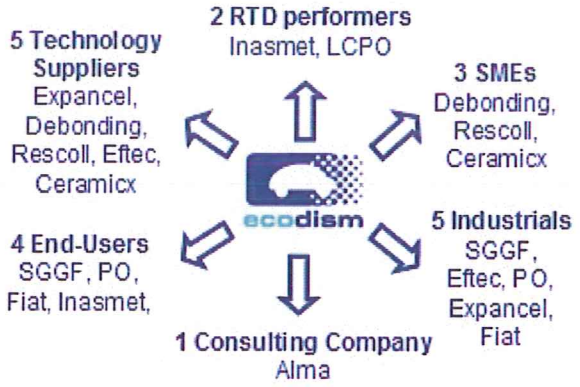
- Setting efficient maintenance and dismantling protocols in order to reach the ELV directive objectives.
- The ELV directive will impose a maximum ASR weight of 5%. Plastics and composites (13% in weight) and glazing (3%) which are the main responsible for ASR become critical objectives. ECODISM aims at dismantling these components to make their reuse and recycling possible. The objective is to lower the ASR as follow:

	Before ECODISM	After ECODISM
ASR rate	**20%**	**12%**
Plastics and composites	*13%*	*8%*
Glazing	*3%*	*0%*
Others	*4%*	*4%*

These targets are realistic because **ECODISM** will allow both **reuse** of vehicle parts (windscreens, wings, bumpers, tailgates etc) and **recycling** (after dismantling) of vehicle parts (plastics, composites and glazing).

Contractors involved:

This project gathers 12 partners (from 7 European countries) that are representative of the European automotive industry: car manufacturer, glazing suppliers, plastics/composites suppliers, adhesives suppliers and car dismantlers.

European Dimension	Complementary profiles
	

Work performed and results achieved so far:

ECODISM project is now at the end of the second year, and a lot of advancement has been achieved so far in the first two years of the project.

The main work items and achievements of the project consist in:

- Understanding of the behaviour and conditions of efficiency of adhesive primer modified with Thermo-Expandable Microspheres. First cases studied were with glass primer, but adhesive for other types of materials (plastics/composites for example) are now also considered with the same methodologies. Stability of the modified primers has been assessed, as well as durability of bonded joints. Efficiency of the debonding effect has been validated according to methodology developed within the project (at lab-scale but also at larger scale). Durability of this efficiency is being assessed.

- Understanding of the behaviour and conditions of efficiency of chemical agent as active system in modified primers or adhesives. These systems were studied for different types of adhesive systems (for glass, for metals). Stability of these systems has also been studied as well as durability of the bonded joints.

- Assessment of the feasibility of the application of modified primer or adhesive systems in industrial conditions.

- Studies of different type of energy sources, assessment of their performance regarding different types of materials to be debonded. Different systems have been developed to perform the trials. Energy delivery has been modelled.

- Life Cycle Analysis and Life Cycle Cost study have been launched to assess the benefits of the technologies studied in the ECODISM project.

- Dismantling process has been studied in order to integrate the technologies developed in ECODISM project in an optimized ELV treatment scheme.

Expected results for the last year of the project:

- Final results of durability of the bonding & debonding capabilities for different type of assemblies/active systems.
- Selection of the best activation system for an optimized use in a dismantling process (for each type of material to be debonded).
- Assessment of the technologies developed in the ECODISM project via LCA & LCC.