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# **Industrial Ecology for a Sustainable Future**

Royal Institute of Technology  
Stockholm

12 - 15 June 2005

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# Welcome to Stockholm and the 3<sup>rd</sup> International Conference

## Industrial Ecology for a Sustainable Future

**The ISIE-2005 conference** highlights the contributions that industrial ecology can make towards attaining a sustainable future for the planet and its population. The conference provides a forum to introduce theoretical advances and to discuss practical experience, to learn about IE modelling and to explore the human dimensions of applying IE in corporate, public policy, and consumer decision making.

The conference in Stockholm 2005 is a major event in the history of Industrial Ecology. There has been an overwhelming response to the ISIE-2005 conference, which will guarantee an event of very high interest. The ISIE Governing Council, Organizing Committee, and Technical Committee, thank you for joining us at the ISIE-2005 conference.

The conference will take place in the Swedish capital, Stockholm - a city built on 14 islands. Well-preserved medieval buildings stand alongside modern architecture. Stockholm is a city of contrasts – land and sea, history and innovation, a small town and a big city, and long, light summer evenings in June. All this leaves the visitor with a wonderful variety of impressions.

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## Recycling Potential Index (RPI) of materials and parts in End-of-Life vehicle for Design for Recycling

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Every year, end of life vehicles(ELVs) generate about 0.6 million cars and trucks in South Korea. More than 75wt% of the materials and parts from end-of-life vehicles are profitably recovered and recycled by the private sector. In 1997, the European Commission adopted a Proposal for a Directive which aims at making vehicle dismantling and recycling more environmentally friendly, sets clear quantified targets for reuse, recycling and recovery of vehicles and their components and pushes producers to manufacture new vehicles also with a view to their recyclability. In the European Commission, they set the recycling regulation target value; 85% in 2005, 95% in 2015. For attainment of this goal, it will be needed reducing about the Automatic Shredder Residue, infrastructure and technical development for using effective resources.

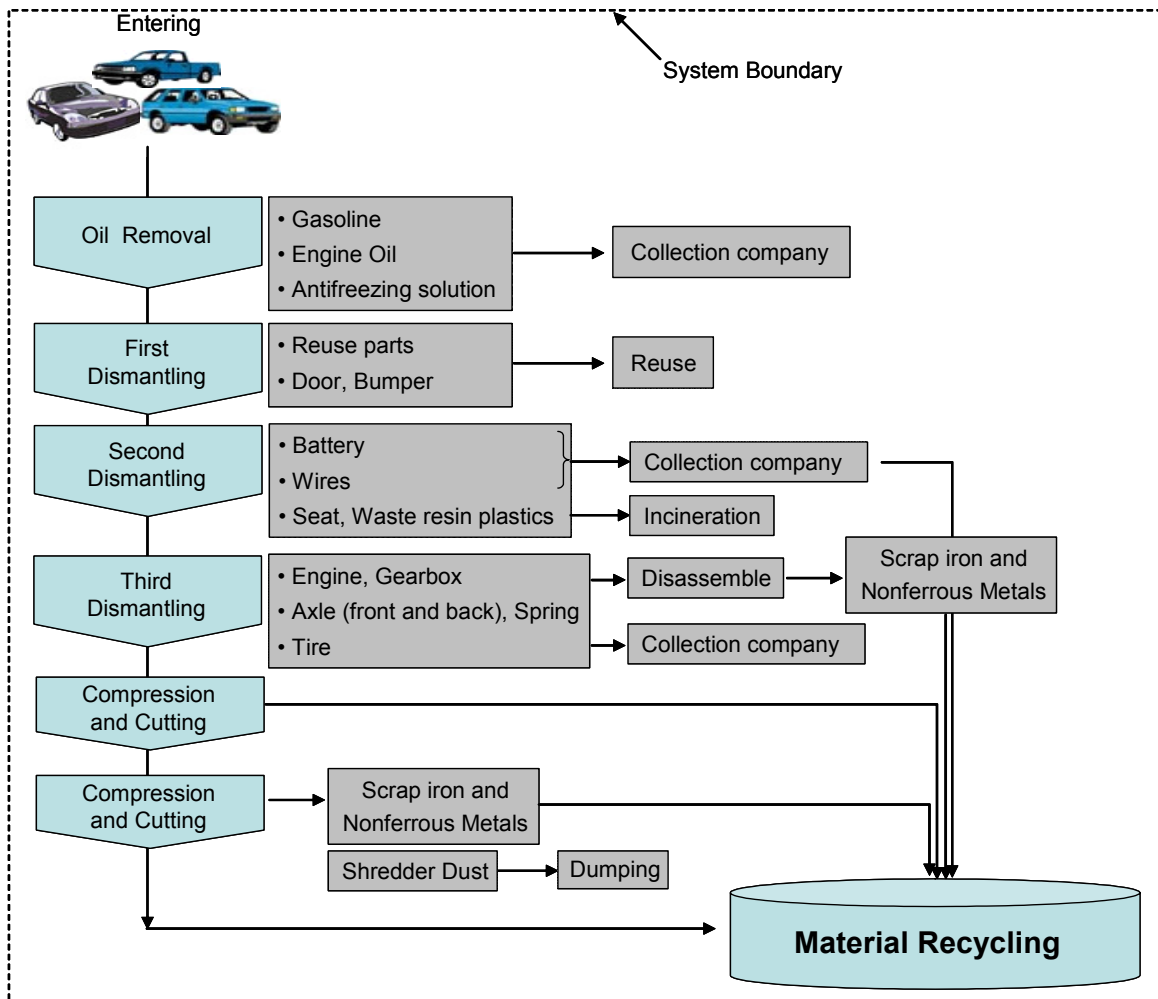
The purpose of this research is to construct a materials and parts database using environmental and economic assessment in the recycling system of end-of-life vehicles (ELVs). This research is about issues and technologies in recycling, both current and future, with a focus on end-of-life vehicles (ELVs). Furthermore, this study includes the issues involved in design for recycling and the existing scrap recycling system.

In this study, the Life cycle assessment (LCA) method was used to evaluate the environmental load in the recycling process of End-of-life vehicles (ELVs). A static economic evaluation method was used in this study. In this method, present market price is employed and future change of technology and market is not taken into account. Total economic value for the material and parts recovery can be calculated using equation (1)

$$\text{Economic value}_{total} = \underbrace{(C_C - C_D - C_M - C_R + C_S)}_{\text{Dismantler process}} + \underbrace{(-C_C - C_D - C_M - C_R + C_S)}_{\text{Shredder process}} \text{ ----- (1)}$$

- $C_F$ : Collection fee
- $C_D$ : Disassembly cost
- $C_M$ : Maintenance cost
- $C_R$ : Residue disposal cost
- $P_S$ : Selling price

We set the system boundary to the end-of-life vehicles (ELVs) recycling system. Fig. 1 shows the recycling process of End-of-life vehicles (ELVs) and the boundary of this research.



**Fig. 1** End-of-life vehicles (ELVs) recycling system

The recycling potential of each material and part can calculate by adding up the environmental score ( $S_{Env}$ ) and the economic score ( $S_{Eco}$ ) (equation 2). In equation 2, the weighted value of  $\alpha$  and  $\beta$  will be determined by a questionnaire survey.

$$S_{RP} = \alpha S_{Env} + \beta S_{Eco} \text{ ----- (2)}$$

**Keywords;** End-of-life vehicles (ELVs), Recycling Potential Index, LCA, Design for Recycling

## References

1) Methodology for Recycling Potential Evaluation Criterion of Waste Home Appliances

Considering Environmental and Economic Factor, Junbeum Kim, Yongwoo Hwang, H. Scott

Matthews, Kwangho Park, "2004 IEEE International Symposium on Electronics and the Environment" Phoenix, AZ.

2) Proposal for a directive of the European parliament and of the council on the type-approval of

motor vehicles with regard to their re-usability, recyclability and recoverability and amending

Council Directive 70/156/EEC, Brussels.

3) Auto recycling demonstration project, *Great Lakes Institute for Recycling Markets, 1998.*