



IB-2: Comparative assessment of carbon emissions and cost-effective of auto-bumper recycling methods

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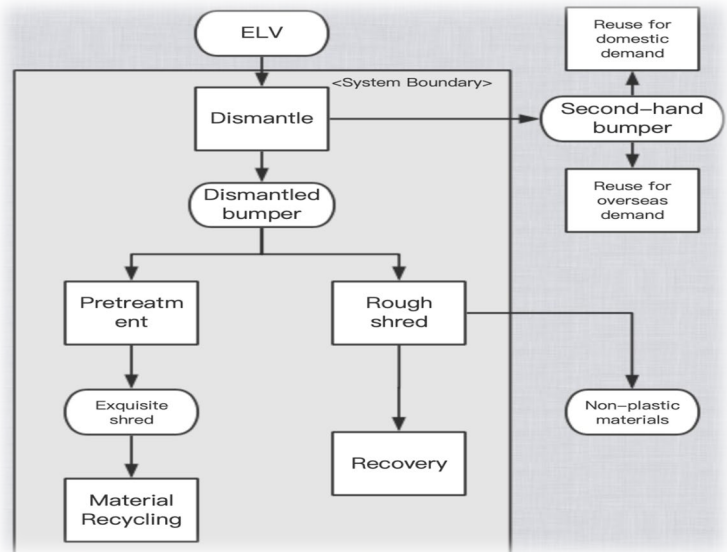
1. Introduction

- Plastic prevalence enhances the convenience of daily life however their disposal is daunting problem.
- Lightweight trending and electric vehicle promotion boost auto-plastic productions.
- Proper disposal of these auto-plastic is crucial.
- In this study, the focus is on bumper End-of-Life Vehicles (ELV).
- In Japan's system, a mix of dismantling company, shredding company, ASR dealing company and recycling company is responsible for ELV disposal.
- Known applications of recycled PP include automobile, building materials, daily appliances and stationery.



2. Methods

- The Life Cycle Assessment (LCA) is used to evaluate CO₂ emission during recycling options.
- The comparison targets on material recycling and electricity recovery scenarios.
- Functional unit is one pair of bumper (frontal & rear) and weighs 6 kg⁽¹⁾.
- Environmental data ←previous papers⁽²⁾.
- Economic data ←reports⁽³⁾ and recycling companies.

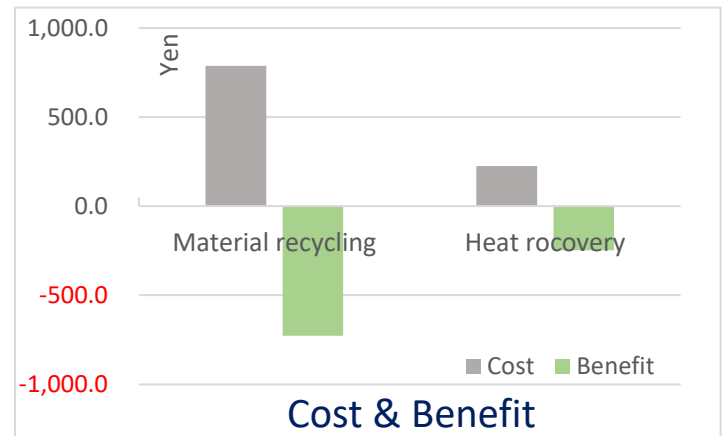
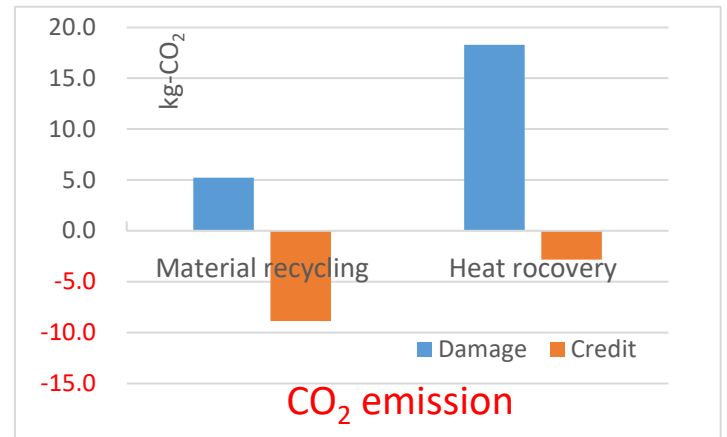


3. Analysis

- Material recycling is beneficial on preventing carbon emission but not profitable compared to heat recovery. This explains why amounts of heat recovery dominates in disposal options.
- Financial assistance on building incineration facility & Recycling Fee make heat recovery more applicable.

4. Conclusion & Discussion

- Emissions calculated mainly from incineration and recycling of PP, machine and credit of by-products.
- Total CO₂ emission of material recycling is positive, while that of heat recovery is negative.
- Machine emission from material recycling is higher than heat recovery while the gap is outstripped by incinerating.
- Opposite pattern of cost than CO₂ emission when material recycling needs more exquisite screening procedures.
- Although recycled PP can be sold in much higher price, shred and recycling processes are more costly than simply incineration for electricity.



References:

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- Hokkaido University, 2012. Material balance/energy balance/cost analysis of general waste incinerator.