



## End-of-life vehicles: influence of production costs on recycling rates

**End-of-life-vehicles** are a major stream of waste in the EU. A new study investigates the costs of landfill, advanced thermal treatment and incineration of waste from vehicle recycling factories and suggests that the factories are profitable, even while operating under strict conditions designed to meet the requirements of the EU's Directive on End-of-Life vehicles.

**Around 6.34 million** end-of-life vehicles were processed in the EU in 2008<sup>1</sup>. The EU's End-of-Life Vehicles Directive<sup>2</sup> requires that a minimum of 85% by weight of an end-of-life vehicle is reused or recovered, including 5% energy recovery. By 2015, 95% of an end-of-life vehicle must be reused or recovered, including 10% energy recovery.

Vehicles that have reached their end-of-life are sent to dismantlers, who remove reusable and hazardous parts and materials. The stripped vehicles, or 'hulks', are then sold to recycling factories, where they are shredded. About 20 to 25% of the weight of an ELV is classified as automobile shredder residue (ASR) (non-metal waste from the shredding process), which consists mainly of plastics, rubber, textiles and fibrous materials and wood, which are contaminated with metals, oil residues. An estimated 1.93 to 2.34 million tonnes of ASR are generated in the EU each year, much of which is sent to landfill.

To help vehicle recycling factories maximise their profits and eco-efficiency, this study developed a model that captures the complex material stream flows, processes and costs in a vehicle recycling factory and applied it to a typical European vehicle recycling factory. The results suggest the greatest current costs (about 71%) are associated with purchasing the hulks, followed by processing (about 17%) and then transport of materials to final destinations (about 7%). Despite operating under controlled conditions to meet the ELV Directive's requirements, the high prices of secondary metals, such as aluminium and copper, make the business very profitable. Maximum profits ranged from around €134-162 per tonne of processed hulk. Modelling suggests that vehicle recycling factories will try to maximise the number of hulks that can be handled, despite the controlled conditions, and recover the highest amount and best quality of metals.

A vehicle recycling factory will best meet the legislative eco-efficiency targets when the cost of landfill disposal of ASR is high - over €115 per tonne of ASR, and when the cost of processing ASR in advanced thermal treatment (ATT) plants is low - under €92 per tonne of ASR. For either of these disposal methods, the recycling rate of the facility is about 84%. To meet the increased future recycling targets from 2015 onwards, and for vehicle recycling factories to remain 'green', the landfill cost should remain over €115 per tonne, ATT costs should still be less than €92 per tonne and the cost of disposal in municipal solid waste incinerators (MSWIs) should be less than around €85 per tonne. The higher recycling, energy recovery and recovery rates will be achieved with more intensive processing of generated ASR, mainly in certain types of ATT plants.

Until recycling quotas increase in 2015, if ATT costs are high (more than about €95 per tonne) or MSWI costs are about €82 per tonne, an increase in landfill disposal costs would not necessarily reduce the amount of ASR sent to landfill. At present, vehicle dismantlers and vehicle recycling factories operate independently. The researchers suggest greater recycling efficiencies could be achieved if these two operations were integrated.

New, post-shredding technologies coming on-line in Europe, that further treat the ASR will reduce or eliminate the amount of ASR entering landfill.

1. See: Environmental Data Centre on Waste: End-of-Life Vehicles  
<http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastestreams/elvs>
2. See: Directive 2000/53/EC on end-of-life vehicles <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0053:EN:NOT>

**Source:** Simic, V., Dimitrijevic, B. (2012) Production planning for vehicle recycling factories in the EU legislative and global business environments. *Resources, Conservation and Recycling*. 60: 78-88.

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