



Automotive industry challenges in meeting EU 2015 environmental standard

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ARTICLE INFO

Article history:

Received 28 July 2011

Received in revised form 28 September 2011

Accepted 21 December 2011

Keywords:

ELVs

ASR

Tires

Hazardous waste

Directive 2000/53

ABSTRACT

Automotive Shredder Residue (ASR) generation in EU is approximately 2–2.5 million t/y, constituting 10% of total hazardous waste in the EU. Currently, about 75% of ELVs total weight is recycled while the remaining 25% (ASR). Not surprisingly, Europe is the world's largest vehicle producer as about 30% of the 50 million cars produced globally are manufactured in the EU. Worldwide, ASR is considered an increasingly problematic waste, consisting of a large number of different materials that basically remains unprocessed and directed to landfills. The aim of this study is to provide an overview of the ASR problem and the options for processing this waste in order to minimize the waste directed to landfills.

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1. Introduction

According to modern market strategies, the working life of most goods is expected to keep shortening. Consequently, an increasing amount of waste material is conveyed every year to landfill [1]. In the automotive field, it has been observed that a huge amount of material is produced from vehicles dismantling, still with high market value (e.g. steel, aluminum, glass and plastics). There is thus an economic drive to the efficient reuse of such matter; in addition, most of them should be carefully handled by reason of their potential environmental impact. In order to address the problem effectively, the common approach of

“use and throw” (i.e. disposable) must be overcome: a new policy of reusing and recycling has to start for the rough materials that form worn out goods [2].

The average weight of small vehicles is about 1 ton while most of them weight more (1.5–2.5 t) and 25% of its mass consists of ASR. This corresponds to about 2.5 million tons yearly generated and almost totally land filled in Europe–25 (with an estimation of 3.5 million tons within 2015), with economical (due to the expenses related to this type of disposal) and environmental problems (associated to the physical chemical processes of contamination which can occur in this situation) [3].

The European automotive industry has a long history in Europe and today, car manufacturers have production facilities in almost all the Member states. Not surprisingly, Europe is the world's largest vehicle producer: one third of the 50 million cars produced globally are manufactured in the European Union. In total, more than 12 million European families depend on automobile employment, with 2.3 million direct jobs and another 10 million in related sectors. The car industry represents 6% of total European employment. Cars

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also represent a major source of income for the EU member states. Vehicle taxes contribute for € 360 billion yearly to government revenues, that is, 3.5% of European gross domestic product. The European car industry has given important support to the shape of the current European Social Model. The European automobile manufacturers are fully part of the achievements of the European social model. They are committed to maintain its existence: A skilled and flexible work force is essential, and the industry makes continuous efforts to achieve even higher standards. The car industry is and will remain a cornerstone of the European economy and society [4].

Disposal of cars and light commercial vehicles at the end of their operational lives (end of life vehicles – ELVs) is estimated to generate over 10 million tonnes of material requiring treatment and disposal in 2005 within the EU [5]. This volume is projected to increase to 14 million tonnes by 2015 as the number and average weight of vehicles increases. Currently, 80% of the ELV total weight is recycled [6–8] during the end-of-life treatment phases; namely, (i) pre-treatment, which is mandatory, and it is aimed at removing most of hazardous components such as batteries, fuels and lubricating oils; (ii) dismantling, which consists of components removal from the car body in order to reuse them, if undamaged, or recycle material, e.g. as it happens for glass from windscreens and plastics bumpers in the Netherlands [9,10]; finally, (iii) shredding phase, in which ELVs are turned into pieces in order to release ferromagnetic scraps allowing separation and recovery. This metallic fraction amounts to around 60% of the total weight [8]. The remaining 20% is called automotive shredder residue (ASR) and, at present, it is disposed by land filling in most European countries [11] considered either a hazardous waste or a municipal solid waste depending on the results of chemical characterization. The complexity of ASR composition, due both spatial and temporal variations, as well as the different source materials shredded (i.e. vehicles and white goods) puts several limits over material recycling processes.

As automakers further adapted stocks and output levels to the economic situation, total vehicle production in 2009 fell by 17% compared to 2008 and 23% compared to the pre-crisis level of 2007, reaching a total of 15.2 million units. New passenger car production dropped by 13% compared to

2008 and by 18% compared to 2007. The decrease is the steepest recorded since 1993, when car production in the EU fell by 15.1%. In total, 13.4 million cars were manufactured in 2009, hitting the lowest level since 1996. The production of passenger cars went up 22.8% in the fourth quarter compared with the low level recorded in the last quarter of 2008. When compared with the pre-crisis level of the fourth quarter of 2007, car production dropped by 7.6%. Germany remained by far the largest vehicle producer (5.2 million units) in the EU, despite a 13.8% decrease. Following a 20.2% drop, France fell to the third rank while Spain (–14.6%), with 2.2 million vehicles, became the second largest manufacturing country in 2009. The UK (–33.9%) once again ranked fourth with more than 1 million units. Italy fell to the seventh place, after the Czech Republic and Poland which accounted for 974,569 and 879,186 vehicles respectively. The Czech Republic and Slovenia were the only countries to see their total production increase, by 3.0% and 7.5% respectively. The steepest fall was recorded in Austria (–52.6%). Fig. 1 presents the passenger car production in EU from 1990 to 2009 [12].

In Europe, car manufacturers face the challenge of anticipating and responding to recycling legislation. They must offer a united front, avoiding the fragmented, piecemeal and ineffective strategy which the European Commission claims was the outcome of a voluntary code within the packaging industry. Directives on the proposed action from the European Commission (EC) on ELVs provide an insight into the ‘polluter pays’ principle, and its target group includes those who dismantle and reprocess the ELVs. It comes, however, as little consolation to auto manufacturers that their products are demonstrably the most effectively recycled major consumer item [13], eclipsing the efforts of their counterparts in white product manufacture (Fig. 2).

The generation of ELVs is considered as significant environmental issue due to the large amount and volume of this waste stream, the complexity of their composition, as well as the presence of hazardous materials. European Commission considers ELVs as priority waste stream according to the European Union (EU) policy and it is expected that ELVs quantities will be growing rapidly in the coming years. The entire cycle of a vehicle from its production to its management as ELV is presented in Fig. 3.

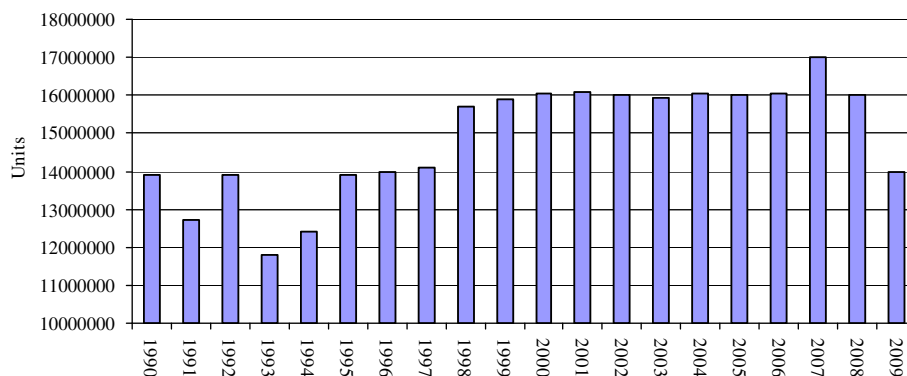


Fig. 1. Passenger car production in EU from 1990 to 2009 [12].

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