Executive Summary, based on ERA Study

Ecological and economic efficiency analysis
on the permanent review of restrictions
on lead within the European ELV Directive (2000/53/EC)
and the RoHS directive 2011/65/EU

Conducted on behalf of ACEA, CLEPA, JAMA, KAMA and ZVEI

Summary

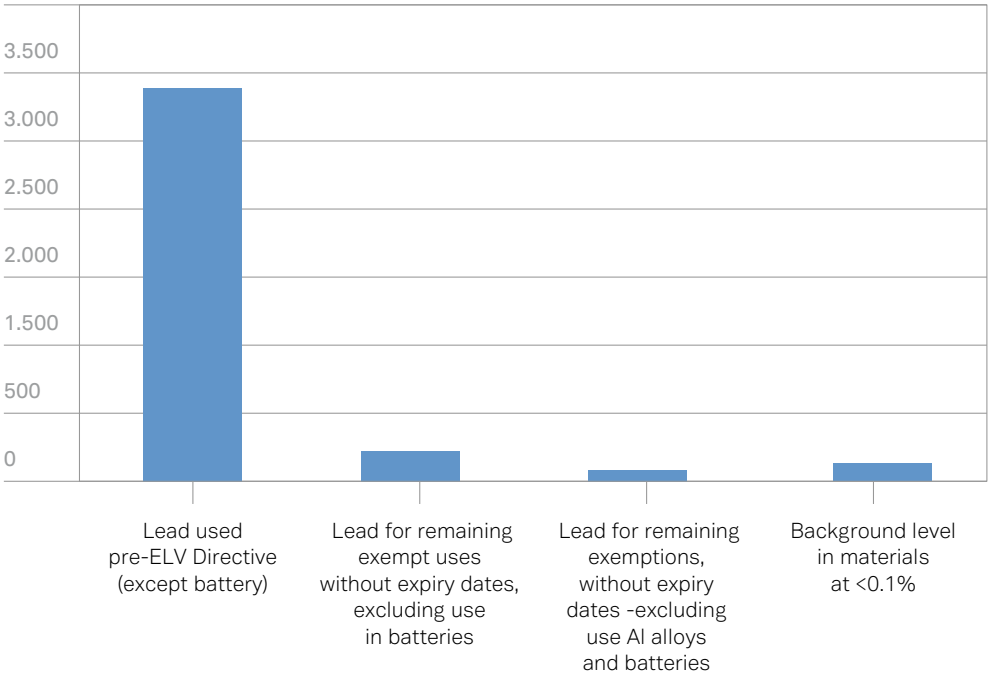
This report is a review of ELV directive exemptions and considers how the exemption procedures could be improved in line with EU policies on better regulation and protection of the environment and human health. The ELV directive has resulted in a significant reduction in the intentional use of lead in vehicles in the EU and it is estimated that, excluding lead based starter batteries, the amount of lead will have been reduced by 92% to 230g per average vehicle since it was adopted (FIGURE 1). The four ELV-restricted substances (Pb, Cr(VI), Cd and Hg) have been replaced in very large variety of uses with only a small number of applications remaining that require exemptions. For these, technically feasible alternatives are still missing, despite extensive research.

Of the remaining exempt uses where no alternatives exist, the use of lead in batteries is the largest. Collection, recycling and recovery from lead based batteries at end of life is however extremely efficient and is performed in a closed loop system. Therefore no risk of exposure for the general public and, due to existing regulations only minimal risk for recycling workers is to be expected.

The next largest use is lead mainly in secondary aluminium alloys which derives mainly from unintentional use due to recycling processes. Even if an alternative were to be discovered, the large amount of aluminium alloy in current use could not be re-used without an exemption as suitable lead removal processes do not exist, so primary metal would be needed. The manufacturing processes of primary aluminium need much more energy than scrap reuse and would result in much higher energy consumption with associated emissions of lead, and lead in wastes.

The 92% reduction in lead use, excluding batteries, conveys the huge effort made by the automotive industry to replace lead in a very large number of different applications. The very few remaining uses will be very difficult or impossible to replace and most use relatively small amounts of lead, apart from lead in batteries and lead in aluminium alloys. If these two uses are excluded, then the remaining quantity of exempt lead is smaller than the amount present in a vehicle as a background impurity (lead in materials at a concentration below the worldwide standardised and accepted maximum impurity limit of 0.1 %).

FIGURE 1
Amount of lead before and after ELV Directive lead (grams / vehicle)



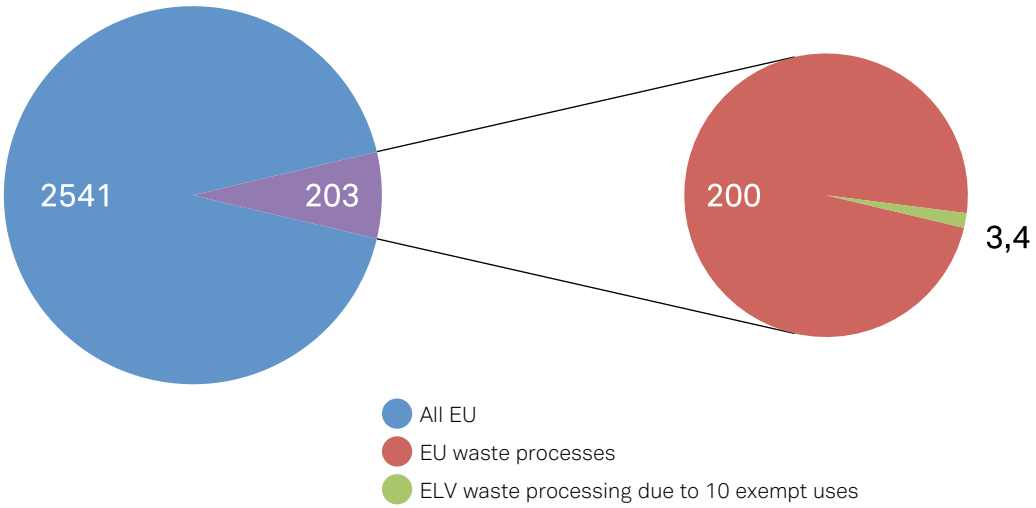
It is clear that most vehicles that reach end of life (ELV) in the EU are collected and recycled and that the recovery of any exempt lead is very efficient with well over 99% of lead being recovered for reuse. There will be some emissions of lead from lead battery recycling processes, but in comparison with other EU lead emissions, both anthropogenic and natural, these are very small. EU lead emissions into air are shown in Figure 2 (FIGURE 2: EU IN 2011, DATA FROM EEA).

Figure 2 compares lead emissions data published by the European Environment Agency as follows and an estimate for ELV recycling emissions considering the ten exempt forms only. These are:

- Total EU lead emissions
- Total emissions from waste treatment processes
- ELV recycling lead emissions from remaining exempt uses, calculated by ERA for this study. These are a very small proportion of total emissions (ca. 0.1%).

The remaining ten exemptions that have no expiry dates or dates have been proposed by the automotive industry (1a, 2c, 3, 5, 8 e, 8f, 8g, 8j, 10a and 10b) have been briefly reviewed and are still required. Moreover, the costs incurred already by the automotive sector and by the EU regarding the relevant exemptions are extremely high. Although the true cost cannot be predicted as alternatives are unknown, the estimated costs could be of the order of €5 billion, whereas the estimated monetised health benefits from not using lead would probably be less than €100 million per year if substitutes could be found.

FIGURE 2
Amount of lead emitted (tonnes) EAA 2011



The ELV directive obliges vehicle manufacturers to look for substitutes and so this is considered to be a high priority, but they have finite resources for R&D (as do all manufacturers) and expenditure on improved fuel efficiency may result in a larger reduction in EU lead emissions, from the current 381 tonnes per year from transport (data from European Environment Agency), than from the same expenditure on looking for alternatives to the applications covered by the remaining ELV exemptions. A lot of work has already been carried out looking for alternatives materials and designs to replace the remaining forms of exempt lead, so far without success, whereas there are many innovative developments being pursued by the automotive sector to reduce fuel consumption, which will reduce EU lead emissions.

A variety of options for the future have been considered. Significant changes to the ELV directive would probably not be beneficial. In the future, it will be difficult to identify, test and approve alternatives for all of the remaining exemptions that do not have expiry dates, so there would be beneficial cost savings for both the EU and to industry from longer periods between exemption reviews and for some exemptions much longer periods, without loss of the incentive to continue efforts to replace lead. The option of using different definitions of homogeneous materials has been assessed and the impact from alternatives has been explored. In practice, different homogeneous material definitions for electronic components will not significantly affect the amount of lead used in new vehicles.

Potential changes with no negative impact on the environment thus could be:

– Prolongation of the time between exemption reviews from 4 to 8 years, thus keeping existing exemptions unchanged for longer periods. This time period is intended to be consistent with the time required to develop, test and gain approval for use in vehicles for the new materials.

– Changing the definition of "homogeneous materials" for small components and PCB boards to simplify conformity assessment and market surveillance. If small components and PCBs (excluding heavy components to avoid compliance by "dilution" of lead to <0.1%) were regarded as homogeneous materials, lead concentrations would stay at the same level. This is because when lead solders are used for attaching components to PCBs this will almost always increase the lead content to more than 0.1%. This would mean that lead-based solders could not be used and only lead-free alloys would be permitted. There is no way back to lead-containing solders if production has been adapted to lead-free soldering. There, would be an extremely small risk that leaded solders would be intentionally reintroduced for PCB assemblies. For electronic components not used on a PCB, all remaining exemptions would still be needed as the lead content would usually exceed 0.1% when exemptions are utilised. A "homogeneous materials" definition for ELV could be rewritten to enable conformity assessment by industry and by market surveillance authorities to be much easier.

ACKNOWLEDGEMENTS

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