International Lead Association

Additional Notes to editors in relation to the Oeko Institute's recommendation to the European Commission for a continued exemption for lead batteries

Lead-based batteries are vital for the following applications in vehicle types*:

1. **Starter-lighting-ignition (SLI) battery:** these 12V batteries are required to start the engine and supply the complete electrical system (starter-lighting-ignition).
2. **On board supply battery: i**n addition to a traction battery used to power a vehicle (usually Li-based), all plug-in hybrid electric and full electric vehicles require a separate lead battery for functional safety, controls, comfort features and redundancy.

* It should be noted that the information below is not relevant to high voltage batteries for use in electric-vehicles and full hybrid vehicles. The batteries used in these vehicles have different functionalities and requirements.

Start-Stop and Hybrid applications: advanced lead batteries are used in all hybrid vehicles utilising start-stop technology, thereby leading to significant CO_2 savings. Lead batteries may also be used in future for hybrid applications, therefore increasing the potential for further CO_2 savings.

Lead batteries stand out from other battery technologies and have a number of key automotive features:

- **Cold cranking** capabilities are required as part of OEM vehicle specifications to ensure cranking function can be provided in very cold weather conditions (-30°C). The unrivalled cold cranking properties of lead-based batteries are one of the key reasons that make this battery type essential and currently irreplaceable for mass market vehicles. At low temperatures no other commercially available battery system for volume production is able to meet the required performance demanded.
- **Safety** is essential to OEMs and to their customers, and should be considered at both a component and vehicle level, in addition to service and end-of-life. Lead-acid is a well-understood system with an aqueous electrolyte that is inherently safe making battery fires and explosions an extremely rare event. In contrast, lithium-ion (Li-ion) batteries need carefully designed systems to ensure safe operation. The high energy density of these batteries, coupled with the use of flammable organic solvent electrolytes and the use of thin electrodes and separators make battery integrity more challenging.
- **Vehicle design:** lead-based batteries are intrinsically safe and as a consequence can be located in all positions in a vehicle. In contrast, due to safety concerns, currently incorporating a Li-ion SLI battery would generally require a full redesign of the vehicle platform (considering the specific requirements of this component and the reliable board-net functionality).

- **Durability at high temperatures** the temperature of a battery within vehicle architecture is a key parameter for the safety and the life time of the battery. Lead-based batteries can withstand up to 75°C internal temperatures, which covers all scenarios. For example under the bonnet ambient temperatures can reach 75°C in hot climates. In comparison, the operating temperature range for a Li-ion battery only goes up to 55 °C.
- **Sustainable recycling** virtually all lead-acid batteries are collected and recycled through a very efficient infrastructure that is driven by the economic value of the battery. In Europe, 99% of lead-based batteries are collected and recycled and a lead-based battery is comprised of approximately 85% recycled material. This is in contrast to the very low recycling rates of Li-ion batteries.
- **Low combined cost:** at present, lead-based batteries remain by far the most cost-effective and durable battery technology for SLI applications in conventional powertrains (in the region of €50-150 per kWh). On a battery level, it was reported during the consultation period that lead batteries cost €30-80 per battery, in contrast the cost is €300-500 per Li-ion battery. This cost differential is prohibitive except in the case of luxury vehicles where cost is not a major issue. In addition to the lower cell-level cost, lead batteries do not require heat shielding, active cooling, or a sophisticated battery management system. This is an important consideration for consumers and the automotive industry, due to the higher financial burdens of a more expensive alternative battery system. This combination of cost and performance make lead batteries the most cost efficient option for CO_2 reduction in automotive applications.