

Research claims battery-electric cars are greener than expected

Published on 1 September 2010

Manufacturing newsdesk



A detailed life-cycle assessment of the modern lithium-ion batteries used in electric vehicles has shown that they are less environmentally harmful than previously thought.

Added to a life-cycle assessment (LCA) of a complete electric car, the research showed that e-cars, powered with Li-ion batteries and charged with a typical European electricity mix, are significantly less environmentally-harmful than best-in-class petrol fuelled cars.

The research by scientists at EMPA, the Swiss Federal Laboratories for Materials Science and Technology, calculated the ecological footprint of e-cars fitted with Li-ion batteries, taking into account all possible relevant factors from those associated with the production of individual parts, through the operation of the vehicle during its lifetime, to the scrapping of the vehicle and the disposal of the remains.

This life-cycle assessment (LCA) discovered that the battery has a more limited effect than expected - contrary to initial expectations that the manufacture of the batteries could negate the advantages of the electric drive. At most only 15 per cent of the total LCA burden could be ascribed to the battery (including its manufacture, maintenance and disposal).

Half of this figure, that is about 7.5 per cent of the total environmental burden, occurs during the refining and manufacture of the battery's raw materials, copper and aluminium. The production of the lithium, in the other hand, is responsible for only 2.3 per cent of the total. "Lithium-ion rechargeable batteries are not as bad as previously assumed," said Dominic Notter, co-author of the EMPA study.

Instead, the eco-burden of an electric vehicle primarily derives from its operation and from the sources of electricity used to charge it. Recharging with electricity sourced from a mixture of nuclear, coal-fired and hydroelectric power stations, as is usual in Europe, results in three times as much pollution as from the Li-ion battery alone. It is therefore worth considering alternative power sources, said the EMPA researchers: if the electricity is generated solely by coal-fired power stations, the ecobalance worsens by another 13 per cent. If, on the other hand, the power is purely hydroelectric, then this figure improves by no less than 40 per cent.

While other relevant LCA information could be obtained from the Ecoinvent database (www.ecoinvent.org) managed by EMPA, data on the batteries had to be obtained specially. The electric vehicles evaluated were equivalent in size and performance to a VW Golf, and the power used to charge the batteries was assumed to be derived from sources representing an average European electricity mix. In performing the LCA the researchers also made some intentionally unfavourable assumptions. One was to ignore the possibility of a redundant car battery subsequently being used in a stationary setting for other purposes.

A best-in-class new petrol-engined car, meeting the Euro 5 emission regulations, was used for comparison. It consumes on average 5.2 litres per 100km (54 miles per UK gallon) when put through the New European Driving Cycle (NEDC), a value significantly lower than the European average. The conclusion drawn by the EMPA team: a petrol-engined car must consume between three and four litres per 100km (between 70 and 94 mpg) in order to be as environmentally friendly as the e-car studied.

Further information:

[Contribution of Li-Ion Batteries to the Environmental Impact of Electric Vehicles](#)

Comments

Thanks for the article I have benefited

Mr salim asli,
01 Sep 2010
([Report to moderator](#))

[All comments](#)

You need to be registered with the IET to leave a comment. Please [log in](#) or [register as a new user](#).