Energy rating labels for cars needed to reverse 'damaging' legislation

12 July 2017

Green legislation on vehicle tailpipe emissions has increased CO2 emissions worldwide, according to new research.

The Sustainable Manufacturing Systems Centre at Cranfield University has found substantial evidence that the sole focus on tailpipe emissions as a measure of environmental impact has led to serious unintended consequences. In order to cut fuel use and emissions, the automotive industry has been pushed into using lightweight aluminium in the manufacture of vehicles with a far higher cost to the environment than any savings achieved through reduced tailpipe emissions.

A typical aluminium engined car, the research discovered, would need to be driven for between 185,000 km and 560,000 km before there were any environmental benefits from the lower fuel use involved. The average life expectancy of motor vehicles is 210,000 km.

The conclusions are based on a 'cradle-to-grave' study of the total energy and CO2 impact of passenger vehicle engine production, interviewing more than 100 manufacturers and industry experts, from mining through to engine production and on-the-road use. The study focused on the most representative engine in use globally, a 1.6 litre four-cylinder engine, and compared aluminium models with the more traditional cast iron engines with the same driving performance.

In response, researchers are calling for the introduction of energy rating labelling for all motor vehicles globally - similar to those used for white goods, homes and other

buildings - to provide a more accurate indication to consumers of the real environmental impact of their vehicle choice.

“Current legislation takes such a narrow view of what makes a car environmentally-friendly that it has caused more damage than good,” said research lead Professor Mark Jolly, Head of Sustainable Manufacturing at Cranfield University. “Legislation encourages engineers to use low-density materials, forcing them to swim in dirty water. It’s critical that governments and consumers start to look at the whole life cycle involved in manufacturing vehicles, not one indicator, with more holistic policies that actually reduce CO2 emissions rather than just presenting the image of doing so.

“An energy rating label for all cars, taking into account the full environmental costs, would provide more transparency. Consumers who thought they were making a more sustainable choice have often been misled, and this needs to change.”

The study has highlighted how, despite the lighter weight of an aluminium cylinder block, it is the production phase that determines the level of energy efficiency. The production of each aluminium cylinder block consumes 1.8 to 3.7 times more energy than the production of cast iron. The nearly twofold increase in energy consumption occurs when the aluminium components are produced in re-usable metal moulds, referred to as high pressure die casting.

The almost fourfold energy increase results when the aluminium cylinder blocks are produced by sand casting; where the components are produced in expendable sand moulds. Overall, more than 70% of the global aluminium production is based on fossil fuels. Under these conditions, the energy intensive production of aluminium generates over 10 kg of CO2 per kilogram of aluminium. This up-front CO2 burden presents a significant hurdle opposing on-the-road emissions breakeven.

The aluminium industry has argued that the highest energy consumption occurs during the production of ‘virgin’ aluminium from ore and that cylinder block production primarily uses recycled aluminium. The Cranfield study took this into account, adopting the best-case scenario for aluminium via infinite recycling.

“The findings have wide-ranging implications for larger V6 and V8 engines,” said Professor Jolly. “With more complex design, most V-type cylinder blocks are produced by sand casting. For V-engines, the CO2 and energy breakeven distances of aluminium engines far exceed the vehicle life.

“There are also major implications for the electric vehicle market - seen to be the future in terms of environmentally friendly transport. But, again, taking the life cycle into account you have to highlight the potential horrendous impacts of manufacturing the batteries.“

-ends-

For further information please contact:
Media Relations, Cranfield University. T: +44 (0) 1234 754999
Email: mediarelations@cranfield.ac.uk

Notes to editors:

About Cranfield University
Cranfield is an exclusively postgraduate university that is a global leader for education and transformational research in technology and management.

We are focused on the specialist themes of aerospace, defence and security, energy and power, environment and agrifood, manufacturing, transport systems, and water. The Cranfield School of Management is world leader in management education and research.

We are home to many world-class, large-scale facilities which enhance our teaching and research. We are the only university in the world to own and run an airport on campus and to have airline status.

We work closely with business, industry and government across the world. Through our industry partnerships, applied research projects and our executive education and professional development programmes, we currently work with over 1,500 companies and organisations.

Cranfield was formed in 1946 as the College of Aeronautics, the first postgraduate college of its kind. The School of Management was founded in 1967.