

Major Project Questions

Project Title: What is The Future for Vehicle Emissions?

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Question 1

You say on page 21 that electric and hybrid vehicles are carbon neutral. Please explain this statement?

Question 1 Response (maximum 200 words)

Yes, I mentioned that electric and hydrogen powered vehicles are known as “carbon neutral”. However, they aren’t considered completely carbon neutral unless the power used is generated from a renewable source (thegreenage.co.uk. 2020). This means that during their use phase where they will be driven around, these vehicles won’t be releasing carbon into the atmosphere. Electric vehicles don’t produce the harmful gases, especially carbon, that a petrol or diesel vehicle does. However, the manufacturing process isn’t efficient and produces lots of emissions compared to manufacturing a petrol or diesel car.

“Scientific studies have shown that manufacturing an electric vehicle generates more carbon emissions than building a traditional car. Factories use vast amounts of energy and often produce huge levels of greenhouse gas emissions.” (thegreenage.co.uk. 2020)

Also, when used in a fuel cell, hydrogen vehicles don’t release carbon during their use phase due to these vehicles only producing water vapour. (Gibbs, Evans. N, J. 2019)

With the manufacturing of these vehicles producing a lot of emissions, companies are trying to implement more efficient methods to lower emissions. **“The production of hydrogen from processes with a low or zero carbon-footprint is at the core of developing the hydrogen economy.”** (Lorentzu, S. 2019)

Question 2

What are the emissions implications of storing hydrogen? Can it be carbon neutral?

Question 2 Response (maximum 200 words)

To store hydrogen, it needs to be compressed, cooled to. However, because hydrogen molecules are so small, they are known to permeate through pretty much anything you store it in (Lis, A. 2007). This means that over time the hydrogen content will drop, even if the driver isn’t using the vehicle.

The hydrogen can be stored as a gas in high pressure tanks (5000 to 10000psi), as a liquid in a tank cooled to - 253°C, or as a solid by either absorbing or reacting with metals or chemical compounds or storing in an alternative chemical form (fsec. 2014). In vehicles the hydrogen would usually be stored under pressure, but the only emissions being released from the vehicle should be water vapour and miniscule amounts of hydrogen escaping from the storage cylinder.

“To liquify the hydrogen, it is compressed and passed through two heat exchangers, then cooled using liquid nitrogen, followed by another pass through a heat exchanger”. (HydrogenEurope. 2017).

“A HYDROSOL-PLANT has developed a technology that has the potential to produce hydrogen on a large-scale, cost-effectively. This renewable energy could slow climate change and create a sustainable future”. (HydrogenEurope. 2017)

Question 3

So what drive cycle did you use on the rolling road?

Question 3 Response (maximum 200 words)

The aim of the emissions testing was to find a difference in emissions produced when reducing the vehicle speed down to 50mph on the motorway, therefore there wasn't a specific drive cycle used when testing the vehicles on the rolling road because we wanted to simulate the vehicles driving along the motorway at a steady speed. This allowed me to find the emissions being produced whilst the vehicle drives through a 50mph motorway speed zone, and then compared this to the motorway speed limit of 70mph. This meant that I could find a difference in emissions produced between the two different speeds, however as shown in the graphs provided in my report, there weren't a noticeable difference in the emissions produced. If anything, the testing had shown me that the downsized EcoBoost engines produce a lot of NOx which I wasn't expecting, in which this gas can become harmful in high quantities.

"It can cause breathing problems, headaches, chronically reduced lung function, eye irritation, loss of appetite and corroded teeth." (phys.org. 2015)

Question 4

How would the fact that you tested the cars on two different days impact your results?

Question 4 Response (maximum 200 words)

With the factor of testing both cars on separate days, there can be small differences in the results. This can be caused by the difference in temperature and air density, with the air possibly mixing with the exhaust gases to adjust the measured data. A method of reducing this that was implemented, was the use of a double shutter system to block out the external air from entering the workshop.

This meant that we could control the atmospheric temperature of the workshop more closely, and the tests were conducted around a similar workshop temperature to reduce the risk of these differences in data.

Question 5

What does your research tell you about the low emission zone on the M4?

Question 5 Response (maximum 200 words)

My research tells me that the low emissions zones were meant to be a temporary method, being used to help reduce the emissions in those areas that were struggling to meet the emissions targets. However, they were lately made permanent due to the improvements that these low emissions zones were providing.

Whilst they may slow the motorists down and add time onto their journeys, using this method was the quickest option to lower the emissions.

As mentioned in the report, Dutch researchers found that there can be a 30% reduction in CO₂ by reducing the speed to 50mph (Squatriglia, C. 2010), which can have a large impact over time. This has helped to improve the air quality in the area, reduced the risk of collisions, and also improved the fuel economy of vehicles travelling through these low emissions zones (Gaffigan, M. 2008).

References

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