



Future of the Engine

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Introduction

The future of engines is driven by advancements in efficiency, stainability and digitalizing. The UK government has set a goal for car regulations for zero emission as of **2030** 80% of new cars and 70% of new vans sold in UK will be zero emission and 100% by **2035**. This is because combustion engine are contributing to climate change and lots of people believe that removing combustion engine will drastically help with global carbon emission. lots of companies are looking for alternatives to power vehicles such as **EV, hydrogen, synthetic fuel and biofuel**.

Electric cars:

EV are automobile that is propelled by electric motors, using energy that is store in rechargeable batteries.

Pros:

- zero emission
- lower operating costs
- quiet and smooth driving
- energy efficiency

Cons:

- limited range and Infrastructure
- Long charging times
- Battery degradation and recycling
- Heavier vehicles (**BMW petrol 4 series weighs 1695kg and the i4 electric weighs 2065kg**)



Photo from BMW (BMW i4 left and BMW 4 series on right)

Hydrogen

A hydrogen powered uses hydrogen gas to generate electricity through chemical reactions in a fuel cell. Emitting only water vapour. It can also be used in Internal combustion this is less common. Where hydrogen is mixed with air and ignited in the engine cylinders, similarly to gasoline or diesel in a combustion engine.

Pros:

- Zero emission, only emit water vapor.
- Longer range than electric cars
- Quick refuelling
- High energy density

Cons:

- Limited infrastructure only 15 stations in the uk (Feb 2022)
- Safety concern hydrogen is highly flammable.
- Energy intensive production
- High production cost

Synthetic fuel

Synthetic fuel is a type if carbon neutral fuel used in ICE engine. It’s made by separating water into oxygen and hydrogen by electrolysis. The hydrogen is then mixed with CO2 to make synthetic methanol, which can be refine into synthetic petrol or diesel.

Pros:

- Carbon neutral
- Compatibility with existing infrastructure and vehicles
- High energy density
- Energy security

Cons:

- Requires a lot of energy to create
- Still produces CO2 and other gasses. (while it generates fewer particles)
- Competing land use
- Emission from production



Porches e-fuel plant in Chile (Photo by Porsche)

Biofuel

Fuel that is derived from biomass that plans or algae material or animal waste. Biofuel sources are corn, soybeans ,sugarcane, oil palms are traditional agricultural crops. Biofuels are considered renewable energy sources because the organic material used to produce them can be replenished through agricultural or waste management practice.

Pros:

- Renewable energy source
- Domestic production
- Compatibility with existing infrastructure
- Cost effective

Cons:

- Land use and competition with food production.
- Resource intensive production (high usage of water for irrigation 10,000 square meter of corn take 3000 to 5000 cubic meters of water per year)
- Impact on ecosystem and biodiversity

Conclusion

In conclusion the future of the engine is transitioning towards cleaner and more sustainable technologies. Both hydrogen fuel cell and electric vehicles technologies show promise in reducing greenhouse emission and reliance on fossil fuels. While hydrogen combustion engine offers an alternative for certain application, but advancement in battery technology, infrastructure development and renewable energy source are likely to accelerate the adoption of electric in the coming years. Overall, the future of the engine is expected to be increasingly electrified and environmentally conscious.

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