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Sustainable and new materials in engineering and every day use

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Introduction

Sustainable materials and new reliable sources are becoming extremely important throughout the world. With global warming and climate change becoming increasingly worrying, a cleaner and more efficient method of fuels and materials for cars is being needed. This topic has been studied by many people around the world but the future is still unclear on whether sustainable fuels and materials are 100% effective and efficient. New infrastructure and regulations will need to be created in order to be fully sustainable and still efficient.

Cleaner fuels, smarter materials

Major efforts have been directed towards finding sustainable sources of fuels such as biomass fuels and e-fuels.

- Electric vehicles (EV's)
- Hydrogen
- Synthetic fuels

These are more examples of potentially sustainable alternatives to ICE. While it is a known fact that each one of these is better for the environment then fossil fuels, they all still have there downsides and reasons to why they are not fully introduced globally.

Many materials are now also being replaced for cleaner, more sustainable ways. Such as:

- Fossil-free steels being used to make cars.
- More natural composites.

In doing this we are moving away from harmful green house gases and CO2 emissions.

Regulations

New regulations such as, Euro 7 are going to be implemented in November 2026 and are the strictest rules so far. It looks at not only controlling tailpipe emissions but also factors like tyres and brakes along with EV's.

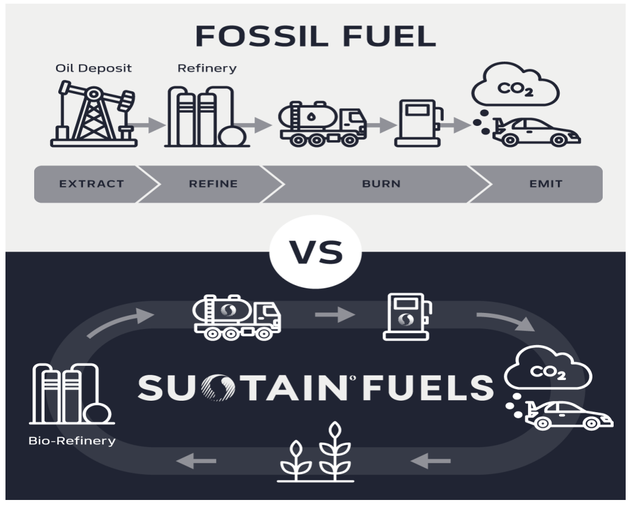


Figure 1- photo showing the process of fossil fuels compared with sustainable fuels.

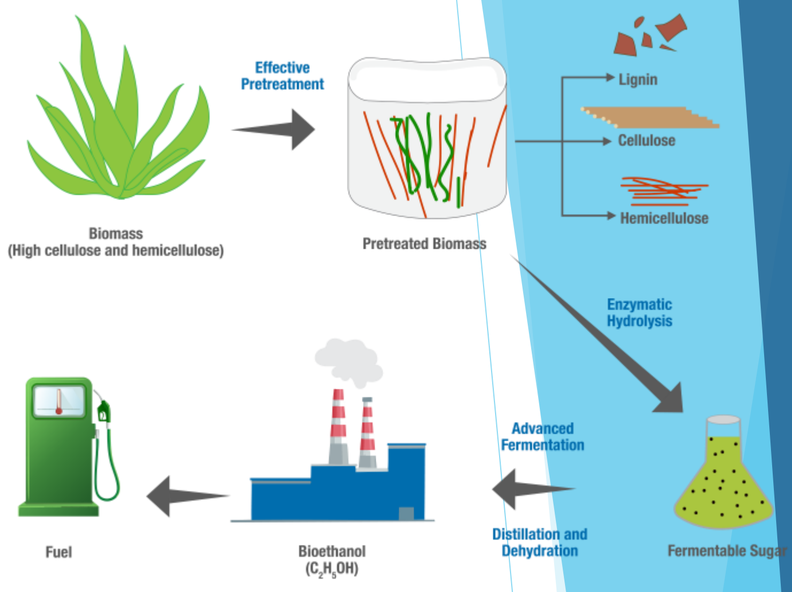


Figure 2- diagram showing how biofuels are made.

Motorsport and future

Motorsports, being a source of harmful emissions, has been working towards innovative ideas to keep the sport alive while also cutting down on emissions.
Formula one made a massive step this year in turning to 50/50 ICE and electric systems. Along with 100% sustainable fuels.
However, there is still issues with this. The 2026 season wasn't a promising start for this new system and some teams have struggled significantly.
There is also areas of motorsports where this isn't a sufficient option. Moto GP and other motorcycle events have significantly struggled with this as it changes the entire racing dynamic.

Real world problems

While in theory this could all be made possible, in reality this is very difficult. As mentioned in the lecture, country disagreements and China owning the majority of rare earths refining, it makes it increasingly difficult for all countries to get their hands on materials or technology, therefore little progression in some areas of the world.
A step in the right direction however, is the progression of testing and analysis. More real world testing is being done such as temperature ranges and short/fast trips. This leads to more accurate analysis on emissions and real damage cars are doing.

Conclusion

This lecture provided a good insight on how sustainability works in theory but is rather difficult to achieve in reality. The focus around sustainability through materials and fuels is a constant topic in engineering and motorsport and is continually advancing. While there are many options for replacing ICE and other harmful materials, none has proven to be fully adequate to replace them entirely. It is an on going search to find answers to this, however motorsport and engineering have made significant steps in sustainable energy.

References

RAC (2025). *Euro 7 emissions standard: What is it and when does it come into effect? | RAC Drive*. [online] Rac.co.uk. Available at: https://www.rac.co.uk/drive/advice/emissions/what-is-euro-7-and-when-does-it-start/.

jesusrangel3 (2025). *Renewable Fuel Production Innovations*. [online] Sulzer Chemtech - Process Solutions. Available at: Renewable Fuel Production Innovations [Accessed 18 Apr. 2026]

SUSTAIN Fuels. (2025). *What are Sustainable Fuels? | SUSTAIN Fuels*. [online] Available at: https://sustain-fuels.com/education/what-are-sustainable-fuels/

Veza, I., Asy'ari, M.Z., Idris, M., Epin, V., Rizwanul Fattah, I.M. and Spraggon, M. (2023). Electric vehicle (EV) and driving towards sustainability: Comparison between EV, HEV, PHEV, and ICE vehicles to achieve net zero emissions by 2050 from EV. *Alexandria Engineering Journal*, [online] 82(82), pp.459–467. doi: https://doi.org/10.1016/j.aej.2023.10.010.

Monash University (2025). *Anaerobic fermentation of biomass for fuel production*. [online] Student Academic Success. Available at: https://www.monash.edu/student-academic-success/biology/biotechnological-applications-of-biochemical-pathways/anaerobic-fermentation-of-biomass-for-fuel-production