

Climate change and Global Warming

Mid exam

Fuel cells science and engineering

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Over the years there have been numerous advancements in technology and science. We have learnt how to convert energy as per requirements and to use this energy as efficiently as possible. What good things can't exist without bad things. For every new way of creating and using energy we have created a new way of ruining the planet.

The best example for this is the automotive industry. With many advancements in power generation, vehicle dynamics and powertrains, we never once stop to consider how these developments were affecting our planet. Since the creation of the automobile till as nearly as the last decade we have used fossil fuels as the main ingredient for power generation. Given the easy availability of fossil fuels to an average consumer and the mature ways of using these fuels to do mechanical work, we overlooked the global warming that was being caused.

Fossil fuels are essentially organic compounds which have a high calorific value. They give off a lot of heat during combustion. This heat is then used to power mechanical systems like engines. However, fossil fuels, similar to other organic compounds, don't undergo complete combustion. These fuels burn to give off high amounts of CO and CO₂. They also form a lot of soot which further affects efficiency of fuel combustion.

A lot of pollution is also generated during the process of extracting fossil fuels from the earth. These emissions along many others play a major role in global warming. According to research, air quality has dropped drastically since the invention of the automobile. This also led to premature degradation of the ozone layer.

Improvements in media have allowed people to be more aware of the adverse effects of using fossil fuels. The past decade has seen an active shift of manufacturers from IC engines to electric and hybrid powertrains. New technologies have popped up and new ways of reducing global warming are created almost every day.

When seen from a wider perspective hybrid and electric vehicles though producing less pollution might not be that much better in comparison because most of the electricity that we use is generated using fossil fuels.

Automobiles which run on fossil fuels also fall short on efficiency with only about 23% maximum efficiency even with perfect conditions. Electric and hybrid vehicles promise better efficiency of up to 42%.

Among so many causes of global warming, the automotive industry is constantly creating new ways to mitigate global warming and also to reduce climate change. Companies are being urged to reduce their carbon footprint with a goal of 0 carbon footprint by 2030.

In my opinion the best way to control global warming and to limit climate change is to make every process as sustainable as possible. We can start by using renewable sources of energy like wind solar and hydro to generate electricity sufficient enough to run or start-up other sustainable processes.

One of the most fascinating sustainable energy fields is fuel cells. Fuel cells use hydrogen and oxygen to form electricity and water as outputs. Although there are no sustainable fuel cells in existence right now, multiple companies are working their way to making their whole production line fully sustainable by the end of this decade.

I think that fuel cells are the best way to mitigate global warming because fuel cells use abundantly available materials like H_2 and O_2 . H_2 can be generated by a simple process called electrolysis. Any water source can be used to generate H_2 , as long as it is refined finely first. Electrolysis basically means passing current through electrodes immersed in water. The electricity carries enough charge to split the water molecule. H_2 is collected at the anode.

The process of creating H_2 gas and using this gas to run fuel cells can easily be made sustainable. Solar energy and wind energy when harvested across sufficient area of land, can be enough to smoothly run the purification and electrolysis of water without using power from the grid. This sustainable system should technically be able to run itself without any external inputs except sunlight, wind and water.

Automotives which employ the use of fuel cells and other electric and hybrid powertrains promise to deliver a much higher efficiency compared to internal combustion engines. This is because most of the electric and hybrid vehicles come with a sophisticated vehicle management system which allows the user to control various aspects of vehicle dynamics such as power output, torque output, traction and top speed.

It is estimated that the fuel cell technology can be fully sustainable by 2030. By that time, we are sure to see numerous improvements in electric power trains and sustainable energy sources while also minimizing energy losses.

I believe that it is essential for us to make every process as sustainable as possible to ensure the planet stays safe and habitable for the upcoming generations. I also believe that the developments being undertaken in the automotive industry right now along with all the developments to this day will be the baseline for future transport and energy demands.

All the technologies we develop and improve, irrespective of how small they may be, will play a crucial role in how our next of kin survives. And as engineers, I think it is our duty to give the process a head start and to set the path for the future.