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DEVELOPMENT OF HYBRID POWERTRAIN FOR PETROLEUM POWERED VEHICLES

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Abstract: The objective of this project is to design a hybrid system for already existing vehicles in order to make them eco-friendlier and more efficient. This report will consider the adoption of hybrid electric vehicles, look at the arguments for and against the technology and suggest some recommendations. A hybrid vehicle is an automobile that obtains its motion from two different energy forms which are fuel and electricity. Here we are adding a motor and battery to the existing axle so that electric power can be supplied to the vehicle when its needed. The performance of each vehicle differs depending on the size of the motor and battery capacity.

IndexTerms **– Hybrid Vehicle**

I. INTRODUCTION

The underlying premise behind hybrid cars is that various motors perform better at different speeds; the electric motor is more efficient at creating torque, or turning power, while the combustion engine is better at maintaining high speed. Switching from one to the other at the right time while speeding up results in a win-win situation in terms of energy efficiency, which translates to higher fuel economy.

The scope of our project is to design and fabricate a model of a hybrid system, which can be applied to all sorts of petroleum vehicles. This will in turn make the system much more efficient and reduce fuel bills. This method is also very ecofriendly and reduces CO2 emissions. [6]

II. SCOPE

In India we have seen a steady rise in fuel prices over the last couple of years. It has increased from being 65 rupees per liter for petrol to almost 116 rupees in 2022. This rapid increase in price has made it very hard for people to travel and use their vehicles. People are forced to spend more than double of what they were spending for fuel 5 years back.

Electric Vehicles are the way forward and we see new vehicles come out every day, but they do come with a cost. The Nexon EV which is the highest selling electric car in India comes at a base price of 15.6 lakh rupees and goes all the way up to 23 lakhs. Hybrid cars aren't much better. They start at a price of 15 lakhs (MG Hector) and go all the way up to 90 lakhs (Toyota Vellfire). This makes it impossible for the common man to buy a hybrid or EV in India. Our focus is to help the common man by designing a hybrid conversion kit and make their current petroleum powered vehicles to a hybrid to some extent. This will help combat the environmental crisis India is currently facing and make the vehicle more fuel efficient to own.

Our project aims to convert the current petroleum powered cars into hybrid vehicles at some level to help people cope up with the rising fuel prices. We can convert any type of vehicle from 2 wheelers to large trucks into hybrid powered vehicles. Each vehicle will have different specifications and capacity. The bigger the vehicle the larger the motor and the battery.

III. DESIGN

We connect the axle of a vehicle to a motor, which is in turn connected to a battery. The motor is connected to batteries connected in series and operates under a switch. The axle we have used here is the axle of an electric 3-wheeler used for waste collection. This is because this axle weighed only 18kgs and was not welded to the body work. The axle can carry a load of 400kgs and give a top speed of 28 kmph.

Since its not feasible for us to use a full-size IC engine for our model, we have used a 48V DC motor. We have used a 24V motor to power our electric drive system. The motor is connected to two lead acid batteries connected in series each giving an output of

18Amp and 12Volts. The total power obtained is 18 Amp and 24Volts. Both the motors are connected to the drive by a belt and pulley mechanism. The model with the battery at full charge and zero load will run for 1 hour and 43 minutes at 100 RPM.

Fig,.1 Mechanism

IV. METHODOLOGY

- The single-phase supply is given to the DC motor. Once we turn the switch to the right, we activate our IC engine drive. Here we have connected a DC motor instead as connecting a full-size IC engine is not practical nor feasible.
- The belt and pulley system runs subsequently causing the axle to rotate.
- We turn the switch off causing the process to shut off.
- We turn the switch to the left activating our electric drive system.
- The power comes from 2 18 -Amp, 12 V batteries connected in series.
- The battery activates the DC motor which rotates.
- The DC Motor connected to the belt and pulley system starts to run causing the crown pinion drive in the axle to rotate
- The speed achieved through this is much slower than the speed achieved by the IC engine because of our motor specification.
- The Ideal model can achieve a top speed of 30 – 45 kmph only on electric drive.
- An advancement to this is the addition of a controller which will switch between IC engine and hybrid system to give peak efficiency and performance.

V. IDEAL MODEL

Since fabricating the Ideal model wasn't technically or financially feasible, we have created a 1:3 scale model. The ideal model will cost around 20,000 rupees to acquire and install. The battery pack needs to be of 150 Amps and 60 Volt output. This will develop a power of 1.5 kW. The motor needs to be a DC motor of 48 V and of the power of 1000 – 1500 Watts. If the model is built to these specifications, then the vehicle will have a range of 80 – 90 kilometers. It will also have a max speed of 25 – 28 kmph. If the owner wants to give priority to speed instead of range, then we can make changes internal to increase the speed to 35 – 40 kmph but doing this will decrease the range to about 50 kilometers.

Each full charge will take about 8 – 10 hours depending on the temperature of the battery and its surrounding. The hotter the temperature the slower the rate of charging. Due to the high charging time, the owner can look into battery swapping technology. Here the user will have a spare battery pack which he/she can switch out once the current battery pack is depleted. Once the battery is switched, the switched-out pack can be put into charge while the new pack can be used. This will result in zero waiting and higher efficiency.

VI ENVIRONMENTAL IMPACT

Increasing levels of air emissions, regardless of their source, harm the planet, both on the short, as well as on the long term. In the last decades significant increases in global emissions were measured that contributed to the growth of greenhouse gas emissions and global warming. For example, only between 1990 and 2007, CO_2 emissions from transport (land, water and air) increased by 45%. To constrain climate changes, these emission levels must be reduced. To this end, in the recent past, electric and hybrid cars

have entered the market, especially, in the passenger vehicle category. With proven benefits, these new power trains will enter other markets as well, be it commercial trucks, buses, boats, ships and so forth.

There are about 5 million auto rickshaws and tuk – tuks in India out of which only 1.5 million are electric. On an average and LPG powered auto rickshaw emits 3.72 tons of CO2 and a two- stroke auto rickshaw emits about 4.3 tons of CO2 annually. This means that about 14.03 million tons of CO2 are released into the atmosphere every year. We found out that an average auto rickshaw runs an average of 100 kilometers in a day. This means that if our technology is applied then rickshaw drivers can use the electric drive for 70 out of the 100 kilometers. If the hybrid mechanism is applied to each and every auto rickshaw then we can reduce the CO2 emissions to less than 4 million tons per year that is we can reduce the emissions to one - fourth of the current rate.

VII CONCLUSION

Our current lifestyle is unsustainable and in the next 100 years Earth will become uninhabitable unless we make some changes now. Based on a study in 2017, more than 90 percent of the world is exposed to polluted air. Each and every one of us have a responsibility to change this and preserve the Earth for our future generations.
We have tried to create a system that reduces the amount of pollutants that are being released into the atmosphere by the vehicles we use on a daily basis. Our system can be implemented on any petroleum powered vehicle and make them more efficient. If this is applied to every single vehicle, we can cut down up to sixty percent of the pollution caused by road vehicles.

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