

Advanced Design Of Hybrid Vehicle With Improved Materials

Abstract

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Abstract—The enormous amount of gases emitted by the limitless amount of automobile has created an suffocating situation in the Morden day society. The rate of pollution by the automobile industry is so high that the harmful effect can not be prevented but it can be controlled. So a question arises here is that is it possible to make the entire automobile mechanism ecofriendly? Is it possible to control the emission of poisonous gasses from the vehicles? The only way that it can be done is through the hybrid vehicles. So in this paper the design of an advanced hybrid vehicle with improved materials is done. Here in this paper the hybrid vehicle is designed by means of the interaction between the mechanical linkage and electrical system. The advanced version of materials that can make the vehicle more effective and comfortable is mentioned in a detailed manner.

Index Term—introduction, internal working mechanism, internal working principle, advanced current sensor and calculations, use of advanced materials, use of advanced steel technology, conclusion

1. INTRODUCTION

In the Morden society, the use of vehicles has become an essential part of the human life. The use of automotive vehicles, no doubt has made the transportation system more reliable, efficient and comfortable but the emission of poisonous gas is continuously destroying the environment. So to restrict the environment from being polluted by the automobile gas there is an urgent need for the vehicles to be ecofriendly. So in this paper an advanced design of a hybrid vehicle is done with advanced current sensing capability.

In this paper, an advanced steel material technology is used to make the hybrid vehicle more comfortable and reliable. A detailed research on the advanced materials

For the construction of the internal and external part of a hybrid vehicle.

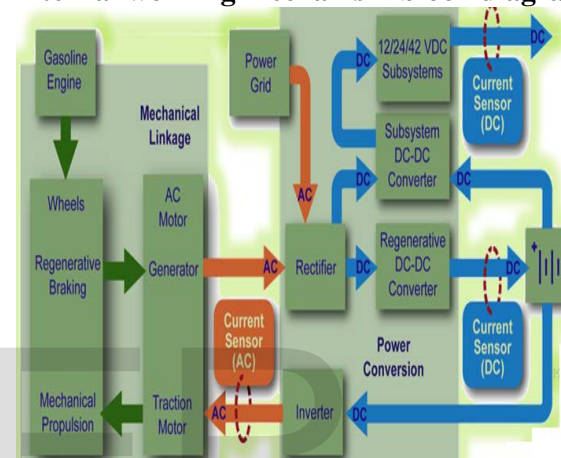
The use of the hybrid vehicles had the following advantages

1. The minimum emission of gas
2. The minimum fuel consumption
3. Ecofriendly
4. Use of renewable energy resource (solar cell is used here)
5. More reliable and comfortable

In this paper advanced steel design is used to make the vehicle metallurgically improved.

Here in this paper the concept of conversion of solar energy to the electrical energy is taken into consideration. Here in this paper the regenerative braking principle is used along with the involvement of the gasoline engine. The design of the hybrid vehicle is designed by taking into consideration the minimum fuel consumption. The design and mathematical calculation of an advanced current sensor is mentioned here.

Internal working mechanism block diagram



2. Working principle

As per the block diagram drawn above, the gasoline engine has a power output = 300KW

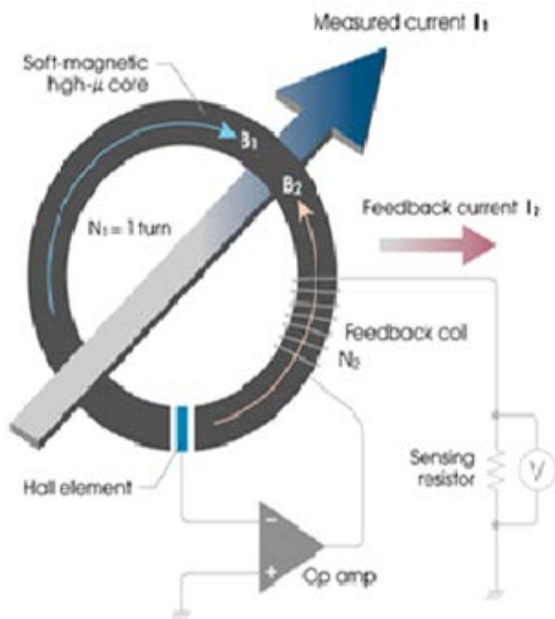
The gasoline engine is directly coupled to the wheels. At the time of starting the normal petrol engine vehicle consumes more petrol than during the working condition. So first the DC power is generated from the solar PV module. The mathematical expression of the solar output open circuit voltage = 100V

The output voltage of the rectifier is then regulated using a step-up chopper and the output of the chopper is connected to the battery that charges the battery to a value of 100V.

The voltage output of the battery is again given to an inverter that converts the DC voltage to the AC value and that drives the traction drive.

The 100V DC is again stepped down to a value of 24V taken here and is used for extra purposes like light, sparking etc.

The current sensors are designed in such a way that they measure the current accurately.



A gap is created in a high - permeability soft - magnetic core for inserting the hall element.. The magnetic flux density B_1 , that flows through the Hall element, increases or decreases in proportion to the measured current (cables, etc.) Which move across the core. The Hall element output is entered to an operational amplifier and the output is connected to a feedback coil where feedback current flows through and the magnetic flux density B_2 occurs. A feedback loop is formed to have magnetic flux density B_2 equal to B_1 .

I_1 (A): Measured current value
 N_1 (turn): Number of turns in the path of measured current
 I_2 (A): Current value flowing through the feedback coil
 N_2 (turn): Number of turns of the feedback coil
 With "equal ampere-turn law",
 Let I_1 (A) = 100amp

$N_1 = 1$

$N_2 = 1000$

From the formula we have

$I_1(A) N_1 = I_2(A) N_2$

$I_2 = (I_1 \times N_1) / N_2$

3. Use of advanced materials in hybrid vehicle

The use of the of lightweight materials such as aluminium, magnesium, ceramic and carbon fibber. With an approximate of 100kg reduction in material used in the hybrid vehicles the fuel efficiency can be increased.

Reduction of weight = 100 gruel saved=0.3 litre per 100 kilometre

Decrease in $CO_2 = 7.5$ gm per 100 kilometre

Reduction in weight = 70 kilo

Reduction in fuel = 20 litres per 100 kilometres

Replacement of the high tensile steel material by aluminium makes the hybrid vehicle comparatively lighter and has the above mentioned advantages.

Use of high tensile steel has the following consequences.

Reduction in the emission of CO_2 gas and increase in the fuel efficiency.

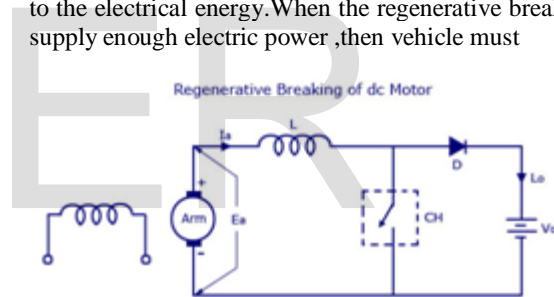
$I_2 = (1 \times 100) \div 1000$
 $= 0.1$ amp

This means that 0.1(A) of feedback current flows through the detected resistor, so the measured current I_1 is monitored correctly by measuring the voltages at both the ends of the resistor.

4. Application of break and regenerative braking

In the traditional braking system, brake pads produce friction with the brake rotors to slow

Down or stop the vehicle. Additional friction is produced between the slowed wheels and the surface of the road. This friction turns the kinetic energy of the car to heat. With regenerative brakes, on the other hand, the system that drives the vehicle does the majority of the braking. When the driver steps on the brake pedal of an electric or hybrid vehicle, these types of brakes put the vehicle's electric motor into reverse mode or reverses the terminal of the electric motor causing it to run backwards, thus slows the car's wheels. While running backwards, the motor also acts as an electric generator that delivers the current from the load to the source producing electricity that's then fed into the vehicle's batteries. These types of brakes work better at certain speeds than at others. So it has an advantages when the break is applied the heat energy developed by the regenerative breaking process, soon converts to the electrical energy. When the regenerative breaking doesn't supply enough electric power, then vehicle must



have a backup system.

5. Advanced steel technology that can be used in hybrid vehicles

To make the electric motor drive more effective the weight matter should be taken into consideration. here an advanced type of steel material is mentioned that has a lower weight and make the electric motor drive more effective.

We begin the series with steel, which has been the material of choice since the earliest days of the industry, primarily due to its strength, formability, and relatively low cost. Some have suggested that we must move away from steel to achieve the new weight reduction targets, though two things are clear at the outset.

The yield strength of the advanced steel= 1500 to 1700 kilo Pascal. These new steels are designed using a combination of new formulations and alloys, as well as different processing and treatment techniques. The newest steels are not only stronger, but they also tend to be more formable



Most vehicle's current structures have been based on the grades of steel, and the strengths of steel. In essence, they work together with their OEM partners to redesign the structural load paths to take advantage of these higher strength steels, resulting in lighter designs.

This level of weight reduction, when used in conjunction with high-efficiency power trains, improved aerodynamics, and other advances, is sufficient to achieve the new mileage goals, as verified by the computer models used by Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHSTA). That is without taking full advantage of all the weight-reduction opportunities arcelor mital has identified.

Steel is used to lighten body structure, closures, bumpers, and engine cradles. There are also opportunities for using steel in suspensions. Advanced bar steels can be used for making lighter springs and stamped high-strength steel suspension control arms, which, in many cases, match the weight of an aluminum control arm. Improvements in axles and drive shafts, using both advanced steels and multi-walled tubes, provide substantial weight reductions. Manufacturers also have done a great deal of work on doors so that they can now match the weight of an aluminum door.

The dual phase steels have an excellent strength that can be used in the hybrid vehicles. Transformation induced plasticity (TRIP) steels bring these same properties to complex parts due to their high formability.

6. Conclusion

Here in this paper, an advanced hybrid vehicle is designed with the improved materials and advanced steel technology.

Further matter of concern is that the efficiency is appreciable but the future research is to be done regarding the speed of advanced hybrid vehicle.

Future research is to be done regarding the improved material design used in the hybrid vehicle. The use of the advanced steel technology is to be modified to improve the outer construction. The proper maintenance of the electrical equipments is taken into consideration. The development of the backup system that works when the regenerative braking doesn't store approvable power, should be taken into consideration.

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