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FABRICATION OF DUEL CHARGED LOW EMISSION HYPER GO-KART

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Urban traffic involves frequent acceleration and deceleration. During deceleration, the energy previously used to accelerate the vehicle is mainly wasted on heat generated by the friction brakes. If this energy that is wasted in traditional Internal Combustion Engines (ICE) could be saved, the fuel economy would improve. Today there are several solutions to meet the demand for better fuel economy and one of them is the electric hybrids. The idea with electric hybridization is to reduce the fuel consumption by taking advantage of the electrical motor. Thus reducing the load on the IC engine and thereby reducing the emissions as a result of complete combustion of the fuel being used in the engine.

INTRODUCTION

The Hybrid Electric vehicle (HEV) concept is a low-cost alternative for the conventional low fuel efficient IC Engine vehicles. It's a highly fuel efficient vehicle which can carry comparatively high loads with the amount of fuel it consumes. The HEV comprises of an additional Electric propulsion source. The main idea of this HEV is to use the IC Engine to charge the batteries through an alternator. The generated electricity through the alternator is used to power the DC Motor to propel the drive axel.

The actual concentration of the project we intended to do is to:

- Minimise exhaust emissions from the IC Engine.
- Increase the fuel efficiency.
- Carry higher loads compared to conventional vehicles for same fuel consumed.
- Adaptation of hybrid technology.

THE DUEL CHARGED LOW EMISSION HYPER GO-KART CONCEPT

This fabricated model actually follows the "Power-split HEV" concept. It uses a 5 hp IC Engine and 1 hp DC Motor as the primary propulsion sources.

The ICE is connected to a alternator through a pulley connected to it. The alternator being used is 12V which is used in maruti800. This charges the battery which is mounting on the chassis frame.

The battery then is used to supply current to the DC Motor which, as already told is a 1hp starter motor which is used in ambassador. It is then used to drive the rear axle through a chain drive.

Propulsion sources used here are different.

I.C Engine Drive

EngineType: Single Cylinder, Air-cooling, 4-Stroke

For ICE a rigid sprocket is used and is run using a chain

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drive. A centrifugal clutch is used here to connect the engine to the sprocket. This is the main mechanism used to power the vehicle using the ICE.

The main idea of using a centrifugal clutch is:

A centrifugal clutch is used at the engine crankshaft so as to facilitate idling of the engine. The driving sprocket is mounted on the clutch and the driven on the axle. A reduction gear ratio of 3:1 (approx.) is used so as to reduce the speed of the wheels without losing torque, while maintaining sufficient traction on the wheels and also to ease off switching of power.

D.C Motor Drive

DC Motor 1 hp

12V @ 50Ah

Propulsion source used for the DC Motor is mainly based on the concept of freewheel.

It is the sole idea behind the hybrid concept.

As both the sprockets are mount on the same rigid axle, there should be cut-off functionality for the smooth running of the vehicle.

So, a free-wheel is used on the rear axle on the DC Motor side.

Concept behind this is when the ICE rotates the axle faster than the DC Motor does the free-wheel rotates freely with-out exerting any Extra load on the DC Motor.

A reduction gear ratio is used between the motor and axle again to keep traction, but the sprocket on the axle uses a FREE WHEEL to mechanically disconnect the electric motor from the drive when the engine is driving the axle, so as to protect the motor from any undesirable load.

The free wheel is a ratchet and pawl mechanism, which allows the outer wheel to rotate freely in one direction and locks the inner wheel with the outer in the other direction.

This works on the relative motion between the two wheels hence when the inner

wheel (axle) is rotating faster than the outer sprocket it rotates freely without any load on the motor, but when the motor rotates the outer sprocket it locks the inner wheel to give the drive to the axle. This mechanism is similar to that used on a bicycle, when forward motion is given to the pedal it rotates the rear wheel in the same forward direction but when going downhill or moving due to inertia of motion there is no load on the pedal.

Power Source Selection

The power source selection is done between ICE and DC Motor using an accelerator pedal and a switch respectively. The vehicle initially starts with the Cranking of the IC Engine and is used to attain a particular speed as required by the driver and when the situation is favourable the ICE is idled and the DC Motor switch which is located in the steering chamber is used to continue the Drive. This will be done until the vehicle requires extra speed for propulsion.

As the Engine crank shaft is connected to the alternator, as soon as the engine is cranked the pulley drives the alternator and it starts producing AC Power and that power is stored in the battery. This power stored in the battery can be used for the operation of the auxiliaries and also can be used to power the DC Motor. To reduce the conversion losses the power produced by the alternator can be directly given to power the DC Motor and this functionality is also available in the fabricated model. The power selection should be done cautiously as per requirement and can be done easily with accuracy; with the kind of mechanism used in the vehicle the efficiency and conversion losses are minimum.

POWER TRAIN

As for the project is concerned the most important components are

- IC Engine
- DC Motor
- Centrifugal clutch
- Free Wheel
- Solenoid Switch
- Alternator
- Crank pulley
- Axle Sprocket

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- Battery
- Rear Axle
- Driving Sprocket

All the above components are incorporated and coordinated together to move the vehicle.

IC Engine power train:

We used automatic transmission in the vehicle.

For this a centrifugal clutch is incorporated for this purpose.

The centrifugal clutch is used to alter the gear ratio with acceleration.

Working:

As the IC Engine is cranked, The Crank pulley is rotated.

Another pulley is attached to the crank pulley and it used to connect the ICE to the Alternator through a belt drive.

The alternator is connected to the battery to charge it.

DC Motor power train:

In our project the DC Motor is also used to run the rear axle.

This is done by connecting the DC Motor to the free wheel sprocket through a chain drive.

The Motor acquires the power to run from the battery which is being charged by the ICE.

The reason behind using a free wheel sprocket is that there should not be a problem for the drive when switching between power sources.

As the axle we used is a rigid axle and we don't have a differential unit we used a centrifugal clutch for ICE and a free wheel sprocket for the DC Motor.

As a result of this we can freely switch between sources and also can use any source or combine them while driving.

Electric Circuits

We have used many electrical circuits in the fabrication of Duel charged low emission hyper go-cart.

Some of them are:

- Light.
- Horn.
- ON/OFF Switches.
- Solenoid switch.
- Fuse.

These were used for

- Alternator circuit
- DC Motor circuit
- Light and horn circuit

Advantages & Disadvantages

ADVANTAGES

HEVs have several advantages over conventional vehicle:

- Regenerative breaking capability helps minimize energy loss and recover the energy used to slow down or step a vehicle.
- Engines can be sized to accommodate average load, not peak load, which reduces the engine's weight.
- Fuel efficiency is greatly increased (Hybrids consume significantly less fuel than vehicles powered by gasoline alone)
- Emissions are greatly decreased.
- HEVs can reduce dependency on fossil fuels because they can run on alternative fuels.
- Special lightweight materials are used to reduce the overall vehicle weight of HEVs. The HEVs available for sale are very cost competitive with similar conventional vehicles. Any cost premium that may be associated with HEVs of the future can be off-set by overall fuel savings and possible incentives.

DISADVANTAGES

- The design of a HEV is complex.
- Initial cost is high.
- Need efficient and cautious driving standards.

CONCLUSION

Through this project we are able to fabricate a Hybrid

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Electric Vehicle modal know as the DUEL CHARGED LOW EMISSION HYPER GO-CART which can be run on both petrol and electricity successfully and efficiently. We were able to run the fabricated vehicle on ICE, DC Motor separately and also simultaneously. The testing of the vehicle is done and the respective results are noted.

Finally, we as a team tried to popularise the concept of hybrid technology which is very advantageous and which also helps in conserving the fossil fuels which are being discriminated in the present day. We also

wanted to decrease the exhaust emissions as far as possible thus helping in protecting the environment from further damage.

In our fabrication of THE DUEL CHARGED LOW EMISSION HYPER GO-CART as the name itself says its duel charged with low emissions, we are successful in demonstrating them.

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