Hybrid Two Wheeler for Handicpped Person

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Abstract: *In today's world, transportation has become one of the prime requirements of people for moving self or goods from one place to another. We have even come across people travelling for more than 200 km every day for reaching their work place. Mobility has thus become an essential part of our lives with many development and improvements happening in this field. Because of the changing lifestyle of today's world, there is a huge reduction in the level of interactions within the people group. In these conditions it becomes more difficult for physically challenged people to commute and to perform their day to day activities like working, education, shopping etc. as they have to constantly depend on others for getting assistance to alight and board the vehicle. In this project. Our project deals with the design and the fabrication of "HYBRID TWO WHEELER FOR HANDICAPED PERSON". This project will be very ion in form of a user friendly three wheeler vehicle, which allows physically challenged people to commute on their own and perform their activities without anyone's assistance, has been proposed.*

I. INTRODUCTION

In human life transportation is playing very important role from ancient time, due to transportation and communication facilities we say that, world is coming closer and closer. Day by day new vehicles with variety of models are coming into market, at this time when the fuel prices are rocketing sky high the daily running cost of a vehicle and its cost of ownership are hitting the roof and there is a dire need to protect our environment, alternative means of transport are few. Electric vehicles are slow and expensive with limited range and hydrogen powered cars are decade away. The solution comes in the form of HYBRID VEHICLES, which in layman term refers to an automobile that runs A COMBINATION OF GASOLINE ENGINE AND AN ELECTRIC MOTOR.

The vehicle manufacturers fight the hike in fuel prices by banking on alternate fuel technologies like CNG and LPG, though this technology offers much lower running costs, has been accepted by the market very well, they involve huge cost of customization and also has adverse effects on the engine. A hybrid vehicle uses multiple propulsion systems to provide motive power. The most common type of hybrid vehicle is the gasoline-electric hybrid vehicles, which use gasoline (petrol) and electric batteries for the energy used to power internal combustion engines (ICEs) and electric motors. These motors are usually relatively small and would be considered "underpowered" by themselves, but they can provide a normal driving experience when used in during acceleration and other maneuvers that require greater power.

So we are introducing an electric hybrid handicapped two wheeler could be an ideal option for the disabled people who use a two wheeler for daily commute as these vehicles will bring down the running costs by a considerable amount and the eco-friendly too without the disadvantage of having limited range on full charge.. Normal person i.e. person without any disability can avail this vehicles easily. But in our society the number of disabled persons is also considerable, some of them born with disability, some get disabled due to accidents (road, workplace, natural calamities, etc.), large number of persons get disabled due to war activities and due to many other factors. Depending upon the severity of disability, the disabled persons can use the transportation facilities; persons with lesser disability can use the facilities as it is for normal persons, some persons are able to use the vehicles with little bit modifications like retrofitted bikes and cars. There are some utilities like wheelchairs, tricycles which are used by the disabled persons. In some cases the disability is so severe that person can't move from one place to other place without help. The persons with hand and leg disability are able to travel but they are unable to use the vehicles for normal persons as it is. So the vehicles are modified (customized vehicles) to make them accessible to the disabled persons. And also we are providing a reverse motiom of the vehicle, due to the opposite rotation of the hub motor .

II. LITERATURE SURVEY

A. Hybrid Technology

A hybrid electric vehicle (HEV) has two types of energy storage units, electricity and fuel. Electricity means that a battery (sometimes assisted by ultracaps) is used to store the energy, and that an electromotor (from now on called motor) will be used as traction motor.Fuel means that a tank is required, and that an Internal Combustion Engine (ICE, from now on called engine) is used to generate mechanical

power, or that a fuel cell will be used to convert fuel to electrical energy. In the latter case, traction will be performed by the electromotor only. In the first case, the vehicle will have both an engine and a motor.

Depending on the drive train structure (how motor and engine are connected), we can distinguish between parallel, series or combined HEVs. This will be explained in paragraph 1. Depending on the share of the electromotor to the traction power, we can distinguish between mild or micro hybrid (start-stop systems), power assist hybrid, full hybrid and plug-in hybrid. This will be explained in paragraph 2. Depending on the nature of the non-electric energy source, we can distinguish between combustion (ICE), fuel cell, hydraulic or pneumatic power, and human power. In the first case, the ICE is a spark ignition engines (gasoline) or compression ignition direct injection (diesel) engine. In the first two cases, the energy conversion unit may be powered by gasoline, methanol, compressed natural gas, hydrogen, or other alternative fuels. Motors are the "work horses" of Hybrid Electric Vehicle drive systems. The electric traction motor drives the wheels of the vehicle. Unlike a traditional vehicle, where the engine must "ramp up" before full torque can be provided, an electric motor provides full torque at low speeds. The motor also has low noise and high efficiency. Other characteristics include excellent "off the line" acceleration, good drive control, good fault tolerance and flexibility in relation to voltage fluctuations.

The front-running motor technologies for HEV applications include PMSM (permanent magnet synchronous motor), BLDC (brushless DC motor), SRM (switched reluctance motor) and AC induction motor. A main advantage of an electromotor is the possibility to function as generator. In all HEV systems, mechanical braking energy is regenerated .max. operational braking torque is less than the maximum traction torque; there is always a mechanical braking system integrated in a car. The battery pack in a HEV has a much higher voltage than the SIL automotive 12 Volts battery, in order to reduce the currents and the I2R losses. Accessories such as power steering and air conditioning are powered by electric motors instead of being attached to the combustion engine. This allows efficiency gains as the accessories can run at a constant speed or can be switched off, regardless of how fast the combustion engine is running. Especially in long haul trucks, electrical power steering saves a lot of energy.

1) Types by drivetrain structure

(a)Series hybrid

In a series hybrid system, the combustion engine drives an electric generator (usually a three-phase alternator plus rectifier) instead of directly driving the wheels. The electric motor is the only means of providing power to the wheels. The generator both charges a battery and powers an electric motor that moves the vehicle. When large amounts of power are required, the motor draws electricity from both the batteries and the generator. Series hybrid configurations already exist a long time: diesel-electric locomotives, hydraulic earth moving machines, diesel-electric power groups, loaders. Structure of a series hybrid vehicle (below with flywheel or ultracaps as peak power unit)Series hybrids can be assisted by ultracaps (or a flywheel: KERS=Kinetic Energy Recuperation System), which can improve the efficiency by minimizing the losses in the battery. They deliver peak energy during acceleration and take regenerative energy during braking. Therefore, the ulracaps are kept charged at low speed and almost empty at top speed. Deep cycling of the battery is reduced, the stress factor of the battery is lowered.

A complex transmission between motor and wheel is not needed, as electric motors are efficient over awide speed range. If the motors are attached to the vehicle body, flexible couplings are required. Some vehicle designs have separate electric motors for each wheel. Motor integration into the wheels has the disadvantage that the unsprung mass increases, decreasing ride performance. Advantages of individual wheel motors include simplified traction control (no conventional mechanical transmission elements such as gearbox, transmission shafts, differential), all wheel drive, and allowing lower floors, which is useful for buses. Some 8x8 all-wheel drive military vehicles use individual wheel motors. A fuel cell hybrid electric always has a series configuration: the engine-generator combination is replaced by a fuel cell.

Weaknesses of series hybrid vehicles: The ICE, the generator and the electric motor are dimensioned to handle the full power of the vehicle. Therefore, the total weight, cost and size of the powertrain can be excessive. The power from the combustion engine has to run through both the generator and electric motor. During long-distance highway driving, the total efficiency is inferior to a conventional transmission, due to the several energy conversions.

Advantages of series hybrid vehicles: There is no mechanical link between the combustion engine and the wheels. The engine-generator group can be located everywhere. There are no conventional mechanical transmission elements (gearbox, transmission shafts). Separate electric wheel motors can be implemented easily. The combustion engine can operate in a narrow rpm range (its most efficient range), even as the car changes speed. Series hybrids

are relatively the most efficient during stop-and-go city driving.
Example of SHEV: Renault Kangoo.

(b).Parallel hybrid

Parallel hybrid systems have both an internal combustion engine (ICE) and an electric motor in parallel connected to a mechanical transmission. Most designs combine a large electrical generator and a motor into one unit, often located between the combustion engine and the transmission, replacing both the conventional starter motor and the alternator (see figures above). The battery can be recharged during regenerative breaking, and during cruising (when the ICE power is higher than the required power for propulsion). As there is a fixed mechanical link between the wheels and the motor (no clutch), the battery cannot be charged when the car isn't moving.

When the vehicle is using electrical traction power only, or during brake while regenerating energy, the ICE is not running (it is disconnected by a clutch) or is not powered (it rotates in an The parallel configuration supports diverse operating modes.

Some typical modes for a parallel hybrid configuration

PE = Power electronics

TX = Transmission

(a) electric power only: Up to speeds of usually 40 km/h, the electric motor works with only the

energy of the batteries, which are not recharged by the ICE. This is the usual way of operating around

the city, as well as in reverse gear, since during reverse gear the speed is limited.

(b) ICE + electric power: if more energy is needed (during acceleration or at high speed), the electric motor starts working in parallel to the heat engine, achieving greater power

(c) ICE + battery charging: if less power is required, excess of energy is used to charge the batteries. Operating the engine at higher torque than necessary, it runs at a higher efficiency.

(d) regenerative breaking: While braking or decelerating, the electric motor takes profit of the kinetic energy of the he moving vehicle to act as a generator.

Sometimes, an extra generator is used: then the batteries can be recharged when the vehicle is not driving, the ICE operates disconnected from the transmission. But this system gives an increased weight and price to the HEV.A parallel HEV can have an extra generator for the battery (left) Without generator, the motor will charge the battery (right)

Weaknesses of parallel hybrid vehicles: Rather complicated system. The ICE doesn't operate in a narrow or constant RPM range, thus efficiency drops at low rotation speed. As the ICE is not decoupled from the wheels, the battery cannot be charged at standstill. Advantages of parallel hybrid vehicles: Total efficiency is higher during cruising and long-distance highway driving. Large flexibility to switch between electric and ICE power Compared to series hybrids, the electromotor can be designed less powerful than the ICE, as it is assisting traction. Only one electrical motor/generator is required.

Example of PHEV: Honda Civic.

(c).Combined Hybrid

Combined hybrid systems have features of both series and parallel hybrids. There is a double connection between the engine and the drive axle: mechanical and electrical. This split power path allows interconnecting mechanical and electrical power, at some cost in complexity.Power-split devices are incorporated in the powertrain. The power to the wheels can be either mechanical or electrical or both. This is also the case in parallel hybrids. But the main principle behind the combined system is the decoupling of the power supplied by the engine from the power demanded by the driver.

In a conventional vehicle, a larger engine is used to provide acceleration from standstill than one needed for steady speed cruising. This is because a combustion engine's torque is minimal at lower RPMs, as the engine is its own air pump. On the other hand, an electric motor exhibits maximum torque at stall and is well suited to complement the engine's torque deficiency at low RPMs. In a combined hybrid, a smaller, less flexible, and highly efficient engine can be used. It is often a variation of the conventional Otto cycle, such as the Miller or Atkinson cycle. This contributes significantly to the higher overall efficiency of the vehicle, with regenerative braking playing a much smaller role.

At lower speeds, this system operates as a series HEV, while at high speeds, where the series powertrain is less efficient, the engine takes over. This system is more expensive than a pure parallel system as it needs an extra generator, a mechanical split power system and more computing power to control the dual system.

B. Analysis Of Wheel Hub Motor Drive Application In Electric Vehicles

Compared with conventional vehicles, electric vehicles have the advantages of high efficiency of energy conversion,low noise, zero emission, etc., and the load-carrying property and wide range speed control characteristics of motors can remove the mechanical devices such as clutch and gearbox, simplifying the structure and facilitating maintenance [1, 2].Driven by the dual pressures of energy and environment nowadays, the world's major automobile producing countries are developing electric vehicle industry with unprecedented efforts. Electric vehicles are creating a new pattern of the automobile industry, which will sure lead the main direction of the automobile industry development.

As the core component of an electric vehicle, the quality of driving motor has a great influence on the power, economical efficiency and safety of the electric vehicle. However, different from other industrial motors, the motor drive system of vehicle drive motor is not only affected by the size of vehicle structure, but shall also meet the operating conditions under complex conditions [3-6]. Therefore, in addition to the requirements of high efficiency, low mass, high power density, small size, good reliability and low cost of the drive motor, it shall also adapt to the frequent start, stop, climbing, acceleration and deceleration conditions of vehicles, which require a wide range of speed and high overload factor of automotive drive motor in order to meet the performance requirements of high torque under low speed or climbing or low torque under high speed [7, 8].

1) Drive Mode

According to the different installation locations of drive motor in electric vehicles, there are single-motor centralized drive and multi-motor distributed drive modes. Distributed drive is further divided into wheel side motor drive and wheel hub motor drive.

(a) .Centralized drive

Centralized drive is close to the conventional vehicle structure, in which the internal combustion engine is replaced by a motor, and the motor torque is transmitted to the drive wheel through the power train to drive the vehicle. It can be achieved by making a slight change based on the conventional vehicle structure, which has mature, safe and reliable operation technology, but has the shortcomings of small interior size, heavy mass, low transmission efficiency and complex control. There are 3 transmission modes of centralized drive, . a shows the transmission mode with a clutch, the transmission of pure electric vehicle generally has 2-3 gear shifts, the clutch plays the role of breaking off power and reducing shift shock while shifting. Fig. 1b eliminates the clutch and connects the motor to the fixed speed ratio reducer via the transmission shaft, reducing the power train mass and the transmission volume, thus increasing the space inside the vehicle. Fig. 1c integrates the motor, reducer and differential, drives the corresponding side wheel through the left and right axle shafts, respectively, and is compact in layout, mainly for small cars.

(b).Distributed drive

Distributed drive transmits power to the corresponding wheel by integrating multiple motors in the vicinity of the wheel or rim, greatly shortening the transmission chain. According to the motor position and different transmission, it can be divided into wheel side motor drive and wheel hub motor drive.

(c)Wheel side motor drive

Wheel side motor drive installs the drive motor on the side of the drive wheel of the sub frame, and drives the corresponding side wheel with or without the reducer. The drive mode with a reducer connects the motor to the fixed speed ratio reducer and drives the corresponding side wheel through the axle shaft. As shown in Figure 2 [9,10], the two motors can drive the corresponding side wheel separately through the corresponding side reducer. The motor speed can be controlled independently, and the speed differential on the left and right axle shafts can be realized by an electronic differential.

The vehicle transmission chain and transmission space of wheel side motor drive are further reduced, making the mechanical structure of the chassis simple, reducing the vehicle mass, achieving more reasonable layout, and improving the transmission efficiency. Audi R8e-tron pure electric sports car is driven by four asynchronous motors, with 100 km acceleration of only 4.8s.

(d)Wheel hub motor drive

Wheel hub motor drive is the most advanced electric vehicle driving technology, which installs two, four or more motors in the wheel, direct driving wheels, commonly known as electric wheels, which is especially suitable for pure electric vehicles

III. METHODOLOGY

A. Selection of hybrid:

Series hybrid is suitable, the single electric motor and the internal combustion engine are installed such that they can power the vehicle either by electric source or gasoline engine as controlled by the driver. Most commonly the internal combustion engine, the electric motor and gear box are coupled by

automatically controlled clutches. For electric driving the clutch between the internal combustion engine is open while the clutch to the gear box is engaged.

B. *.Selection of Two Wheeler:*

The frame geometry of the two wheeler has to be modified accordingly to suit the hybrid two wheeler hence 110cc scooter is being selected .

C. Selection of Motor:

Typical brushless DC motors use a rotating permanent magnet in the rotor, and stationary electrical current/coil magnets on the motor housing for the rotor, but the symmetrical opposite is also possible. A motor controller converts DC to AC. This design is simpler than that of brushed motors because it eliminates the complication of transferring power from outside the motor to the spinning rotor.

IV. SERIES HYBRID TECHNOLOGY

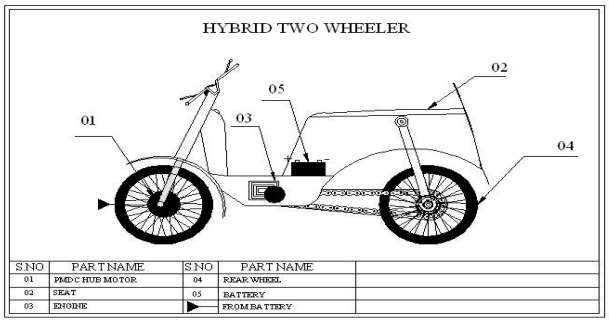
Hybrid Technology uses two sources of power to propel the vehicle forward instead of one. Generally an electric motor is used to drive the vehicle at low speeds. The advantage of the motor is its higher efficiency at low speeds compared to the engine running at the same speed. Hybrid Technology has become highly successful in cars, improving the efficiency and reducing the pollution. In our project we are implementing the same hybrid technology on two wheelers. The alternative power source is a DC motor. Since the motor used is a series wound motor it provides high torque at low speed, thus ensuring high efficiency in stop and go traffic frequently encountered in urban areas. The IC engine has its maximum efficiency in the speed range of 40-60 KMPH so it is used in the normal cruising speed.

For this, we will modify a scooter and install a hub motor to enable it to power the front wheel. Separate speed control is designed for the motor and built under the conventional accelerator of the vehicle. The motor is powered by a battery pack which can be charged during the running of the vehicle during gasoline engine drive. switching from electric to engine drive is facilitated by a manual switch provided.

This design is ideal for urban traffic condition, where 20 -30% of the fuel is wasted in idling. Since the driver can uses the battery power when required thus, wasted power can be saved. This further cuts down on the pollution.

V. COMPONENTS OF HYBRID TWO WHEELER

Hybrid Electric Vehicle uses battery as one of its power source for vehicle motion during at low power conditions. Batteries are devices that consist of electrochemical cells and provide electrical energy converted from stored chemical energy [5]. Generally batteries are of two types: primary batteries that are disposable and secondary batteries that are rechargeable. Secondary batteries are preferred for vehicles as they can be rechargeable



S.NO	PART NAME	S.NO	PART NAME
01	PMDC HUB MOTOR	04	REAR WHEEL
02	SEAT	05	BATTERY
03	ENGINE	▶	FROM BATTERY

Figure. 5.1 Diagram of hybrid two wheele

There are major rechargeable batteries available today. They are as follows: lead-acid (Pb acid), nickel-cadmium (Ni Cd), nickel-metal hydride (NiMH), lithium-ion (Li-ion), lithium polymer (Li-poly), zinc-airThe major parts that are effectively employed in the design and the fabrication of the vehicle for disabled person are described below:

- Engine,
- Bearing ,
- Battery,
- Brushless DC Motor,
- Sprocket and chain drive,

A. Engine

A four-stroke cycle engine is an internal combustion engine that utilizes four distinct piston strokes (intake, compression, power, and exhaust) to complete one operating cycle. The piston make two complete passes in the cylinder to complete one operating cycle. An operating cycle requires two revolutions (720°) of the crankshaft. The four-stroke cycle engine is the most common type of small engine.

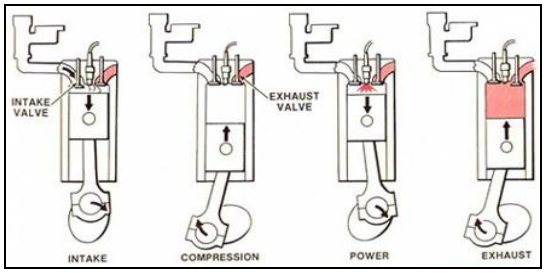


Figure 6.1 : Four strokes of an engine

A four-stroke cycle engine completes five Strokes in one operating cycle, including intake, compression, ignition, power, and exhaust Strokes.

B. Bearing

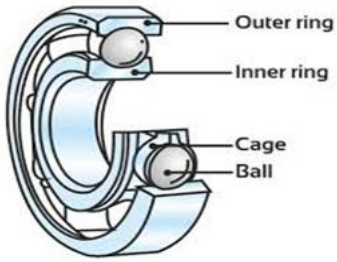


Figure .6.2 Diagram of ball bearing

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

C. Battery

Figure 5.3: 12V Lead Acid Battery

We use lead acid battery for storing the electrical energy from the solar panel for lighting the street and so about the lead acid cells are explained below .Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulfuric acid (H_2SO_4). In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 2.1V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery.

D. Brushless Direct Current Hub Motor

Figure 5.4: BLDC HUB Motor

In order to make the operation more reliable, more efficient, and less noisy the recent trend has been to use brushless D.C (BLDC) motors. They are also lighter compared to brushed motors with the same power output. This article gives an illustrative introduction on the working of BLDC motors.

BLDC motors are used in most of the modern devices. Efficiency of a BLDC motor is typically around 85-90%, whereas the conventional brushed motors are only 75-80% efficient. BLDC motors are also suitable for high speed applications (10000 rpm or above). The BLDC motors are also well known for their better speed control.

VI. EXPERIMENTATION

Here the hub motor runs with the help of battery power. The motor is fixed in the front wheel of the vehicle and it is controlled by manual switching . The hub motor is steadily emerging as the standard drive method just like e-bikes. With a hub motor conversion, there is no need for external mounting brackets and drive chains to support a motor and transmission. The motor is exactly fixed as in the center axis of the wheel hub. Now the vehicle rim starts to spin which leads to the rotation of the wheel. The electric power supply is charged to the battery while running with the gasoline engine. Here some

losses may be occurred due to mechanical friction. Here the model also has the fuel drive which is coupled with the back wheel of the vehicle as shown as in the vehicle.

Figure 6: Assembled Model

The project discloses a hybrid system consisting of an Electric and Internal Combustion(IC) based power drives. The front wheel is being propelled by battery and the rear wheel is powered by gasoline, i.e, it includes a single cylinder, air cooled internal combustion engine and a DC motor based electric power drive used for hybrid powering of the vehicle. The vehicle is designed to implement the switching between IC Engine and Electric motor depending on the driving areas and load conditions.

VII. ADVANTAGES

1. Quite simple
2. Readily available
3. Compact
4. Easy maintenances
5. Reduces pollution
6. Energy efficient
7. Reverse motion provision.

VIII. CONCLUSION AND FUTURE SCOPE

In this modern world where we are facing a great crisis in the energy resources , this project HYBRID TWO WHEELER can reduce the fuel consumption rate and there by reduce for energy crisis. Since motor drive does not creates any exhaust emission ,HYBRID TWO WHEELER plays a great role in reducing environmental pollutions.

Reverse motion arrangement in scooter with the help of hub motor can aid driving for handicapped person.

Future scope of this project is that by introducing this HYBRID TWO WHEELER we greatly reduce the usage of non renewable energy resources and save for the future purpose.

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