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Pollution control and fuel saving Electro-Mechanical bike

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I. Abstract:

The Electric Bike System is a systems project that incorporates three different parts like 12-volt battery, alternator, DC motor. DC motor which is used to power an electric hub motor runs a bike and gasoline motor is used to drive conventionally. The purpose of the project is to show that it is possible and relatively simple, to build an electro-mechanical bikes which reduces containments of hazardous gases in the environments and drive the bikes in varying load conditions. This project can be divided into segments i.e. first one is gasoline drive and other is an electrical drive: the lithium-ion battery, the alternator, the motor, and the motor controller and gasoline engine. Each of these will be built upon and improved further by future students, one category at a time. The hope is that this design can become very efficient, cost-effective to increasing congenital fuel prices, and one day mass-produced, especially in developing countries where automotive transportation is an impossibility.

Keywords: Motorcycle, Alternator, Battery, DC Motor, Speed, Weight, Torque, Free Wheel.

II.Introduction:

When thinking of possible senior projects, we all decided that we wanted to do something that would somehow be beneficial to the planet and save money of increasing prices. Therefore, decided that the electro-mechanical bikes would be the best fit. The electro-mechanical bike offers a cleaner alternative to travel short, moderate and long distances travel without being charging a battery and filling of fuel in the tank rather than driving a gasoline-powered bikes. In recent years, the United States has increasingly encouraged a cleaner environment and less dependence on foreign oil. The price of crude oil has increased significantly over the past few years and there seems to be no turning back. The environment has also been more of a focus throughout the world in the past few years, and it seems that cleaner alternatives have been steadily on the rise with no end in sight. The electro-mechanical bike is a project that can promote both cleaner technology as well as a lesser dependence on oil. It will run on clean electric power as well as gasoline power as per the varying load requirements with the ability to recharge the battery through by generating power through the gasoline engine which drives an alternator which interns charge them. This bike can drive in city road with an electrical drive system where driving load is moderate and controlling of pollution is major duty in cities like Delhi. It also can be useful when driving in Intercity where vehicle can bear varying load condition with gasoline engine which charge the battery of the system to drive the electrical system efficiently. An extra benefit to building the electro-mechanical bikes is that it can also show the general public how much cost-effective it would be to convert their regular bikes into an electro-mechanical bikes rather than driving

solely in their gasoline powered vehicles. The greater importance of the environment in the world leads to an opportunity for students in our position. With the economy trying to get out of one of the worst depressions of the century, there are numerous opportunities for us to help\out. This is our opportunity to contribute a greener and more efficient planet.

III.WORKING OF ELECTRO-MECHANICAL BIKE WITH ACCESSORIES:

The electro-mechanical bike is basically works on two principles i.e. newton's third law of motion, faradays law of electromagnetic induction and law of thermodynamics.

Electric bikes pedal and handle just like a regular bicycle. By and large, an electric bike will use the same parts too. The electric component is meant to augment human power, not completely replace it. It makes obstacles like hills and headwind more manageable and allows you to travel further without getting as tired.

See our diagram for a more detailed look at how electric bikes work including the motor, battery, drivetrain, and charging process:

Fig.1 Freewheel

1. Motors:

Electric bike motors come in a wide variety of power ratings, from 200W to 1,000W or more. The legal limit in the US is 750W, although different countries can set their own limits.

Think of this limit kind of like horsepower. A higher rating means that the bike will be able to pull more weight with greater ease – but at theexpense of using more batterycapacity while doing so. Consequently, a 750W motor will drain the battery much quicker than a250W one, but it will be more powerful.One more factor needs to be considered, however. The design and location of the motor plays an important role in how electric bikes work.

The most common type of motor for electric bikes is called a hub motor. It is generally integrated into the rear or front wheel. When engaged, it pulls or pushes the wheel along. Although this system works well, it has one key disadvantage. Since it is not connected to the bike's gears, it loses efficiency on hills and varied terrain. Imagine driving a vehicle in just one gear the entire day. It will get you places, but it won't give you the optimum amount of torque or speed that you get with a full gear range. Therefore, in that situation we can switch motor power to gasoline power to deals with higher range of torque and speed.

Fig.2 Rear Hub Motor

2.Battery:

The project revolves around supplying and utilizing energy within a high voltage battery. It demands for a battery with longer running hours, lighter weight with respect to its high output voltage and higher energy density. Among all the existing rechargeable battery systems, the lithium ion cell technology is the most efficient and practical choice for the desired application. The battery required for this project was a high capacity lithium ion battery pack designed specifically for electric bikes by Golden Motor Technology Co Ltd. Aluminium casing is provided to house the internal components of the battery yet remains at a reasonable weight below 12.12 pounds. The battery is rated is at 48V, 12AH. A maximum electrical output results at an approximate constant speed of 50km/h (31mph). The amount of charging cycles of the battery is greater than 800. Fig.7.Lithium Ion Battery Lithium ion batteries are one of the most popular

types of battery for portable electronics. Although slightly lower in energy density than lithium metal, lithium-ion is safe, provided certain precautions are met when charging and discharging. With its many advantages over other conventional types of batteries, the lithium ion battery were the optimum choice for an electric powered bike is used which in terns drive both the system. It is supply power to the electrical drive during the optimum load requirement in cities and charged during gasoline operation in hilly roads. In that way we do not need to remove battery for the charging.

3.Controller:

The controller lets you operate the electric assistance on your electric bike and is an important part in how electric bikes work. The controller can be located on the dash board for ease of use. There are two main styles of controllers – pedal-activated and throttle-based controllers.

Fig.3 Motor Controller

In our system we need to use Throttle-based controllers which work with a simple throttle mechanism. The throttle will either be a twist-grip type or a thumb-press type. With a throttle, you simply pull back or press the throttle to receive the electric assistance

By and large, electric bikes are simple to use, ride, and maintain. Overall, they require little maintenance beyond that which a standard bike requires.

4.Charging system:

The charging system consists of three main components: the battery, alternator, and the regulator/rectifier. Your motorcycle battery stores electrical energy for use and acts as a buffer for the bike's electrical system. The alternator creates alternating currents to run the bike and charge the battery. The regulator/rectifier changes, or rectifies, the alternating current produced by the alternator into direct current so it can be stored in the battery and regulates the amount of current produced to prevent overcharging.

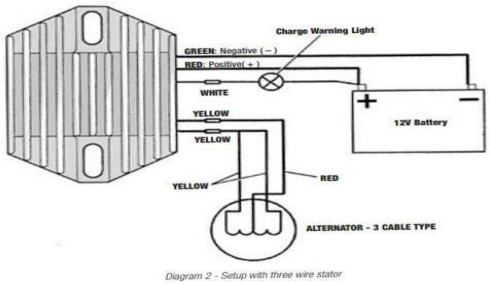

Fig. 4 Battery charging System

The electrical drive is to be driven by DC motors that were configured to turn a hub assembly. On the drum shaft the sprocket is coupled to transmit rotary motion between two shafts.

It was settled that the best solution in driving the bike is with an electric DC motor; thus, creating an electric bike. In the DC motor, a static field flux is induced using permanent magnets or a stator field winding. Located on the rotor of the DC motor is the armature winding. The armature winding is the series of conducting coils, each connected in segments of a commentator that are wound around the iron core in which voltage is induced. This causes it to rotate within a magnetic field; if the wires are broken or damaged, the armature will not rotate properly. For the DC motor to generate any torque, the coils of the armature must be connected to an external DC circuit with an even number of brush heads. Figure shows a circuit model of a DC motor. Theapplication of DC motors has increased dramatically. As technology advances, new and improved designs of the DC motor will be implemented. Brushless DC (BLDC) motors are the primary choice for a wide variety of applications. The BLDC motor system is emerging as one of the most useful drive options for a wide range of applications ranging from small, low power fans and disc drives, through medium size domestic appliance motors and up to larger industrial and aviation robotic and servo drives. When comparing a typical DC motor to an AC motor, the fundamental advantage is the ease with which the motor can be controlled to give varying speeds, direction, and even regenerative breaking. The main drawback to the DC motor is that the carbon brushes of a conventional DC motor wear down and create a great amount of dust. This in-turn requires a great amount of maintenance and lead to the overall replacement of the motor

itself. Another major problem that conventional DC motors have is their high level of radio frequency interference (RFI). The RFI generated by the brush gears can be of major concern to communications between certain aspects of a DC motor application and may cause failure. Thus, the brushless DC motor was developed to have the same advantages of a conventional DC motor, without the problems and disadvantages caused by the brushes. The main advantages and characteristics of a BLDC motor compared to a conventional DC motor include:

- Longer life and higher reliability
- Higher efficiency
- Ability to operate at various speeds, including high speed applications
- Construction of motor rigid
- Rotor has permanent magnet
- Low Cost to manufacture
- Simple, low-cost design for fixed-speed applications
- Clean, Fast and Efficient
- Complex control for variable speed and torque.

Feature scope and modification

The available feature scopes are as:

1. The bikeshall require high torque DC motor with variation of load and speed.
2. Advancecharging system to eliminate the gasoline engine.
3. Additional power source such solar system can be used for charging of battery.
4. Micro controller can be used for changing the mode of operation directly.

Fig.5 Electrical bike without engine mounting

IV.ADVANTAGES: -

1) Separately use of bike with required mode.
2) Cost-effective with respect to increasing rate of fuel.
3) Environmental Eco-friendly.
4) Less effort.
5) Can be used various range of DC motor.
6) Can be operate both the system with one unit of battery without removal of battery
5) Can be use electrical drive in the city roads to control air pollution.
6) It can be used as an optional drive when one of system is fails.

V.LIMITATION: -

1) Less speed with electrical drive hence required high torque motor.
2) Two generative systems are increasing initial cost.
3) Maintenance cost high.

VI CONCLUSION: -

The main purpose of this idea is to control the air pollutions in the city like Delhi and other populated cities and provide fuel economy to the lower and medium economy peoples who use drive bike for various purposes. The major challenge remaining is creating the set of software that the microcontroller can use to control the system given all the feedback systems that communicate with it. In conclusion, it is required designed a electromechanical bike with a minimal amount of additional weight, an integrated control system, based on the decision-making of the rider and microcontroller, and that is capable of greater efficiency than conventional bikes through its use of regenerative motor control and various other feedback control mechanisms.

REFERENCES

1 S.Matey, A. Prabhu, “Design and Fabrication of Electric Bike” International Journal of Mechanical Engineering and Technology- Vol. 8 Issue 3- March 2017.

2.C.D. Ajudiya,M. M. Trivedi, “Design and Development of EBike –A Review” Iconic Research and Engineering journalsVol.1 Issue 5- Nov 2017

3.K. Schleinitz, T. Petzoldt, L. FrankeBartholdt, J. Krems, T. Gehlert, “The German Naturalistic Cycling Study – Comparing cycling speed of riders of different e-bikes and conventional bicycles”, ScienceDirectElsevier July- 2015

4.Ajinkya Parab, Ankit Kamath, SatwantSingh Rajpurohit, Zeeshan Mulla, Urban Electric Bike, IJSRD - International

Journal for Scientific Research & Development| Vol. 3, Issue 02, 2015 ISSN (online): 2321-0613

5. Chetan Mahadik, Sumit Mahindrakar, Prof. Jayshree Deka, "An Improved & Efficient Electric Bicycle System with The Power of Real-time Information Sharing, Multidisciplinary Journal of Research in Engineering and Technology", www.mjret.in, ISSN:2348-6953, M15-1-2-7-2014

6.Rahul Sindhwani, Punj L. Singh, Anjum Badar, Ankur Rathi,"Design Of Electric Bike With Higher Efficiency", International Journal of Advance Research and Innovation Volume 2, Issue 1 (2014) 247-251 ISSN 2347 - 3258

7.M. Reddi Sankar, T. Pushpaveni, V. Bhanu Prakash Reddy, Design and Development of Solar Assisted Bicycle, International Journal of Scientific and Research Publications, Volume 3, Issue 3, March 2013 ISSN 2250-3153