

# FABRICATION OF E-BIKE WITH REGENERATIVE BRAKING SYSTEM

KUMARESAN.N<sup>1</sup>, BHARATHKUMAR.M<sup>2</sup>, PRAVEEN.M<sup>3</sup>, RAMACHANDRAN.S<sup>4</sup>

<sup>1</sup>Assistant Professor, Dept. of Automobile Engineering, SNS College of Technology, Coimbatore, Tamil Nadu, India.

<sup>2,3,4</sup>UG Scholars, Dept. of Automobile Engineering, SNS College of Technology, Coimbatore, Tamil Nadu, India.

\*\*\*

**Abstract** - In this system, regenerative braking mechanism reuses the energy created by the braking process and uses this energy to charge the battery for further use. Generally the energy lost in the conventional use is transferred to the generator of the rotating wheel and is given to the battery. This saves an energy. Carbon dioxide is one of the major causes of global warming. Hence, it is important to develop pollution-free and environmentally friendly energy. Using regenerative braking when braking, improves the efficiency of an electric vehicle as it recovers energy that could go to waste if mechanical brakes were used. Regenerative Braking System (RBS) is an efficient system to reduce vehicle emission and fuel consumption. RBS is a system which converts mechanical energy to electrical energy during braking action. It will become an important system for future vehicle. The important components used in RBS will be determined such as electric motor and battery. So our project is to develop a regenerative braking system on E-Bike

the cable is free to release its tension and the ratchet is moved in the opposite direction such that the wheel acquires the speed of the ratchet. Thus the cruise speed control is easily enabled for two wheelers with easily available components.

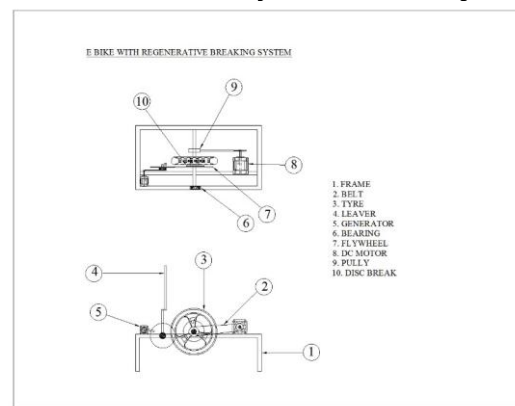


Fig -1: Block diagram

## 1. INTRODUCTION

In this system, regenerative braking mechanism reuses the energy created by the braking process and uses this energy to charge the battery for further use. Generally the energy lost in the conventional use is transferred to the generator of the rotating wheel and is given to the battery.

## 2. BLOCK DIAGRAM

A tightening cable is connected to the handle bar near the accelerator. The handle bar is connected with a ratchet such that when the bar is rotated, the ratchet also rotates. A pawl is mounted near the ratchet such that when the ratchet is rotated, it cannot rotate in the reverse direction since the pawl locks it unless the pawl is released from the ratchet. Hence as high the throttle is given, the more tension is built up in the cable. Hence the cable tends to move in the opposite direction. When the clutch is locked, the pawl gets released from the ratchet. Now

## 3. COMPONENT USED

Table -1: Components used

SL. NO.	NAME OF THE PARTS	MATERIAL
1	Frame	Ms
2	Dc motor	12v
3	Battery	Lead acid
4	Bearing	Steel
5	Generator	12v
6	Belt drive	-
7	Fly wheel	Steel
8	Tyre	-
9	Cycle disc	-

### 3.1 Frame

This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the

bearings properly while assembling. Provisions are made to cover the bearings with grease.

### 3.2 DC MOTOR

An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left hand rule. When a motor is in operation, it develops torque. This torque can produce mechanical rotation. DC motors are also like generators classified into shunt wound or series wound or compound wound motors.



Figure3.2

### 3.3 Battery

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern

### 3.4 BEARINGS

Ball and roller bearings are used widely in instruments and machines in order. This technology was brought to its present state of perfection only after a long period of research and development. The benefits of such specialized

research can be obtained when it is possible to use a standardized bearing of the proper size and type. However, such bearings cannot be used indiscriminately without a careful study of the loads and operating conditions. In addition, the bearing must be provided with adequate mounting, lubrication and sealing. Design engineers have usually two possible sources for obtaining information which they can use to select a bearing for their particular application

### 3.5 BELT DRIVE

A belt is a loop of flexible material used to mechanically link two or more rotating shafts, most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys and the shafts need not be parallel. In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts) or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to continuously carry a load between two points. A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor).

### 3.6 PULLEY

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a cable or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. In nautical contexts, the assembly of wheel, axle and supporting shell is referred to as a "block." A pulley may also be called a sheave or drum and may have a groove between two flanges around its circumference. The drive element of a pulley system can be a rope, cable, belt, or chain that runs over the pulley inside the groove. Hero of Alexandria identified the pulley as one of six simple machines used to lift weights. Pulleys are assembled to form a block and tackle in order to provide mechanical advantage to apply large forces

## 7. CONCLUSION AND RESULT

- A strong multidiscipline team with a good engineering base is necessary for the Development and refinement of advanced computer programming, editing techniques, diagnostic Software, algorithms for the dynamic exchange of informational different levels of hierarchy.
- This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work.
- We are proud that we have completed the work with the limited time successfully. The **"E-BIKE WITH REGENERATIVE BRAKING"** is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality.

## REFERENCES

- 1.Yimin Gao and Mehrdad Ehsani. Electronic Braking System of EV And HEV Integration of Regenerative Braking, Automatic Braking Force Control and ABS. SAE paper 2001
- 2.S. Kliuzovich, "Analysis of control systems for vehicle hybrid powertrains," TRANSPORT VGTU, vol. XXII, no. 2, 2007.
- 3.J. Zhang, X. Lu, J. Xue, and B. Li, "Regenerative braking system for series hybrid electric city bus," The World Electric Vehicle Journal, vol. 2, no. 4, 2008.
4. B. J. Varocky, "Combined control of a regenerative braking and antilock braking system for hybrid electric vehicles," International Journal of AutomotiveTechnology, vol. 9, no. 6, 2011

5.S.J. Clegg A Review of Regenerative Braking Systems. Institute of Transport Studies, University of Leeds, Working Paper 471 2012

6. LOI WEI CHEONG, "A development and use of a regenerative braking model for a parallel hybrid electric vehicle," SAE Technical Paper Series, 2013.

7. Ming-Ji Yang, H.-L. J.-Y.-K. "A Cost-Effective Method of Electric Brake With Energy Regeneration for Electric Vehicles", IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 56, 2203-2212, june 2009.

8. H. Wu, S. Cheng and S. Cui, "A controller of brushless DC motor for electric vehicle", IEEE Trans, vol. 40, no. I, pp. 509- 513, January 2005

9. A. Rufer and P. Barrade, "A supercapacitor-based energy storage system for elevators with soft commutated interface", The 36 IEEE Industry Applications Conference vol.2, pp.1413- 1418, 2001

10. P. J. Grbovic, P. Delarue, P. Le Moigne, and P Bartholomeus, "A bidirectional three-level dc-dc converter for the ultra-capacitor applications", IEEE Trans. Ind. Electron., vol. 57, no. 10, pp. 415-3430, Oct. 2010.

### Authors



N.Kumaresan, Assistant Professor, Dept of Automobile Engineering, SNS College of Technology.



Bharath kumar.M, Pursing B.E Automobile Engineering at SNS College of Technology.



Praveen.M, Pursing B.E Automobile Engineering at SNS College of Technology.



Ramachandran.S, Pursing B.E  
Automobile Engineering at SNS  
College of Technology.