Kinetic Energy Recovery System in Two Wheeler Motorcycle

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Abstract—Due to the soaring prices in fuel and the rise in emissions, there has risen a need for development of new mechanisms that help in overcoming these milestones. New methods have been developed as to control the emissions, increase the fuel economy of vehicles, and also achieve more power from conventional methods by small modifications. One such modification/mechanism is KERS. Kinetic Energy Recovery System (KERS) is a term that implies on the recovery of the kinetic energy of a moving vehicle under braking. This recovered energy is then stored in either a battery or a flywheel for further utilization under acceleration. This system is generally used in Formula-1 race cars where it serves for two purposes. Firstly, the energy stored in the battery/flywheel could be used to boost one’s speed in racing conditions, especially to overtake the opponent at turns. Secondly, since the energy save is purely recovered from the vehicle itself, it can be utilized in the field of “Green Technologies”.

Key words: KERS, Flywheel, Alternator, Transformer, Regenerative Braking, KERS motorcycle

I. INTRODUCTION

KERS is widely being used in Formula-1 race cars and now also has been used by various other supercar manufacturers viz. Porsche, McLaren Mercedes, BMW and Peugeot. KERS has helped car manufacturers to achieve more power from the system itself, saving in the fuel consumption to about 30%. Speed being the basic consideration in supercars and that is met by this conventional method. KERS is already implemented on 4-wheeled vehicles, but its implementation in a 2-wheeled vehicle is yet to be done. We have selected the above topic to be implemented in a two-wheeler motorcycle. The motorcycle that we have selected is a 150cc Bajaj Pulsar to meet our requirements of a motorcycle to test the mechanism on.

II. THEORY AND CONCEPT

A. Definition:

KERS as we know stands for Kinetic Energy Recovery System. We should also know about how the mechanism works and that what are the components used in the mechanism itself. KERS uses the power of the vehicle in motion and stores it in a battery by means of a Flywheel. The Kinetic Energy of the vehicle is converted into Electrical Energy and stored and in turn utilized for further boosting the vehicle for overtaking purpose as in the case of Formula-1 race cars.

B. Application:

KERS has its applications in the following fields

- Motor Sports: Formula-1 race cars for extra boost in speed while taking a turn and overtake one’s opponent. It is approved by the FIA.
- Auto-part Makers: Bosch MotorSport Service is developing a KERS for use in motor racing.
- Car Makers: Peugeot Sport unveiled the Peugeot 908 HY, McLaren Mercedes, Toyota on Supra HV-R hybrid race car, Porsche unveiled a RSR variant of their Porsche 918 concept car at the NAIAS 2011.
- Motorcycles: KTM racing boss Harald Bartol revealed that the factory raced with a secret kinetic energy recovery system fitted to Tommy Koyama's motorcycle during the 2008 season-ending 125cc Valencian Grand Prix

C. Concept of KERS Design:

The design is based on the following considerations:

- Type of vehicle to be used to fit the mechanism.
- Amount of power that could be recovered from the vehicle.
- Accuracy and reliability needed.
- Cost and specifications of components.

D. Objectives:

The objectives of the KERS Mechanism are listed below:

- To gain an extra boost in speed in racing.
To make a greener technology that helps in less emissions and less of pollution.
To increase the efficiency of the vehicle by recovering the energy lost in braking and putting it to proper use.

E. Materials/Components:
- Motorcycle 150cc, Bajaj Pulsar.
- Flywheel (made out of bicycle rim)
- Alternator
- Pedestal bearings
- Shaft

Fig. 3:

Fig. 4:

Fig. 5:

Fig. 6:

Fig. 7:

Fig. 8:

Fig. 9:

III. MECHANISM DETAILS

A. Working:
The mechanism works as under:
1) The energy of the running motorcycle is taken in from the driving shaft and given to the Flywheel. This makes the Flywheel to rotate at a certain velocity corresponding to the driving shaft.
2) The Flywheel is mounted on a one side locking bearing that only moves in one single direction. The shaft on which the Flywheel is mounted is connected to an Alternator that converts this mechanical energy of the Flywheel into Electrical Current that it supplies to the Transformer.
3) The Transformer is next in the line to the Alternator and it converts the AC current produced by the Alternator into a DC current that is suitable for the running of various components of the motorcycle.
4) A circuit consisting of diodes and capacitors is provided between the Transformer and the Battery to regulate the flow of current into the battery and also to prevent the back flow of the current.
5) The electrical energy is stored in the battery and from there; it is supplied to the various components of the motorcycle eg. Head lamps, tail lights, horn, DC geared motor, etc.

6) The DC geared motor is connected to the front wheel of the motorcycle and comes in contact with it to provide the necessary motion when desired.

B. Disadvantages:

One of the main reasons that not all cars used KERS immediately is because it raises the car’s center of gravity, and reduces the amount of ballast that is available to balance the car so that it is more predictable when turning. FIA rules also limit the exploitation of the system.

IV. CONCLUSION

The mechanism is run and tested for its efficiency and success in implementation. There have been many irregularities at first during the making of our project, but we have overcome those obstacles and come up with this final method of recovery of energy from the running motorcycle. The energy recovered is totally from within the motorcycle itself and no extra energy was required to run the system. The testing of the mechanism at various speed and under varying loads have been carried out so as to compare the motorcycle with KERS and the regular one without KERS. We have thus conclude that the energy was recovered from the motorcycle that was a pure regenerative energy and the utilization also was done.

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