

# Kinetic Energy Recovery System

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**Abstract:-** KERS is one of the application of regenerative braking. Regenerative Braking converts some of the waste heat energy produced during braking into more useful form of energy with the help of MGU (Motor Generator Unit). The system stores the energy in a battery (after applying brakes) produced under braking in a reservoir and then releases the stored energy under acceleration. The key purpose of the introduction is to significantly reuse the wasted energy in some application of cars. KERS is introduced to improve fuel efficiency of the engine.

## I. INTRODUCTION

The term KERS stands for Kinetic Energy Recovery System. The device recovers the kinetic energy that is waste heat created by the car’s braking process. It stores that energy and converts it into electrical energy.

### ➤ Electrical KERS

The key challenge faced by this type of KERS system is the lithium ion battery gets hot and therefore an additional

radiator is required in the car. With this system when brake is applied to the car a small portion of energy (for example the rotational force). The main function of the electric motor is to charge the batteries after applying braking and releasing the same energy on acceleration. Then the electric motor converts the kinetic energy into electrical energy that is further stored in the extra placed battery. When the driver demands for the extra amount of energy stored in the battery the energy is provided through the PCU (power control unit).

### ➤ Mechanical KERS

In mechanical KERS the main component used is flywheel. Flywheel is a device which converts the commutation or rotational motion into electrical form. Mostly mechanical KERS or Flywheel based KERS is used in F1 (formula 1 racing cars), the driver does not have the control over the energy that is generated by the flywheel. As soon as the brake pedal is released the energy is deployed also implementation of mechanical KERS is very tedious in the normal cars. And it add more amount of weight to the cars. To avoid all these complications we use electrical KERS.

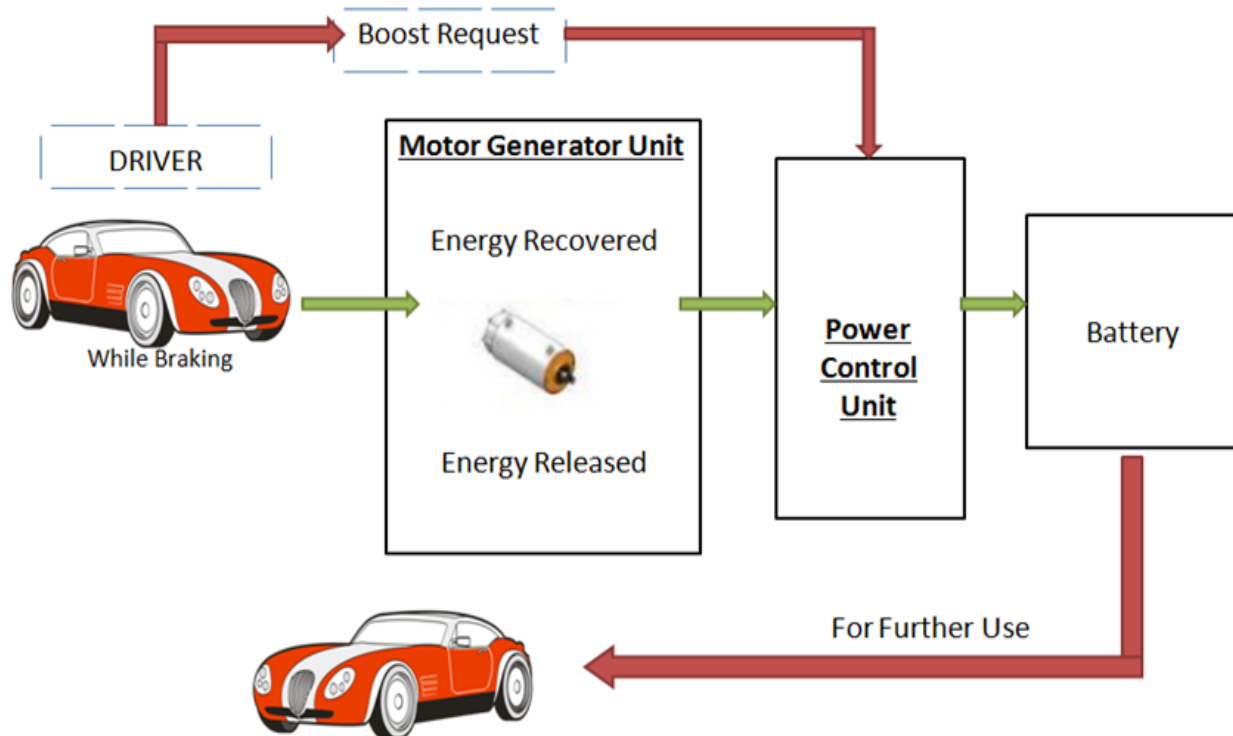


Fig 1:- Block Diagram

## II. HARDWARE REQUIREMENT

### ➤ *Motor Generator Unit (MGU)*

MGU consist of different sets of motors& generators coupled together.

MGU operates in two modes:

- It acts as a motor to increase the speed of the car when power is deployed from the batteries.
- It acts as a generator to convert the Heat energy (Kinetic Energy) energy into Electrical Energy during the braking of the car.

### ➤ *Power Control Unit (PCU)*

It acts as a switch to invert the current from battery to MGU. Managing the battery is a critical issues .Thus the PCU monitors the state of the battery. The main purpose of the PCU is to control the flow of electricity from the battery and to the battery. PCU ensures that whenever the power is required by the driver it is delivered. A switch or a circuit can be used for the PCU which will help to process the electricity easily. When the driver wants the extra amount of energy stored it can be delivered by pressing the switch which will connect the battery supplying the power. And when the driver is not in need of the power the switch will remain open

### ➤ *Batteries*

During braking, the heat energy gets dissipated in the environment. Using KERS we convert the heat energy into the electrical equivalent. These energy is then stored in the battery for further use. The stored energy in the battery can be used in various appliances of cars such as headlights, music system, and AC and also for the battery charging.

- *Lithium Ion Battery*

The energy which is generated by the motor generator unit needs to be stored in an energy storage device. Battery serves this purpose. A lithium ion battery is used in which the energy converted from the kinetic energy is stored. And whenever the energy is required it can be supplied from battery.

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