

REGENERATIVE BRAKING SYSTEM BASED ON HYDRAULIC, MOTOR, AND FLYWHEEL

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Abstract - In this generation of the present situation, energy will be lost is the major challenge for our automotive industries. And in our daily life situation the fossil fuels are depleted at very fast rate. This had produce widespread assumptions that if we use the resources at this rate then it will come time in which there have not so much time that our all resource will expire. So we have required to generate some technique though will saves the energy from getting lost .In case of automobile the RBS has introduce the energy recuperation. When the brakes are applied, a little amount of K.E. is lost in the form of thermal energy as a result of friction b/w brake(pads) and rotor. RBS has regains K.E. during mostly possible when that is wasted during the operation of braking. And it utilizes the energy and release the energy at the time of acceleration. This paper gives the three different methods of conserving energy by electrically and mechanically and hydraulically. The K.E. has to be converted it into E.E. with the help of electric motor and in other method flywheel tackle the K.E.by conversion it into M.E. AND in the other method kinetic energy is to be converted in the form of liquid driven pressure into the high and low pressure accumulator.

Key Words: Regenerative Braking, Hybrid vehicles, K.E recovery system, Flywheel, Electric Motor, Hydraulic Power, battery

1. INTRODUCTION

A braking mechanism is a mechanical framework that hamper movement by engrossing energy from a moving framework. It is utilized for decelerate and halting a moving vehicle, wheel, hub, and to stop its movement, frequently impeccable by methods for friction. The term 'Brake' in a moving vehicle implies the execution of the brakes to diminish its speed or stop its movement, regularly by dispresses a pedal. The slowing down space is the separation between the time the brakes are placed in and the vehicle arrives at a complete stop. In braking mechanisms on an general vehicles, the friction is used to forestall the forward force of a moving vehicle. As the brake cushions rub against the wheels or a saucer that is appended to the axles, unnecessary heat vitality is delivered. This heat vitality filling into the air, abuse as much as 29 % of the vehicle's made force. After some time, this pattern of friction and abuses heat vitality

diminish the vehicle's fuel efficiency. Most extreme vitality from the motor is have to supplant the energy that was lost by brakes down.

A large portion of it essentially happens free as heat and gets unusable. That vitality which could have been use to accomplish work, is for all intents and purposes misused. The arrangement of this kind of an issue is Regenerative Braking System. This is another sort of braking mechanism that can remember a great part of the car's K.E. what's more, change it into E.E. or on the other hand M.E. The vitality made can be store as a M.E. in flywheels, and as, E.E. in the car battery, which can be used once more.

There are 7 various strategies for energy transformation in RBSs including spring, flywheel, electromagnetic and pressure driven. All the more as of late, an electromagnetic-flywheel half breed RBS has come out also. Each sort of RBS uses an alternate energy change or capacity technique, giving differing effectiveness applications for each kind.

2. CONVERSION OF K.E. TO E.E. USING MOTOR

We know that electrical motor is converted the electrical energy to mechanical energy. Electric motor is the key portion of regenerative braking system. When electric stream is salted then electric engine restored work. Similarly when external force is applied in the engine to work, then it behaves like generator and produced power. When motor produced mechanical energy, which energy is used to revive the vehicle. Generator is a inverse process of motor. Generator makes it possible to use the rotation of the driving vehicle to rotate the engines, produce electrical energy by the generator is charged by the battery, in this process force is produced, this force is then used for empowering the battery which is used in the process.

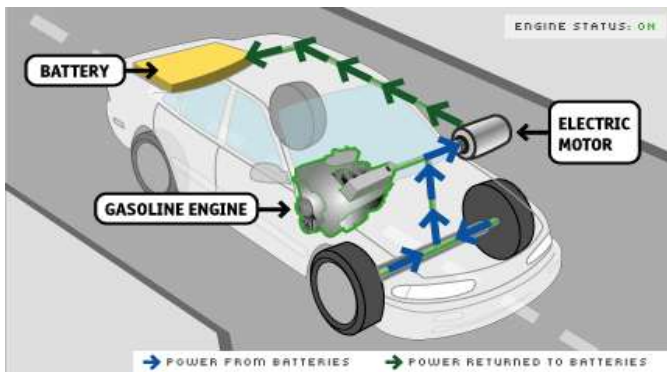


FIG -1: Motor Generator (RBS)

3. FLYWHEEL REGENERATIVE BRAKING SYSTEM

Flywheel is a starting turning mass that stores dynamic energy or the mechanical energy of the wheel in a simple structure. The process of recovering energy is movable qualified. The disasters needed during the process of energy changes are still away from, the fact in which energy is being transmitted in the mechanical frame all through the cycle. When battery is charged, then mechanical energy of system is being changed into electrical energy and in the case of discharging the battery. Electrical energy is being changed over into mechanical energy. The equation of flywheel is given by

$$E = \frac{1}{2} I W^2$$

Where, E= rotational energy of the flywheel

I= moment of inertia of the flywheel

W= angular speed of flywheel

The proportion of energy is avoid by the flywheel depends upon its weight (mass), run and rotational speed. To destroy the energy together and to begin the energy or to begin the energy travel through flywheel, exact power must be opposite.

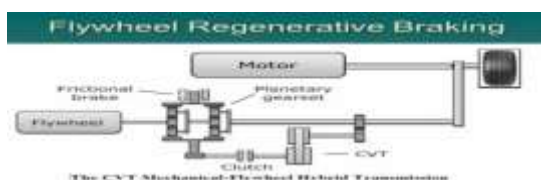


FIG -2: Flywheel RBS

4. HYDRAULIC ASSISTED RBS

The working of the hydraulic assisted regeneration braking system in 3 modes.

1. Regenerative mode
2. Launch mode
3. Recirculation mode

(A). In regenerative braking mode, kinetic energy of wheels is converted into pressure energy using a bio-directional gear motor.

(B). The process of bio directional gear motor is momentary act as a pump, pressurizing the hydraulic fluid gets store in a accumulator, the load on the pump keeps increasing thus resulting into the retardation of object.

(C). In a launch mode, the stored hydraulic energy is converted into kinetic energy. The pressurized fluid in the high pressure accumulator pulls a pressure on the biodirectional gear motor.

(D). AND in the recirculation mode, cleaner and alternatives are used.

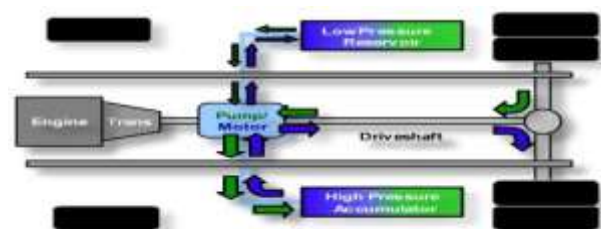


FIG -3: Hydraulic assisted RBS

5. REGENERATIVE BRAKING EFFICIENCY

An IC engine has an efficiency about 15-20% and the efficiency of the gasoline engine only 21 % of energy is converted to the K.E. of the vehicle. It will supposed by the engine efficiency. In we seen in a automotive way then electric motors and vehicles are more and max efficient.

While in an induction motor engine has an efficiency has an range of 70 to 80%(it is for highway driving scenario) PMAC MOTORS (permanent mag. Ac motors) are even more efficient than normal motor and it is 82 to 90% efficient.

Hydraulic powered RB's mechanisms could give greatly increasingly glorious addition, conceivably decreasing oil

use by 23- 47 %. An a centennial that have to seen the complete of the giant fuel subordinate spares that have outfitted us with imperativeness for vehicle and other development has been establish, and in which fear about carbon releases are heading off to an apex, this extra capability is ending up being progressively large.

6.EXPECTED OUTCOMES

1. It ought to store energy while braking down which its fundamental target
2. It ought to reestablish the set aside imperativeness at whatever point required without any problem
3. It should be smaller and simpler to installing
4. It should give adequate ending /slowing down power to the vehicle
5. When used related to traditional braking machine, it ought to effortlessly handle according to our item.
6. It ought to in this way increment the productivity as far as fuel utilization and accordingly decreasing outflows.
7. Because it is an extra, its expense ought to be legitimate during a short time frame length.

7. ADVANTAGES OF REGENERATIVE BRAKING SYSTEM

1. Efficiency is improved as it brings low down the fuel utilization.
2. Subtract the carbon’ impression and in this manner it will be environment friendly.
3. Impromize vehicle execution as it helps the increasing speed in a split second.
4. Regenerative slowing mechanism diminishes large work done by the motor and in this manner diminishes the wear and tear of motor parts.
5. RB’s down enhancements has the friction slowing down and in this manner diminishes the profitable of the assembles parts.

Some are the results of a RB’s setup including with ultra capacitors on The Skoda Rapid

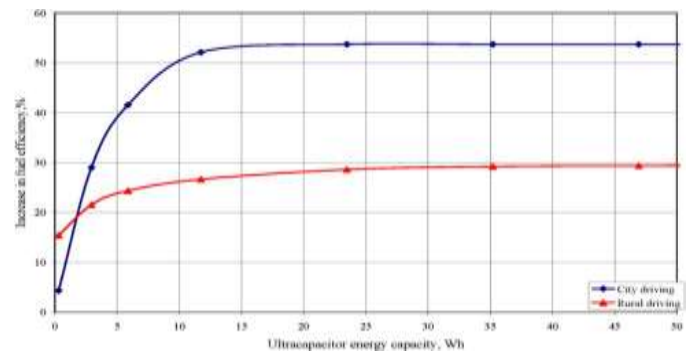


CHART -4: RBS on Škoda Rapid

Table -1: RBS on Urban model

RBS on Urban Model			
Parameter	Frequency %	Avg. Power without Rbs kw	Avg. Power with Rbs kw
Acceleration	28.2	24.6	15.9
Deceleration	28.3	1.5	0.0
Stationary	3.8	0.0	0.0
Constant Speed	39.4	11.4	10.0
Increase in efficiency	29.3%		

Table -2: RBS on Rural model

RBS on rural Model			
Parameter	Frequency %	Avg. Power without Rbs kw	Avg. Power with Rbs kw
Acceleration	15.7	21.9	19.4
Deceleration	0.0	25.2	0.0
Stationary	0.0	8.0	0.0
Constant Speed	10.0	45.8	2.8
Increase in efficiency	29.3%		

In the urban model, a 64% expansion in eco-friendliness has accomplished by this execution of braking down, inside the provincial model, 30% increment in eco-friendliness was fought.

8. DISADVANTAGES OF REGENERATIVE BRAKING SYSTEM

1. If the rotating motor has been used as a generator, it should be restriction of limiting the power when it is act as a motor.

2. And there have an another problem arrive because vehicles has generally can brake much harder with max power with conv., halting based brakes has an accelerate movement forward, and an RB system braking has min – mum efficient than friction based brakes.

3. While it bodes well to endeavor to recoup dynamic energy for later driving, the specific measure of energy and the pace of energy, that can be recuperated, is subject to both the horde of accessible engine, inverter, and battery types, and the driving situation.

4. Maximize the entire weight of vehicle by approx 40-50 Kilograms

9. SCOPES AND OBJECTIVE

1. World's most leading automobiles company like buggati, bmw, maserraati, Ferrari, tesla are developed hybrid type vehicles and to innovate electric vehicles are trying to add this RBS systems.

2. By the help of RBS systems we can achieve the Max efficiency in automobiles in the future.

3. In the usage of I.C. engine automobiles the efficiency is achieved is 30% approx but by the help of electric vehicles the efficiency is maximize upto 50-60%.

4. By using the (RBS) systems it will measure the improvement of the overall efficiency and also safe the energy much more.

ACKNOWLEDGEMENT

I WOULD LIKE TO EXPRESS MY SPECIAL THANKS OF MY GRATITUDE TO MY GUIDE "Prof. PRATESH JAYASWAL" FOR THEIR ABLE GUIDANCE AND SUPPORT IN COMPLETING MY PROJECT REPORT.

I WOULD ALSO LIKE TO EXTEND MY GRATITUDE TO THE HOD OF MECHANICAL DEPT. DR.MANISH SAGAR FOR PROVIDING ME WITH ALL THE FACILTY THAT WAS REQUIRED.

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