ISSN: 2454-9940

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

E-Mail :
editor.ijasem@gmail.com
editor@ijasem.org

www.ijasem.org

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940

www.ijasem.org

Vol 18, Issue 1, 2024

FABRICATION OF REGENRATIVE BRAKING SYSTEM: ELECRIC MOTOR GENERATOR

Dr.N.Janaki Manohar, Mr. G. Manojkumar, Mr. S. A. Vasudevan, Mr. M. Naveenkumar

Associate Professor [3], Assistant Professor [1,2,4]

Manohar.n@actechnology.in, manojkumar@actechnology.in, vasudevan@actechnology.in, mnaveen@actechnology.in

Department of Mechanical Engineering, Arjun College of Technology, Thamaraikulam, Coimbatore-Pollachi Highway, Coimbatore, Tamilnadu-642 120

Abstract— By temporarily storing and then releasing the vehicle's kinetic energy, a system known as "regenerative braking" allows the vehicle to slow down more efficiently. Regenerative braking has the potential to reduce the use of fossil fuels.
Braking causes a significant loss of power in the form of heat. Rather to wasting this potential energy, a regenerative braking system is designed to put it to good use.
An electric traction motor uses the vehicle's forward momentum to make up for the kinetic energy lost during braking. Alternatively, dynamic brakes and the conventional braking system both lead to the unwelcome byproduct of transforming excess kinetic energy into heat and the waste that comes with it. The majority of regenerative braking systems use electric motors as generators to recover the energy.

Keywords— Regenerative braking systems;Electric motor;Generator. The energy is recovered by using electric motors as generators.

1. INTRODUCTION

The use of brakes may slow or stop the speed of any moving object. Like the engine, the brakes are an essential part of every vehicle.
Conventional braking systems consist of a rubber pad (often called a brake lining) that, when touched by a moving item, causes friction and, in turn, the absorption of kinetic energy. The result is a slowing or stopping of the motion. Heat escapes into space, wasting this energy. Pressing the brakes absorbs momentum; to re-accelerate, the vehicle must start from the beginning, creating it again with the engine's power. Consequently, effort will go to waste.
Riding a bike equipped with a Dynamo helps to clarify the concept of regenerative braking. It is more challenging to ride with a dynamo active than without it if your bicycle has one. A dynamo is a small generator that powers the lights. That is due to the fact that in order for the dynamo to convert mechanical energy into electrical energy, which in turn powers the lights, some energy must first be "used" by it. Bicycling, in the event that you intend to

at a certain pace, then switches on the dynamo and stops pedalling, the vehicle will come to a stop more quickly than it would normally (without using the brakes). Imagine now a bicycle that employs a battery-operated dynamo that is both bigger and more powerful. It can quickly stop on the bike because it uses the energy from the bike's motion to charge a battery. Herein lies the foundation of regenerative braking. at a certain pace, then switches on the dynamo and stops pedalling, the vehicle will come to a stop more quickly than it would normally (without using the brakes). Imagine now a bicycle that employs a battery-operated dynamo that is both bigger and more powerful. It can quickly stop on the bike because it uses the energy from the bike's motion to charge a battery. This is how regenerative brakes function.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940

www.ijasem.org

Vol 18, Issue 1, 2024

LITERATURESURVEY

Sayed Nashit, Sufiyan Adhikari, Shaikh Farhan, Srivastava Avinash and Amruta Gambhire, 'Design, Fabrication and Testing of Regenerative Braking Test Rig for BLDC Motor', 2016, 1881-84.

In this study (1), a test bench is built and developed to assess the regenerative braking capability of a Brushless DC Motor. This initiative raises engineers' awareness of the significance of energy efficiency and conservation. Do not rely just on regenerative braking devices, since they are more effective at higher speeds. Regenerative braking, as proposed, would enable vehicles to recover some of the power lost when braking, leading to a future that is both more sustainable and more energy efficient.

Tushar L. Patil, Rohit S. Yadav, Abhishek D. are, Mahesh Saggam, Ankul Pratap, 'Performance Improvement of Regenerative braking system', International Journal of Scientific & Engineering Research Volume 9, Issue 5, (2018). 2229-5518.

This paper discusses ways to improve the effectiveness of regenerative braking systems (2). The use of a super capacitor increases the rate of energy conversion in the regenerative braking system, which in turn improves performance, and, of course, making the car smaller and lighter further aids the system's operation.

C. Jagadeesh Vikram, D. Mohan Kumar, Dr. P. Naveen Chandra, 'Fabrication of Regenerative Braking System', International Journal of Pure and Applied Mathematics Volume 119, (2018). 9973-9982.

Fabrication of the Regenerative Braking System may commence in accordance with the methods described in this article (3), and any future enhancements can be implemented in response to research needs. Regenerative braking systems are essential for the safe and efficient transportation of vehicles.

A. Eswaran, S Ajith, V Karthikeyan, P Kavin, S Loganandh, 'Design and Fabrication of Regenerative Braking System', International Journal of Advance Research and Innovative Ideas in Education-Vol-4 Issue-3 (2018). 2395-4396.

Vehicles that have regenerative braking systems are able to achieve their objective of reducing energy loss when braking, as shown in this study (4). Not only that, it may be employed in hot settings and works better than the traditional brake system. More study is required to create regenerative braking systems with improved energy capture and faster stopping distances. Since these devices recoup energy that would have been lost during braking, they are beneficial for all moving vehicles. More efficient ways may lead to huge savings for any country's economy.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940

www.ijasem.org

Vol 18, Issue 1, 2024

2. EXPERIMENTALDETAILS

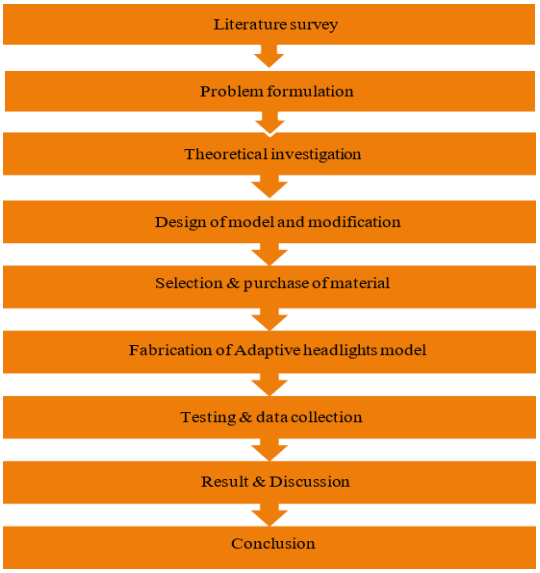

Fig 2 Blocck diagram

2.1 BlockDiagram

3. 5. Aluminium is a common material for the bodies of rack-and-pinion steering gears. Racks are usually secured to vehicle frames or bodies with the help of two bolted U-shaped brackets. Alternatively, you may use fasteners that pass through slots in the rack body and the vehicle's structure to directly attach select components to the vehicle.

4.

4.1 PROBLEMDEFINITION

5. 7. As a component of the 'Euro 5' pollution standard, diesel vehicles were mandated to have DPFs in. Diesel particle filters provide a halving impact on soot emissions.

3.3 ACKERMANPRINCIPLE:

4 4Regenerative braking is a kind of braking that utilises the mechanical energy of the motor by converting it into electrical energy and then feeding it back into the battery supply. Regenerative braking systems, like alternators, have the potential to charge batteries using some of their kinetic energy. The regenerative braking system of the motor may be used to slow down the vehicle. When the brake pedal is depressed, the electric motor goes into reverse to slow it down.

4.3 ACKERMANSTEERINGMECHANISM

5 Whether a vehicle has two or four wheels drive, the geometry that allows the steering wheels to create the right angle while navigating a bend or curve is defined by the Ackerman Steering Principle.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940

www.ijasem.org

Vol 18, Issue 1, 2024

Fig.3 ACKERMANSTEERINGMECHANISM

5.3 PROPOSEDMETHODOLOGY

There are certain necessary requirements for regenerative braking, irrespective of the method of regeneration.

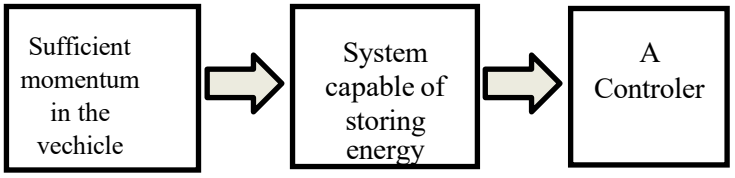

Fig 4 RBS brake is not applied

6. FABRICATIONANDASSEMBLY

4.1 D.C. MOTOR

5 5To get things going, we have one of the motors set to run all the time. A spindle shaft connects this to the gear. The gears on the motor's end may be mesh-mounted with the braking gear. Up to 12 volts, it can manage.

Alternately, there is the dynamo. The motor's tip is connected to another gear, and when the motor is switched on, the two gears mesh, causing the motor spindle to revolve. The conversion of the spinning spindle's kinetic energy into electrical energy is made possible by electromagnetism. No problem, the 12v motor is up to the task.

5.1 BREAK WHEEL

6 6Each brake is connected to the power supply by an axle or gear. It moves continuously with the wheel of the vehicle. Its 12 mm inner diameter and PVC construction make it ideal for this purpose.

The use of the opposing wheel (gear) prevents the shaft from rotating. This gear is connected to the shaft and has an inner diameter of 12mm.

The material used to construct the braking wheel is polyvinyl chloride.

6.1 BRAKE SPINDLE

A little gear attached to the motor's tip is what makes up the braking spindle. The brake spindle's gear engages with the braking wheel gear's gear, causing the shaft to slow down.

6.2 LED

These are used in order to show the power generated from the regenerative brakes.

6.3 ELECTRIC WIRES

Insulation surrounds the copper core of the inner wire. They get from the engine to the lights by means of these.

6.4 WOOD

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940

www.ijasem.org

Vol 18, Issue 1, 2024

Wood for making the frame for the system.

6.5 SCREWS

Screws, to fix the frame and the parts in place.

7. OBSERVATION

We prototype a regenerative braking system.The technology can now provide enough energy to stop the car after successful testing.

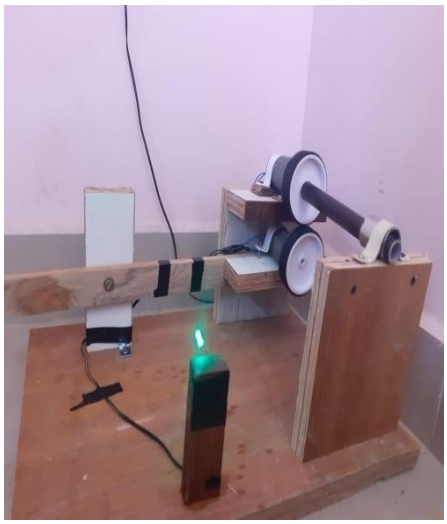

Fig 5 RBS brake is applied

TABLE 1
OBSERVATION DATA

MS medium with NAA mg L⁻¹	MS medium with BAP mg L⁻¹	Percent regenerated plantlet	Number of plantlets callus⁻¹	Average plantlet height (cm)	Average root length (mm)	Number of root plantlet⁻¹
0.1	0.5	16.67 l	3.17 i	3.00 ef	2.83 cdef	2.92 fgh
0.1	1.0	20.00 kl	4.50 ghi	2.83 efg	2.67 def	3.71 cdef
0.1	2.0	26.67 ijk	7.02 cde	3.67 cde	3.83 bc	4.06 cde
0.1	4.0	23.33 jkl	4.50 ghi	2.83 efg	3.83 bc	3.63 cdef
0.25	0.5	26.67 ijk	4.17 hi	3.33 def	3.83 bc	3.26 efg
0.25	1.0	30.00 hij	6.83 def	5.50 b	3.33 cde	3.99 cde
0.25	2.0	33.33 ghi	7.83 bcd	4.00 cd	3.50 bcd	3.97 cde
0.25	4.0	23.33 jkl	6.83 def	3.40 def	3.50 bcd	4.87 b
0.5	0.5	33.33 ghi	3.50 i	3.50 def	2.83 cdef	3.41 defg
0.5	1.0	40.00 fg	8.17 bcd	4.17 cd	3.17 cdef	4.34 bc
0.5	2.0	36.67 gh	8.50 bc	4.33 c	2.67 def	2.95 fgh
0.5	4.0	30.00 hij	4.67 ghi	2.17 g	2.33 ef	3.00 fgh
1.0	0.5	46.67 ef	8.83 b	5.50 b	2.83 cdef	4.38 bc
1.0	1.0	56.67 bcd	8.50 bc	6.00 ab	2.50 def	4.05 cde
1.0	2.0	60.00 bc	8.50 bc	5.50 b	2.50 def	4.18 bcd
1.0	4.0	50.00 de	5.50 fgh	3.50 def	2.17 f	2.79 gh
2.0	0.5	56.67 bcd	5.83 efg	2.77 fg	2.16 f	2.25 h
2.0	1.0	70.00 a	12.33 a	10.18 a	7.33 a	5.90 a
2.0	2.0	63.33 ab	9.17 b	3.33 def	4.50 b	4.00 cde
2.0	4.0	53.33 cde	7.17 cde	3.50 cdef	2.17 f	3.45 defg

8. APPLICATIONS

6.1 Hybrid and Electric Cars:

7 Regenerative braking is a breeze to implement in today's hybrid and electric vehicles since they both use electric motors to propel the vehicle.

7.1 Railways:

The energy-saving properties of regenerative brakes make them a viable option for locomotives used in railway applications. By using the regenerative braking mechanism, the Jaipur metro system is able to reduce electric energy consumption by as much as 35%

CONCLUSION

Some of the energy that would normally be lost when a vehicle applies the brakes may instead be retained by vehicles equipped with regenerative braking systems. It is possible for a vehicle's regenerative braking system to recover some of the energy lost while using the brakes. The energy released when heat is dispersed into the environment by friction brakes. By converting the mechanical energy of the wheels into a useful charge for the battery, this energy spins the generator's rotor. Regenerative braking isn't good for main braking since it can't stop the vehicle.

REFERENCES

1. Sayed Nashit, Sufiyan Adhikari, Shaikh Farhan, Srivastava Avinash and Amruta Gambhire, 'Design, Fabrication and Testing of Regenerative Braking Test Rig for BLDC Motor', 2016.

2. Tushar L. Patil, Rohit S. Yadav, Abhishek D. Mandhare, Mahesh Saggam, Ankul Pratap,'Performance Improvement of Regenerative braking system', International.

3. C. Jagadeesh Vikram, D. Mohan Kumar, Dr. P. Naveen Chandra, 'Fabrication of Regenerative Braking System', International Journal of Pure and Applied Mathematics Volume 119, (2018).

4. A. Eswaran, S Ajith, V Karthikeyan, P Kavin, S Loganandh, 'Design and Fabrication of Regenerative Braking System', International Journal of Advance Research and Innovative Ideas in Education-Vol-4 Issue-3 (2018).

5. Ketan Warake, Dr. S. R. Bhahulikar, Dr. N. V. Satpute, 'Design & Development of Regenerative Braking System at Rear Axle', International Journal of Advanced Mechanical Engineering.Volume 8, Number 2 (2018).

6. Siddharth K Sheladia, Karan K Patel, Vraj D Savalia, Rutvik G Savaliya, 'A Review on Regenerative Braking Methodology in Electric Vehicle', International Journal of Creative Research Thoughts, Volume 6, Issue 1 (2018).

7. Khushboo Rahim, and Mohd. Tanveer, 'Regenerative Braking System: Review Paper', International Journal on Recent and Innovation Trends in Computing and Communication, 5.5 (2018), 736-39.

8. https://energyducation.ca/encyclopedia/Regenerative_braking#cite_note- book1-6

9. https://news.cision.com/market-engineering/r/flywheel-hybrids

10. https://www.autosport.com/f1/news/69199/kers-failure-caused-red-bull-fire- scare

11. https://web.archive.org/web/20090113183348/http://www.racecar-engineering.com/news/people/273697/peugeot-reveal-hybrid-racer-for- 2009.html

12. https://www.popsci.com/article/cars/car-runs-air/

13. https://web.archive.org/web/20080922221623/http://www.racecar-engineering.com/news/people/274178/mclaren-on-track-with-kers.html

14. https://web.archive.org/web/20080922221623/http://www.racecar-engineering.com/news/people/274178/mclaren-on-track-with-kers.html

15. https://insideevs.com/reviews/342108/best-and-worst-electric-cars-for- regenerative-braking