International Journal of Future Generation Communication and Networking
Vol. 13, No. 3s, (2020), pp. 927–931

Regenerative Braking Using Flat Spiral Spring

Mr.A.S.Pawar[1], Dhiraj Vijayrao Patil[2], Omkar Ashok Patil[3], Siddhant Jitendra Kalekar[4] , Prasad Vijay Patil[5]

Group no:02,Department of mechanical engineering.

Sinhgad Institute of technology and science, Narhe, Pune, Maharashtra

Abstract

Energy consumption of a nation is usually considered as an index of its development. Energy is vital for social and economic development. In fact, modern civilization is very much dependent on energy availability, and the whole infrastructure rests upon it. The fossil fuels like coal, oil and natural gas which is at present are supplying 95% of the commercial energy of the world resources and are not going to last for many more years. Our life style is changing very fast and from a simple way of life we are shifting to a luxurious life style. If we just look at the number of electric gadgets, private cars and scooters in our locality we will realize that they have multiplied many folds and all of them consume energy. To meet the increasing energy demands, efforts are being made to improve existing technologies and to develop new approaches for optimising the energy consumption. In this paper kinetic energy storage and recovery system using torsion spring is analysed, the mechanism required to transmit the energy from and to the spring is designed, then its efficiency is tested and amount of fuel saved when this system is adapted to any vehicle for every time the brake is applied is calculated.

Keywords=kinetic energy storage, energy recovery system, torsional spring.

I. INTRODUCTION

The transportation sector includes all modes of transportation from personal vehicles (cars, light trucks) to public transportation (buses, trains) to airplanes, One might think that airplanes, trains and buses would consumes most of the energy used in this sector but, in fact, their percentage are relatively small about 9 % for aircraft and about 3 % for trains and buses. Personal vehicles, on the other hand, consume more than 60% of the energy used for transportation. Our personal vehicles consume more energy than public transportations. Regenerative brake is an energy recovery mechanism which slows down a vehicle or object by converting its kinetic energy into another form, which can be either used immediately or stored until needed. This contrasts with conventional braking systems, where the excess kinetic energy is converted to heat by friction in the brake linings and therefore wasted. There are several types of regenerative braking systems which differs each other in several ways one of them is energy storing element. Basically there are two types of energy storing elements, electrical energy storing elements and mechanical energy storing elements. In mechanical there are two types of energy storing elements flywheels and springs.

II. RELEVANCE

Regenerative braking is a unique technique that is used in EVs to capture energy that the vehicle has due to its motion or, in other words, its kinetic energy that would have been wasted when the vehicle decelerates or comes to a standstill while braking. The converted electrical energy is stored in energy storage devices such as batteries, ultracapacitors and ultrahigh-speed flywheels to extend the driving range by upto 10%.

ISSN: 2233-7857 IJFGCN

III. MOTIVE

Braking system comes in various design and types, sizes and performance specifications. There are different types of braking system using friction lining and direct engagement. Both type contains large amount of loses. Regenerative braking system have been designed in a such a way that it will reduce the losses from braking system and it also creates energy up to some extent. Braking system are used in different machinery along with automobiles . Our moto is to generate power while brakes are applied , When braking system is idle for power generation , also increasing the performance parameters of the vehicle.

IV. OBJECTIVE STATEMENT

• To recreate energy when the brakes are applied

• To create non polluting energy source

• To increase fuel economy of vehicle

• To create simple mechanism for power generations

• To recreate energy when the brakes are applied

- Electrical vehicle consumes large amount of energy in form of electricity. Lot of energy is wasted during braking in the conventional braking system in the form of heat energy. So a secondary mechanism for braking is provided which provides us with energy while brakes are engaged, so through regenerative system we can achieve the aim of creating energy from single mechanism.

• To create non polluting energy source

- The energy generated from regenerative braking system has to be non-polluting. Because that is what an engineer should keep in his top priority. As the spiral spring component doesn't leaves any residual behind it can be considered as eco-friendly component for the environment. Due to simple mechanism it is reliable and easy to operate which gives us an advantage over high maintenance and expensive parts.

• To increase fuel economy of vehicle

- As regenerative parts acts as a secondary braking components which thereby provides us with electrical energy which helps the other components of vehicle for energy needs thereby reducing the load on the battery and increases the overall performance of the vehicle and increases fuel economy.

• To create simple mechanism for power generations

- The main aim of flat spiral spring is to keep regenerative part as simple as possible to avoid heavy maintenance and regular replacement of parts. Due to lack of space the regenerative system must be compact and simple to sudden contact with other car mechanism.

ISSN: 2233-7857 IJFGCN

V. SUMMARY

Braking System Using Flat Spiral Spring is an energy generation system using an alternator. Which creates the energy using the mechanism shown in following figure .considering the losses of gears in breaking system we are using friction lining in below mechanism. The main energy generating component here is flat spiral spring. Which stores kinetic energy of vehicle into potential energy of spring. And this potential energy is again converted to electrical energy using alternator. This series of conversions of energy will lead us to the required energy. and as the energy source is green and renewable it would not affect the environment as well

I. FIGURES

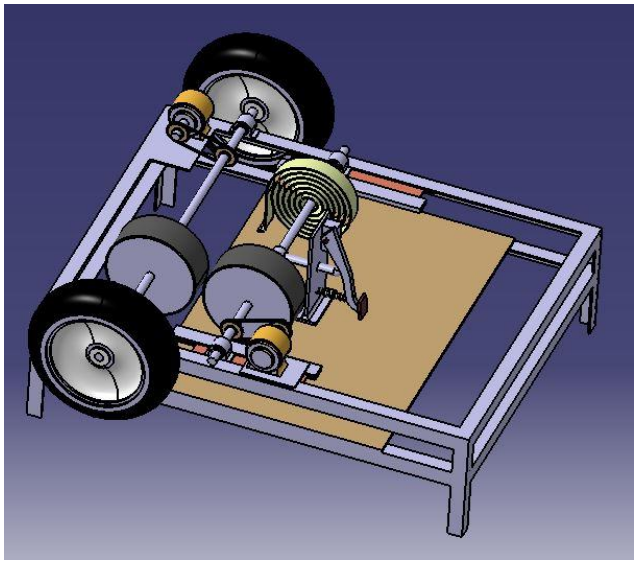

Fig. 1 CATIA model.

VI. ANALYTICAL STUDY

ISSN: 2233-7857 IJFGCN

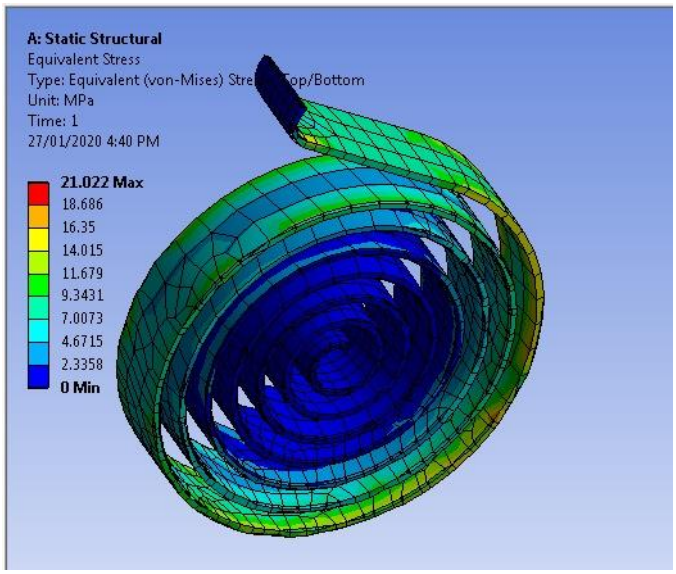

Fig. 2 Analysis of flat spiral spring.

Above analysis shows the von-Mises stress distribution over the flat spiral spring. von-Mises stress is the value used to determine if the given material will yield or fracture . Above diagram states that in the flat spiral spring the stress induced in the spring won't cross yield stress anywhere near the centre of spiral spring.

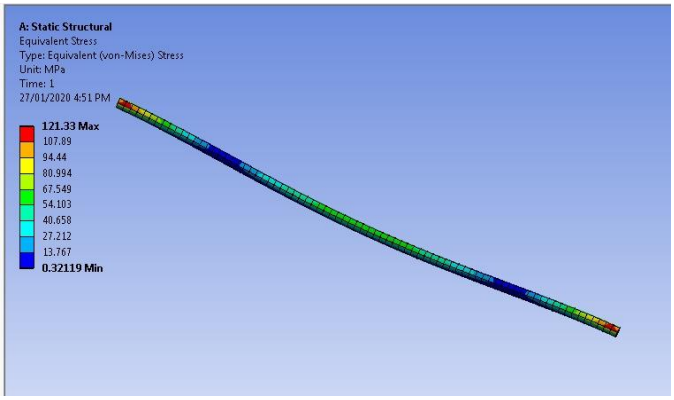

Fig. 3 Analysis of shaft.

ACKNOWLEDGMENT

We take this opportunity with great pleasure to express our deep sense of gratitude towards our guide Prof.A.S. Pawar for his valuable guidance, encouragement and cooperation extended to us during this project work.

We are so thankful to Dr.K.R.Jagtap, Head of Department of Mechanical Engineering for providing departmental facilities for this work.

ISSN: 2233-7857 IJFGCN

We would also like to thank Dr. R.S.Prasad, Principal, Sinhgad Institute of Technology And Science for their unflinching help, support and cooperation during this project work.

We would also like to thank the Sinhgad Technical Educational Society for providing access to the institutional facilities for our project work.

REFERENCES

[1] Hong Zhou Arefin Ahmed. Synthesis of Nonlinear Spiral Torsion Springs. International Journal of Engineering Research Technology., June - 2014.

[2] Andrea Nicolinia Federico Rossia, Beatrice Castellania. Benefits and challenges of mechanical spring systems for energy storage applications. Elsevier Ltd., 2015.

[3] Prajay Lohani Khushal Ahmad and Monis Alam. Design and Analysis of Kinetic Energy Recovery System Involving Flat Spiral Spring.

[4] Ankit Raj. Novel Design of Flat Spiral Spring based Regenerative Braking System. Indian Journal of Science and Technology,, September 2017.

ISSN: 2233-7857 IJFGCN