# Development of Flywheel Based Kinetic Energy For Bicycle

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***Abstract-*** *A kinetic energy recovery system abbreviated as KERS is an automotive system which recovers the kinetic energy of a moving vehicle under braking The Kinetic Energy Recovery System (KERS) is a type of regenerative breaking system which has the capability to store and reuse the lost energy. The flywheel based kinetic energy recovery system (KERS) is possible solution which could potentially replace the electric hybrids. In principle, a flywheel is nothing more than a wheel in the axel which stores and regulates Energy by spinning continuously. In the present occupied world it has been important to investigate the vitality emergencies on the planet*

***Keywords***- kinetic energy recoery,flywheel,electric hybrids

## I. INTRODUCTION

There are two types of kinetic energy recovery system which have gained popularity in recent days.one is Electric KERS and another is mechanical KERS. Both have their respective pros and cons. The electric system is less efficient but it can store power for a longer duration and gives us the ability to manipulate the torque and rpm output as per our requirement. In the other hand the mechanical system has a better efficiency(nearly twice as that of the prior one) but it is prone to decay due to its inherent property of friction, though it is very small in value, hence cannot be stored for longer period and need to be used within a short period of time. In the real world we can find any situations where we need to use the recovered kinetic energy with in very short span of time of its recovery and we don't even need a wide range of torque and rpm output as a particular range of torque and rpm combinations satisfy our requirements completely. A bicycle is a perfect example of this kind.

## II. LITREATURE REVIEW

The first of these systems to be revealed was the Flybrid. This system weighs 24 kg (53 lbs.) and has an energy capacity of 400 kJ after allowing for internal losses. A maximum power boost of 60 kW (81.6 PS, 80.4 HP) for 6.67 seconds is available. The 240 mm (9.4") diameter flywheel weighs 5.0 kg (11 lbs) and revolves at up to 64,500 rpm. The maximum torque generated at the flywheel is 18Nm (13.3 ft-lbs), and the torque at the gearbox connection is correspondingly higher for the change in speed. The system occupies 13 litres of volume. Two small accidents were reported during testing of various KERS systems in the year 2008. The first incident happened with Red Bull Racing when the team tested their KERS battery for the first time in July, the battery malfunctioned and accidentally caused a fire, to avoid any causality evacuated the building. The second incident happened within a week. A BMW Sauber mechanic got an electric shock when he touched Christian Klein's KERS-equipped car during a test at the Jerez circuit. Concluding this literature review we can say that Mechanical KERS is the most suitable type of Kinetic energy recovery system that we can use for a bicycle. As there has not been much work related to bicycle KERS this field needs extensive research and development. No one has done any work on the mass production procedure of this product and its marketing. This field needs serious attention. A tie between the clutch type mechanical KERS and CVT type mechanical KERS can be broken by further study.

Flywheel technology is rising across many kinds of technology. It is a pollution free method of storing energy having many current applications as well as future uses. In the case of road vehicles it necessary to be concerned about energy efficiency, especially when considering pollution per unit of energy output. Any system that can regenerate energy from braking can help that, but flywheels have the potential to increase the efficiency of road vehicles without any direct or indirect negative effects on the environment. The use of batteries can cause serious environmental effects at the time of its manufacturing and disposal whereas flywheels have a very small environmental effect only at its time of their production. Bicycles don't have the pollution problems like cars and other modes of transportation, but use of a flywheel as KERS in a bicycle can tremendously increase its efficiency.

## III. OBJECTIVES

Before During braking, energy is wasted because kinetic energy is mostly converted into heat energy or sometimes sound energy that is dissipated into the

environment and vehicles with Kinetic Energy Recovery System are able to harness some of this kinetic energy and in doing so will assist in braking and therefore our main objectives includes

- To design a KERS bicycle.
- To develop the designed model.
- To carryout performance analysis.

## IV. PROCUREMENT OF PARTS

Procurement of the parts is referred as the act of obtaining or buying goods and services. The process includes preparation and processing of the demand for the project and getting the right materials. Therefore from the literature survey and the detailed design we have got to know what are the parts required for the project and they are as follows


*1.Bicycle*

*2.Flywheel*

*3.Shaft*

*4.Chain drive (sprocket)*

*5.Clutch plate*

*6.Bearings*

## FABRICATION

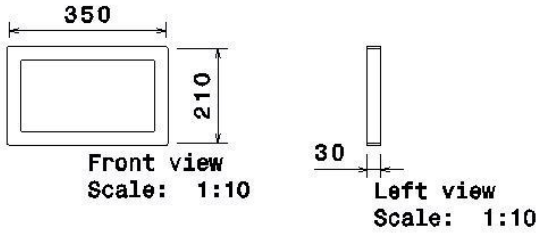
Fabrication is the process of building machine, structures and other equipment's by deploying various process and operations like cutting, forming, setup, full welding and assembling components made from raw material. A brief description of selection of raw material is given below.

In this project, different materials for different elements are used in building a pedal operated can crusher, the selection of appropriate material for the respective components was based on many parameters such as,

- Machinability
- Material strength
- Weight
- Cost of the material

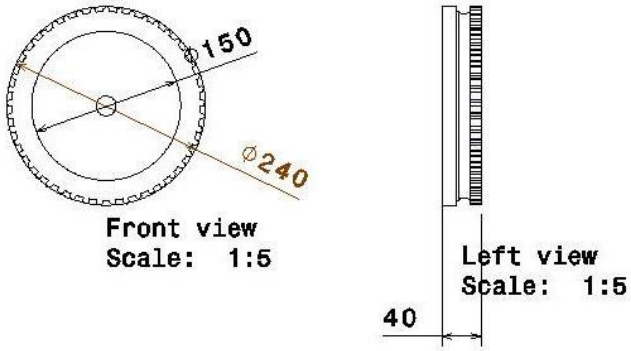
1.Rectangular frame

The rectangular frame carries the entire assembly. It is made up of mild steel.



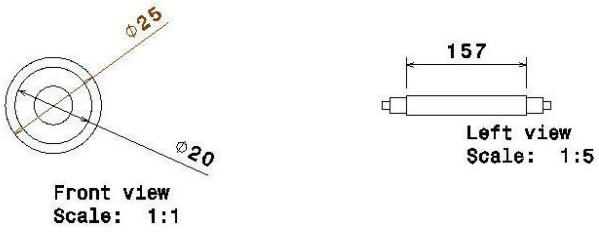

2.Flywheel

The flywheel is mounted at the Centre of the rectangular shaft by means of a shaft. The flywheel wheel we have selected is of Tata Sumo vehicle.



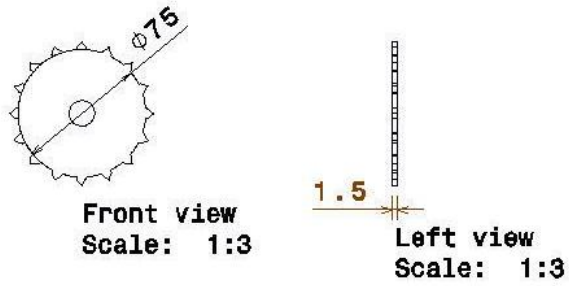

3.Shaft

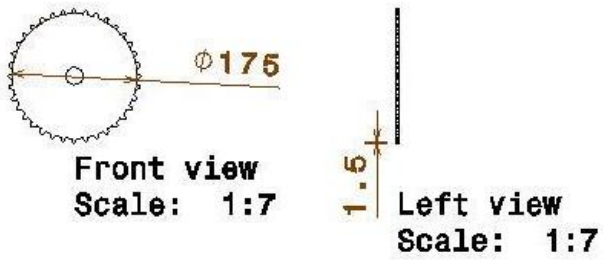
The shaft holds the flywheel mounted on the rectangular frame. It also hold a clutch plate and bearings on either side of the flywheel. It is made up of mild steel.



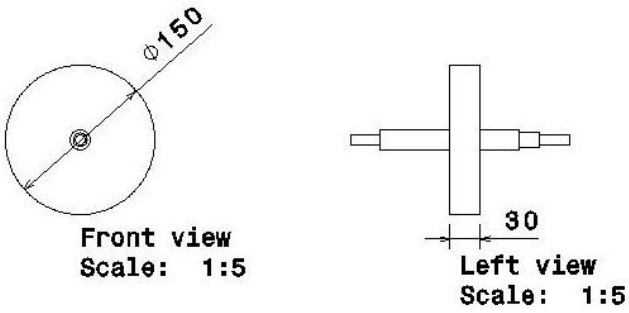

4.Chain drive

Chain drive connects the flywheel to the rear wheel. The energy stored in the flywheel is transferred to the rear wheel through chain drive




5.Clutch plate




**ASSEMBLY**

Assembly is the process of assembling individual components together to become a working module.

Assemblies consist of various parts, from machined parts to commercial standard parts such as screws, nuts and pins. It may also include plastic, metal or a variety of other materials. The processes of combining the components may include mechanical torque, brazing, welding or a variety of other possible processes.

After all the components are prepared according to the drawings provided to the operator all the components are assembled in the following sequence.

A normal bicycle is chosen to build a KERS bicycle.

The fabricated rectangular frame is welded to axles of the bicycle.

A shaft is mounted through the center of the bicycle.

The flywheel and clutch plate are mounted on that shaft,

A chain drive is fixed to one end of the flywheel shaft and rear wheel.

*Assembled KERS Bicycle*

## TESTS AND DISCUSSIONS

Ta This test was carried out to find out how much pedalling power can be saved by having KERS bicycle. This was done by riding the bicycle on a slope and initial pedalling was given same and noted down the distance at which the bicycle stops when flywheel is not being connected. Then taken 10 m back point from the stopping distance. The experiment was again done by riding cycle with flywheel coupled from 10 m side and noted down the extra distance that was covered by the bicycle. The result was tabulated. The values reveal a total gain in energy of about nearly 10 per cent. Thus flywheel bicycles can help in reducing the overall pedalling power by 10 per cent used in overdrives.

| SL.NO | DISTANCE COVERED | | |
|---|---|---|---|
| | TRIALS | FLYWHEEL ENGAGED,m | FLYWHEEL DISENGAGED |
| 1 | 1 | 10 | 10.6 |
| 2 | 2 | 10 | 10.76 |
| 3 | 3 | 10 | 10.72 |

## V. CONCLUSION

As many mating parts are present large amount of friction loss is found in this system which can be improved. Boost is reduced because of friction, continuously variable transmission can be implemented to this system which would prove in drastic improvement in energy transmissions.

The KERS system used in the vehicles satisfies the purpose of saving a part of the energy lost during braking. Also it can be operated at high temperature range and are efficient as compared to conventional braking system. Here we are concluding that the topic KERS got a wide scope in engineering field to minimize the energy loss. As now a day's energy conservation is very necessary thing. Here we implemented KERS system in a bicycle with an engaging and disengaging clutch mechanism for gaining much more efficiency.

## REFERENCES

[1] Siddharth K. Patil., "Regenerative Braking System in Automobiles", International Journal of Research in Mechanical Engineering &Technology vol.2, pp.45-46,2012.

[2] Chibulka.J.,"Kinetic Energy Recovery System by means of Flywheel Energy Storage", Advanced Engineering Vol. 3,No. 1, pp. 27-38,1998.

[3] S.J.Clegg, "A Review of Regenerative Braking System", Institute of Transport Studies, University of Leeds, Working paper of 471, 1996.

[4] Saharat Chanthanumataporn, SarawutLerspalungsanti and MonsakPimsarn, "Design of Regenerative Braking System for an electric vehicle modified from used car", Second TSME International Conference on Mechanical Engineering, 19-21 Oct,2011.

[5] Sreevalsan S Menon, Sooraj MS, Sanjay Mohan, Rino Disney, SuneethSukumaran, "DesignAndAnalysisOf KineticEnergyRecoverySystemInBicycles",Vol.2, Issue

8, August 2013,International Journal of Innovative Research in Science, Engineering and Technology ISSN:2319-87