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Kinetic Energy Recovery System

J. Manikandan and M. Praveen Kumar

Abstract--- *Kinetic energy recovery system is a method of conserving energy lost in machines. I chose this paper to show how this system can be used in the bicycles. The basics of KRES technology is that it stores the kinetic energy of a moving vehicle when braking and then releases it back into the car's drive train during acceleration. The system consists of a flywheel by a transmission to the driver train. The main parts of the system are driver unit, transmission, energy storing unit, energy retrieval unit.*

Keywords--- *Recovery System, Transmission, Energy Storing Unit, Energy Retrieval Unit.*

I. Literature Review

This survey is about the energy efficiency utilizing by a flywheel energy recovering system. According to this article, efficiency is affected by the recovery of kinetic energy from the motion of the bicycle. Recovery of kinetic energy seems to be the most effective option available to improve energy efficiency and reduce the human effort. This system is being installed on some hybrid electric vehicles. These vehicles contain flywheels for energy storage and chain drive which transfer energy to and from the driveline. The chain drive is used because the ratios of the vehicle and flywheel are different during acceleration and deceleration. The clutch allows for disengagement of the flywheel when it is not being used. The bicycle can also be integrated with this KRES. These systems give the hybrid vehicles a greater boost and also improve the fuel economy of the hybrid vehicles. Some areas where these systems were used F1 cars, gyroscopic bearing loads in vehicular flywheel, cross potential for passenger car energy recovery.

II. Methodology

Design Calculation

The initial parameter required to design a KRES is speed of the drive train. Normal bicycles have a gear ratio of 2.44 with 44 teeth at drive side and 18 teeth at driven side. The research explains that the maximum effort produced by a human is 90 candescence at the driven side, which increases the speed of the wheel at the center in 2.44 multiple. The wheel has another sprocket at the other end with a large number of teeth and so there is another fold of increase in speed by a 2.44 to the flywheel.

The optimum linear velocity of a cycle however in a plane terrain with fixed gear of 2.44 ratios varies from 20-30 km/h or 16-25 m/h. the conversion of the linear velocity to angular velocity of the tyre.

$V = r \times \omega$ in m/s

J. Manikandan, Assistant Professor, Department of Mechanical Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai. E-mail: kandan.arni@gmail.com
M. Praveen Kumar, PG Scholar, Department of Mechanical Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai.

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Design of flywheel

A flywheel is an inertial energy-stores device. It absorbs mechanical energy and serves as a reservoir, storing energy during the period. When the supply of energy is more than the requirement and releases it during the period when the requirement of energy is more than the supply. The main function of a fly wheel is to smoothen out variations in the speed of a shaft caused by torque fluctuations. Flywheel absorbs mechanical energy by increasing its angular velocity and delivers the stored energy by decreasing its velocity.

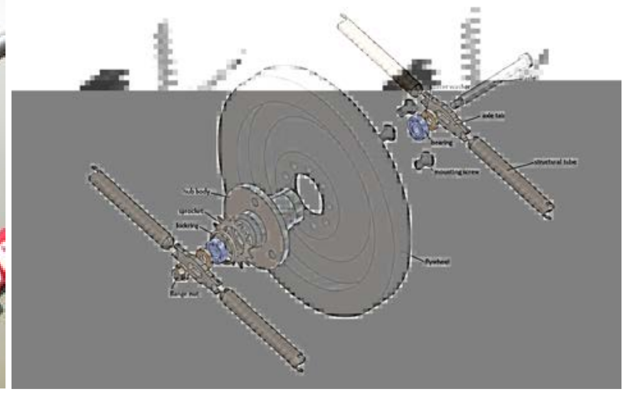

Fig 1 Fig 2

There are two stages to the design of flywheel. First, the amount of energy required for the desired degree of smoothening must be found and the mass moment of inertia needed to absorb that energy determined. Then flywheel geometry must be defined that caters the required moment of inertia in a reasonable sized pack and is safe against failure at the designed speeds of operation. Flywheel inertia is directly depends upon the acceptable changes in the speed.

Speed fluctuation is the change in the shaft during a cycle

ω max –ω min the kinetic energy Ek in a rotating system

$Ek = 0.5\ I\ w^2$

Hence the change in kinetic energy of a system can be given as the mass moment of inertia in needed to the entire rotating system. In order to obtain selected coefficient of speed fluctuation is determined using the relation.

Design of sprocket

The sprockets are to be designed by the requirement of power to be transmitted between the driving and driven gears.

Module = M=PCD/z

Z= no of teeth = 14

PCD = 55mm

So m =4 mm

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Fig 3

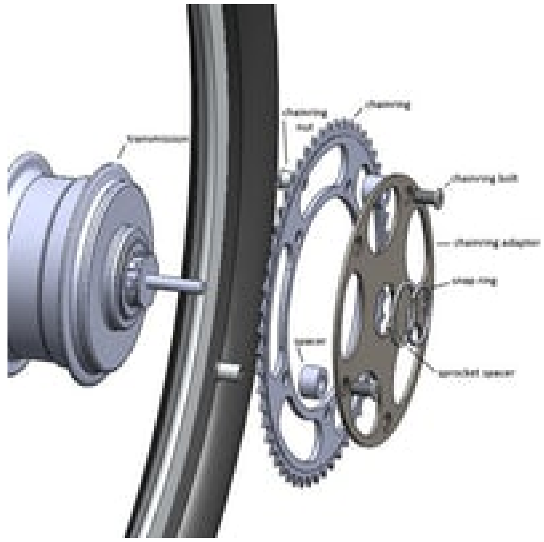

Fig 4

The bigger sprocket has about 44 teeth in it. The larger PCD gives a large gear ratio thereby improving speed velocity. These vehicles contain flywheels for energy storage and chain drive which transfer energy to and from the drive line.

III. WORKING

A KRES was first tried in formula 1 by McLaren during its period of huge innovation way back in 1998. But unfortunately it was banned almost immediately; the cars never raced with it and hybrid formula 1 cars stayed little more than the concept until in 2008 it was announced that the system would be made legal once more in the 2009 season. Only McLaren and Ferrari really got the best out of their systems and at the end of that year the F1 teams agreed amongst themselves not to use the technology in 2010. But for 2011 KERS was back and all the three newest were using it.

In theory KRES makes F1 cars more eco-friendly. They are devices used for converting some of the waste energy from the braking process into more useful types of energy which can then be used to give the cars a power boost. It all sounds very complicated but it really isn't, the basic physics of KRES is laid down in lessons taught to almost every secondary school child in the developed world. It is all based around Newton basic principle which states that energy cannot be created nor destroyed, but it can be endlessly converted. When you drive down the road your car has kinetic energy, when you brake that kinetic energy is mostly converted into heat energy.

In most cars that heat energy is wasted, but in a KRES equipped car that is not the case. When the driver brake most of the kinetic energy is still converted to heat energy but a portion is treated differently and is stored up in the car. When the driver presses his boost button that stored energy is converted back into kinetic energy and under the current F1 regulations give car about an extra 85 Bhp for six seconds.

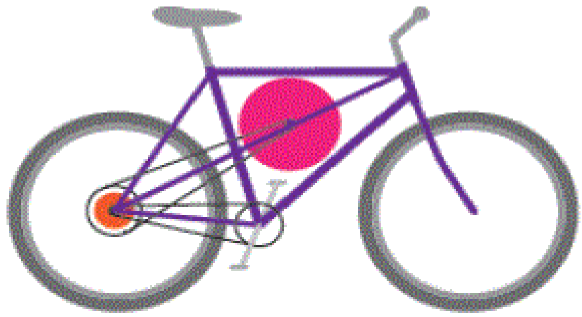

Fig 5

IV. CONCLUSION

I would like to conclude that my paper on kinetic energy reservation system would be future of automobile; the system integrated in bicycle in my project could be integrated to all automobiles and also in machines. In bicycle human effort could be sustainably saved in all ways by conservation of momentum.

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