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Power Generation With Pressure Energy Using Speed Breaker

Prof. S.p. Velapure [#1], Onkar Rajendra Mahamuni [#2], Rushikesh Subhash Mahamuni [#3], Santosh Dattatraya, Nandiyawar [#4], Aniket Mohan Naik[#5]

[#]Department, of Mechanical Engineering ,Sinhagad Institute of Technology,narhe

[1]sachinvelapure@gmail.com

[2]onkarmahamuni007@gmail.com

[3]mahamunirushikesh@gmail.com

[4]santoshwalker719@gmail.com

[5]aniketnaik8298@gmail.com

Abstract

Flywheel have consideration to be used for energy storage purposes. Developing countries like India, with growth in the economy, the demand for electricity is increasing. With the demand for reliable, cost effective, and environmentally friendly storage, Flywheel Energy Storage System (FESS) is coming into its own. Study presents an analysis shows that using a FESS is a promising alternative in mitigating energy storage problems in decentralized electricity generation where an uninterrupted power supply is required. An electrical machine is used as a motor to store Kinetic Energy when the solar energy is available, and then the stored energy is converted back to electrical energy by running the machine when the solar energy is no longer available. Flywheel Energy Storage systems using advanced technology have come up as a promising alternative to the traditional battery. Energy storage depends on the mass, flywheel shape, and rotational speed. Energy fed into the rotational of a flywheel, store it as Kinetic Energy, and release when it is in demand.

Keywords— Kinetic Energy; Flywheel Energy storage system (FESS); Power hump

I. INTRODUCTION

This is a mechanical device which uses the flywheel to store energy in the form of inertia. Let us explain all the system. In this system we apply extra energy source to start the main motor like electricity or by applying the mechanical energy. In this system a main motor is used to drive a series of pulley and belt arrangement which forms a gear train arrangement which produce a twice/ thrice speed at the shaft of generator. The inertia of flywheel can be increase by increasing the radius of flywheel, weight of flywheel. Flywheel energy storage (FES) works by accelerating a rotor (flywheel) to a very high speed and maintaining the energy in the system as rotational energy. When energy is extracted from the system, the flywheel's rotational speed is reduced as a consequence of the principle of conservation of energy; adding energy to the system correspondingly results in an increase in the speed of the flywheel. Advanced FES systems have rotors made of high strength carbon-fibre composites, suspended by magnetic bearings, and spinning at speeds from 20,000 to over 50,000 rpm in a vacuum enclosure. Such flywheels can come up to speed in a matter of minutes reaching their energy capacity much more quickly than some other forms of storage. Flywheel (named mechanical battery) might be used as the most popular energy storage system and the oldest one. Flywheel (FW) saves the kinetic

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energy in a high-speed rotational disk connected to the shaft of an electric machine and regenerates the stored energy in the network when it is necessary.

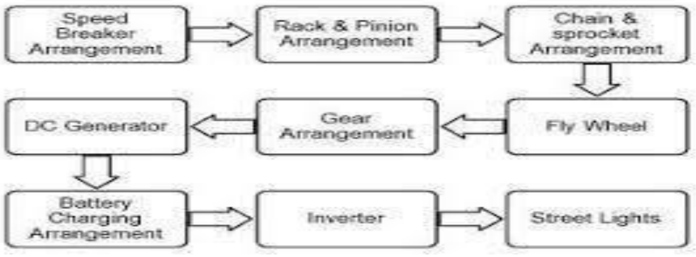

Fig. 1 FLOW DIAGRAM OF THE PROJECT PROCESS.

II. RELEVANCE

This topic is more beneficial as compared to solar panels. As both do the same work as production of energy, but in our case our prototype has more advantages as compared to panels. As the solar panels has more maintenance problem and is more expensive, so we came with an idea of using vehicles mass as KE, to produce the energy that we can use to light up the Street light. The more we use solar panels the higher will be the cost. The "Power Hump" is more likely mechanical device, the components we use are all simple to design and it is Economical.

III. MOTIVE

Generating electricity with the help of kinetic energy using Vehicle. Energy is the primary need for the survival of the universe. We can tap the energy generated and produce power by using the speed breaker as power generating unit. The kinetic energy of the moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism.

IV. OBJECTIVE STATEMENT

- To design a Flywheel which will maximize the power generation(3-5kw)
- To design a chain and sprocket, to transmit the power.
- To assemble and to test of Power hump.
- To increase the efficiency of Power Hump with the help of varying dimension of flywheel.

V. SUMMARY

- The objective of this work is to develop a New Automatic operated Machine of flywheel power generation.
- This concept allows us to achieve our goal as well as better space management.
- The new model takes into account all the real time conveying system and provide solution over their short coming.
- The New model will get good efficiency compare to old method.

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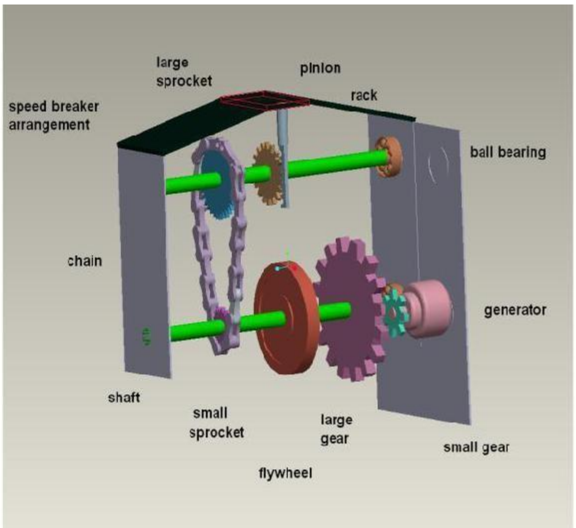
VI. FIGURE



VII. POWER CALCULATION & RESULT ANALYSIS

Let's consider, The mass of vehicle moving over the speed breaker = 30Kg (Approx.) Height of speed breaker = 15 cm = 0.15 m Weight of the Body = 300*9.81 = 2943 N Distance travelled = Height of the speed breaker = 0.15 m Work done = weight of the body × distance travelled by the pressure of vehicle. Power = Work done/Second = (2943*0.15)/60 = 7.35 Watts Output Power developed for 1 vehicle passing over the speed Power developed for 60 minutes (1 hr.) = 441 watts Power developed for 24 hours = 10.58 Kw Our proposed system can provide 250 v and 24 amp. We are using CFL bulb (100 watt) In one km 50 bulbs are needed. Total watt = 50×100 = 5000 watt = 5 Kw This power generated by vehicles is more than sufficient to run four street lights in the night time.

VIII. DESIGN CALCULATONS CHAIN & SPROCKET

Let us consider Speed of chain = 410 RPM
For the speed of 410 Rpm we will select the chain no. 06B Consider no. of teeth = 16,18
Used chain no.06B For Z=18
Roller diameter, d1=6.35 mm

Width' b1=5.72 mm Transverse pitch pt=54.85 mm z1= 18
z2= 44

Approximate center distance,

a = 40*P nominal

a = 40*9.525

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a = 381 mm No of links
Ln=2(a/p) + (z1+z2/2) + (z2- z1/2* π)^2 *(p/a)

= 2(381/9.525) + (18+44/2) + (44-18/2* π)^2* (9.525/381)

= 111.43 = 111

Pitch, P = 9.525 mm

Width between inner plates, b1= 5.72 mm Roller diameter, d1= 6.35 mm
Transverse pitch pt =10.24 mm

Pitch circle diameter

D1 = p sin (180/z1) D2 = p sin (180/z2)

= 9.525 sin (180/18) = 9.525 sin (180/44)

D1 = 54.85 mm D2 = 133.59mm

Roller seating radius (RI)

rimax = 0.505d1 + 0.069* (d1)$^{1/3}$ rimax = 3.33mm
rimin = 0.505 d1 = 3.2mm Tooth Flank Radius (re)
remax = 0.008(z^2+180) =16.928mm

remin = 0.12*d1(z+2) = 15.24mm Root Diameter (Df)
Df = D – 2* ri = 88.47mm Tooth height above pitch polygon (ha)
hamax = 0.625*p – 0.5*d1 +0.8*p/z = 2.9513mm hamin = 0.5(p-d1) = 1.5875mm
Tooth Width (bf)

bf = 0.93 *b1 = 5.3196mm Tooth Side Relief (ba)
ba = 0.1p to 0.15p = 1.1907mm

SHAFT DESIGN:
Consider, Material of Shaft = M.S. Yield Strength = 250 MPa
Shear Strength = 0.75*Yield Strength = 0.75*250 = 187.5MPa
From Page No. 9.7, For Angle of Twist = Ɵ Permissible Angle of twist is 0.25 per meter length. Let us assume length of Shaft = 550mm G = 79300 N/mm2.
We know that, According to Torsional Rigidity,
D4 = 584$*T*L$ /$G*\theta$
D4 = 584∗25.39∗1000∗550/ 79300∗0.1375
D = 30 mm

SPRING DESIGN:
10 KN for 1 spring & spring index C=5
Consider, material of spring IS 4454 grade 2
Tall =0.45*Sut ….(Sut = 1500 N/mm2)
T=675N/mm2
Modulus of rigidity to material of steel G=80 Gpa

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1. Wire diameter
Wahl Stress factor Kw =(4C-1/4C-4)+(0.615/C)
Kw=1.35
Shear stress include T=Kw[8*F*C/∏*d^2]
d^2 = 1.35[8*10000*5/∏*675]
d=15.65
Mean coil diameter D=C*d, 5*15.65, D=78.25mm
No of Coils
Spring stiffness K=f max /δ max,
Assume δ max =50mm
K=200N/mm
Now, K= [Gd/8*C3 *n]
n=6.26
For Square & Grounded side spring, Total no of coils
n'=n+2
n'=8.26
spring length & pitch
solid length Ls =(n+2) *d
Ls=129.26mm
Free Length
Lf =Ls +δmax+(n'-1) *1
Lf=186.52
Lf=P*n+2*d 186.52=P*6.26+2*15.65
P=24.79mm

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