

Gravity Powered Light using Compound Gear System

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Abstract- From Recent circumstances man has been in quest for energy to take care of his consistently expanding demand. These days the general public has woken up to the immense dangers of contamination and a dangerous atmospheric deviation caused by fuel based energy sources. The issue of creating power is late journey, so everybody should think gravity be the alternative in non-customary energy sources. Since gravity is accessible all finished in bottomless amount. Since gravity is available all finished from start of universe. Sir Issac Newton find marvel of gravity close to 400 year prior. On top of it is inexhaustible. It is predictable i.e. 24×7 . Contrasting with concoction, warm and other energy source gravity is frail, is adaptable. This shortcoming is basically because of the consistency, or relentless state, of our cooperation with gravity. As gravity is feeble it can't be proficiently be changed over into electrical energy or in other frame. In this paper we have outlined a strategy wherein gravitational energy is additionally opened up as far as its greatness by utilizing mass unbalancing mass. It can be effectively be changed into usable electrical energy. At the point when contrasted with different wellsprings of energy like hydal, warm, tidal, wind, atomic and so on it's available all more than 24×7 reliably. Idea of gravity control age is straightforward. It is the point at which a body goes descending from higher elevation to bring down one its potential energy get changed over into dynamic energy through straight movement. Dynamo produces power changing over this linear motion into round motion.

Keywords: Renewable source, Gravitational Energy, Dynamo, Electrical Energy

INTRODUCTION

Age of energy in the any frame is request of the day and electric energy in particular is the most elevated energy popular. The greater part of the electric energy is delivered by warm power plant and rest of it is created by hydro-electric power stations, tidal power, sun powered, atomic, geo-warm and wind factories.

As of late there is a solid drive from every one of the administrations all through the world for age of clean energy without dirtying nature and utilizing sustainable power source assets. Wind factories are utilized as a part of a large portion of the nations to produce the spotless energy which can be created by utilizing the high breeze

weight which is accessible in plenitude in nature and non-contaminating the nature. Notwithstanding copious accessibility of wind and non-contaminating characters of the breeze process, there are couples of confinements in utilizing the breeze factories. In and around the breeze process establishment areas, there can't be any human and winged animal's inhabitations because of high vibrations from the breeze factories and gigantic clamor levels created from wind process outfit box. Flying creatures are limited not to enter the close region of the breeze processes by utilizing a particular scope of radio waves to maintain a strategic distance from fledgling effect on the cutting edges and consequently harm of the breeze process itself. Likewise high breeze weights and great soil quality required to introduce the breeze factories. Because of every single above confinement, energy age because of wind factories isn't practical dependably.

Another most normal type of clean energy age is sunlight based energy. Indeed, even sun oriented energy is plenteous and non-contaminating in nature. Sun oriented cells are utilized to change over the plentiful light beams falling on sun based cluster into electric current. Sadly, the measure of energy produced per unit range of sun powered cells is less contrasted with some other type of energy age. Additionally sun powered energy can be produced just amid crest summer season to the most extreme degree and is regular. Less or insignificant measure of energy is created amid winter and blustery season which is tremendous downside of sun based energy. Likewise the underlying venture made to build up the setup required to trap sunlight based energy is colossal as there is a need of battery dependably to store the energy caught. Contrasted with different types of energy, due to above reasons it is infeasible to utilize sun oriented energy on regular schedule. Is just sun oriented, wind and hydro energy are sustainable and clean energy accessible to deliver electric current..? Be that as it may, the developments and inventiveness changed those fundamental musings. Presently we can deliver electric current utilizing gravitational power, vehicle hitting guard, rec center gear development, cycling and so on gravitational power which is sustainable power source likewise spotless and non-dirtying which is better contrasted with other type of sustainable power source. Utilizing gravitational energy we can create electric flow at all season. In current circumstance numerous nations like

India as yet utilizing lamp fuel lights in remote zones which are exceptionally unsafe to wellbeing. Gravity light which replaces this place to give clean and non-contaminating energy the space required for establishment of gravity light is little contrasted with some other sustainable power source assets. The gravity light is essentially blend of planetary apparatus framework, little generator and dead weight which changes over potential energy into dynamic energy. It just takes enough venture expenses and give the yield which is free till its lifetime. Executing this in every single home can change the world to deliver eco-accommodating energy and brings down the interest for non-sustainable wellsprings of energy primarily incorporate coal, oil based goods. The gravity light encourages the world to be a superior place by giving contamination free electrical energy.

In the present this is I am working towards the age of electrical energy by utilizing gravitational power which is plenteous in nature and a free type of energy. Here the dead weight is lifted to a predefined tallness and left to fall under gravity. This dead weight set aside some opportunity to achieve the ground and drives the compound gearbox driving the yield shaft which will be associated with the generator which produces current and is put away in the battery through which globule is driven.

PROBLEM DEFINITION

The goal of project is to provide cheap and harmless energy alternative. The power output is enough to light a small room. But with subsequent research and developments more output could be generated.

METHODOLOGY

- The essential goal of the present instrument is to give gravity control age component which can be nonstop and stable operation to constantly change over the gravity potential energy into the active energy and after that to change over the dynamic energy into the electrical energy, in order to play out quite a while viable and stable energy yield.
- This component used the gravity energy transformation unit to change over the gravity potential energy into the active energy. The gravity energy change unit produces positive torques by compound riggings. Transformation of changing over gravity potential energy into the dynamic energy. Next, the dynamic energy will be transmitted to a power producing unit to play out another energy change of changing over the active energy into the electrical energy. Lastly, a power supply framework used to transmit the electrical energy out.

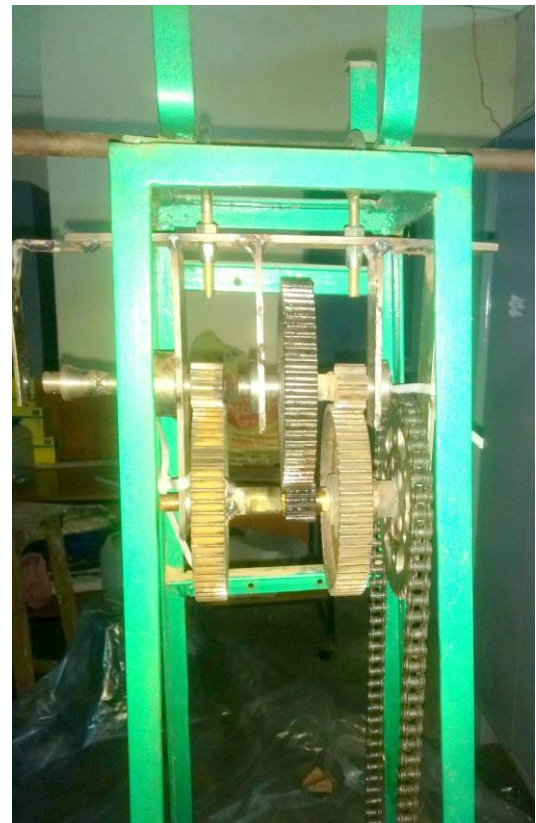


Fig. 1: Fabricated gravity light

The main components used in this project are:

1. Spur gear
2. Shaft
3. Load
4. D.C. motor
5. sprocket
6. Chain
7. Bearing
8. Casing
9. Stand

3.1 Spur gear

Spur gears are the least difficult kind of gear. They comprise of a chamber or plate with teeth anticipating radially. Despite the fact that the teeth are not straight-sided the edge of every tooth is straight and adjusted parallel to the pivot of turn. These rigging work together accurately just if fitted to parallel shafts. No hub push is made by the tooth loads. Goad gears are incredible at direct speeds however have a tendency to be loud at high speeds.



Fig.2: Spur gear

3.2 Shaft

A drive shaft, driveshaft, driving shaft, propeller shaft is a mechanical part to transmit torque and turn, generally used to interface different segments of a drive prepare that can't be associated specifically in light of separation or the need to take into consideration relative development between them



Fig.3: Shaft

3.3 Chain drive

Chain drive is a method for transmitting mechanical power starting with one place then onto the next. It is frequently used to pass on energy to the wheels of a vehicle, especially bikes and bikes. It is likewise utilized as a part of a wide assortment of machines other than vehicles.

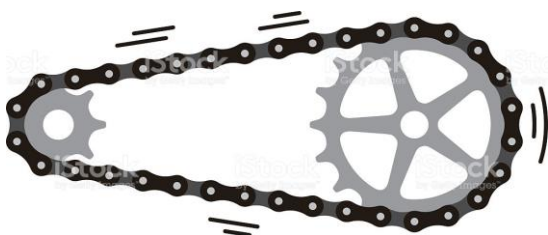


Fig.4: Chain

3.4 D.C motor

The motor used is a 12-volt electric motor. The motor is a permanent magnet motor that operates on the 12-volt battery, which gives the motor enough power to turn the steel blade at high speeds. The design of the blade motor will remain consistent to that of other electric mowers except that the microcontroller with a relay onboard will control it.



Fig.5: D.C motor

3.5 LED Light

A light-transmitting diode (LED) is a semiconductor light source. LEDs are utilized as marker lights in numerous gadgets and are progressively utilized for other lighting. Showing up as down to earth electronic segments in 1962, early LEDs discharged low force red light, however present day variants are accessible over the unmistakable, bright, and infrared wavelengths, with high brilliance.



Fig.6: LED light

4. DESIGN AND FABRICATION

Gravity light is designed to eradicate the kerosene lamp. Gravity light's output is better than a kerosene lamp.

4.1 Working procedure of the Gravity Light:

The gravity light consists of a D.C motor as the generator, a compound gear system which is a combination of spur gears of gear ratio 1:5 and a sprocket which is attached to a chain. When a heavy load applied to the one end of the sprocket due to gravity the load starts to move downward. Hence the compound gear system starts to rotate. With the rotation of one spur gear combination we get speed ration of 1:5 and combination of three of them gives the ratio about 1:125. As the D.C motor rotates with a low rpm, it produces enough electricity to light the LEDs.

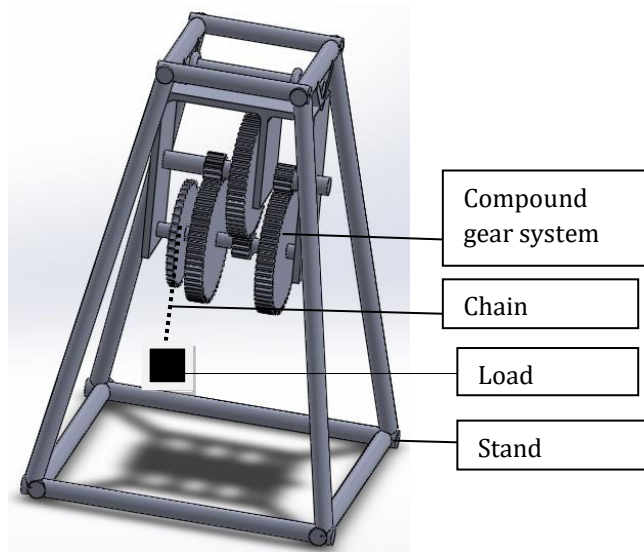


Fig.7: Designed Gravy Light

4.2 Calculations:

The diagram above has larger spur gear of dia 160mm

Smaller spur gear has a dia of 30mm

By starting with the generator, in this case a D.C motor is used. When it is turned the shaft of a motor, the motor acts like a generator, producing electricity. There is a small gear at the end which is connected to the generator shaft and its speed is above 200rpm, to find some combination of large gear with attached small gear and possibly more than one of them would cause a mass to fall at a slow speed which is sufficient to light the LED for a long time.

Using 15 kg of load, the potential energy of the load for an height of 80cm, $E_p = \text{mass} \times \text{gravity constant} \times \text{height of the load} = mgh = 15\text{kg} \times 9.81 \text{ ms}^{-2} \times 80\text{cm} = 117.72 \text{ J}$

This Potential energy is converted to electrical energy by the generator. Hence,

Generator output = Voltage \times Current flow \times time of load landing = $VIt = 7 \text{ V} \times 12 \text{ mA} \times 140 \text{ s} = 11.76 \text{ J}$

The height from where the load is falling by the gravity is, $h = 80\text{cm}$.

Time required to fall the load, $t = 140 \text{ s}$.

Hence, velocity of the falling mass, $v = 0.57 \text{ cm per second}$.
 Efficiency = $(\text{Output energy} / \text{Input Energy}) \times 100\%$
 $= (11.76\text{J} / 117.72\text{J}) \times 100\% = 10\%$

5. RESULTS

Some observations are made from the gravity light are given below:

Table 1: observations of lightning time for different mass of height 0.8m:

| Observations | Weight (kg) | Height (meter) | Lighting Time (seconds) |
|--------------|-------------|----------------|-------------------------|
| 1 | 15 | 0.8 | 140 |
| 2 | 20 | 0.8 | 105 |
| 3 | 25 | 0.8 | 80 |
| 4 | 30 | 0.8 | 65 |

Plotting of lightning time:

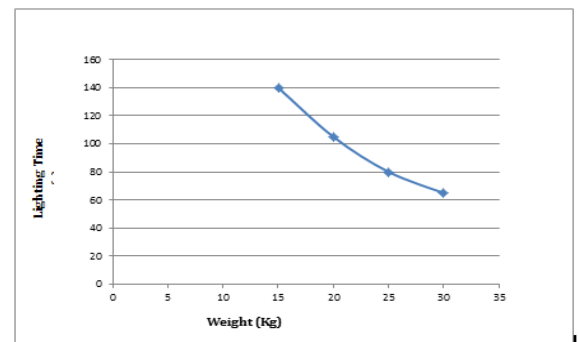


Fig.8: Graph for lighting time(s) vs. height (feet)

Table 2: Observations of voltage for different weights for constant height 0.8m

| Observations | Weight (kg) | Voltage (V) | Lighting Time (seconds) |
|--------------|-------------|-------------|-------------------------|
| 1 | 15 | 7 | 140 |
| 2 | 20 | 9.2 | 105 |
| 3 | 25 | 11.5 | 80 |
| 4 | 30 | 14 | 65 |

Plotting for voltage and weight from 0.8 m height

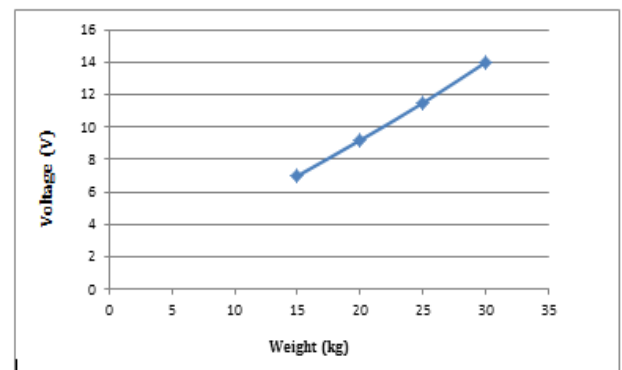


Fig.9: Graph for Voltage(V) vs. Weight (kg)

Table 3: Observations of efficiency for different weights and lighting time for a constant height 0.8m

| Observations | Weight (kg) | Efficiency (%) | Lighting Time (seconds) |
|--------------|-------------|----------------|-------------------------|
| 1 | 15 | 10 | 140 |
| 2 | 20 | 8.74 | 105 |
| 3 | 25 | 7.65 | 80 |
| 4 | 30 | 7 | 65 |

Table 4: Observations of current for different masses and a constant height 0.8m

| Observations | Weight (kg) | Current (mA) | Lighting Time (seconds) |
|--------------|-------------|--------------|-------------------------|
| 1 | 15 | 12 | 140 |
| 2 | 20 | 14.2 | 105 |
| 3 | 25 | 16.4 | 80 |
| 4 | 30 | 18.3 | 65 |

Plotting for current and weight from 0.8meter:

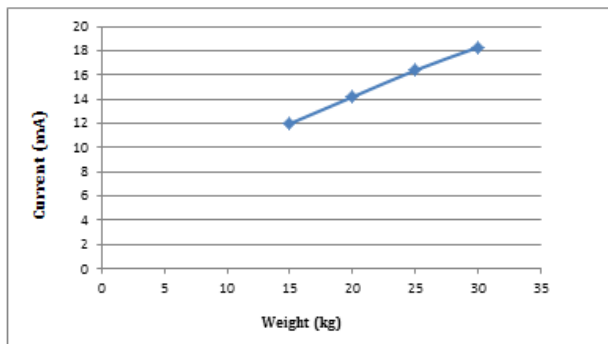


Fig.10: Graph for Current(mA) vs. Weight (kg)

6. CONCLUSION

Generation of gravity power can be increased by applying much higher load at the end of the sprocket. Though heavy load increases the voltage and current of DC motor but decreases the lighting time of the LED. Applying heavy load, it may cause bending to the shaft and stand. So a suitable mass must be used to fall it as much long time as possible. Due to low gear ratio there is a power loss in a great extent. Gravity light needs no operating cost, so it can be operated as the demand of the light. In the remote areas, it may play a very important role for studies and educating children as well as fulfilling the power demand. Moreover, the power can be stored in the battery so that it may be very helpful during emergency situations.

8. REFERENCES

- [1] R S Khurmi, J K Gupta, Theory of Machines, Pg 428-479, Eurasia Publishing House Pvt. Ltd. , Distributors S. Chand and Company Ltd. For Toothed Wheels.
- [2] V B Bhandari, Design of Machine Elements, Third Edition, McGraw Hill Education (India) Pvt. Ltd. for Rolling Contact Bearings, Pp. 564-596.
- [3] Prathamesh Natu, Sameer Nadkar, Abhishek Badgajar[2015], Generation of electricity using gravity International Journal of Mechanical Engineering and Technology (IJMET) Volume 6, Issue 7, July 2015
- [4] Pankaj Gode, Ankit Jadhav, Kalpesh Gardi, S.R Bhandari[2016], Changing Perspective: Gravity Light IOSR Journal of Computer Engineering (IOSR-JCE)
- [5] Digvijay S. Jadhav, Sagar N. Hullule, Nitin N. Jejurkar[2016], Gravity power generation International journal of Advance Research in Science and Engineering (IJARSE)
- [6] Sabir Hossain [2015], Design and Fabrication Of a Gravity Powered Light <https://www.researchgate.net/publication/2015>
- [7] Shahu A. Zalte, Mithil R. Mogare [2017], Design and Development of Gravity Lamp International Research Journal of Engineering and Technology (IRJET)
- [8] "Gravity Light Description of the Concept and its Realization" archived at <http://archive.aec.at/> last accessed on 15 th May, 2016
- [9] <http://www.fastcoexist.com/3050137/hows-that-working-out-for-you/this-ingenious-20-lamp-gets-all-its-energy-from-gravity> accessed on 19 th May, 2016.
- [10] <http://www.engineering.com/DesignerEdge/DesignerEdgeArticles/ArticleID/13777/GravityLight-Brings-Clean-Energy-to-Kenya.aspx>