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# Generation of Electricity by Combining Gravitational Pull and Harvesting Energy by Artificial Lights

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**Abstract:** *Presently and upcoming future electricity requirement is increasing at a large rate and most of the regions are not getting the amount of electricity as they actually needed to fulfill our daily requirement. So they have forced to utilize alternate sources of energy to generate electricity as we know not all alternate sources do not give clean, abundant and freely available energy. This type of alternate sources can be eliminated by use of gravity and artificial indoors lights. The power generation through gravity is basically acquiring electrical energy through gravitational force by motion of effective mass which is attached to the grooves wheel and v- type belt is attached in another groove in wheel and to the small pulley so when wheel rotates pulley also rotates with the help of belt and pulley is attached with generator that converts mechanical work into electrical energy which can be stored in battery, for continue cycle and to overcome friction a rod type linear actuator is attached. From secondary source, solar panels or cells are widely used to generate electricity as an alternative renewable energy. In this study an experiment of different light bulbs with standard illumination were conducted using reflecting mirror and solar panel or cell and reported to measure the voltage and current generated by a solar cell or panel from artificial lights and generate electricity and stored on a battery or to run small equipment's which consume less electricity.*

**Keywords:** *Sustainable energy, Gravitational force (pull force), Wheel, Grooves pulleys, Actuator, Generator, cell or panel, Reflecting mirror, Artificial lights.*

## I. INTRODUCTION

Indeed even today after improvement of science and technology, worldwide more than 1 billion peoples do not have approach even to essential electricity. That is just almost 1 among every 5 peoples. These peoples used other expensive and injurious resources like kerosene to light their homes. Gravity being one of the fundamental forces of nature is accessible everywhere over the Earth. As of now it is a dream to meet all energy necessity of the world. But when we have a light that gives free, clean energy at least the basic requirement of millions of people will be fulfilled. Power generation is done through different of methods, some of which uses Renewable vitality sources and some use Non Renewable Energy Resources. Be that as it may be used to produce the Electrical energy only for some extent.

The energy generated from the Renewable sources is also not constant all over the day for 24hrs. Therefore a source through which energy can be harvested persistently for 24hrs is to be found. Gravity is the force that is present on the earth at each time hence with suitable mechanism it can be used as a source to generate Electrical energy. An arrangement is made in such a way that the Kinetic Energy of a body due to the gravitational power is changed into electrical energy.

Energy harvesting is the physical procedure by which the energy is caught from the environment then convert into usable electricity. As of late there has been a growing interest of researchers for creating energy collect systems miniaturized scale level, from a different of sources: light, vibration, heat, radiofrequency waves. Scientist defined the conceptual approach of a neutral energy and proposed a model energy management for a system of gathering solar energy from the outer conditions. The stage has been used for evaluation.

This paper provides general rules in harvester design to relieve this risk. An examination of the distinction in the vitality gathered, brought about by changing the electrical lighting source is introduced in detail in this paper. This work examine the output power reachable from four sorts of solar cell under three diverse electrical enlightenment sources: incandescent (halogen), compact fluorescent lamp (CFL), metal halide bulb (MH) typically encountered within buildings, for different brightening levels.

## II. LITERATURE SURVEY

Another such system is created by Chunchan Wang et al [1] [Kaohsiung City] which produces vitality utilizing gravity transformation unit that produces positive forces by embracing outward-spreading single directional swing arms and decreases the negative forces by helping out collapsing activity of single directional swingarms. According to RS Ambade et al [2] Conserving vitality has become the greatest issue in present situation. Because of the turn of events and modernization the power request is expanding at serious degree. To satisfy this interest universally which is with no destructive impact on condition is conceivable by utilizing gravity power method to generate electricity. They are utilizing attempted and tried assembling who has the correct information to make gravity light. Gravity light is a progressive new way to deal with putting away vitality and making enlightenment. It takes just three seconds to lift the weight which powers gravity light, making 30 minutes light on its drop. Maximo Gomez-Nacer et al [3] have structured an arrangement of acquiring power by methods for utilization of the power of gravity, by joining pendulums whose weight and speed give vitality to power age. Romania inventor, Aurel Chirap, Valetin Popa, Eugen Coca, Dan Alin Potorac et al [4] presented a study concerning the harvesting of energy from natural light radiation and/or artificial in the indoor environment. The principal objective is to utilize the energy collecting subsystems dependent on mini-photovoltaic panels to help the operation of the permanent regime of electronic devices with low power utilization such as sensor nodes. Mikhail Dmitriev et al [5] a Russian inventor to think about his gravity engine. He has evidently conceived a component whereby static gravitational force can be harness to create valuable energy. He has worked for a long time creating and testing gravity fueled gadgets and he has been effective in his work. His different plan depends on the guideline of having loads joined to a haggles for those loads to be balanced outwards when falling and counterbalanced inwards when rising. As a result of the diverse switch arms included, that gives a power unevenness which makes the wheel turn consistently and on the off chance that the loads are of an extensive size, at that point the revolution is incredible and can be utilized to produce electrical vitality. Md. Muqtar Ahmed, Heena Naaz et al [6] have presents a new innovative method of power generation using the gravitational force of our earth which is present all the time and can be utilized at any place on the earth. A positioning is made so that the kinetic energy of a body due to the gravitational power is changed into electrical energy.

## III. RESEARCH SIGNIFICANCE

The main aim of this research is to utilize the force to produce economical and safe energy alternatives, to utilize energy which we using in our homes for daily purposes, to investigate the different artificial lights bulbs which are used in our homes so that we come to an outcome that which bulbs is better for harvesting energy to generate electric current and to generate and supply continuous energy in the form of electricity with help of gravity in the form gravitational force. From gravity experiment we predict that this arrangement can help many villagers to utilize it for their daily requirements.

## IV. WORKING OF PROJECT

From the below figure illustrates the working of this system. In this we take a wheel with grooves in it of diameter (1.5m) and all (7) weights is attached in such a manner so that they all (6) weight will cancel out each other by moving in state of balancing equilibrium and every time the top most weight on the wheel is treated as the effective weight and each weight is placed at a spacing of (51.428°) each and wheel is attached with shaft and belt is wrapped on another grooves it. The remaining (7th) weight that is the effective weight which is responsible to rotate the wheel and pulley and each of weights is (6kg). The principal on which this gravity project work is when an object with a mass is placed at a higher altitude with the help of gravitational force which pull it to a lower altitude which it gains kinetic energy can further converted into mechanical energy and then electrical energy. On the other side the smaller pulley of diameter (12cm or 0.12m) is coupled or attached to the shaft on which flywheel is attached and also on this shaft a small pulley (D<sub>4</sub>) is there which is wrapped with belt to other pulley (D<sub>5</sub>) and this attached to the DC generator is rotate which convert mechanical work into electrical energy. As we know that among the five fundamental forces gravity is weakest force with this due friction our wheel stops after certain rotations to overcome the friction and to continues the operation for longer time. We use a device called linear actuator of rod type which helps to rotate the wheel attached with weight by striking the topmost weight which comes in its directions with the help of rod which give intense energy to rotate the wheel again. A sensor is attached to top of actuator it sense the motion (rpm) of wheel and give sudden signal to actuator to strike the top most weight, we set the speed sensor and actuator in such a way that after the calculate speed of wheel if rotation of larger wheel is trying to decreased it strike the weight and automatically it cut-off its power and this way the same cycle will continues and MCU circuit is attached that helps to control all of the functions of an electronics devices and give signal to the actuator. In secondary method, in our household we always use bulbs to illuminate are homes and during night also.

Here we harvesting the energy from artificial lights bulbs and tube lights of different types that we use in our homes such as (metal halide, incandescent, halogen etc) with the help of solar cell or panel with proper arrangement by using reflecting mirror placed at suitable angle ( $45^\circ$ ) depend on position of bulbs. The mirror is placed on the upper side of bulb and solar cell or panel is placed on lower side of bulb and then bulb is placed between them in the sandwich condition and we also cover it side by aluminum foil. When the bulbs illuminate it emits maximum light on the cell or panel with high intensity so that panel gets activated and cause photovoltaic effect. This extraction of energy is stored in battery. To charge the battery we use buck- boost convertor to manage the voltage and prevents from transmission losses.

NOTE-We take a D.C generator of (1 KW) because to match the rated rpm which we are getting so that they are capable to produce that much of power that help for our requirement that what we need because some of the power is lose in transmission, that means generator are not design as for 100% efficiency. They have some their own limitations. generally we assume that generator gives us 80 percentage of transmission efficiency and also battery have their own capacity to recharge, that means they losses power during charging and we use actuator for transmission of force to wheel so they also consume power so we take (1KW) generator so that, at least they will gives us 500+power every time.

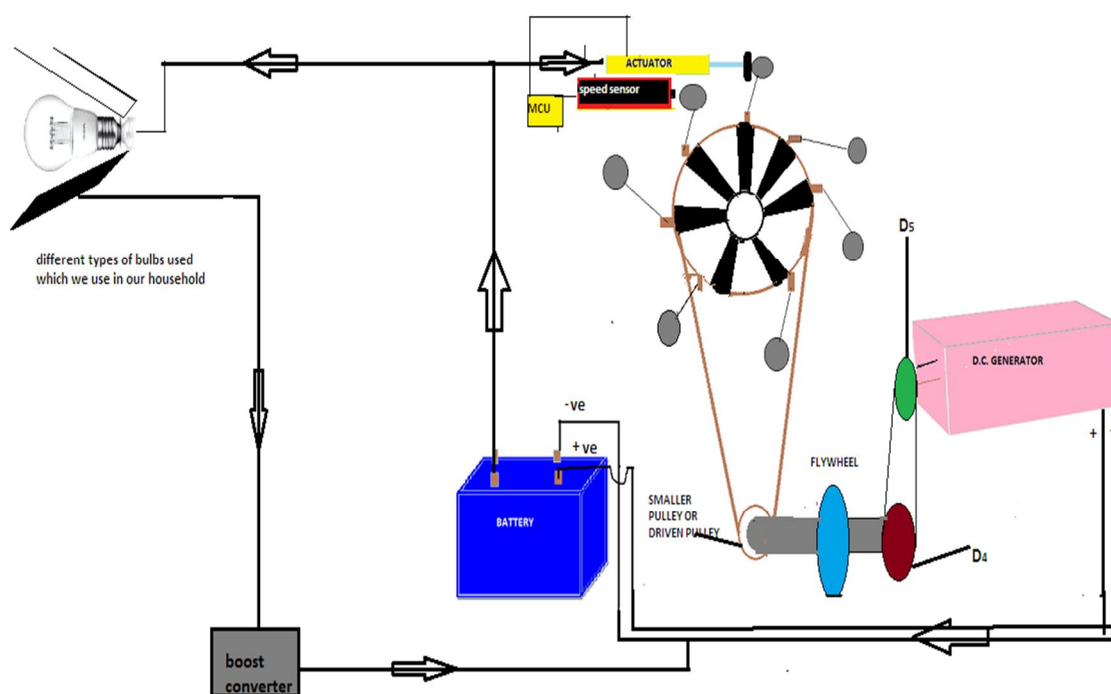


Figure.1

## V. RESULTS WITH DETAILS

Here, the assumption taken that the rim and the spoke have the same density we have make correct distributions of mass. In this compound mechanism,

Mass of ball ( $M_b$ ) = 3 kg  
Mass of rim ( $M_R$ ) = 3.8 kg  
Mass of spoke ( $M_S$ ) = 0.8 kg  
Length of spoke ( $L_S$ ) = 0.75m

Here we first calculate the moment of inertia of wheel attached with (7) weight at equal distance and each of (3) kg because moment of inertia of wheel states that how much energy is required to move the object against resistance.



#### A. Moment of Inertia of Wheel

$$I_W = 7 I_{\text{slope}} + I_{\text{rim}}$$

$$= 7 \left( \frac{1}{3} M_S L_S^2 \right) + M_R (L_S)^2$$

$$= 1.05 + 2.1375$$

$$I_W = 3.1875 \text{ kg-m}^2$$

Now we can calculate the moment of inertia of ball of weight (3) kg about its central axis

Diameter of ball ( $D_b$ ) = 0.06 m or 6 cm or 60 mm

$$I_B = \frac{2}{3} M_B R_b^2$$

$$I_B = 0.0126 \text{ kg-m}^2$$

So, total moment of inertia of wheel attached with weight,

$$I_{\text{TOTAL}} = I_W + I_B$$

$$I_{\text{TOTAL}} = 3.2001 \text{ kg-m}^2$$

Above value show that this much energy is required to rotate the wheel.

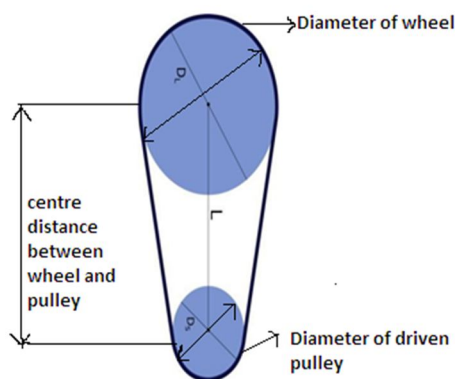


Figure.2

#### B. Formula for Belt Length

$$L_p = 2C + 1.57(D+d) + \frac{(D-d)^2}{4C}$$

Where c is the center distance between pulley and wheel

Calculated – belt length (L) = 4664 mm or 4.664 m

To rotate the wheel the torque is required which is done by the actuator (ETT type) Here, the actuator force given to wheel = 800 N or 81.5494 kg

The stroke length rod that hit the weight = 0.4 m

Speed of the stroke length rod = 4 to 8 m/sec

Work done by actuator =  $800 \times 0.4 = 320 \text{ N-m}$  or joule

Here we added the potential energy also because potential energy is the energy stored in an object due to its position relative to some zero position. An object possesses gravitational potential energy if it positioned at a height above (or below) the zero height.

Total work done on the wheel =  $320 \text{ N-m} + M \cdot g \cdot h$

$$= 320 + 3 \times 9.81 \times 1.5$$

$$= 364.15 \text{ N-m or joule}$$

Now this work done is converted into kinetic energy

$$364.15 = \frac{1}{2} I \cdot \omega^2$$

$$364.15 = \frac{1}{2} \times 3.2001 \cdot \omega^2$$

Angular velocity ( $\omega$ ) = 15.0859 rad/sec

This above value shows that how fast the object rotates or revolves relative to other position Now through angular velocity of wheel we calculate the speed (N) of wheel in R.P.M

$$\omega = 2\pi N_w L / 60 \quad 15.0859 = 2 * 3.14 * N_w / 60$$

$$N_w = 144.132 \text{ r.p.m}$$

Now we have to calculate the speed of smaller pulley or (driven pulley)

$$\text{Wheel diameter (D}_w\text{)} = 1.5 \text{ m}$$

$$\text{Pulley diameter (D}_p\text{)} = 0.4 \text{ m or } 40 \text{ cm}$$

$$\text{Flywheel diameter (D}_F\text{)} = 0.6 \text{ m or } 60 \text{ cm}$$

$$\text{Weight of flywheel} = 35 \text{ kg}$$

By using pulley and belt system, comparing the

Size of two pulleys we can calculate the velocity ratio of system-

$$N_L * D_w = N_p * D_P$$

$$144.132 * 1.5 = N_S * 0.4$$

$$N_p = 540.495 \text{ r.p.m}$$

From above shows the driven pulley speed which is connected to the flywheel and through flywheel two pulleys also connected (D4) and (D5) which help to changes the speed (increasing) which is connected to the generator rotor in such a way that the (D5) pulley speed match the generator rated speed to get rated power output.

NOTE- Speed changes are made by using different size pulleys on the driver or driven shafts.

Since, pulleys which is connected on the flywheel shaft have the same speed (N4) Diameter (D4) = 30 cm or 0.3 m

$$\text{Diameter (D}_5\text{)} = 15 \text{ cm or } 0.15 \text{ m}$$

Again by using belt and pulley system, we find the speed of (N5) pulley which is connected to generator.

$$D_4 * N_4 = D_5 * N_5$$

$$0.3 * 540.495 = 0.15 * N_5$$

$$N_5 = 1203.99 \text{ R.P.M}$$

To calculate the torque of smaller pulley (driven pulley) - According to the belt and pulley system,

The speed ratio also tells about the torque of the system as the ratio of output torque to input torque is equal to speed ratio.

$$D_p / D_w = \tau_p / \tau_w$$

$$0.4 / 1.5 = \tau_p / 600$$

$$\tau_p = 160 \text{ N-m}$$

Similarly-we find other torque,  $\tau_4 = 120 \text{ N-m}$

$$\tau_5 = 60 \text{ N-m}$$

For flywheel- flywheel energy storage system (FESS) use to stored energy in the form of kinetic energy. When the short term back-up power is required because utility power fluctuates or is lost, the inertia allows the rotor to continue spinning and the resulting kinetic energy is converted to electricity.

**NOTE-** Installing a lightweight flywheel does not decrease torque but it does decreased inertia means less torque will be needed to break. It maintains the rotating mass (inertia) to assist the wheel rotation and

Provide a more torque during running. Heavy flywheel need more torque to rotate.

Energy stored in flywheel-

$$\text{Diameter of flywheel} = 60 \text{ cm or } 0.6 \text{ m}$$

$$\text{Mass of flywheel} = 35 \text{ kg}$$

$$\text{Velocity of rotating wheel (v)} = \pi D_F N_F / 60$$

Here the speed of flywheel is same as speed of smaller pulley ( $N_S = N_F$ )

$$v = 3.14 * 0.6 * 540.495 / 60$$

$$v = 16.971 \text{ m/sec}$$

$$E = \frac{1}{2} m v^2$$

$$E = 5040.25 \text{ joule or } \text{kg-m}^2/\text{sec}^2$$

The (D5) pulley which is attached to the generator whose speed is ( $N_s$ ) is 1200 rpm is same as rated speed of rotor is generator which gives us the rated output of 1 K.W. Here we use the D.C. generator of 220v which further connected to the battery to stored electric current. The battery we are using in this project is the battery which is used in inverter like Exide, luminous etc. as per requirement.

**Note-** To estimate the energy capacity of a battery in kilowatt- hours, multiply the typical operating voltage by the amp- hour rating then divide by 1000.

The main parameter output which we are getting are-

Diameter (mm)	Rotation Per Min.(rpm)	Torque
Dw = 1500	144.132	600
Dp = 400	540.495	160
D4 = 300	540.495	120
D5 = 150	1203.99	60

Table.1

### C. Secondary Process

Harvesting energy of artificial light through solar panel to generate electricity Using 12v, 18v, 24v polycrystalline solar panel – By simulating different bulbs of different intensity to check weather which is suitable for harvesting energy through cell or panel and gives best output.

1) *Metal Halide ARC Lamp Or HPS*: Reason for using this lamp because of its high light efficiency of over 87 lm/w, good balance in spectral qualities and emit high lumens compared to other bulbs.

Using – 100w-metal halide arc lamp

Energy emitted by metal halide bulb in lumens = 8500

Solar panel area in cm = 22.4cm\*18cm

Luminous efficiency of metal halide bulb in lumens per watt = 87 lm/w

By standard formula for calculating artificial light poweroutput

$P(\text{watt}) = E_v(lx) * A(m^2) / \eta(lm/w)$  Here,

$E_v(lx)$  = energy emitted in lumens

$A(m^2)$  = area of solar panel in which light strike the panel

$\eta(lm/w)$  = standard luminous efficiency

Power (p) =  $8500 * 0.224 * 0.18 / 87$

P(output) = 3.93 watt

By using reflecting mirror and placed at suitable position at 45° angle so that it converge it and focus maximum light to solar panel

.At 45°- the value of lumens increased Energy emitted by the lamp = 9000 lumens

$P = 9000 * 0.224 * 0.18 / 87$

P(output) = 4.0871 watt

By using multi-meter to check out current and voltage.

The distance between the bulb and the solar panel is about = 10cm Energy emitted by the metal halide bulb = 8500 lumens

Placing mirror at suitable position= 45°

When the light fall after reflection on the solar panel

The output current and voltage measure with multi-meter –

Output current (Amp) = 0.2A

Output voltage (V) = 18.24V

We know that,

$P(\text{output}) = V * I = 3.648 \text{ watt}$

Table of Output Getting With Different Bulbs -

Different Solar panel	Artificial light bulb	Multimeter reading		Power output (Watts)
		(V)	(I)	
12 volt	100 watt metal halide bulb	12	0.100	1.2
18 volt	100 watt metal halide bulb	18	0.206	3.708
18 volt	100 watt incandescent bulb	18	0.126	2.268
18 volt	100 watt halogen bulb	18	0.056	1.008
24 volt	100 watt metal halide bulb	24	3.24	77.76

Table.2

## VI. CONCLUSION

From this research we conclude that the rated output power which we are getting from gravity power generation of 1 kw is helpful for our daily power requirements or we can directly supply to our homes for daily consumption.

From the secondary experiment that is parallel connected from gravity also help to generate electricity but not in large amount as compared to gravity. The harvesting energy from solar cell or panel using poly-crystalline the value of power which we getting from artificial light bulbs is efficient the charge the small battery. The output voltage is low so, to maintain the output voltage generated by the cell or panel we use buck- boost convertor. From the artificial light experiment we conclude that the incandescent bulb and metal halide bulbs are efficient than other light bulb in terms of giving output with solar cell or panel but metal halide bulb emits more lumens compared to other artificial lights bulbs and by using reflecting mirror and cell or panel arrangement at an certain angle to concentrate more light on panel so that we get more output.

The gravity power generation mechanism of the present invention utilizes a gravity energy conversion unit to which can provide a stable operation to continuously convert the gravity potential energy into kinetic energy and then to electrical energy So as to perform a long time effective and stable energy output. Renewable energy is currently looked as the sources which will meet the future energy requirement such as solar, wind, tidal etc yet these sources have their own unique geographical as well as other limitation and not available throughout. But gravity is available across our entire planet thus, we can use something like electricity from gravity on a large scale to generate electricity any time at any place. The present invention not only can independently generate electricity but can be parallel connected to the harvesting energy of artificial lights through solar panel to generate electricity.

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