

GENERATION OF ELECTRICITY USING GRAVITY

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ABSTRACT

Early in our lives, we become aware of the tendency of all material objects to be attracted towards the earth. Anything thrown upwards eventually falls down. The constituents of universe are galaxy, stars, planets, asteroids, meteors, etc. The force which keeps them bound together is called gravitational force. Earth exerts a force of gravity on all objects.

With every passing day, the need for sustainable living on Earth is increasing greatly. For this world needs to start using renewable energy resources. The following project shows how electricity can be generated using gravity in simplest possible way. Mechanical components like Spur gears, chain and mass provide input to an electrical circuit through a generator motor. Every time you lift the weight, gravitational potential energy is converted into electrical energy for 68 seconds in this model. Power generation from gravity is cheaper and bio-efficient as compared to solar and other renewable energy sources.

Keywords: Gravity, Potential, Energy, Electrical, Power, Weight

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1. INTRODUCTION

Even today, after advancement of science and technology, more than 1 billion people do not have access even to basic electricity. That is almost 1 among every 5 people. These people use other costly and harmful resources like kerosene to light their homes. Gravity being one of the fundamental forces of nature, is available everywhere across the Earth. Currently it is a dream to meet all energy requirements 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.

2. EXPERIMENTAL SETUP AND PROCEDURE

In this project we have used Spur Gears for reduction of input speed, a chain for suspension of weight around a bicycle sprocket. The sprocket and larger spur gear are mounted on a shaft which can rotate freely between the bearings. Smaller spur gear is coupled with an AC Synchronous Motor which provides input to an electrical circuit. The circuit consists of a rectifier, capacitor and LEDs.

When the weight is suspended from a chain across the sprocket, the shaft rotates. Thus the larger spur gear rotates at speed of shaft and in turn rotates the smaller gear. This acts as an input to AC synchronous motor. Rectifier converts Alternating current into Direct current and LEDs glow.

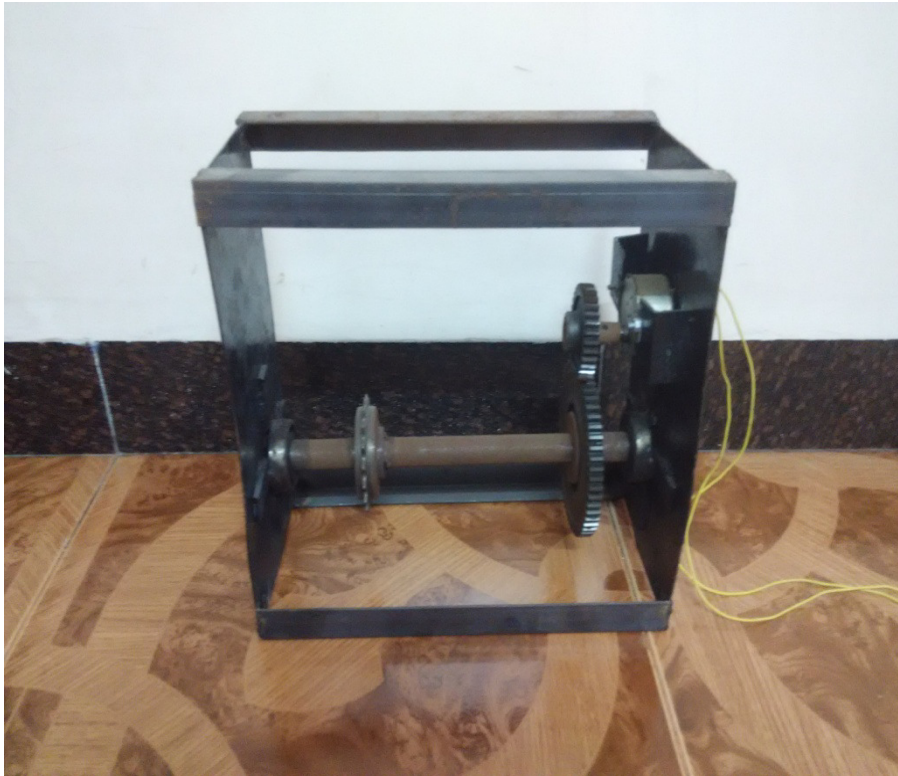


Figure 1 Actual model with gears, sprocket and motor

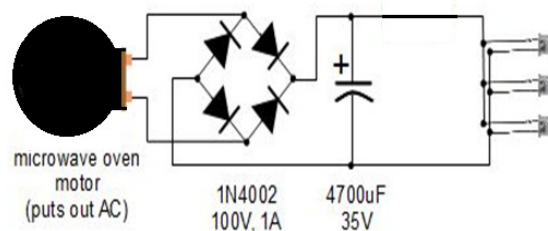


Figure 2 Circuit of the output

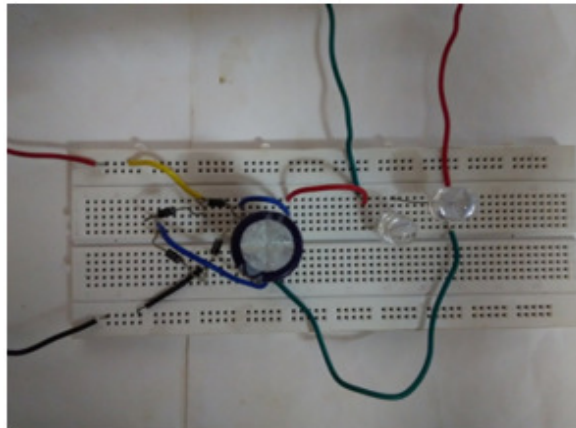


Figure 2 Actual output Circuit

3. PROBLEM DEFINITION

The various problems associated with production of gravity light are mentioned below

3.1 Problem

Gravity is the weakest of the four [fundamental forces](#) of nature.

Remedy

Gravity is the dominant force at the macroscopic scale. It is responsible for causing the Earth and the other planets to [orbit](#) the Sun; for causing the [Moon](#) to orbit the Earth; for the formation of [tides](#). Thus we can use it to pull a gathered weight of around 10-15 pounds.

3.2 Problem

Due to Excessive weight the apparatus may be Damaged.

Remedy

Design the stand according to the weight specifications and clearly mention the limits of weight it can manage.

3.3 Problem

Belts cause slips.

Remedy

Use Grooved or strap belts and gears to avoid slips.

3.4 Problem

Power output is small.

Remedy

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.

4. FIGURES AND TABLES

Consider the diagram representation of gravity powered light as shown in the figure below:

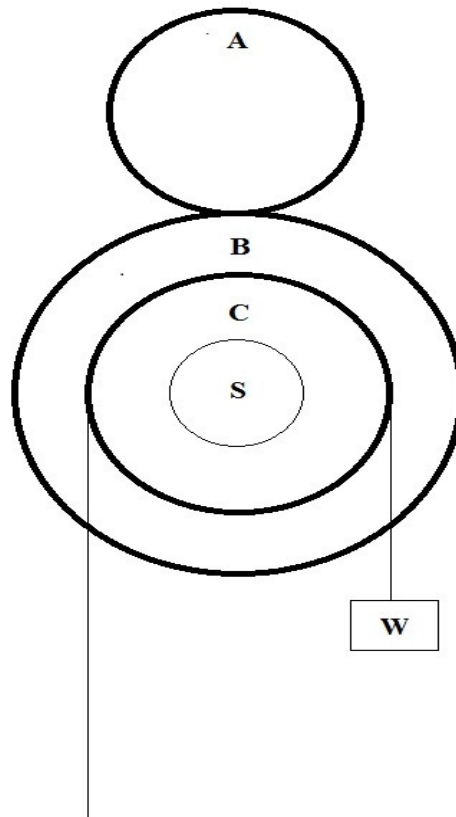


Figure 3 Diagram Representation of the model

From the experiments performed on our gravity powered light, different readings were obtained for different masses suspended from the chain.

The model has A_r , B_r and C_r added to it. These are the:

- Rotational speed A_r of the small gear A with the generator attached,
- rotational speed B_r of the large gear B, and
- Rotational speed C_r of the small sprocket C that's attached to the large gear that is mounted on shaft 'S'.
- Mass of 'W' kg is suspended with the help of chain for the rotation of shaft.

To get enough power to light the LED, the motor had to turn at the rate of 15 rpm. That means it has to turn 1/4 turn each second.

Circumference of A = $2\pi \times 30 = 188.5$ mm

$$\therefore \text{Rotational Speed of A} = 188.5 \times 15/60 = 47.125 \text{ mm/s}$$

If the circumference of the small gear A is moving at a speed of 47.125 mm/second then the circumference of the large gear B is also moving at 47.125 mm/second. So B_r is 47.125 mm/second.

The small sprocket (C) is mounted on a shaft with the large gear (B). A single turn of the large gear results in a single turn of the small sprocket.

The circumference of the large gear is 377 mm and the circumference of the small sprocket is 235.6 mm. Since one turn of the large gear means one turn of the small sprocket, that means when the large gear goes 377 mm, the small sprocket goes only 235.6 mm. The ratio of those two lengths is 0.625.

Since the rotational speed of the large gear is 47.125 mm/second (Br), the rotational speed of the small sprocket:

$$\text{Rotational Speed of C} = 0.625 \times 47.125 = 29.45 \text{ mm/s}$$

∴ The mass will be falling at 29.45 mm/second. If the distance it has to fall is 2 meter, 2000 mm, then that will take 68 seconds.

That means the calculated run time is 68 seconds, not taking into account losses, and assuming a reasonably sized mass can do it.

After conducting series of Calculations based on the available data, the following results were obtained for different parameters.

4.1 Time and Reduction Ratio Results

For 2000mm,

Table No 4.1 Time Descent Reduction table

Sr. No.	Running Time (second)	Sprocket Descent(mm/s)	Reduction Ratio
1.	68	29.45	0.625
2.	600	3.33	0.07
3.	900	2.22	0.047

4.2 Power Output

The Potential available for the model at the height of 2m depends on the mass suspended from the Sprocket.

$$\text{For Mass} = 3 \text{ kg, Force of Gravity} = g = 9.81 \text{ m/s}^2$$

$$\begin{aligned} \text{Power} &= m \cdot g \cdot h / t \\ &= 3 \times 9.81 \times 2 / 68 \\ &= 0.8655 \text{ W} \end{aligned}$$

Table No 4.2 Mass Time Power Table

Sr. No.	Mass (kg)	Time (seconds)	Power (Watts)
1	3	68	0.8655
2	2	96	0.4088
3	3.5	48	1.43

5. CONCLUSION

Thus we have successfully conducted the project using a mechanical model and can claim that it is feasible to generate electricity with the help of gravity. Further developments can be made in this field to make it more efficient and resourceful.

Renewable energies are currently looked at as the sources which will meet the future energy requirements. Solar, Wind, Tidal, Geothermal are some popular examples of renewable energy sources. Yet these sources have their own unique geographical as well as other limitations and are 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 impact will be beneficial for the social, health and economic situations of end users; the economic situation of local distributors and everyone on earth as replacing kerosene lamps with a product free of any fuel will reduce greenhouse gas emissions and thus reduce climate change.

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