

A RESEARCH PAPER ON POWER GENERATION USING GRAVITY

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Abstract - - *In present scenario the fossil fuel sources are depleting and their combustion products are causing global environmental problems. So, it is inevitable to shift towards the use of renewable energy sources. Sources which in turn will reduce pollution and fossil fuels. For meeting the regular demand of energy, we need to design a system such that electricity can be produced without destroying the nature. This paper explains the power generation using gravity and the projects attempt to show how energy can be tapped and used at a commonly used machine. The model idea can be used in the industrial for the peak demands avoiding the load shedding and in the rural areas for the power generation for less initial investment.*

Key Words: *power generation, renewable energy, gear drive, gears, alternator, supply and demand, gravity.*

1. INTRODUCTION

Man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Primitive man required energy primarily in the form of food. He derived this by eating plants or animals, which he hunted. Subsequently he discovered fire and his energy needs increased as he started to make use of wood and other bio mass to supply the energy needs for cooking as well as for keeping himself warm.

With the industrial revolution and the increase in the industries they started using the fossil fuels for the generation of the electricity to the meet the demand of the factories and also for the production of electricity the nonrenewable sources are used. In this project we will use the renewable and effective type of energy source for the power generation without harming the environment. The energy source is going to be gravity which will be used for the generation of electricity. Therefore, to overcome this problem we need to implement the techniques of optimal utilization of conventional sources for conservation of energy and also to identify the new source for producing renewable energy.

During peak demand hours the power requirement (demand) and the supply or production there is gap between both supply and demand. Our aim is to generate power using eco-friendly methods like using gravity and to drop the weight when the demand is high and to generate the power and fulfil the demand requirement in best possible way and gain more revenue as there is more

demand and naturally if we will deliver in high demand period the cost per unit is high.

2. LITERATURE REVIEW

In [1] this project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries. We are proud that we have completed the work with the limited time successfully. The foot step generation is working with satisfactory conditions.

We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus, we have developed a "FOOT STEP POWER GENERATION" which helps to know how to achieve low cost automation. The application of pneumatics produces smooth operation. By using more techniques, they can be modified and developed according to the applications.

In [2] this project works the utilization of energy is an indication of the growth of a nation. One might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy. And this project utilizes the best source of energy that we get in day to day life. It is a nonconventional type of producing the energy. The existing source of energy such as coal, oil etc may not be adequate to meet the ever-increasing energy demands. These conventional sources of energy are also depleting and may be exhausted at the end of the century or beginning of the next century. Consequently, sincere and untiring efforts shall have to be made by engineers in exploring the possibilities of harnessing energy from several nonconventional energy sources. This project is a one step to path of that way. The overall goal was to design the speed breaker System while keeping the engineering, producer and customer models in check. The reason why this feature was used more than all of the other features are because the other features would not have as much effect on the complete system. By changing the size and desirable price, weight and capacity can be realized. Future work would consist of a redesign of this model to see exactly how much data we may be missing with the assumption that we made with low price, weight and capacity.

In [3] this project works the author concluded that, Vehicle Suspension Energy Generation is very efficient and useful in converting the Kinetic Energy from the movement of the vehicle, especially the suspension, which usually goes waste, to electric energy that can be used to fulfil needs of the auxiliaries in the vehicle. Currently the batteries of automobiles are charged by specific alternator which is attached to IC engine shaft. So that the fuel used in automobiles is also consumed for rotating the alternator to charge the battery, this consumption is found to be 4% of total consumption. By newly designed suspension, regeneration system presently using alternator is detached from the engine and attached to the suspension system. The advantage of this concept is energy storage system is possible using "BESS system" and even fully drained battery is charged by ultra-capacitor using high frequency charge controller system. If we install this regeneration system for all 4 wheels then we can generate high amount of electric power. This high amount of electric power can be used for the working of vehicle air conditioner or refrigeration system of vehicles. This suspension system will be mostly useful for heavy compressed vehicles, milk trucks, fire brigade trucks and also those having high requirement of electricity inside it. From result graph we are observed that for a small amount of vibration of vehicle, we get the maximum voltage and current.

3. WORKING PRINCIPLE

Dead weight is been used as an agent to drop from the height which will travel the certain specified distance to rotate the pulley, the pulley is attached to the shaft which is supported by the bearings and then input to the Gear box, at the gear box the RPM which is available at the input shaft is amplified and the RPM is increased and made available at the output shaft of the gear box, that output high RPM shaft is attached to the generator/alternator to produce power and the power generated is directly sent to the grids to the consumers to run the load, this technology is used to produce power in peak demand hours.

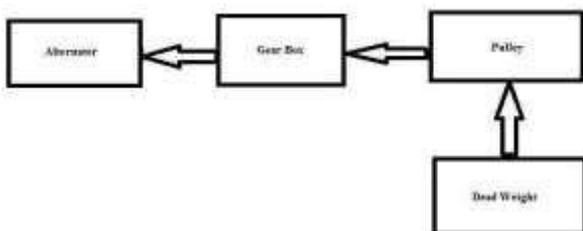


Fig 1. Basic working of the model

4. COMPONENTS

4.1 GEAR BOX

A gear or cogwheel is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part to transmit torque. Geared devices can change the speed, torque, and direction of a power source. Gears almost always produce a change in torque, creating a mechanical advantage, through their gear ratio, and thus may be considered a simple machine. The teeth on the two meshing gears all have the same shape. Two or more meshing gears, working in a sequence, are called a gear train or a transmission. A gear can mesh with a linear toothed part, called a rack, thereby producing translation instead of rotation.

Material used: Stainless Steel

Z1= 120 Z2= 35

D1= 192mm

D2= 58mm



Fig 2. Gear box

4.2 BEARING

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Many bearings also facilitate the desired motion as much as possible, such as by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.



Fig 3. Bearings

4.3 ALTERNATOR

Without a commutator, a dynamo becomes an alternator, which is a synchronous singly fed generator. When used to feed an electric power grid, an alternator must always operate at a constant speed that is precisely synchronized

to the electrical frequency of the power grid. A DC generator can operate at any speed within mechanical limits, but always outputs direct current. Typical alternators use a rotating field winding excited with direct current, and a stationary (stator) winding that produces alternating current. Since the rotor field only requires a tiny fraction of the power generated by the machine, the brushes for the field contact can be relatively small. In the case of a brushless exciter, no brushes are used at all and the rotor shaft carries rectifiers to excite the main field winding.

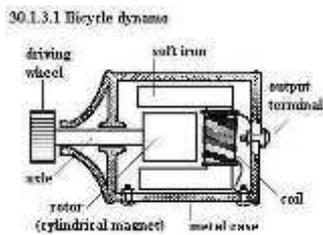


Fig 4. Alternator

4.4 PULLEYS

Pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a taut cable or belt, or transfer of power between the shaft and cable or belt. In the case of a pulley supported by a frame or shell that does not transfer power to a shaft, but is used to guide the cable or exert a force, the supporting shell is called a block, and the pulley may be called a sheave. A pulley may have a groove or grooves between flanges around its circumference to locate the cable or belt. The drive element of a pulley system can be a rope, cable, belt, or chain.



Fig 5. Pulley

4.5 DEAD WEIGHT

Dead weight is a metal solid block with calibrated weight as per standards. Deadweight (DWT) or tons of deadweight (DWT) is a measure of how much weight a ship can carry, not its weight, empty or in any degree of load. DWT is the sum of the weights of cargo, fuel, fresh water, ballast water, provisions, passengers, and crew. DWT is often used to specify a ship's maximum permissible deadweight (i.e. when it is fully loaded so that

its Plimsoll line is at water level), although it may also denote the actual DWT of a ship not loaded to capacity.



Fig 6. Dead Weight

5. DESIGN CALCULATIONS

- Spur Gear:

$$D1 = 190\text{mm} \quad D2 = 58\text{mm}$$

$$Z1 = 120 \quad Z2 = 35$$

$$M = D1/Z1 = 1.58$$

$$M = D2/Z2 = 1.65$$

- Gear ratio

$$T2/T1 = N1/N2$$

$$= 35/120$$

$$= 0.2916$$

If the rpm of gear 1 is $N1 = 50\text{rpm}$ (assume)

Therefore,

$$N1/N2 = D2/D1$$

$$= 50/N2 = 58/192$$

$$= 163.7\text{rpm}$$

$$\text{Torque} = \text{Force} * r$$

Also,

$$\text{Force} = m * a$$

$$= 20 * 9.81 = 192.2 \text{ N}$$

Therefore

$$T = 192.2 * 95$$

$$= 18.2 \text{ Nm and for pinion,}$$

$$T = 192.2 * 29$$

$$= 5.57 \text{ Nm}$$

Thus,

$$\text{Power transmitted} = 2\pi NT/60$$

$$= 2 * \pi * 163.7 * 5.57 / 60$$

$$= 95.48 \text{ watts}$$

Also, if the rpm of $N1$

$$= 20\text{rpm}$$

Then,

$$\text{Similarly, } N2 = 68.58\text{rpm}$$

Therefore,

$$P = 2\pi NT/60$$

$$= 40 \text{ watts}$$

Estimated power output

Power delivery is directly affected by the capacity of alternator. Following are the standard values regarding the same. Power = $2 \pi N T / 60$ watts

$$= 40 \text{ watts (approx.)}$$

6. DESIGN MODEL (NX- CAD)



7. METHODOLOGY

1. Literature review for press machine & forging machine, linear generators and magnets were carried out from SAE papers, books, Journals, magazines and websites.
2. Based on reviewed literature a system that converts linear motion of ram of presses to electrical energy was conceptualized.
3. Designed system was retro-fit and it was integrated to existing press machine & forging machine.
4. Based on the generated magnetic flux different concepts were built.
5. A technology prototype was fabricated to exhibit the functionality using one of the concepts among various concepts.
6. Prototype was validated with the analysis results for generated voltage.

8. RESULT

8.1 Observations

1. In the model, I have successfully simulated the project.
2. We designed of the system on Cad software
3. Approximate calculation of the power produced.

9. CONCLUSION

In over project we have used pulley and dead weight for an electricity generation this system is low cost. Conventionally, the power generation is one by hydro,

nuclear or thermal power plant. All gap between the demand and supply can be adjusted using this system.

10. FUTURE SCOPE

1. Increase the overall efficiency of the model
2. Implementation of the lithium ion for the storage of the electricity produced
3. Design and development of the large-scale model.
3. Analysis for the large-scale load in the shaft and the respective members.

11. REFERENCES

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