

Generation of electrical power at rural area using pet animals

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ABSTRACT

Our project is simply following the principle of energy conversation rule according to theory of relativity(Animal power converted into mechanical energy by gear assembly and mechanical energy is converted into electrical energy by DC generator.). In rural area the transmission and distribution of electrical grid is till difficult but if we use this phenomenon of generation of electrical power using pet animal at those area we can solve the problem of electricity.

Keywords: Generation, Electricity, Using Pet animal, Gear assembly.

I. INTRODUCTION

Now a day, electricity is basic requirement of human being. Electrical power is used in agriculture purpose, commercial purpose and industrial purpose also in routine daily life at our home for various appliance. So, we use as more as power generating plant in our daily life. This all requirement is fulfilled by thermal power station, hydro power station, nuclear power station, wind power station, etc. In our country most of area is supplied power from power station. But in rural area where electricity is not supplied because unavailability of electricity due to long distance, hilly areas where transmission is difficult. So, for irrigation purpose also need electricity. But, due to unavailability of electricity, farmer has many problems. Then, we think about how to generate electricity in rural area and hilly area at low cost and easiest way. We think, basically farmer use bull for agriculture purpose in that area. But bull is not working during whole day or all day. Also, the working capacity of bull is 3 to 4 hours per day. So, we decide, to generate electricity when the bull is not

working in farm. Our project is based on to generate electricity when they are not in use.

In this project first we connect cattle animal to shaft. That shaft is made up from good quality iron material. It is connected to gear increaser. The ratio of gear increaser is 1:3. The arrangement of gear increaser in very proper manner. That gear increaser is further connect to generator of 12V,2A. It is connected to rechargeable battery of 12V,95A. The charging circuit is connected between generator and rechargeable battery. Charging circuit is made from DC to DC converter. We can use that store power in AC or DC both form.

II. BLOCK DIAGRAM

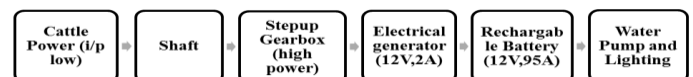


Figure 1: Block diagram

In this paper we experimentally studied the animal powered electric generation system for home lighting.

Animals	Typical weight (KN)	Typical working speed (m/s)	Power output (W)	Working hours per day
Ox	4.5(450)	0.9	450	6
Buffalo	5.5 (50)	0.8	520	5
Horse	4.0 (400)	1.0	500	10
Donkey	1.5 (150)	1.0	200	4
Camel	5.0 (500)	1.0		

Although animals have been using for domestic works at rural and remote areas, but the electricity generation by Animal power is a novel technology. This invention provides animal powered mechanical device for home lighting system. It has unique features of using animal power as prime mover for electric generator. Animal energy in form of high-torque low-speed can be converted into low-torque high-speed through speed increaser to energize the electric generator. The electricity generated is stored in the battery and used when lighting is required either for DC light or AC light using inverter. This equipment is emission free, low cost and has long life. Also this equipment needs less maintenance and any person can run either skilled or unskilled.

III. METHODS AND MATERIAL

A. Draught animal

The main object is to use the animal power for generating electricity for domestic and agriculture use. And bullocks are mainly used in Indian agriculture for different purposes. For this invention bullock is use. The weights of bullocks are 456 kg and 478 kg. The mechanical link is fitted with a device pulled by pair of bullocks called bellan (Dhauri) which is made of wood.

Table 1. Sustainable power of individual animals in good condition

B. Mechanical link

Mechanical link of mild steel material with extended extra strong GI pipe, capable of transmitting animal power in form of high torque low speed is attached to speed increaser. Mechanical link starts moving in a circular path when bullock driven belan attached to mechanical link with the help of GI wire starts moving.

A bullock moves in a circular path With approximate speed of 60 meter/min. Input shaft of the speed increaser coupled to mechanical link rotates at 3 to 5 rpm when bullock completes one round circular path in one minute.

C. Gear Assembly (Increaser)

Speed increaser is a set of spur gears housed in a frame of mild steel. Input shaft of the speed increaser of mild steel material is in vertical position whereas output shaft of mild steel material of the same is also in vertical position.

D. Chassis

It is made up from mild steel material which carries the whole assembly of the invention. Gear, generator, connecting shaft are mounted or fitted in chassis. Chassis is fix on the ground using nut-bolt or concrete.

E. Generator

DC Generators are that devices which convert directly the mechanical energy into the Electrical Energy of DC form. It is work on same principle of PMDC motor.

Advantages of the DC generators are very few like ease of parallel operation, simple design and construction and lesser system stability and another various advantages are describe below.

F. Rechargeable Battery

A storage battery, secondary cell, rechargeable battery, or accumulator is a type of battery which can be charged and discharged into a load, and recharged many times, as they opposed to a disposable or primary battery, which is fully charged and discarded after use.

In our project the battery is charge through the generator, the stored energy can be use for different purpose.

The fabrication of speed increaser was done very carefully because there are three vertical shafts which are supported by taper roller bearing. The bearing covers were fitted with the help of nut and bolt on the mild steel ties, which are welded on the frame at top and bottom. Collars are provided at bottoms of shaft to support the load on bearings. Gears are fitted by means of nuts by drilling two holes on the shafts and on gear houges. There are three step gear transmission system.

The system was tested by means of human power for three times and it was recognized that the initial force (torque) to rotate alternator at idle speed was very low, it can easily operated by using single hand. Before starring the experiment the alternator was connected with battery and ampere meter was jointed in series. The mechanical link GI pipe was fitted with the first shaft of speed increaser by means of elbo and nut- bolt at one end and another end was coupled on belan.



Figure 2: A sample assembly for power generation

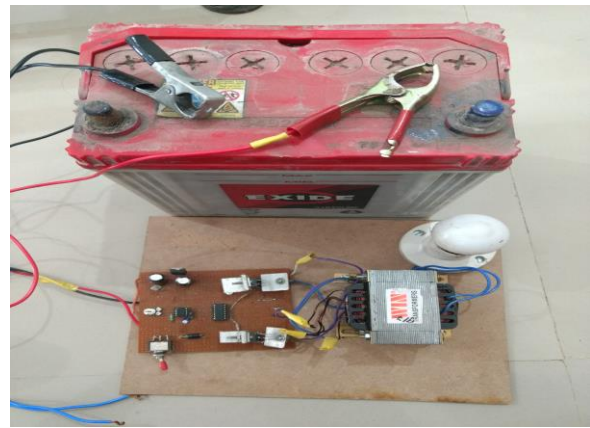


Figure 3: Semi-Inverter and battery

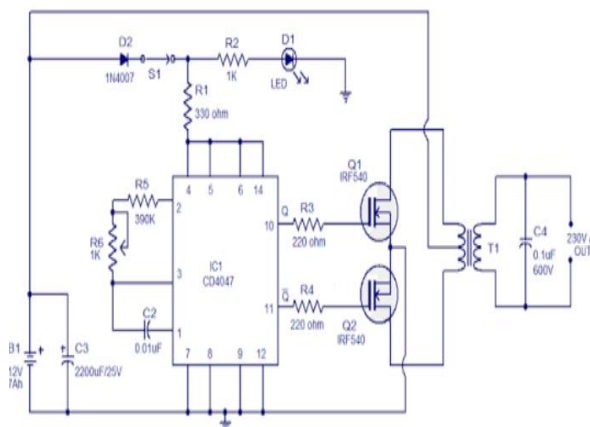


Figure 4: Circuit diagram of Semi-Inverter

IV. FABRICATION AND PROCEDURE

The fabrication of speed increaser was done very carefully because there are three vertical shafts which are supported by ball bearing. The bearing covers were fitted with the help of nut and bolt on the mild steel ties, which are welded on the frame at top and bottom. Collars are provided at bottoms of shaft to support the load on bearings. Gears are fitted by means of nuts by drilling two holes on the shafts and on gear houges. There are three steps gear transmission system. The first gear of 127 teeth was mounted on first shaft which meshes with the second gears of 22 teeth of second shaft and also the third gear of 127 teeth are on second shaft. The forth gear having 40 teeth was mounted on third shaft and meshes with the third gear having 127 teeth which was mounted on second shaft. Also, the fifth gear having 110 teeth was mounted on third shaft and

meshes with the sixth gear having 25 teeth which was mounted on the alternator shaft.

The dimension details about fabrication are given in table below:

Table 2. Dimension details about fabrication

No.	Details of Fabrication	Dimensions
1	Angle	1.25inches
2	Height of Chassis	17 inches
3	Upper four Supports	22*22 inches
4	Lower three supports	22 inches
5	Main Supports	21.5 inches
6	Support Frame	7*10 inches
7	Pedox sets	Nos. 6
8	Pedox (OD/ID)	20mm
9	Main Shaft	15inches
10	Gear assembly	127>22>127>40> 110>25
11	Dynamo supports	6*3mm

V. RESULTS AND DISCUSSION

The animals' effort and speed depend on the load subjected and force applied by shepherd. Animal speed is change very quickly and abruptly. It is very difficult to taking speed reading continuously because animals got puzzled. The readings are taken after every four minutes within one hour and results are shown in graphs. Speed vs.Time graph shows that average speed of alternator is mostly changes, but it is within the ideal working range of alternator. Speed vs. Current shows that at low rpm at starting of animal motion it is not generating current, but as well as rpm is increasing and reaches to ideal working rang alternator producing high value of current.

Experimental result shows that animals take very little time to get their average speed of 0.8 m/s to 1 m/s. But still alternator is not generating current as expected and specified by company due to very quick and

abrupt changes in animal speed. Voltage vs. RPM proves to be completely unchanging as expected and alternator generates constant voltage of 12V as specified after reaching ideal speed. State of Charge vs. Charging Time shows that battery takes more time to charge as less as state of charging is low for charging same amount. Fully charged battery shows 12.6V. Fully charged battery takes the approximately 2 hours and 7 minute to discharge 50% when 6 bulb of 60W DC is loaded.

Since alternator takes initial current to energise the battery must not be discharge completely. Lighting Time of 6 CFL bulb of 25W AC for different state of discharge is shown in graph. Results shown that battery and inverter have more than 80% efficiency as expected. Finally result was found that at least 4 hrs (6pm – 10pm) the home will be lighted using that system.

VI. ADVANTAGES

- It produces eco-friendly energy.
- Simpler farmer friendly, skill and non-skilled person can handle.
- It uses maximum power of animal.
- Maintenance free operation
- It uses for rural, hilly area.
- It saves the fuel such as kerosene.
- Solving the power crisis to an extend by installing ox powered electricity generators

VII. APPLICATIONS

- Home appliances
- Irrigation pump
- Use of TV, Fan, Computer & Internet centre, Replacing Kerosene usage in villages

VIII. LIMITATION

- If we want continuously power than we must be needed additional unit (animal).
- Transmission and distribution it not possible.
- One person is required to complete accurate operation.

IX. FUTURE ENHANCEMENT

- In this project we will make the model which is further generate more power by increasing bull power and interconnecting generators in future.
- Farmer used this project not only for irrigation but also for running home appliances like a fan, tube light, etc. if it will expand in future.
- We can use PLC in our project and get constant value of power.

X. FEATURES

- Highly sensitive
- Very accurate
- Economical
- Less Maintenance
- Reliable

XI. CONCLUSION

The present work provides a system and method for producing electricity for home lighting using the biological energy of the muscles of animals like bullock by means of a mechanical device. The project goal was to supply a battery array with a 12 volt DC output for 1.5 billion people who rely on kerosene for light. This goal had to be met within the constraints of a low production cost and high safety. The project has to offer a durable product with relatively good efficiency. Authors believe authors accomplished this goal. The project results were conclusive with the animal as a prime mover for alternator as an electricity generator. This is also concluded that

Animals are the great energy source for generating power even running at low speed at least for 6pm – 10pm at night for rural and isolated areas.

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