

BIOLOGICAL EXTRACTION OF POWER FROM BIO MASS

Karuna kumar .G^a, Lagadapati Murali krishna^b Dr. Kesava Rao V. V. S^c

^{a,b}Assistant professor , Department of Mechanical Engineering , Gudlavalleru Engineering College, Gudlavalleru,

^cProfessor, Department of Mechanical Engineering , Andhra University College of Engineering, Visakhapatnam A.P., India.

Abstract: The technological development has generated a great demand for energy. Scarcity of natural resources, human being was forced to seek alternative ways to generate energy then came to renewable energy resources. The sources seeking to generate power efficiently without causing environmental impacts. The natural sources of renewable energy available to human are; the solar, tidal, wind, bio-gas and biomass etc. This paper introduces a new source of renewable source of energy; energy from cow urine and dung that can produce electricity by electrolytic conditions.

In this present study we had constructed 10 simple cells by using plastic bottles, 2 electrodes (copper and zinc) which are dipped in cow urine and dung which acts as electrolytic solution for the system. Cow dung and urine contains uric acid. Copper with the presence of water will react with Uric acid. When zinc and copper plates come in contact with uric acid, electrons start to move to generate electricity. The system works like conventional battery system. However discharged battery system needs to recharge by electricity in order to reactivate it. On the other hand cow urine and dung based system needs only to replace old urine and dung by fresh cow urine and dung to activate the system again. The output of each cell containing 150ml of cow urine and cow 150gr of cow dung can produce 0.875v and 0.585 respectively.

We measured the performance of the system with loads and observed its outputs. The details of the system and its performance have been described in this paper.

Key words: cow urine and dung, renewable energy, uric acid.

I. INTRODUCTION

Electricity is the sole of today's society and economy. Global demand for energy has risen inexorably in the last 100 years in step with industrial development and population growth. Hunger for the electrical energy is increasing day by day and predicted to continue to rise by 50% by 2030. Developing country like India is seeking a tremendous scarcity of electricity generation. The maximum source of electrical energy is thermal power station is coal. But the problem of this fossil fuels is environmental pollution such as greenhouse gases which leads to global warming and it is very expensive and also limited source of energy. So we devise a self-sustainable energy production via simple yet recyclable way that

would be helpful to reduce the inevitable scarcity of electricity. India is a agricultural country peoples living in rural areas are directly dependent on the farm, farm related activities and domestic animals like cow, bullock, etc for their survival. A large amount of cow urine and dung is available in rural areas.

All this motivates us to work on cow urine and dung as alternative source of electricity generation to lighting the tribal areas and domestic animal farm. We can build urine and dung based plant to facilitate backup power system which will help the rural people immensely. The system is very cheap, easily accessible and pollution free. Here in this work we are showing small scale and simple model of generating electricity by using cow dung and urine as electrolytic solution and copper and zinc plates as electrodes, which can be directly implemented in rural areas to make them self-dependent.

II. COMPOSITION OF COW URINE AND DUNG

Cow urine contains sulfur, nitrogen, phosphorous, iron, sodium, potassium, copper, manganese, carbolic acid, and 24 other salts. It contains 95% of water, 2.5% urea, 2.5% minerals, hormones, enzymes, amino acids, etc. Cow dung consists of moisture-77%, organic matter-20%, urea-1.125%, nitrogen, phosphorous, potassium, calcium, other salts and minerals as 1.875%. From both cow urine and dung is having same type of salts and common as uric acid, which acts as electrolyte for this system.

A. URIC ACID

Uric acid is hetero-cyclic compound of carbon, nitrogen, oxygen, and hydrogen with the formula $C_5H_4N_4O_3$. It forms ions and salts know as urates

such as ammonium acid urate. Chemical bond of uric acid is given below

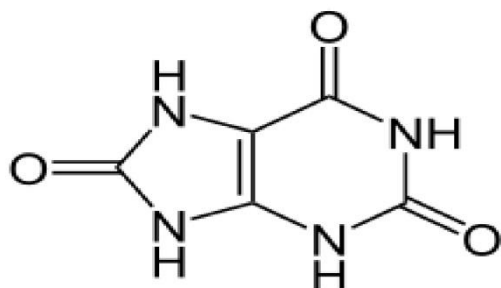
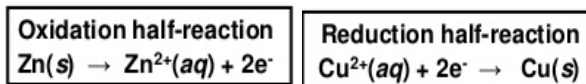


Fig. 1 Chemical bond of uric acid

III. WORKING PRINCIPLE

Here in this experiment copper acts as a cathode and having negative charge and zinc acts as anode and having positive charge. Electrolyte uric acid present in the cow dung and urine. Zinc with presence of water will react with uric acid and then oxidation takes place at anode. Copper react with water in presence of uric acid forms copper urates. This basically a salt solution and can be made an ionic bond then this bond will be contacted with zinc plate. The chemical reactions in this source cause a build-up of electrons at the anode. This results in an electrical difference between the anode and the cathode. When the circuit is closed (a wire connects the cathode and the anode) the electrons will be able to get to the cathode. This is one way of describing how electrical potential causes electrons to flow through the circuit. From this reaction it can be known that when copper and zinc plates come in contact with uric acid movement of electrons takes place, generates the electricity. The copper is having high tendency to attract the electrons and zinc is having low tendency to attract the electrons. So electrons move from anode (zinc) to cathode (copper). Here at cathode reduction takes place and at anode oxidation takes place.

General chemical equations are as follows:



Here in this process zinc (Zn) is oxidized to form Zn^{2+} . Copper (Cu^{2+}) is reduced to form Cu (solid). General voltaic cell is shown below

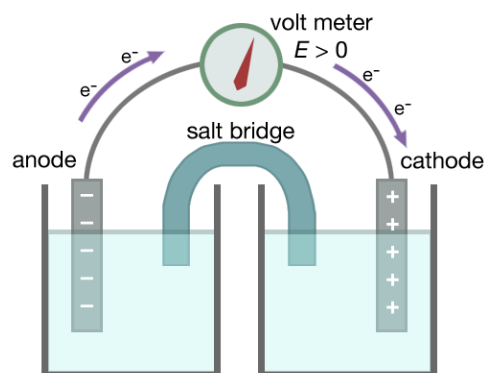
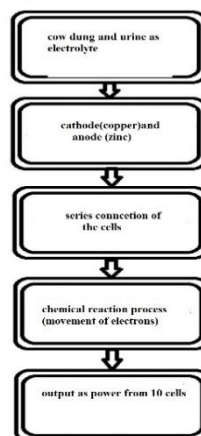


Fig. 2 Voltaic cell

A. EXPERIMENTAL SETUP

The flow chart of cow urine and dung power generated system



In the present study we had taken fresh cow urine and dung as electrolyte separately. In first we will understand with cow dung and later on we move with cow urine.

B. GENERATION OF ELECTRICITY USING COW DUNG

10 small containers were prepared by using plastic bottles. In each container we had kept 150 grams of fresh cow dung and dipped with 2 electrodes of zinc and copper. So 10 separate cells were constructed we have connected them in series to form a battery to get more potential difference



Fig. cow dung power generating system



Fig. Dung generated power system with load

Potential difference of each cell measured by Multi meter was around 0.585V after connecting them in series total output of the battery was found to be 5.85 to 6V of voltage. The current of the battery was measured to be 80mA. Hence at beginning, without connecting to load the total calculated power was about 0.468watts from 1.5 kg of dung.

Fig. shows total voltage produced using cow dung was about 5.85V



C. GENERATION OF ELECTRICITY USING COW URINE

Similarly cow urine is used as electrolyte in place of cow dung. The potential difference of each cell measured by multi meter was around 0.87V. After connected them in series, total potential of the battery was found to be 8.6V. Current was measured about 63mA. Hence at the beginning without load, the total power calculated power was about 0.54watts.

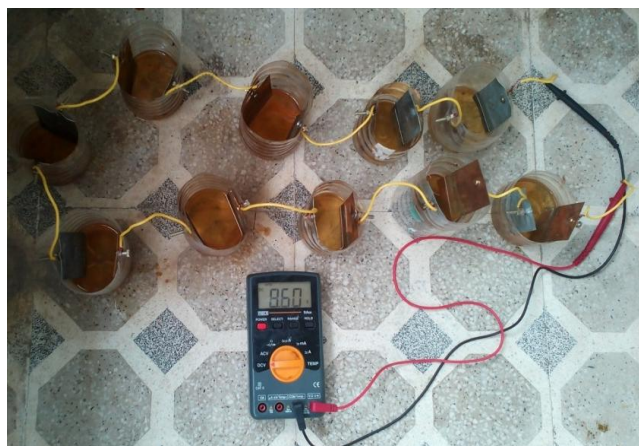


Fig. shows the voltage produced from the cow urine

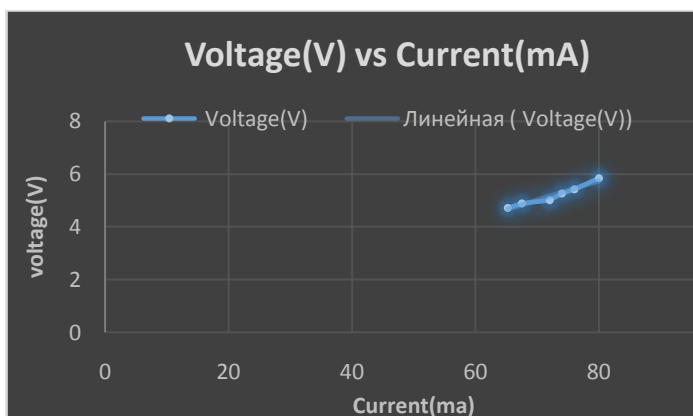
D. EXPERIMENTAL RESULTS AND DATA ANALYSIS

In this present study we had observed a system for current, voltage, power with respect to time for

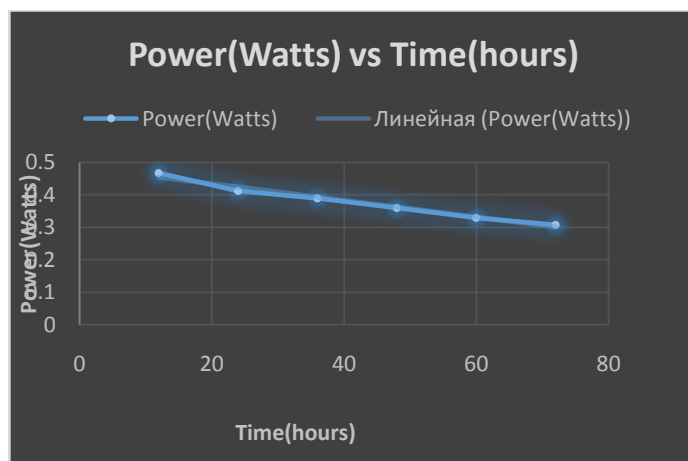
every 12 hours for both cow dung and urine based power system. The graphs are plotted between voltage vs. current and power vs. time for both systems

Table 1:experimental data of cow dung power plant taken in the time interval of 12 hours

Observations	Time(hours)	Volume(kg)	Voltage(V)	Current(mA)	Power(Watts)
1	12	1.5	5.85	80	0.468
2	24	1.5	5.425	76.01	0.4123
3	36	1.5	5.272	74.26	0.3900
4	48	1.5	5.0125	72.54	0.3600
5	60	1.5	4.892	67.50	0.330
6	72	1.5	4.725	65.25	0.308



Graph on power vs. time

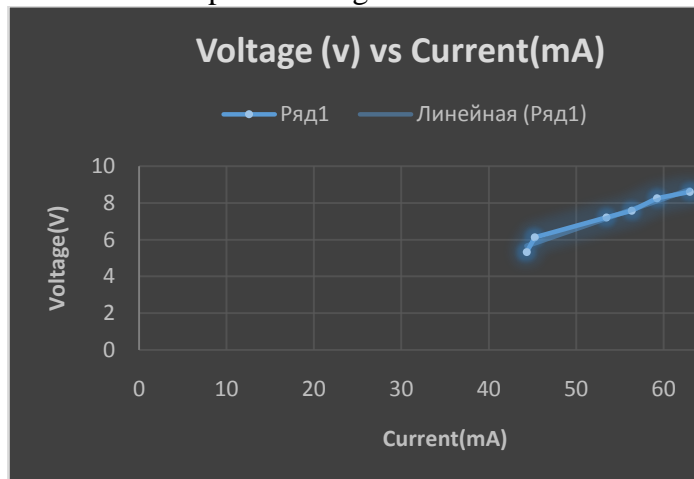


Graph on voltage vs. current

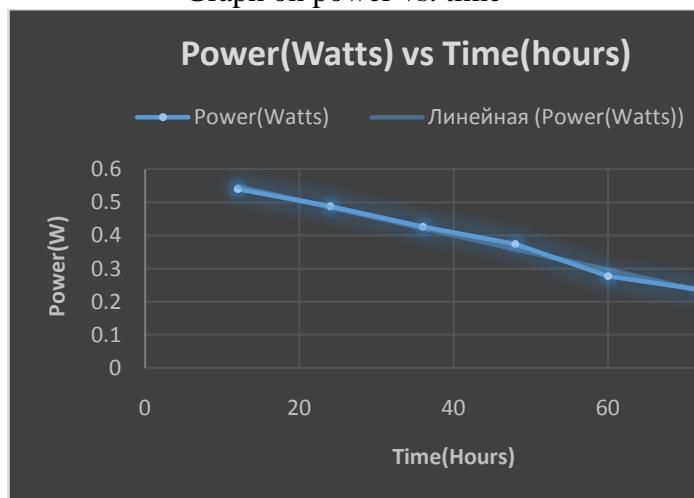
Table 2:experimental data of cow urine power plant taken in the time interval of 12 hours

Observations	Time(hours)	Volume(lit)	Voltage(V)	Current(mA)	Power(Watts)
1	12	1.5	8.6	63	0.54
2	24	1.5	8.25	59.24	0.488
3	36	1.5	7.568	56.35	0.426
4	48	1.5	7.11	53.46	0.374
5	60	1.5	6.125	45.28	0.277
6	72	1.5	5.325	44.33	0.236

Graph on voltage vs. current



Graph on power vs. time



Suppose take small scale dairy form having 10 cows. From this farm each cow we may get on an average 10kg of dung and 10liters of urine.

From 10 cows we may get 100kg of dung and 100 liters of urine. So we can produce nearly 1000volts daily from the farm.

IV. CONCLUSION

From this research we have demonstrated small cow dung and urine based power generation system. The performance of the both systems are given satisfactory results. Our main aim is to install this type of system in dairy farms in place nearer to the bio-gas plant. After completion of generation of electricity from the given battery we have to recharge the system with new dung or urine. The produced dung again sent into the bio-gas plant in turn to generate biogas which can sent to generator to produce electricity. This is how the biomass is handled efficiently.

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