

Pedal Operated Bicycle for Multipurpose Use

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Abstract – Bicycle is a two wheel vehicle, which is being powered by a rider and can be steered using a handle. It is one of the most eco-friendlier and an economical mode of transport word wide. The rotary motion of bicycle is efficient and can be use for multitasking purpose. One of which is Drainage system which works on the rotary motion to control the disposal of wastages and with regular filtration of wastages. Drainage pipes are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. To overcome this problem and to save the human life Rather than it helps to protect the environment from different kinds of environmental hazards through the promotion waste management by the removal of garbage from the drainage system. Second is Electricity. Renewable power generation system is currently preferred for clean power generation. With ongoing revolution in the generation, electricity is generated at small level by using bicycle pedal. Most of the villages are un-electrified. Power generated by pedaling can be converted from mechanical to electrical energy by using dynamo. Our project goal is to use this in efficient way to control the disposal of wastages with clean power generation in frequent manner.

Index Terms – Bearing, Chain drive, drain cleaner, dynamo, Gear, sprocket, waste management, etc

1. INTRODUCTION

The bicycle is extraordinarily efficient in both biological and mechanical terms. The bicycle is the most efficient human-powered means of transportation in terms of energy. India is the second most popular nation in the world. Like many other countries where agriculture is the main activity, biomass and other non – commercial fuels constitute around 40% of energy requirements in India. Around 85.49% of Indian villages are electrified. In India, many of the villages are still without electricity With reference to the report statistics, “No. of Towns and Villages Electrified in India”, Ministry of Statistics and Program Implementation, India, it can be seen that even after 65 year of independence 17.7% of India is still in dark during nights.

2. LITERATURE SURVEY

Power generated by pedalling can be converted from mechanical to electrical energy by using either dynamo or alternator. Small powered lighting devices can be charged using dynamo and can be used in the night by students for study purposes. This principle can be extended to power mobiles, iPods, laptops etc. Power can be also generated from the rotation of the wheels of alternator vehicles like bikes and cars, where there is a possibility of generating more power. The

generated power can be either used in the same vehicle or can be stored in a battery for powering some other devices. Riding bicycle helps in maintaining a good physic and along with it power can be also generated. This paper presents methods in generating electricity by pedalling a bicycle.

2.1 OVERCOME FROM LITERATURE SURVEY

The human power there is vast scope in economical use of bicycle mechanism as an alternative energy source thereby renewable energy generation as well as exercising for good health cause. the benefits associated with access to safe drainage system provide a strong arguments to increase resource allocation to aim at further improving the current waste management situation.

2.2 OBJECTIVE

- The goal of our project is to remove the garbage from drainage system by using pedal operated drain
- Cleaner which require less power that is activated while the rider is pedaling.
- Rather than it to provide comfort, reliable and effective bicycle which can provide a better Support and performance to the peoples as compare to the present bicycle in market.
- As concern with health of human being it will comfort for rider to riding.

2.3 SCOPE OF STUDY

- In future we can tie up with many Organizations which help people in their villages to make their life better.
- It is easily used in disaster and ruler area with better efficiency.
- Organization is may tie up with the government to help people in rural areas and remote areas.

2.4 BENEFITS FROM STUDY

- Electricity is save using pedal power.
- It is easily operated and required less maintenance cost.
- It is helps to remove the garbage from drainage system by using pedal operated drain cleaner.
- Electricity is generated by using dynamo which is mountain on wheel of bicycle.

3. DRAIN CLEANER

Drainage systems are blocked most times by garbage like nylon, plastic bottles, and empty cans which cluster together and find their way into the drainage systems. If these garbage are allowed to flow they will end up flowing down to recreational beaches used for tourism purposes making a scene not pleasurable to the eyes else these garbage flow to residential sites where they are burnt in a way of getting rid of them, thereby causing climate change.

The drainage systems are cleaned when there is no water in them i.e. when it is not raining, but when it is raining the drainage systems cannot be cleaned because of the harsh conditions of the rain which no one would volunteer to endure to ensure garbage does not enter into the drainage systems. There have been several attempts to develop equipment which would deal with the garbage when it is raining. The major examples of this include the net system which entails using a net to block the entrance or exit of the drainage system for the net to sieve out the net and The perforated metal sheet covering system using a protective metallic covering which is perforated on the drainage systems with the view of sieving out the garbage. But these methods proved less than 20% efficient.



Fig -3 Pedal operated Drain Cleaner

4. PEDAL POWER GENERATION

Firstly by using pedal power we generate electricity by using dynamo in pedal power generation the rotary motion of wheel sense by dynamo and this mechanical energy is converted into electrical energy. Electricity is a secondary type of energy. Primary energy is inside fines as the energy that is available enough in nature such as energy is reserved in gas, coal etc as comical energy. On the other hand secondary energy is the energy that is derived from primary energy such as electricity can be derived from gas by means of mechanical rotation or from light by means of Photo Voltaic panel. Human power is basically as old as mankind. As long as people are used their muscles to pick up, carried handle things. Human began making small tools which are the first examples of Human powered products. The first human powered product to convert human work into electricity was the Philips dynamo torch .The pedal power transfers the energy from a human source through the use of a foot pedal and crank system. This technology is most commonly used for transportation and has been used to

propel bicycles for over a hundred years. Less commonly pedal power is used to power agricultural cited avid and hand tools and even to generate electricity. Some applications include pedal powered mobiles pedal powered grinders and pedal powered water wells .Most of the power plant in Bangladesh uses gas as fuels. Few of the power plants are High Speed Diesel (HSD) based and few are renewable energy based. However, only around 40% of people in India have the facilities of electricity. Rest of the population does not have electricity. Besides that the people of remote area are normally far from modern facilities such education, health, online services etc. Normally they use kerosene as fuel for lighting purpose and it is hard for them to access modern technologies such as mobile, computer internet, e-health. Somewhere people use Solar Photo Voltaic (PV) module to meet the purpose. However, it is quite costly and some times and somewhere sunlight is not available and has some bad effect on environment due to cutting long trees. Pedal generator may be an alternative solution in these situations. We have shown in this research works that the pedal system power generation is suitable for the remote area of India. It can be operate in a standalone mode or may be used with PV module as a hybrid system. Specific objective of this research project is to have an easy, cheap, and handy and pollution free source of energy by means of pedal generator World is a storehouse of energy. We all know that energy can neither be created nor destroyed but can be transformed from one form to another. But we are wasting resources that can produce energy as if they are limitless. bicycle dynamo are alternators equipped with permanent magnets, which produce ac current. Two types of dynamo available are the hub dynamo and the bottle dynamo. Hub dynamo is built into the hub of a bicycle wheel. Here generation of electricity is done by using the rotation of the bicycle wheel. A bottle dynamo is also small electric generator like hub dynamo. It is generally placed to the rear wheel of the bicycle. A bottle dynamo acts like a small alternator.

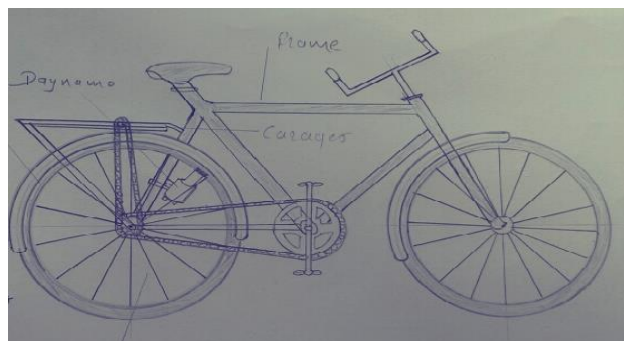


Fig4. Pedal Power Generation

4.1 PEDAL POWER USING DYNAMO

An electrical generator is a device that converts mechanical energy to electrical energy, generally using electromagnetic induction. The source of mechanical energy may be a

reciprocating or turbine steam engine, water falling through a turbine or waterwheel, an internal combustion engine, a wind turbine, a hand crank, or any other source of mechanical energy. The Dynamo was the first electrical generator capable of delivering power for industry. The dynamo uses selector magnetic principles to convert mechanical rotation into an alternating electric current. A dynamo machine consists of a stationary structure which generates a strong magnetic field, and a set of rotating windings which turn within that field. On small machines the magnetic field may be provided by a permanent magnet; larger machines have the magnetic field created by electromagnets. The energy conversion in generator is based on the principle of the production of dynamically induced emf. Whenever a conductor cuts magnetic flux, dynamically induced emf is produced in it according to Faraday's Laws of Electromagnetic induction. This emf causes a current to flow if the conductor circuit is closed. Hence, two basic essential parts of an electrical generator are (i) a magnetic field and (ii) a conductor or conductors which can so move as to cut the flux.

4.2 PEDAL POWER USING ALTERNATOR

The output energy from the dynamo is very low. Only three 1.2V Ni MH batteries can be charged using this power, which can be used for low power applications like small LED lights. Also, it takes a lot of time in charging these batteries. It is definite that the dynamo output will be insufficient for high power applications and an alternative is needed. A dynamo can be replaced with an alternator since it is capable of producing more power in less time. Alternator has both pros and cons over dynamo, but alternator generates more power than dynamo with lesser time and effort. Alternator is larger in size compared to dynamo and it would seize more space. One way to connect an alternator with the bicycle is to place it behind the seat by removing the carrier. The shaft of the alternator should be connected to the tire with a belt that rolls over shaft on one end and other end rolls over a cylindrical structure attached to its rear tire's hub. In this way when the bicycle moves, the structure rotates and thereby facilitates rotation of alternator's shaft. The other way to connect the alternator with the bicycle is by making the shaft directly roll over the tire. A rubber cap placed on the shaft is used to provide grip and to facilitate roll without slipping. Among the two ways, the first way will be more power efficient but the bicycle is needed to be pedaled in stationary mode. As alternator would produce more power, a rechargeable battery of high voltage rating is required. The rectifier (conventional bridge rectifier) and filter will not undergo any alterations. However, in the regulator part, a regulated voltage of 15V has to be maintained using a regulator IC 7815. Also while travelling there is a possibility of alternator to be get stolen. To avoid this, alternator can be attached to the bicycle through welding or can be kept in a separate box which can be locked.

4.3 PEDAL POWER USING GENERATOR

Permanent magnet synchronous generator is the best suited one for this mechanism. Synchronous generators are a major source of commercial electrical energy they are mostly used to convert mechanical input from wind turbines to electrical energy. A permanent magnet synchronous generator is a generator where the excitation field is provided by the permanent magnet instead of a coil. Here the rotor contains the magnet and the stator is a stationary armature connected to load. Magnetic field is generated through a shaft mounted permanent magnet mechanism and current is induced into armature. The magnitude of the voltage depends on the magnetic field strength and rotational speed of generator. Generator which is used in proposed system was a 100 Watts 3/4 belt drive pedal power dynamo. Back wheel of the bicycle is disconnected with chain mechanism, and pedal chain is connected to rotor of the generator with the help of metal rod welding. On the rotation of pedal rotor also rotates with high speed thus producing proper output.

5. SPECIFICATIONS

5.1 PROPELLER:

This mechanism generates energy needed for the entire machine system through the action of running water in the drainage system. The propeller consists of eight arms which are flat and are connected to a center rod, also the center rod is rigidly fixed to the two rigidly fixed holding poles across the sides of the drainage system. The arms are interconnected and are being connected to the center rod through a central axis which ensures swift rotation of arms. The arms are of the same width with the drainage systems but only marginally different but is higher in length allowing the arms to easily oppose the running water. The arms also, due to its lightness are pushed by running water to cause rotation. The arms also have soles that are flat that help them to balance and resist motion from oncoming water effectively. The motion is passed out through belts drives A and B. Belt drives A and B are connected to the second and third mechanism respectively.

5.2 BELTS DRIVES

The links in the drainage system cleaner consist of gears and belts drives, which transmit motion to other parts of the machine system. Belt drive A is connected to the cleaner which allows it to make a motion to sieve out the waste materials in the drainage system. The cleaners move in opposite direction to the propeller, the motion provided by Belt drive A (gear A) is then linked to gear B which allows the Belt drive A to provide a mechanism in the cleaner that moves opposite the direction of the running water. While Belt B is directly linked to the third mechanism.

5.3 CLEANER

The cleaner sieves out the waste materials. Just like the propeller, the cleaner consist of eight arms which are also connected to a center rod to allow motion. It receives it source of energy through Belt drive-A from the propeller. Unlike the propeller the cleaner does not wholly constitute of a flat metal but half of it is made of a net to effectively sieve the running water without any form of blockage. The soles of the arms are also made of nets which help the arms effectively sieve the water running in the drainage system.

5.4 PAN AND THE PAN MECHANISM

The pan is the third part of the system which helps to remove waste materials that has been removed by the cleaner to the trash can it is made of a light metal, it is receives its own energy through Belt B from the propeller and it is also connected to one of the holding poles of the cleaner. The is mechanism made up of two gears; gear 1 and gear 2. The gears are connected with the ratio of 4:1 which helps gear be to create a complete rotator motion, gear 2 constitutes a flat curved "S" shaped metal connected on top of it and also attached in its center to the holding pole. Also the pan itself is held by a smooth rod which allows it to spin thereby releasing material from the cleaner to a trash can. A trash can is dropped at a close distance allowing the pan to pour in the materials from the cleaner.

1) Shaft

Length =240mm

Diameter =35mm

2) Bearing

Pedestal bearing =25mm (inner)

Ball bearing =35mm (inner)

3) Chain Drive

Pitch =12.7mm

Width =3.17mm

Chain length =1600mm

4) Spocket

Inner diameter =350mm

Outer diameter =780mm

Pitch =12.7 mm

Width =3mm

Teeth =18

6. ADVANTAGES

- Quick response for rural and disaster area.
- Easily to operated and maintenance.

- It can be quick to move to others area
- Electricity is save using pedal power.
- It is portable.

7. DISADVANTAGES

- It not constant pedaling process.

8. APPLICATIONS

- It can be used to separate plastic, thermocol from sewage.
- It can be used in plastic industries.
- It is used almost in all types of drainage (Large, Small and Medium).
- Cleaning and maintenance of sewer lines drains of mechanical drainer.

9. RESULTS AND DISCUSSIONS

From above discussion on pedal operated bicycle for multipurpose use and bicycle it is observed from literature survey on pedal operated bicycle for multipurpose use. Through extensive research we found cost effective parts that will meet our goal of building a portable system that can be retrofitted to any standard bicycle and facilitate. In the coming months a prototype will be constructed which consist of a drain cleaner, Each component will be thoroughly tested in order to provide. the best product possible at the most reasonable price. In the future we hope to be able to partner with one of the many non-profit organizations dedicated to provide clean water around the globe such as, The Water Project, Water.org and Charity Water and reach the millions of people in need of a product like ours The pedal operated bicycle for multipurpose system is a new system that is useful in developing countries like India to have daily access to safe drinking water all by harnessing the energy of pedal power.

10. CONCLUSION

The project is focused on the non convectional energy resource. The drain cleaner as well as electricity generation is run on pedal energy and through extensive research we found cost effective parts that we meet our goal of empower the ruler area by using bicycle it will play an important role in development of developing countries to empower ruler area. The pedal operated drain cleaner system is a new system that is useful in developing countries to have daily access to cleaning waste by using the pedal power.

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