

Modelling and Design of Indegenous Self-Generating Fan

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Abstract— In this paper we are generating an electricity from an DC fan and reusing it. In the future, it is possible to generate an electricity from an AC source fans in the addition of oscillator and stabilizer circuit for generating electricity. One such alternate way to generate power is presented in this paper. The rotational energy of the dynamo, can be used to operate several small powered devices. Output of dynamo is 6V.

Initially it take one hour to charge the battery and one and half hour to discharge the battery. Here switching between the batteries have taken for every one minute. In this paper the output of the motor is given to an dynamo which is an DC Generator. It converts mechanical energy to an electrical energy. The electrical energy is used to charge the battery. After when battery is full charged, fan starts to rotate by conserving energy from charged battery where it cut off from an main supply.

Keywords— Dynamo, Mechanical energy, Electrical energy, Charge the battery, AC source fans etc.

I. INTRODUCTION

This project is based on energy recycle process. The main motive of this project is to reduce the utilization of electrical energy by recycling the electricity supplied. The electricity supplied to various towns, cities and villages are provided by various different power stations. The power stations generates these electricity through various different natural sources like hydro energy through water, geothermal energy through the heat of the earth core, tidal energy through tides occurring on our earth's surface, wind energy through wind, nuclear energy, etc.

The energy resources of earth will not last forever and someday these resources will be finished. So there is a need for energy conservation by using some other alternatives of these resources and also there is a need to utilize this energy in a proper manner and not to waste them. So keeping these points in mind we has decided to develop a project which will help not from getting these energy resources wasted by recycling the energy resources and also generating an additional energy. With the implementation of this device at home one will be able to operate their different electrical

devices without utilizing earth's resources. This project is also

developed keeping in mind the problems of common people and their expenditure which they have to face while paying their high electric bill.

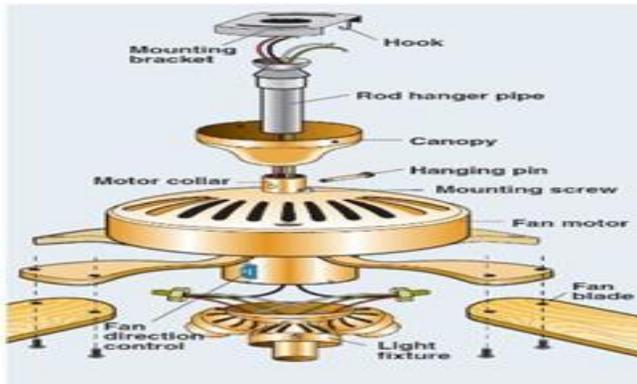
A. OVERVIEW

By using the concept of wind turbines Wind-generated electricity can be used for battery charging and for connection with the power grid. Beside every fan there is a tube light by a mechanism inside the fans motor or a belt that rotates and light up the bulb or store the energy in a battery which could be used to power up other machines.

II. LITERATURE SURVEY:

Akash Narayan Deshmukh Student, Dept. of electrical engineering, SIEM, Nashik, India published a paper on a topic "Electricity Generative Fan" on may 2016.

In this abstract they used the principle of mutual induction. Here they used power generative assembly which is fitted on the rod of fan for the production of electricity. The electricity generative fan works on the faraday's law of electromagnetic induction. When fan is in working period, by using fan rotation energy rotates the magnets which placed around the copper winding in the power generative assembly. With the help of power generative assembly we produced electricity from the fan in it's working period. By using this assembly we produce electricity more effectively and efficiently. In this abstract main disadvantage is only 20% of charge is stored remaining is wasted where they use only one battery to store energy which is not more effective. Akshay Kanfode, Saket ranjan singh, Nikhil Dhapodkar published a paper on a topic "Self Powered Fan" on April 2014 in International Journal Of Scientific and Engineering Research. This project is based on energy recycle process and power generation. The main motto of this project is to reduce the utilization of electrical energy by the method of energy recycle process which is being generated from a very common electrical appliance. In this paper they used the concept of dual battery to conserve energy from fan but the circuit used here is more complexed.



III. OPERATING PRINCIPLE OF CEILING FAN:

A. Principle behind the Ceiling Fan:

The electric motor is the electric machine within the ceiling fan that converts electrical energy into mechanical energy. The ceiling fan capacitor torques up the electric motor, allowing it to start and run. An electrical current reaches the motor and then enters coils of wire that are wrapped around a metal base. As this current passes through the wire, a magnetic field is caused that expends force in a clockwise motion that actually changes the electric energy into mechanical energy.

This action causes the motor coils to spin. As the coils are spinning, the fan captures this spinning motion, transferring it to the fan blades.

B. How the Ceiling Fan Cools

Fans do not actually cool air (if anything, electric fans warm it slightly due to the warming of their motors), but the breeze created by a ceiling fan speeds the evaporation of sweat on human skin, which makes the body feel cool. Thus, fans may become ineffective at cooling the body if the surrounding air is near body temperature and contains high humidity.

IV. TOOLS USED

- Software required
- Arduino
- Relay
- Battery
- Step down Transformer
- DC Generator
- DC Geared motor

A. SOFTWARE REQUIRED:

For designing the auto generating fan, we need to have knowledge about various programming language to detect the charging and discharging of two batteries. Arduino microcontroller and Atmega328P had been programmed by Arduino IDE Software.

Arduino IDE Software is a open source software which is used for compiling the program into the microcontroller. In this software C programming has been used for code. This coding has mainly two parts –void set up() which is known as preparation for the program, runs only once and another part is void loop() which is known as executive of the program. We

had written some functions to detect the charging and discharging of the battery.

4.1.1.PROGRAM:

```
int LED1 = 2;
int LED2 =3;
int LED3 = 4;
int LED4 =5;
int LED5 = 6;
int LED6 =7;
int LED7 = 8;
int LED8 =9;
void setup()
{
  pinMode(LED1, OUTPUT);
  pinMode(LED2, OUTPUT);
  pinMode(LED3, OUTPUT);
  pinMode(LED4, OUTPUT);
  pinMode(LED5, OUTPUT);
  pinMode(LED6, OUTPUT);
  pinMode(LED7, OUTPUT);
  pinMode(LED8, OUTPUT);
}
// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED1, HIGH);
  digitalWrite(LED2, HIGH);
  digitalWrite(LED5, HIGH);
  digitalWrite(LED6, HIGH);
  delay(60000);
  digitalWrite(LED1, LOW);
  digitalWrite(LED2, LOW);
  digitalWrite(LED5, LOW);
  digitalWrite(LED6, LOW);
  delay(500);
  digitalWrite(LED3, HIGH);
  digitalWrite(LED4, HIGH);
  digitalWrite(LED7, HIGH);
  digitalWrite(LED8, HIGH);
  delay(60000);
  digitalWrite(LED3, LOW);
  digitalWrite(LED4, LOW);
  digitalWrite(LED7, LOW);
  digitalWrite(LED8, LOW);
  delay(500);
}
```

B. ARDUINO

1) Introduction

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not

need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package. The Uno is one of the more popular boards in the Arduino family and a great choice for beginners.

2) PINS AND THEIR DESCRIPTIONS:

a) Power (USB / Barrel Jack)

Every Arduino board needs a way to be connected to a power source. The Arduino UNO can be powered from a USB cable coming from your computer or a wall power supply (like this) that is terminated in a barrel jack. In the picture above the USB connection is labeled (1) and the barrel jack is labeled (2). The USB connection is also how you will load code onto your Arduino board. More on how to program with Arduino can be found in our Installing and Programming Arduino tutorial.

b) Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)

The pins on your Arduino are the places where you connect wires to construct a circuit (probably in conjunction with breadboard and some wire. They usually have black plastic ‘headers’ that allow you to just plug a wire right into the board. The Arduino has several different kinds of pins, each of which is labeled on the board and used for different functions. GND (3): Short for ‘Ground’. There are several GND pins on the Arduino, any of which can be used to ground your circuit. 5V (4) & 3.3V (5): As you might guess, the 5V pin supplies 5 volts of power, and the 3.3V pin supplies 3.3 volts of power. Most of the simple components used with the Arduino run happily off of 5 or 3.3 volts.

Analog (6): The area of pins under the ‘Analog In’ label (A0 through A5 on the UNO) are Analog In pins. These pins can read the signal from an analog sensor (like a temperature sensor) and convert it into a digital value that we can read.

Digital (7): Across from the analog pins are the digital pins (0 through 13 on the UNO). These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).

PWM (8): You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). We have a tutorial on PWM, but for now, think of these pins as being able to simulate analog output (like fading an LED in and out).

AREF (9): Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

c) Reset Button

The Arduino has a reset button (10). Pushing it will temporarily connect the reset pin to ground and restart any

code that is loaded on the Arduino. This can be very useful if your code doesn’t repeat, but you want to test it multiple times. Unlike the original Nintendo however, blowing on the Arduino doesn’t usually fix any problems.

d) Power LED Indicator

Just beneath and to the right of the word “UNO” on your circuit board, there’s a tiny LED next to the word ‘ON’ (11). This LED should light up whenever you plug your Arduino into a power source. If this light doesn’t turn on, there’s a good chance something is wrong. Time to re-check your circuit

e) TX RX LEDs

TX is short for transmit, RX is short for receive. These markings appear quite a bit in electronics to indicate the pins responsible for serial communication. In our case, there are two places on the Arduino UNO where TX and RX appear – once by digital pins 0 and 1, and a second time next to the TX and RX indicator LEDs (12). These LEDs will give us some nice visual indications whenever our Arduino is receiving or transmitting data (like when we’re loading a new program onto the board).

f) Main IC

The black thing with all the metal legs is an IC, or Integrated Circuit (13). Think of it as the brains of our Arduino. The main IC on the Arduino is slightly different from board type to board type, but is usually from the ATmega line of IC’s from the ATMEL company. This can be important, as you may need to know the IC type (along with your board type) before loading up a new program from the Arduino software. This information can usually be found in writing on the top side of the IC. If you want to know more about the difference between various IC’s, reading the datasheets is often a good idea.

g) Voltage Regulator

The voltage regulator (14) is not actually something you can (or should) interact with on the Arduino. But it is potentially useful to know that it is there and what it’s for. The voltage regulator does exactly what it says – it controls the amount of voltage that is let into the Arduino board.

h) Arduino Uno Technical Specifications

Microcontroller ATmega328P – 8 bit AVR family microcontroller

Operating Voltage 5V

Recommended Input Voltage 7-12V

Input Voltage Limits 6-20V

Analog Input Pins 6 (A0 – A5)

Digital I/O Pins 14 (Out of which 6 provide PWM output)

DC Current on I/O Pins 40 Ma

DC Current on 3.3V Pin 50 Ma

Flash Memory 32 KB (0.5 KB is used for Bootloader)

SRAM 2 KB

EEPROM 1 KB
Frequency (Clock Speed) 16 MHz

C..RELAY:

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches.

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available.

Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay.

The coil will be obvious and it may be connected either way round. Relay coils produce brief high voltage 'spikes' when they are switched off and this can destroy transistors and ICs in the circuit. To prevent damage you must connect a protection diode across the relay coil.

The relay's switch connections are usually labelled COM, NC and NO:

COM = Common, always connect to this, it is the moving part of the switch.

NC = Normally Closed, COM is connected to this when the relay coil is off.

NO = Normally Open, COM is connected to this when the relay coil is on.

Connect to COM and NO if you want the switched circuit to be on when the relay coil is on.

Connect to COM and NC if you want the switched circuit to be ON when the relay coil is off.

D.BATTERY:

1) How Do Lead Acid Batteries Work?

Lead Acid batteries have changed little since the 1880's although improvements in materials and manufacturing methods continue to bring improvements in energy density, life and reliability. All lead acid batteries consist of flat lead plates immersed in a pool of electrolyte. Regular water addition is required for most types of lead acid batteries although low-maintenance types come with excess electrolyte calculated to compensate for water loss during a normal lifetime.

2) Battery Construction

Lead acid batteries used in the RV and Marine Industries usually consist of two 6-volt batteries in series, or a single 12-volt battery. These batteries are constructed of several single cells connected in series each cell produces approximately 2.1 volts. A six-volt battery has three single cells, which when fully charged produce an output voltage of 6.3 volts. A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts.

A battery cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between. The plates are enclosed in a plastic battery case and then submersed in an electrolyte consisting of water and sulfuric acid (see figure # 1). Each cell is capable of storing 2.1 volts.

In order for lead acid cell to produce a voltage, it must first receive a (forming) charge voltage of at least 2.1-volts/cell from a charger. Lead acid batteries do not generate voltage on their own; they only store a charge from another source. This is the reason lead acid batteries are called storage batteries, because they only store a charge. The size of the battery plates and amount of electrolyte determines the amount of charge lead acid batteries can store. The size of this storage capacity is described as the amp hour (AH) rating of a battery. A typical 12-volt battery used in a RV or marine craft has a rating 125 AH, which means it can supply 10 amps of current for 12.5 hours or 20-amps of current for a period of 6.25 hours. Lead acid batteries can be connected in parallel to increase the total AH capacity. In figure # 2 below, six single 2.1-volt cells have been connected in series to make the typical 12-volt battery, which when fully charged will produce a total voltage of 12.6-volts.

Lead Acid Batter Discharge Cycle

In figure 3, above a fully charged battery is connected to a load (light bulb) and the chemical reaction between sulfuric acid and the lead plates produces the electricity to light the bulb. This chemical reaction also begins to coat both positive and negative plates with a substance called lead sulfate also known as sulfation (shown as a yellow build-up on plates). This build-up of lead sulfate is normal during a discharge cycle. As the battery continues to discharge, lead sulfate coats more and more of the plates and battery voltage begins to decrease from fully charged state of 12.6-volts (figure # 4).

In figure # 5 the battery is now fully discharged, the plates are almost completely covered with lead sulfate (sulfation) and voltage has dropped to 10.5-volts.

NOTE: Discharging a lead acid battery below 10.5 volts will severely damage it!

Lead sulfate (sulfation) now coats most of the battery plates. Lead sulfate is a soft material, which can be reconverted back into lead and sulfuric acid, provided the discharged battery is immediately connected to a battery charger. If a lead acid battery is not immediately recharged, the lead sulfate will begin to form hard crystals, which can not be reconverted by a standard fixed voltage (13.6 volts) battery converter/charger.

NOTE: Always recharge your RV or Marine battery as soon as possible to prevent loss of battery capacity due to the build-up of hard lead sulfate crystals!

Lead Acid Battery Recharge Cycle

The most important thing to understand about recharging lead acid batteries is that a converter/charger with a single fixed output voltage will not properly recharge or maintain your battery. Proper recharging and maintenance requires an intelligent charging system that can vary the charging voltage based on the state of charge and use of your RV or Marine battery. Progressive Dynamics has developed intelligent charging systems that solve battery problems and reduce battery maintenance.

The discharged battery shown in figure # 6 on the next page is connected to a converter/charger with its output voltage set at 13.6-volts. In order to recharge a 12-volt lead acid battery with a fully charged terminal voltage of 12.6-volts, the charger voltage must be set at a higher voltage. Most converter/chargers on the market are set at approximately 13.6-volts. During the battery recharge cycle lead sulfate (sulfation) begins to reconvert to lead and sulfuric acid.

During the recharging process as electricity flows through the water portion of the electrolyte and water, (H₂O) is converted into its original elements, hydrogen and oxygen. These gasses are very flammable and the reason your RV or Marine batteries must be vented outside. Gassing causes water loss and therefore lead acid batteries need to have water added periodically. Sealed lead acid batteries contain most of these gasses allowing them to recombine into the electrolyte. If the battery is overcharged pressure from these gasses will cause relief caps to open and vent, resulting in some water loss. Most sealed batteries have extra electrolyte added during the manufacturing process to compensate for some water loss.

The battery shown in figure # 7 above has been fully recharged using a fixed charging voltage of 13.6-volts. Notice that some lead sulfate (sulfation) still remains on the plates. This build-up will continue after each recharging cycle and gradually the battery will begin to lose capacity to store a full charge and eventually must be replaced. Lead sulfate build up is reduced if battery is given an Equalizing Charge once every 10 discharge cycles or at least once a month. An Equalizing Charge increases charging voltage to 14.4 volts or higher for a short period. This higher voltage causes gassing that equalizes (re-mixes) the electrolyte solution.

Since most RV and Marine craft owners seldom remember to perform this function, Progressive Dynamics has developed the microprocessor controlled Charge Wizard. The Charge Wizard will automatically provide an Equalizing Charge every 21 hours for a period of 15 minutes, when the battery is fully charged and not in use. Our 2000 Series of Marine Battery Chargers have the Charge Wizard feature built-in. One disadvantage of recharging a lead acid battery at a fixed voltage of 13.6-volts is the recharge time is very long. A typical 125-AH RV or Marine battery will take approximately 80 hours to recharge at 13.6 volts. Increasing the charge voltage to 14.4-volts will reduce battery recharge time for a

125-AH battery to 3-4 hours. Once a battery reaches 90% of full charge, the voltage must be reduced from 14.4-volts to 13.6-volts to reduce gassing and water loss. The optional Charge Wizard automatically senses when a battery has a very low state of charge and automatically selects its BOOST MODE of operation. BOOST MODE increases the voltage of a PD9100 Series converter/charger to 14.4 volts. When the battery reaches the 90% charge level, the Charge Wizard automatically reduces the charge voltage down to 13.6 volts to complete the charge. Again, this is a standard feature on our Marine Chargers.

Another disadvantage of recharging a lead acid battery at a fixed voltage of 13.6-volts is that once it is fully charged, 13.6 volts will cause considerable gassing and water loss. To prevent this from occurring the charging voltage must be reduced to 13.2-volts. The Charge Wizard will automatically select its STORAGE MODE of operation (13.2-volts) once the battery reaches full charge and remains unused for a period of 30 hours. This feature is standard on all of Progressive Dynamics Marine Battery Chargers.

At a charging voltage of 13.2 volts, the converter/charger will maintain a full charge, reduce gassing and water loss. However, this lower voltage does not provide enough gassing to prevent a battery condition called Battery Stratification. Battery Stratification is caused by the fact that the electrolyte in the battery is a mixture of water and acid and, like all mixtures, one component, the acid, is heavier than water. Therefore, acid will begin to settle and concentrate at the bottom of the battery (see figure #8).

This higher concentration of acid at the bottom of the battery causes additional build-up of lead sulfate (sulfation), which reduces battery storage capacity and battery life. In order to prevent Battery Stratification, an Equalization Charge (increasing charging voltage to 14.4-volts) must be applied periodically. The Charge Wizard automatically selects its EQUALIZATION MODE (14.4 volts) every 21 hours for a period of 15 minutes. This Equalizing Charge feature is standard on our Marine chargers. In order to properly charge and maintain a lead acid battery you must use an intelligent charging system. Progressive Dynamics, Intelli-Power 9100 Series RV converters with a Charge Wizard installed, or one of our Intelli-Power Marine Battery Chargers will provide the intelligent charging system your battery needs for a long life, with low maintenance.

a) TRANSFORMER:

A Transformer is a static device which transfers electrical energy from one circuit to another through the process of electromagnetic induction. It is most commonly used to increase ('step up') or ('step down') voltage levels between circuits.

b) WORKING PRINCIPLE OF TRANSFORMER

The working principle of a transformer is very simple. Mutual induction between two or more windings (also known as coils) allows for electrical energy to be transferred between

circuits.

c) TRANSFORMER THEORY

We have one winding (also known as a coils) allows which is supplied by an alternating electrical source. The alternating current through the winding produces a continually changing and alternating flux that surrounds the winding. If another winding is brought close to this winding, some portion of this alternating flux will link with the second winding. As this flux is continually changing in its amplitude and direction, there must be a changing flux linkage in the second winding or coil. According to Faraday's law of electromagnetic induction in the secondary winding. If the circuit of this secondary winding is closed, then a current will flow through it. This is the basic principle of transformer. The winding which receives electrical power from the source is known as the 'Primary winding'.

The winding which gives the desired output voltage due to mutual induction is commonly known as the 'Secondary winding'.

A Transformer that increases voltage between the primary to secondary winding is defined as a step - up transformer. Conversely, a transformer that decrease voltage between the primary to secondary winding is defined as a step - down transformer.

Ideal transformer is not very practical. This is because in open air only a very tiny portion of the flux produced from the first coil will link with the second coil. So the current that flows through the closed circuit connected to the secondary winding will be extremely small (and difficult to measure).

The rate of change of flux linkage depends upon the amount of linked flux with the second winding. So ideally almost all the of the flux of primary winding should link to the secondary winding. This is effectively using and efficiently done by using a core type transformer. This provides a low reluctance path common to both of the windings.

d) TRANSFORMER PARTS AND CONSTRUCTION

The three main parts of a transformer:

- Primary Winding of Transformer
- Magnetic Core of Transformer
- Secondary Winding of Transformer

(1) Primary winding of the transformer

This produces magnetic flux when it is connected to electrical source.

(2) .Magnetic core of transformer

The magnetic flux produced by the primary winding, that will pass through this low reluctance path linked with secondary winding and create a closed magnetic circuit

(3) .Secondary winding of transformer

The flux produced by primary winding passes through the core will link with the secondary winding. This winding also winds on the same core and gives the desired output of

transformer.

(4) EMF equation of the transformer

According the faraday's law of electromagnetic induction if any coil or conductors links with any change in flux there must be an induced emf in it. As a current source to primary sinusoidal the flux induced by it will be also sinusoidal. Hence the function of flux may be considered as a sine function will be given a function for the rate of change of flux linkage with respect to time. $d(\sin\theta)/dt = \cos\theta$ so if we derive the expression for rms value of this cosine wave and multiply with the no. of turns of the winding, we will easily get the rms value of the induced emf of that winding. In this way we easily derive the emf transformer.

Emf, $e = -T d\phi/dt$ where ϕ is the alternating flux and represented as,

$$\phi = \phi_m \sin 2\pi ft$$

$$\text{Hence, } e = -T d/dt (\phi_m \sin 2\pi ft)$$

$$e = -T d/dt \cos (2\pi ft) \times 2\pi f$$

$$e = -T \phi_m 2\pi f \times 2\pi f \cos(2\pi ft)$$

As the maximum value of $\cos (2\pi ft)$ is 1, the maximum value of induced emf is,

$$e_m = T \phi_m \times 2\pi f$$

To obtain the rms value of induced emf, divide this maximum value of e by $\sqrt{2}$

$$E = 2\pi/\sqrt{2} \times \phi_m f T$$

$$E = 4.44 \phi_m f T \text{ volts (Since } 2\pi/\sqrt{2} = 4.44)$$

This is the emf equation of the transformer.

If E_1 & E_2 are primary and secondary emf's and T_1 & T_2 are the primary and secondary turns then, voltage ratio or turns ratio of transformer is,

$$E_1/E_2 = 4.44 \phi_m f T_1 / 4.44 \phi_m f T_2$$

$$E_1/E_2 = T_1 / T_2$$

(5) Transformation ratio of transformer

This constant is called transformation ratio of transformer, if $T_2 > T_1$, $K > 1$ then the transformer is step up transformer. , if $T_2 < T_1$, $K < 1$ then the transformer is step down transformer.

(6) Voltage ratio of transformer

This above stated ratio is also known as Voltage ratio of transformer if it is expressed as ratio of the primary and secondary voltages of the transformer.

(7) Turns ratio of transformer

As the voltage in primary and secondary of transformer is directly proportional to the no. of turns in the respective winding, the transformation ratio of transformer is sometime expressed in ratio of turns and referred as turns ratio of transformer.

(8) Step down transformer

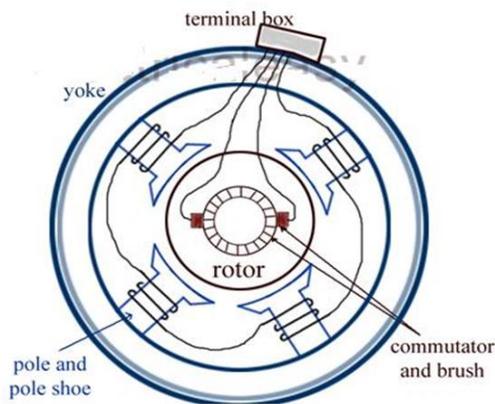
Here in our project we use a step down transformer. A step down transformer is used to provide this low voltage value which is suitable for electronics supplying. It transform

ohm voltage(230V/120V) from primary to a low voltage on the secondary side which is used for the electronic supplying. If electronic devices are designed to have higher nominal power, transformers with high operating frequency are used (kilo hertz).

The transformer with higher nominal power value and 50/60 Hz nominal frequency would be too large and heavy. Also, the daily used battery charges use the step down transformer in its design.

E. DC GENERATOR:

A DC generator is an electrical machine which converts mechanical energy into direct current electricity .This energy



Cross Sectional View of DC Generator

conversion is based on the principle of dynamically induced emf.

1) CONSTRUCTION OF A DC MACHINE:

A DC generator can be used as a dc motor without any constructional changes .Thus dc generator or dc motor can be termed as a dc machine.

Above figure shows the constructional details of a simple 4-pole DC generator. A DC generator consists two basic parts, stator and rotor.

Basic constructional parts of a DC generator are described below.

Yoke: The outer frame of a generator or motor is called as yoke. Yoke is made up of cast iron or steel. Yoke provides mechanical strength for whole assembly of the generator (or motor). It also carries the magnetic flux produced by the poles.

Poles: Poles are joined to the yoke with the help of screws or welding. Poles are to support field windings. Field winding is wound on poles and connected in series or parallel with armature winding or sometimes separately.

(1) Pole shoe:

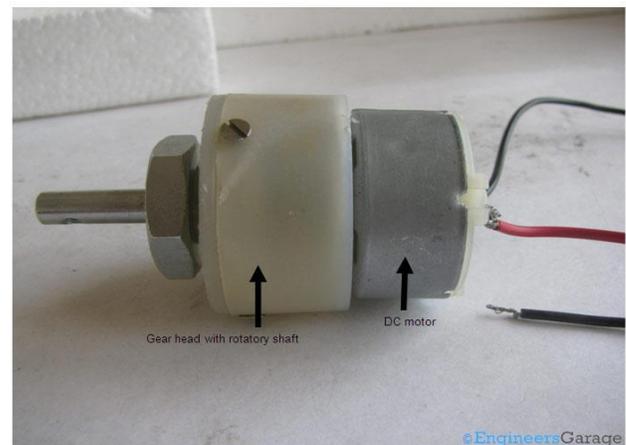
Pole shoe is an extended part of the pole which serves two purposes, (i)to prevent field coils from slipping and (ii)to spread out the flux in air gap uniformly.

(2) Armature core:

Armature core is the rotor of a generator. Armature core is cylindrical in shape on which slots are provided to carry armature windings.

(3) Commutator and brushes:

As emf is generated in the armature conductors terminals must be taken out to make use of generated emf. But if we can't directly solder wires to commutator conductors as they rotates. Thus commutator is connected to the armature conductors and mounted on the same shaft as that of armature core. Conducting brushes rest on commutator and they slides over when rotor (hence commutator) rotates. Thus brushes are physically in contact with armature conductors hence wires can be connected to brushes.



2) WORKING PRINCIPLE OF A DC GENERATOR

According to Faraday's law of electromagnetic induction, when a conductor moves in a magnetic field (thereby cutting the magnetic flux lines), a dynamically induced emf is produced in the conductor. The magnitude of generated emf can be given by emf equation of DC generator. If a closed path is provided to the moving conductor then generated emf causes a current to flow in the circuit.

Thus in DC generators, when armature is rotated with the help of a prime mover and field windings are excited (there may be permanent field magnets also), emf is induced in armature conductors. This induced emf is taken out via commutator-brush arrangement.

3) EMF EQUATION OF A DC GENERATOR:

Let Φ = flux/pole in Wb (weber)

Z = total no. of armature conductors

P = no. of generator poles

A = no. of parallel paths in armature

N = rotational speed of armature in revolutions per min. (rpm)

E = emf induced in any parallel path in armature

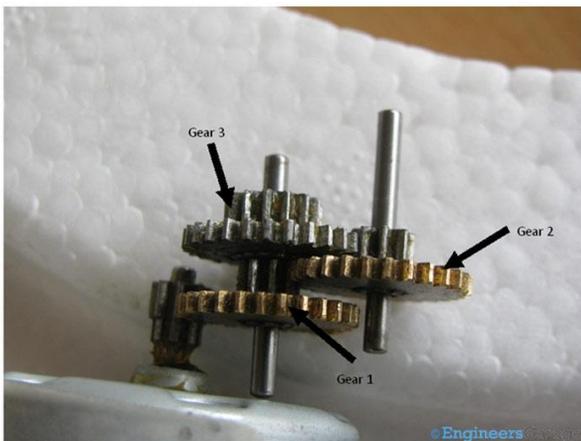
Now,

Avg. emf generated per conductor= $d\Phi / dt$ volts and

Flux per conductor in one revolution, $d\Phi = \Phi.P$ (Wb)
No. of revolutions per second (Speed) = $N/60$
Time per one revolution = $dt = 60/N$
Emf generated/conductor = $d\Phi/dt = \Phi PN/60$ volts
But generated emf (E_g) will be equal to generated emf in any parallel path
Generated emf (E_g) = $\Phi PN/60 Z/A$ volts

F. GEARED DC MOTORS

Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM. The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.



1) External Structure

At the first sight, the external structure of a DC geared motor looks as a straight expansion over the simple DC ones.

The lateral view of the motor shows the outer protrudes of the gear head. A nut is placed near the shaft which helps in mounting the motor to the other parts of the assembly.

Also, an internally threaded hole is there on the shaft to allow attachments or extensions such as wheel to be attached to the motor.

The outer body of the gear head is made of high density plastic but it is quite easy to open as only screws are used to attach the outer and the inner structure. The major reason behind this could be to lubricate gear head from time to time.

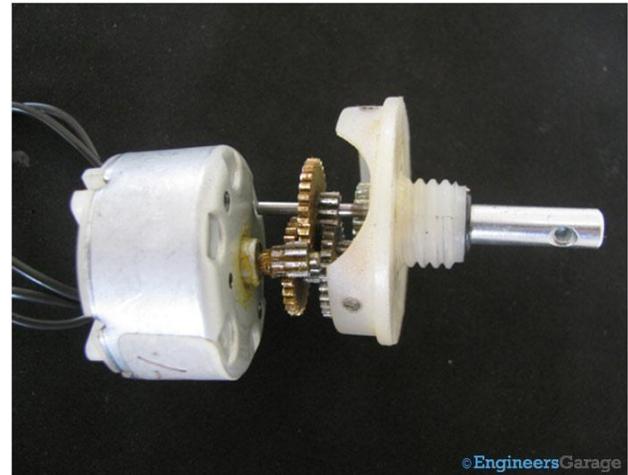
The plastic body has a threading through which nut can be easily mounted and vice versa from the gear head.

The cap that accommodates the gear has an arc cut from its side to avoid frictional resistance forces with the bottom gear assembly.

The gear assembly is set up on two metallic cylinders

whose working can be called as similar to that of an axle. A total of three gears combine on these two cylinders to form the bottom gear assembly out of which two gears share the same axle while one gear comes in between them and takes a separate axle.

The gears are basically in form of a small sprocket but since they are not connected by a chain, they can be termed as duplex gears in terms of a second cog arrangement coaxially over the base. Among the three gears, two are exactly same while the third one is bigger in terms of the number of teeth at



the upper layer of the duplex gear. The third gear is connected to the gear at the upper portion of the gear head. The manner in which they are located near the upper part of the gear head can be seen through the image shown below.

The combination of bottom gear assembly with the upper one can be seen down under.

2) Working of the DC Geared Motor

The DC motor works over a fair range of voltage. The higher the input voltage more is the RPM (rotations per minute) of the motor. For example, if the motor works in the range of 6-12V, it will have the least RPM at 6V and maximum at 12 V.

In terms of voltage, we can put the equation as:

$$\text{RPM} = K_1 * V, \text{ where,}$$

K_1 = induced voltage constant

V = voltage applied

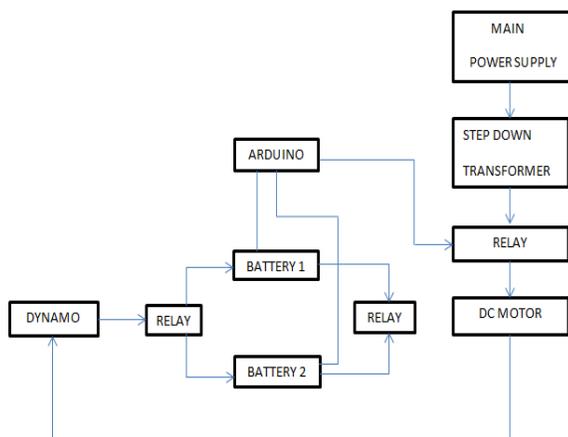
The working of the gears is very interesting to know. It can be explained by the principle of conservation of angular momentum. The gear having smaller radius will cover more RPM than the one with larger radius. However, the larger gear will give more torque to the smaller gear than vice versa. The comparison of angular velocity between input gear (the one that transfers energy) to output gear gives the gear ratio. When multiple gears are connected together, conservation of energy is also followed. The direction in which the other gear rotates is always the opposite of the gear adjacent to it.

In any DC motor, RPM and torque are inversely proportional. Hence the gear having more torque will provide a lesser RPM and converse. In a geared DC motor, the concept

of pulse width modulation is applied.

In a geared DC motor, the gear connecting the motor and the gear head is quite small, hence it transfers more speed to the larger teeth part of the gear head and makes it rotate. The larger part of the gear further turns the smaller duplex part. The small duplex part receives the torque but not the speed from its predecessor which it transfers to larger part of other gear and so on. The third gear's duplex part has more teeth than others and hence it transfers more torque to the gear that is connected to the shaft.

V. BLOCK DIAGRAM:



A. MODEL:

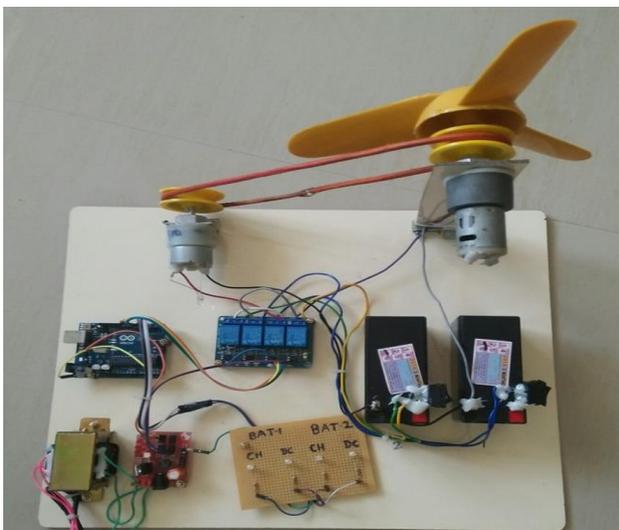


Figure 1



Figure 2

B. WORKING :

The power supply is given to a model where a step-down transformer is used to convert 220V to 12V, which is given to the DC geared motor to rotate. The motor takes electrical energy as an input and converts it to mechanical energy.

Now the output of the motor is given to a dynamo, which is a DC generator. It converts mechanical energy to electrical energy. The electrical energy is used to charge the battery. After the battery is fully charged, the fan starts to rotate by conserving energy from the charged battery where it cuts off from the main supply.

During this time, the energy from the dynamo makes another battery to charge, which is connected in series with the main battery.

Here, Arduino is used to detect the charging and discharging of the battery. In this design, we used four modules of relays. The relays are used to switch between the batteries during charging and discharging. Here, charging and discharging between batteries can be indicated by using a LED circuit.

C. RESULTS:

Output of dynamo is 6V.

Initially, it takes one hour to charge the battery and one and a half hours to discharge the battery.

Here, switching between the batteries has taken for every one minute.

VI. APPLICATION AND BENEFITS

A. APPLICATION:

1) Colleges, hospitals, hostels are equipped with at least 50 fans where this energy-generating mechanism may be used to light up the tube lights or charge a battery and power up other devices like computers, laptops, and any other electronics.

devices that are required.

2) In order to charge cell phone we need a mobile charging circuit which would give the appropriate voltage and current required for charging the mobile and will be helpful to middle class people to save energy and money.

3) It is also used in power stations for further generation of power.

B. BENEFITS:

1) The main advantage is that electric bill which we have to pay for running ceiling fan is reduced to almost greater than 50%. Other power appliances can run free of cost. i.e. we don't have to pay bill for those appliances

2) Low initial cost: - The initial cost of an electric motor is considerably lower than solar photovoltaic (PV) panels with the same Output.

3) No emissions of carbon dioxide (CO₂), mercury (Ag), nitrogen oxide (N₂), sulphur dioxide (SO₂) or particulate matter into the air, water or soil and helps preserve and protect the environment for future generations.

4) Minimum maintenance cost once generators are constructed, they can operate efficiently without any problems for long period of time. Additionally, one need not have to check them on a regular basis and extra cost of generator maintenance can be avoided.

5) Reduces the cost to transmit electricity along power lines.

Research where Akshay Kanfode, Saket ranjan singh, Nikhil Dhapodkar published a paper on a topic "Self Powered Fan" on April 2014

VII. CONCLUSION

A. FUTURE WORK:

Now in this project we are generating an electricity from an DC fan and reusing it. In the future, it is possible to generate an electricity from an AC source fans in the addition of oscillator and stabilizer circuit for generating electricity.

B. CONCLUSION:

At a time when there is crisis casting its shadows all over the world one has to look into alternate renewable sources. One such alternate way to generate power is presented in this paper. The rotational energy of the dynamo, can be used to operate several small powered devices. Both dynamo and alternator can be used. Battery can be of high AH, so it can run the other devices for a long time. Battery charging through capacitor should be fast as compared to the discharging of battery. More no of devices can be operated by power generated by fan itself.

VIII. REFERENCES:

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