

# Development of 60 Watt Hybrid Smart Table Fan

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*Abstract-Nowadays the demand for electrical power generation is very high and there is frequent power cut due to unexpected natural disasters. During the summer months the heat becomes unbearable and staying at indoor is without fan is not possible. Hence we need a multi-power energy generator and it should be portable. A table fan is a small, portable type of fan that is used in various rooms of a home or office. It is more convenient and serves a number of functions for home owners and office workers such as conservation of energy compared to using air conditioners, removal of heat and unwanted fumes from indoor areas, cooling a room and avoid generation of mechanical noise. Solar energy currently represents the most abundant inexhaustible, non-polluting and free energy resource that could be used economically to supply man's increasing energy demand. The second part of energy generation is pedal powered energy generation. The handgrip mechanism is also used to generate electricity. The design can also work with the AC supply provided from the power system. The loads provided are a lighting system, charging plug and the motor of table fan. This is designed to sustain on emergency situations, especially during the time of prolonged power cut due to natural disasters.*

**Keywords:** solar panel, pedaling, hand grip, battery.

## I. INTRODUCTION

In India the demand for electrical energy needed is less than the amount of electrical energy generated. The population of India is increasing day by day and the world is also seeping up with its technology. Hence to sustain with the day-to-days life need the basic requirement is electrical energy source. During the time of natural disasters, power cut due to voltage fluctuations, etc. is also increasing. To overcome such emergency situations the development of multiple powered electricity generator is needed.

The most commonly used non-polluting and free energy resource is the solar energy resource. The solar powered gadgets are developing and it is capable of powering the system continuously

during the day time. The pedal powered generators use bicycling mechanism as a major method of power generation.

The pedal powered generators have good efficiency which is fully dependent on the rpm. Handgrip power generation is by squeezing the handgrip which is connected to the generator which spins much revolution and power is generated. Thus the electrical energy is stored in the battery for domestic or industrial purposes. All these finally provide with a smart table fan which is very much essential because the battery gets charged automatically during the AC supply and it also operates at the same time.

## II. LITERATURE REVIEW

[1] Nowadays energy harvesting from rotating structure plays a major role in the generation of electrical energy by converting the mechanical energy into electrical energy. [2] The speed of the motor connected at the mechanical part depends upon the number of rotations per minute. Thus the maximum number of rotation gives the maximum efficiency.

[3] The ordinary table fan has low efficiency. The efficiency can be affected by the poor material used in the stator and rotor of the constructional part. The total loss present in a motor can be given by the power flow through the motor. [4] The DC motors are used in controlling systems. By avoiding the loss the total efficiency can be increased at 5% to 8%. [5] On the other hand the development of solar fan has been developed due to the maximum demand of energy usage. A 3-blade table fan of 25 watt capacity is capable of operating for 6hrs powered with just 1.0 photovoltaic module of 80watt power rating.

[6] The efficiency is improved at 80% and the fan runs at a low torque of 0.95Nm. The fan blades rotate at a speed of 500 rpm. [7] The concept of rechargeable electric fan is rising up due to the climatic threats during the winter season due to the absence of solar energy. The system consists of 12V lead acid battery.

[8] The battery should be charged for a long time of 9 to 10 hours which plays as a drawback. The designing of fan blade

arrangement is also considered for better output. [9] Human powered energy source is all time working concept. Bicycling mechanism is an very effective method of converting human power into electrical energy source.

[10] In this human power is used as an prime mover for the operation. Normally 10 minutes of pedalling can generate power for 40 minutes of lighting.

### III. METHODOLOGY

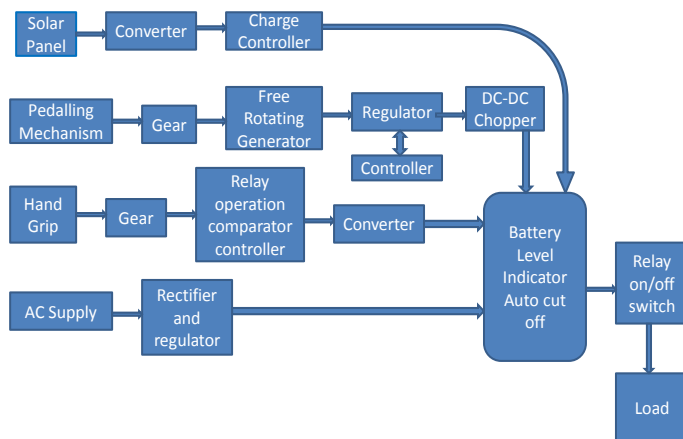


Fig 1. Block diagram

The proposed project contain solar panel, converter, rectifier, gear circuit, pedaling system, battery charging unit and battery. The energy from solar panel, handgrip and the pedaling system is used to drive the table fan under abnormal conditions. Teeth gear will get mechanical energy from the pedaling system and give the energy to the DC motor. The motor can also act as generator. Fig 1 shows the block diagram of the proposed methodology.

#### A. SOLAR MODULE

The first part of energy generation is solar powered energy generation. Sun is a hydrodynamic spherical body and the temperature of interior of sun is estimated at  $8 \times 10^6$  k to  $40 \times 10^6$  k. The energy extracted from the sun is given to the converter circuit. Converter used in this system will convert ac to dc power. Then the energy is stored in the battery. The rating of the photovoltaic panel used is 75 Watt. The components used in this module is photo-voltaic cell, converter, charge controller and the to the battery.



Fig 2. Solar panel

#### B. PEDALING MODULE:

The second set of energy generation is by pedalling mechanism. Pedal Powered Generators have been of interest at many places where no other alternative electricity generator has been viable. The operation is done by the basic principle of bicycling mechanism. Here the mechanical energy is converted into electrical energy. The components used in this system are pedal, teeth gear, free rotating generator, regulator, controller circuit, DC-DC chopper. Finally the system is connected to the battery.



Fig 3. Table Fan

#### C. HANDGRIP:

Handgrip system has an gear circuit, operating relay and converter. The efficiency of handgrip depends on the rate of input man power. Then energy is stored in the battery. The essential use of 12V lead acid batteries in automobile engines to power incorporated electrical appliances, and also the sudden failure of vehicle charging systems that often give rise to a drain of battery cells has necessitated the construction of battery chargers suitable for fully restoring the lost charge into the required 12V battery cells.



Fig 4. Hand grip

#### D. AC SUPPLY:

The fourth set of source provided to operate the system is by AC supply from the EB, which is the normal working of the table fan. All the setups are connected to the battery level indicator followed by relay ON/OFF switch. The loads provided are charging ports, table fan and LED array.

#### IV. IMPLEMENTATION

The solar charge controller circuit is made up of four stages they are the current booster, power supply unit, Battery level indicator and Battery charge controller. The current booster make that the maximum current from the solar panel through the transistor the battery level indicator the charge of the battery use of a comparator which is done by comparing with the reference voltage the power supply and unit supplies a constant output voltage.

The battery cut off the battery is fully charged which is done by IC and relay. In the pedal power system the pedal is connected with the gear teeth the gear teeth is used to increase the number of rotation into 10 timer the gear teeth ratio can be calculated from the number of teeth on the gear in the pedal power system. The hand grip power generation is also use the gear which used to increase the spinning ratio of the gear.

The output of the generator is regulated DC voltage to regulate the voltage for storage the battery are in 12v there is a DC-DC converter circuit used to convert the variable voltage into fixed voltage. The automatic battery charger circuit is mainly involves two sections power supply section and load comparison section. The main supply voltage 230v,50Hz is connected to the primary winding of the centre tapped transformer to step down the voltage to 15-0-15v.

The comparator used in the battery charger is LM324 which is a operational amplifier IC which work as a comparator is connected to a zener diode if the battery level is below the threshold point the reference voltage the comparator output becomes positive and

transistor switched ON by the relay when the battery is full the comparator output become negative and disconnect the supply.

#### V. RESULT DISSCUSSION

The multi source power generation are used to produce electricity in maximum level for operating the table fan. There are four kinds of sources that are used to operate the 60Watt table fan. The solar power can be produced up to the level of 75Watt, the pedal and handgrip produces 12Watt per rotation with the help of gear teeth and the AC source are used in the hybrid system.

The different sources can be controlled by the op-amp voltage regulator to minimize the irregular voltage. The fan can operate continuously for 2hours 30 minutes by using the power stored at the 12V 7.2Ah battery. The special feature of the table fan is it has LED strip for lighting and USB port for charging gadgets.

#### VI. CONCLUSION

In this design, a table fan powered with a 60 watt PV module of solar panel was designed also with pedaling mechanism. The design was necessitated by the need to have a fan that could be powered with a renewable energy source. This machine has not been designed to run for a whole day (24 hours) but rather between 6-8 peaks working hours in the home or office. This is designed to sustain on emergency situations, especially during the time of prolonged power cut due to natural disasters. As a result the design is expected to be relatively noiseless and energy efficient. Weather in-dependent and pollution free.

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