

Aero Dynamic Wind Mill with Reverse Charge Protection for Rural Power Generation

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Abstract: Energy is a major input for overall socio-economic development of any society. Wind energy is the fastest growing renewable energy. From centuries man has been trying to convert wind generation to mechanical & more recently, electric power. Wind technology has improved significantly over the past twenty years, and wind energy has become increasingly competitive with other power generation options. Wind generation has negligible fuel costs. A key challenge for wind energy is that electricity production depends on when winds blow instead of when consumers need power. the quantity of electricity generated from wind has been growing rapidly in recent years. the facility in the wind can be computed by using the concepts of kinetics. The wind mill works on the principle of converting K.E. of the wind to mechanical energy. the facility available in the wind increases rapidly with the speed hence wind energy conversion machines should be located preferable in areas where the winds are strong & persistent. Project is meant by using an aero dynamic wind blade arrangement which is connected to the shaft of the dc geared motor such that its output is given to the Reverse polarity preventer cum polarity corrector. Use of embedded technology makes this technique efficient and reliable. Micro controller (AT89S52) allows dynamic and faster control. liquid display (LCD) makes the system user-friendly to get the voltage. AT89S52 micro controller is that the heart of the circuit as it controls all the functions.

Keywords: Wind Mill, Liquid Crystal Display (LCD), Micro Controller (AT89S52), etc.

I. INTRODUCTION

Solar photovoltaic energy conversion system. Depending upon the movement of the wind blade (clock wise / anti clock wise) the polarity is often corrected automatically which is given as an input supply to the 12V DC rechargeable battery. The o/p of this lead acid battery is given as input to the inverter which drives the AC loads. The battery is connected to the inverter. This inverter is employed to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is employed to activate the loads. Here we also are using Conventional Battery Charger Unit to recharge the battery.

The output of turbine is given to 12V 1.3 Amp-Hour lead-acid accumulator. The battery is connected to the inverter which is employed to convert the D.C 12 Volt to the 230 Volt A.C. By increasing the capacity of battery and inverter circuit, the facility rating is increased. This project uses regulated 5V, 500mA power supply. 7805 three terminal transformer is used for voltage regulation. Bridge type full wave rectifier is employed to rectify the ac output of secondary of 230/12V step down transformer.

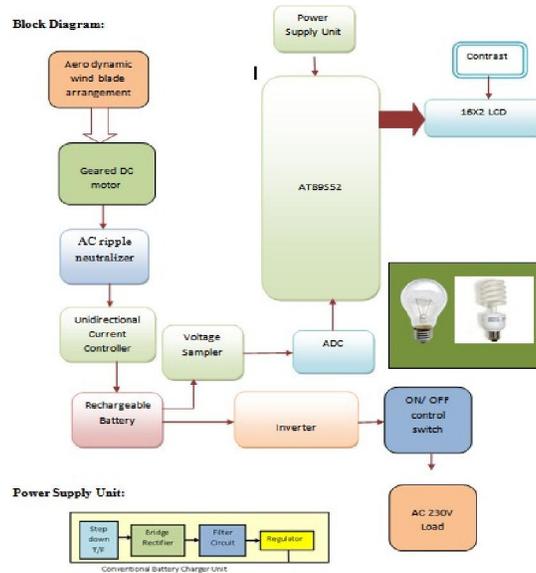
An Embedded System may be a amalgamation of computer hardware and software, and conceivably additional mechanical or other parts, designed to accomplish a selected function. an honest example is the microwave oven. Almost every household has one, and tens of many them are used every day, but only a few people realize that a processor and software are involved in the preparation of their lunch or dinner. It's in undeviating contrast to the personal computer in the family room. In addition, it is comprised of hardware and software and mechanical components (disk drives, for example).

However, a personal computer is not designed to perform a specific function rather; it is able to do many different things. many of us use the term general-purpose computer to make this distinction clear. As shipped, a general-purpose computer may be a blank slate; the manufacturer does not know what the customer will do with it. One

customer may use it for a network digital computer another may use it exclusively for playing games, and a 3rd may use it to write the next great American novel.

II. METHODOLOGY

A key challenge for wind energy is that electricity production depends on when winds gust instead of when consumers need power. The wind mill works on the principle of converting K.E. of the wind to mechanical energy.



III. POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The A.C. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output procured from the rectifier may be a pulsating D.C. voltage. So as to get a pure D.C. voltage, the output voltage from the rectifier is fed to a filter to get rid of any A.C. components present even after rectification. Now, this voltage is given to a transformer to obtain a pure constant DC voltage.

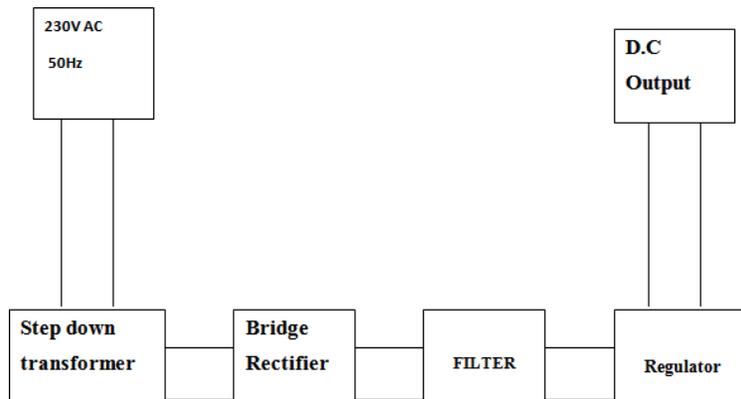


Figure 2.1: Power Supply

Full-wave rectifier circuit with a reservoir capacitor on the output for the purpose of smoothing ripple. Ripple factor (γ) could also be defined as the ratio of the root mean square (rms) value of the ripple voltage to the absolute value of the dc component of the output voltage, usually expressed as a percentage. However, ripple voltage is

additionally commonly expressed as the peak-to-peak value. this is often largely because peak-to-peak is both easier to measure on an oscilloscope and is simpler to calculate theoretically. Filter circuits intended for the depletion of ripple are usually called smoothing circuits.

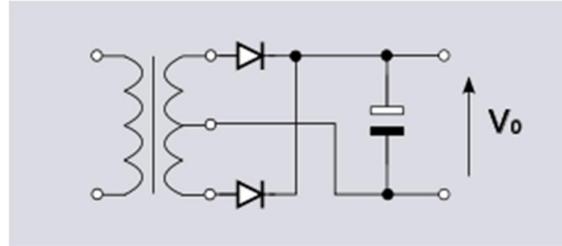


Figure 2.19: Time domine ripple

The only scenario in A.C. to D.C. conversion is a rectifier without any smoothing circuitry at all. The ripple voltage is extremely large in this situation; the peak-to-peak ripple voltage is equal to the peak ac voltage. A more common arrangement is to permit the rectifier to work into a large smoothing capacitor which acts as a reservoir. After a peak in output voltage the capacitor (C) supplies the present to the load (R) and continues to do so until the capacitor voltage has promiscuous to the value of the now rising next half-cycle of rectified voltage. At that time the rectifiers turn on again and convey current to the reservoir until peak voltage is again thrust out. If the time constant, CR, is large in collation to the amount of the ac waveform, then an inexpensive precise approximation can be made by assuming that the capacitor voltage falls linearly. an extra useful presumption can be made if the ripple is compact compared to the dc voltage. during this case the phase angle through which the rectifiers conduct will be small and it can be assumed that the capacitor is discharging all the way from one peak to the next with minuscule loss of accuracy.

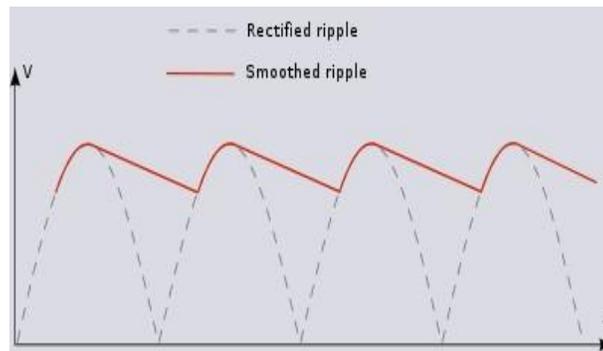


Figure 2.20: Ripple wave form

Ripple voltage from a rectifier, before and after the appliance of a smoothing capacitor with the above assumptions the peak-to-peak ripple voltage are often calculated as:

For a full-wave rectifier:

$$V_{PP} = \frac{I}{2fC}$$

$$V_{PP} = \frac{I}{fC}$$

For a half-wave rectification:

Where, V_{PP} is the peak-to-peak ripple voltage

I is the present in the circuit

f is the frequency of the ac power

C is the capacitance.

For the rms value of the ripple voltage, the calculation is more involved because the shape of the ripple waveform has a bearing on the result. Assuming a saw tooth waveform is an identical assumption to the ones above and yields the result:

$$\gamma = \frac{1}{4\sqrt{3}fCR}$$

Where, γ is the ripple factor

R is the resistance of the load

Another approach to reducing ripple is to use a series choke. A choke features a filtering action and consequently produces a smoother waveform with less high-order harmonics. Against this, the dc output is near the average input voltage as opposed to the higher voltage with the reservoir capacitor which is close to the peak input voltage. With suitable approximations, the ripple factor is given by:

$$\gamma = \frac{0.236R}{\omega L}$$

Where, ω is the angular frequency $2\pi f$

L is the inductance of the choke

More complex arrangements are possible; the filter is often an LC ladder rather than a simple choke or the filter and the reservoir capacitor can both be used to gain the benefits of both. The foremost commonly seen of these is a low-pass Π -filter consisting of a reservoir capacitor followed by a series choke followed by a further shunt capacitor. However, use of chokes is deprecated in contemporary designs for economic reasons. A more common solution where good ripple rejection is required is to use a reservoir capacitor to scale back the ripple to something manageable and then pass through a voltage regulator circuit. The regulator circuit, also as regulating the output, will incidentally filter nearly all of the ripple as long as the minimum level of the ripple waveform does not go below the voltage being regulated to.

The bulk of power supplies are now switched mode. The filtering requirements for such power supplies are much easier to satisfy due to the frequency of the ripple waveform being very high. In traditional power supply designs the ripple frequency is either adequate to (half-wave), or twice (full-wave) the ac line frequency. With switched mode power supplies the ripple frequency isn't related to the line frequency, but is instead associated with the frequency of the chopper circuit.

- The ripple frequency and its harmonics are within the audio band and can therefore be audible on equipment such as radio receivers, equipment for enjoying recordings and professional studio equipment.
- The ripple frequency is within television video bandwidth. Analogue TV receivers will exhibit a pattern of moving wavy lines if an excessive amount of ripple is present.
- The presence of ripple can reduce the resolution of electronic test and measurement instruments. On an oscilloscope it will manifest itself as a visible pattern on screen.
- Within digital circuits, it reduces the threshold, as does any form of supply rail noise, at which logic circuits give incorrect outputs and data is corrupted.
- High amplitude ripple currents reduce the life of electrolytic capacitor.

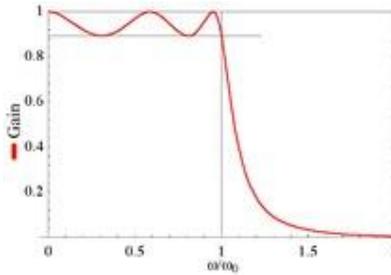
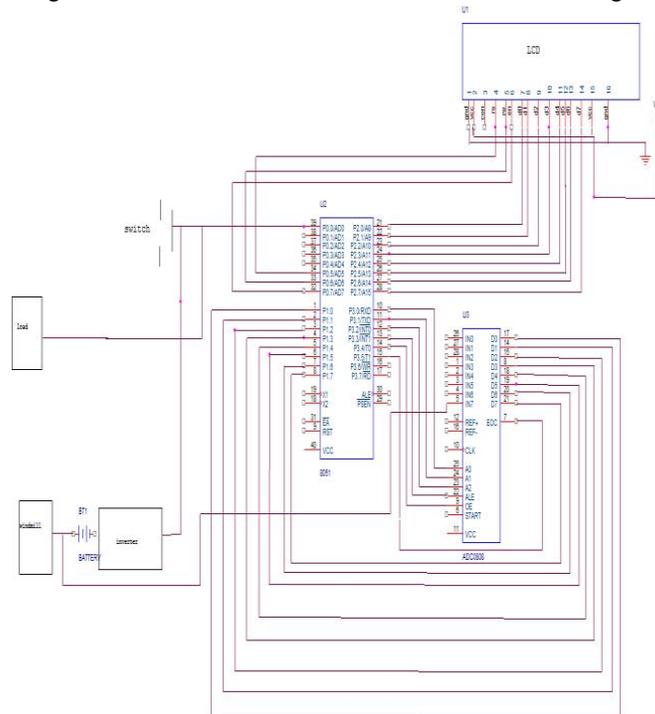


Figure 2.21: Ripple on a fifth order prototype Chebyshev filter

Ripple within the context of the frequency domain is referring to the periodic variation in insertion loss with frequency of a filter or some other two-port network. Not all filters exhibit ripple, some have monotonically increased insertion loss with frequency like the Butterworth filter. Common classes of filter which exhibit ripple are the Chebyshev filter, inverse Chebyshev filter and the Elliptical filter. The ripple isn't usually strictly linearly periodic as can be seen from the example plot. Other samples of networks exhibiting ripple are impedance matching networks that have been designed using Chebyshev polynomials. The ripple of those networks, unlike regular filters, will never reach 0dB at minimum loss if designed for optimum transmission across the pass band as an entire.

The amount of ripple can be traded for other parameters in the filter design. as an example, the speed of roll-off from the pass band to the stop band can be increased at the expense of increasing the ripple without increasing the order of the filter (that is, the number of components has stayed the same). On the opposite hand, the ripple is often reduced by increasing the order of the filter while at the same time maintaining the same rate of roll-off.



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IV. RESULTS AND CONCLUSION

Windmills are used for centuries for various purposes. Today, they're primarily used to generate power and they do so quite efficiently when compared with other renewable resources such as solar. The energy is totally clean and has little effects on the environment. Depending on the overall size the rotor will directly affect the power output capabilities of the system.

The downside to a windmill is that they can't always generate 100% power. The wind hitting the rotor is consistently changing and with it so does the power output of the windmill. Windmills also can be noisy because of the rotation from the rotors, due to this they are not good to be placed near homes.

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