

DESIGN OF VERTICAL AXIS WINDMILL IN HIGHWAYS

Submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering Degree in Electronics and Communication Engineering

By

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL 2021



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **DANISH C (37130096)** and **DANVEER H (37130098)** who carried out the project entitled “**DESIGN OF VERTICAL AXIS WINDMILL IN HIGHWAYS**” under our supervision from September 2020 to April 2021.

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DECLARATION

I, **DANISH C (37130096)** and **DANVEER H (37130098)** hereby declare that the Project Report entitled “**DESIGN OF VERTICAL AXIS WINDMILL IN HIGHWAYS**” done by us under the guidance of **Mrs. MARY SAJIN SANJU I, M.Tech (Ph.D)**, is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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We are pleased to acknowledge our sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

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We express our gratitude to our parents for their constant encouragement and support for the completion of the project.

ABSTRACT

This paper describes the design of a vertical axis windmill for future power generation applications. A defined study has been carried out to find the potential for installing roof-mounted Vertical axis wind turbines (VAWT) systems on highways and house roofs. VAWT power generation equipment can be located at ground level, which makes it for easy maintenance. Also, VAWT are Omni-directional, meaning they do not need to be pointed in the direction of the wind to produce power. The various changes in the design of Thread mill rotor have been made in order to improve efficiency and power output. Wind energy is particularly appealing way to generate electricity because it is essentially pollution free. In our VAWT as a turbine we can use bicycle wheel and PVC pipes as a blades. The cost of power generation from wind forms has now become lower than diesel power comparable to thermal power in several areas especially near coasts. And the wind flow will depend on the velocity of the air, size of the rim and intensity of air flow so a detailed survey has to be done for studying these distributions. Based on the studies made an optimal wind turbine design has to be made. The wind power hamessed through this technique can be used for household purpose, street lighting, traffic signal lighting, toll gates etc. VAWT would have many advantages over an different wind turbines. Though the tip speed ratio is a still a little low for use as an electrical generator, the research demonstrated a simple way to enable a VAWT to be self-starting and achieve higher efficiencies.

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CHAPTER 1

INTRODUCTION

For our daily lives, electricity is most necessary. Electricity is produced by traditional or non-conventional energy sources in two ways. The world's demand for electricity is growing, so electricity has to be generated to meet the demand. The conventional energy supplies such as coal, diesel and nuclear etc. provide electrical energy today. The biggest downside is that waste like ash is generated in the coal-fired power plant, and radioactive waste is very expensive to take care of. And it destroys nature as well. Atomic pollution is also very toxic to people. The traditional energy supplies are diminishing daily. Soon it will disappear from the planet entirely so we must find some means of generating energy. The new source must be safe, emission free and cost-effective. Strong renewable energy options for traditional energy sources should be non-conventional energy resources. The tidal energy has disadvantages as it can only be applied on the coast of the sea; there are other non-conventional sources, such as geothermal, tidal, wind. Along with geothermal energy, heat extraction from earth requires very much lagging phase. In all conditions solar and wind are readily accessible. Winds can be strong renewable fuels as non-conventional energies such as solar panels. Solar power has a disadvantage in that in rainy and cloudy seasons it couldn't provide electricity, and we must address this disadvantage by using two energy supplies to keep a supply that does not generate power from any other source. And we can mix both outlets in good weather conditions.

1.1 Wind Energy

By improving the performance of a wind turbine, more power can be produced, reducing the need for costly energy generators which pollute. The costs of electricity will thus be reduced for the general public. The wind is there simply and it costs no fuel. The wind turbine with little to no emissions will produce and store power. The average people will cut their power costs enormously if the performance of the common wind turbine is increased and widened. Wind turbines are types: wind turbines on the horizontal axis, vertical axis. The wind turbines of the vertical axis are solely dependent on drag power. But the wind turbines in the horizontal axis play a part in lifting and dragging forces. The wind turbines on the vertical axis are less efficient than wind turbines on horizontal axis. But it's very costly to maintain and spend. The vertical axis wind turbines are the best option for low-cost production of wind energy to solve these problems.

1.2 Solar Energy

"Photovoltaic" is a marriage of two terms: "photo," which means "light" and "voltaic." The scientific term used for the transformation of solar energy into electricity, photo-voltaic processing, produces light electricity. We use a semiconductor material that can be adapted to unleash the electrons that form the source of electricity and the negative charged particles. Different forms of photovoltaic panels include mono, poly, thin foil, silicon plates.

1.3 Hybrid Energy System

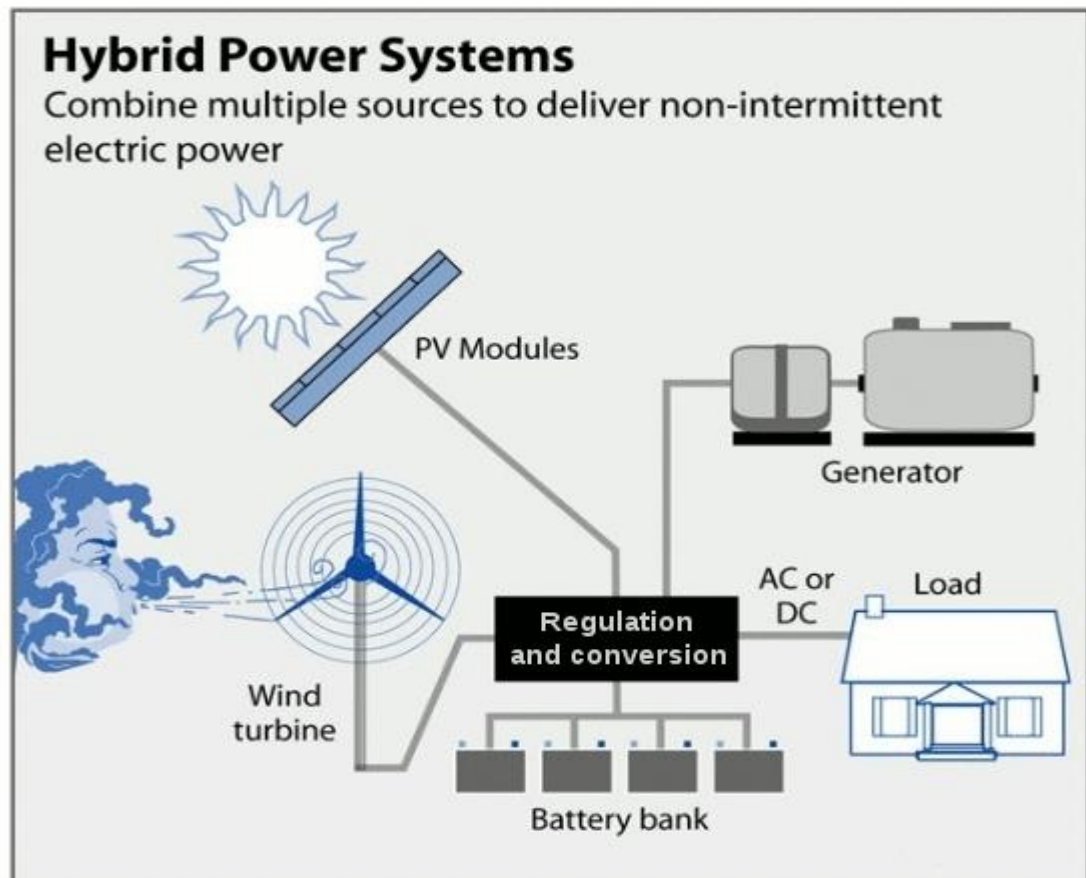


Figure 1.1. Block Diagram of Hybrid System

The fusion of two energy sources provides fuel for the load, the hybrid energy system. It may also be described as "the hybrid energy system," an energy system that is manufactured or engineered to produce power from two energy sources. The hybrid power system is reliable, efficient, emission-efficient and cost efficient. Solar and wind energy are used for power generation in this proposed scheme. Sun and wind have several benefits over other unconventional sources of electricity. Both sources of electricity are more accessible in all regions. It has to be lowered. To mount this device, there is no need for a specific spot.

CHAPTER 2

LITERATURE SURVEY

2.1 “A Family of Three-Port Half-Bridge Converters for a Stand Alone Renewable Power System” This paper is available in: IEEE power electronics transactions, vol. 26, no 9, Sep 2020. IEEE, Junjun Zhang, Yan Xing, member, IEEE and IEEE Member. Hongfei Wu, student member, IEEE. Runruo Chen.

A systemic approach is suggested, for stand-alone renewable power grid implementation for three-port Half Bridge Converter (TTPHBC), interfacing a renewable source, a stored battery and a load. The primary circuit of a half bridge converter allows the dc bias in the transformer to operate a synchronous buck converter that can be used to configure a power flow path from the renewable source to the battery, which is attached parallel to a condenser split. A post-regulation and synchronous regulation for different implementations would be proposed to make the voltage separately controlled on every two of the three ports. The consequence is the presentation of a family of TPHBCs that have basic topology and control merits, reduced unit number and a single stage power transfer among all two of the three ports.

2.2 “A Review on Multiport DC-DC Converter for Different Renewable Energy Sources” Ruchika Sharma; Kuldeep Thakur, Engineering and Technology Research Journal (IRJET) e-ISSN: 2395 -0056 Volume: 31 Edition: 08 | Aug-2020.

This paper focuses on the multiport dc–dc converter for the simultaneous power control of multiple renewable energy sources of related kinds. In each port to which a source is connected the implemented dc–dc converter uses only one controllable switch. The setup is basic and the power switches are minimum. A wind/solar hybrid power generation system comprising one wind turbine generator (WTG) and two separate panels in photovoltaics is supplied by the introduced converter for simultaneous maximum power point (MPPT) piloting.

2.3 “An Isolated Multiport DC-DC Converter for Different Renewable Energy Sources” K.Pradeepkumar, J.SudeshJohny; Vol. 3, Issue 12, December 2020 10.15662/ijareeie.2014.0310033

This article introduces a new isolated DC-DC multi-port converter to handle multiple renewable energy sources simultaneously, and of related forms. In any port to which a source is connected, the proposed dc–dc transformer uses only one controllable switch. The setup is basic and the power switches are minimum. A wind/solar hybrid generating system consisting of one Wind turbine generator (WTG) and two separate PV panels shall be used in the simultaneous maximum power point monitoring (MPPT). The conversion device is used. The experimental results are given to confirm the incisiveness of the suggested converter for the WTG and both PV panels to achieve MPPT simultaneously.

2.4 “An Isolated Three-Port Bidirectional DC-DC Converter with Decoupled Power Flow Management” This paper is available in: IEEE power electronics transactions, vol. 23, no 9, September 2020. Senior Member of the IEEE, Chuanhong Zhao, IEEE student, Simon D. Round.

This paper proposes an isolated three-port, two-way dc-dc converter consisting of three full-bridge cells and a high-frequency transformer. Apart from the phase change regulation of the power flow between ports the duty cycle control is also addressed in order to optimise the system behaviour and the control legislation is also examined, which ensures minimal total system failure. The complex analysis and the corresponding control design are also discussed. A control-oriented converter model is built and the control output conversion functions are seen in the Bode plots. To achieve a quick dynamic response, a control strategy is applied with decoupled power flow management.

2.5 “Hybrid Energy Generation Through Vertical Axis Savonius Wind Turbine and Solar Panel” Ragunath L, Senthilvel S, Dr. P. Ilamathi; IJIRST – IJIRST – ISSN, Volume 2 | Issue 11 | April 2020 IDR (online): 2349-6010 Innovating Research in Science & Technology Www.ijirst.org reserved all rights Thirty-four

The demand for electricity in our country has been raised to reduce power in rural areas consistently. This is because factories use a high amount of electricity and because non-renewable energy supplies are less available. It is also well recognised that the use of the hybrid solar power system to produce electricity to meet rural household energy requirements economically, quickly and reliably. It will substantially reduce the power demand of our solar-wind energy grid in rural areas. However, the wind speed of the energy generated by the horizontal wind turbine varies by day and night. Think of the vertical axis to solve this For the production of electricity in a low wind speed (course cut at around 3 m/s), the Savonius Wind Turbine (SWT), with guided vanes was introduced, in which both the solar photovoltaic (PV) and the SWT were combined. The hybrid construction was made. For the rated power output of the proposed device, the hybrid controller was chosen. The total energy efficiency of 22% in this analysis for the stand alone electric generation system was obtained by the VASWT Vertical and the PV Hybrid System. This study selected the optimised design of VASWT and the efficiency study was performed by adding the PV panel and updated car alternator.

2.6 “Hybrid Power Generation System Using Vertical Axis Wind Turbine And Solar Panel” ChetanSonawane, ManavVelani, Akash Singh and VikaskumarTripathi; International Journal Of Advanced Researches-April 2020.

The energy use & electricity demand in countries around the world is one of the most important things in the world. The growth in electricity demand leads to the diminishing daily use of traditional energy supplies.

Due to this and the problem of global warming and deforestation, there is a growing urgency for unconventional energy options. Clean and continuous power supplies are also essential. Wind turbine and solar energy hybrid energy system gives continuous power. The energy from a device like this can be used for different purposes. This paper deals with power generation by wind turbine and solar panels on a vertical axis at affordable costs with no effect on the balance in the environment.

2.7 Ashish S. Ingole, S.Rakhonde, International Journal of Research and Scientific Publications (Volume 5, issue 3, March 2020, pp. 2250-3153). Hybrid Energy Generating System for the Use of Wind Energy and Solar Energy, Volume 3.

The energy of one day is the human being's most necessary device. Each day, all traditional energy supplies are diminishing. We would then shift from conventional to unconventional energy supplies. The integration of two energy options, wind and solar, takes place. Sustainable energy supplies are reviled without harming nature. By using a hybrid energy system, we can have continuous power. Basically, this method includes the convergence of two continuous power systems. Solar panels used in solar energy conversion and wind turbines are used for electricity conversion of wind power. This electricity can be used for different purposes. Electricity generation can occur at an acceptable price. This paper discusses energy generation from two combined streams, leading to electricity generation at competitive costs without compromising design.

2.8 B. Sahan, S. V. Araujo, C. Noding, P. Zacharia, "Comparative assessment of the grid interface of distributed and renewable energy networks with current source inverters in three stages," IEEE Trans. Power Electron., vol. 26, no. 8, pp. 2304–2318, August 2011.

IEEE student member Hongfei Wu, IEEE member Kai Sun, IEEE member Runruo Chen, IEEE member Haibing Hu, Yan Xing and IEEE member. This report proposes a systematic approach for the derivation of a full-bridge converter (FBC) from the three-port converters (TPCs). The procedure is used in splitting the two switching legs of the FBC into two switching cells from separate outlets. A new Complete Bridge TPC (FB-TPC) is built with this systematic approach for applications involving renewable power systems which include simple topologies and controls, a reduced number of appliances and a single stage power conversion between two or more three ports. The FB-TPC is suggested with two bidirectional ports and a separate output port.

CHAPTER 3

AIM AND SCOPE OF THE PRESENT INVESTIGATION

3. RENEWABLE ENERGY SOURCES

3.1 VERTICAL AXIS WIND TURBINE

In comparison with conventional horizontal wind turbines, VAWTs deliver some advantages (HAWTs). In wind farms they can be packaged more closely, allowing for more in a particular space. They are silent, all-directional, and the support system generates lower powers. They don't have the wind to produce electricity so that they can get closer to the earth

at a lower wind. They are conveniently preserved and placed on fireplaces and similar large structures by being closer to the earth.

Both of them contribute to energy generation as the wind goes through the blades of a HAWT. Just a fraction of the blades create torque as the wind moves through a VAWT, while the other pieces simply 'turn around.' As a consequence, the productivity of electricity production is comparatively diminished. It is very difficult to achieve high performance from limited VAWT size. It is very responsive to the lift/drag ratio of the blade because of the VAWT efficiency and it is not good in small applications due to the low numbers of Reynolds. In scaling VAWTs to commercial scale, many obstacles exist. First, they are not as robust as a HAWT by nature. This is due to the HAWT's tension in comparison to common VAWT models. Only in niche settings is the benefit of VAWTs. VAWTs still do not produce enough power to be cost-effective or material-based compared to HAWTs of complete cycle accounting. VAWT designs have blades far nearer to the ground than HAWTs, meaning large quantities of wind are being lost.

The Drag-Driven VAWT (Savonius type) and the lifting driven VAWT are two major type of VAWT (Darrieus type). Form Savonius works like a water wheel with drag powers. The Darrieus kind, on the other hand, contains HAWT-like blades. Vertically positioned is the VAWT main rotor shaft. By using this axis shaft the generator can be attached. For this sort of wind turbine, the rudder is not required since the wind is acceptable from all directions. Lift-powered turbines provide greater performance than tractor-powered turbines, the major emphasis today is on lift-powered turbines. G.J.M. Darrieus invented the first turbine of this design in 1931.

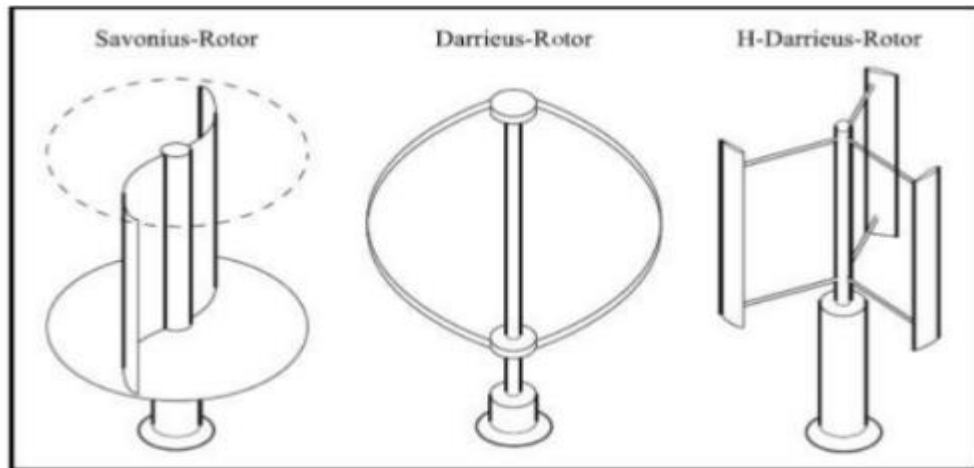


Figure 3.1. shows that main Types of Vertical Axis Wind Turbines

Important torque changes at every turn and the large bending time on the blades were the biggest disadvantages for the original prototypes (Savonius, Darrieus and Giromill). The following projects deal with the problem of the torque torsion by helically balancing the blades. Power coefficient (C_p) is a wind turbine performance indicator. C_p is the real electricity ratio generated by a wind turbine separated into turbine blades with a defined wind speed by the overall wind power. The power of the various VAWTs is seen in the figure below.

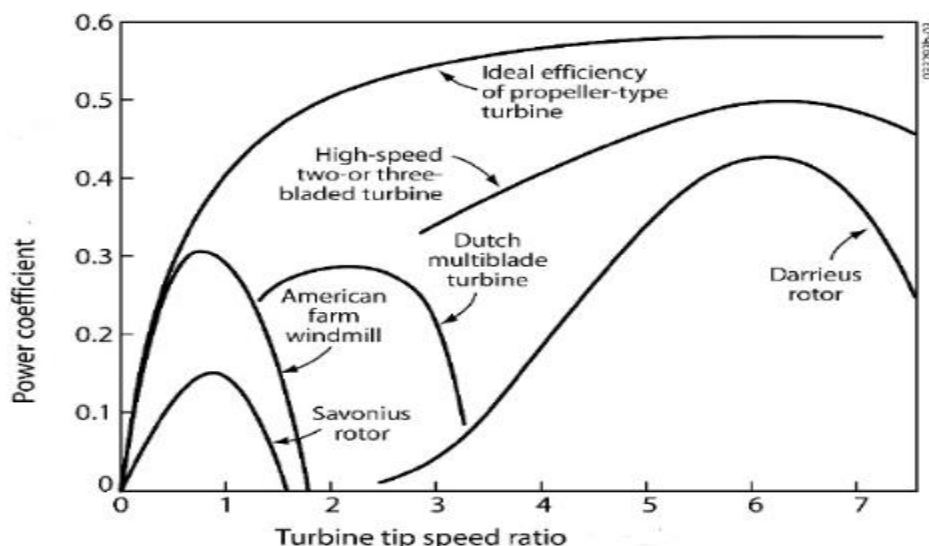


Figure 3.2. Power coefficient of different VAWTs

A large survey of VAWT's current technical states found that in recent years China has been the leading investigator in the region. The

graph below illustrates the interest in VAWT study in European countries from 2010 to 2014.

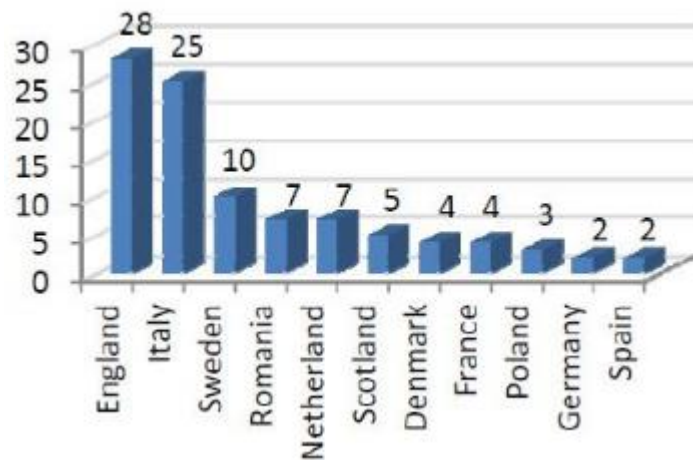


Figure 3.3. Research publications on VAWTs in European countries (2010-2014)

"Espacenet" is a free website that contains more than 95 million patents worldwide. A worldwide patent quest (up to 15 July 2017) in the VAWT area has been conducted in the global database for 1603 patents in recent years.

3.1.1 DARRIEUS TYPE VERTICAL AXIS WIND TURBINE

Georges Jean Marie Darrieus invented and first patented wind turbine in 1927. Blades are aerodynamically shaped with various layouts and a certain distance from the rotation axis, normally NACA-style. When defending the Darrieus turbine from harsh wind conditions and as a self-starter, there are so many problems. This wind turbine is a high speed turbine and low torque, ideal for alternatives (AC). In Cap-Chat, Québec, is the biggest Darrieus wind turbine. It is 60 metres wide and nearly 100 metres high. It has a power of 3.8 MW on the plate.

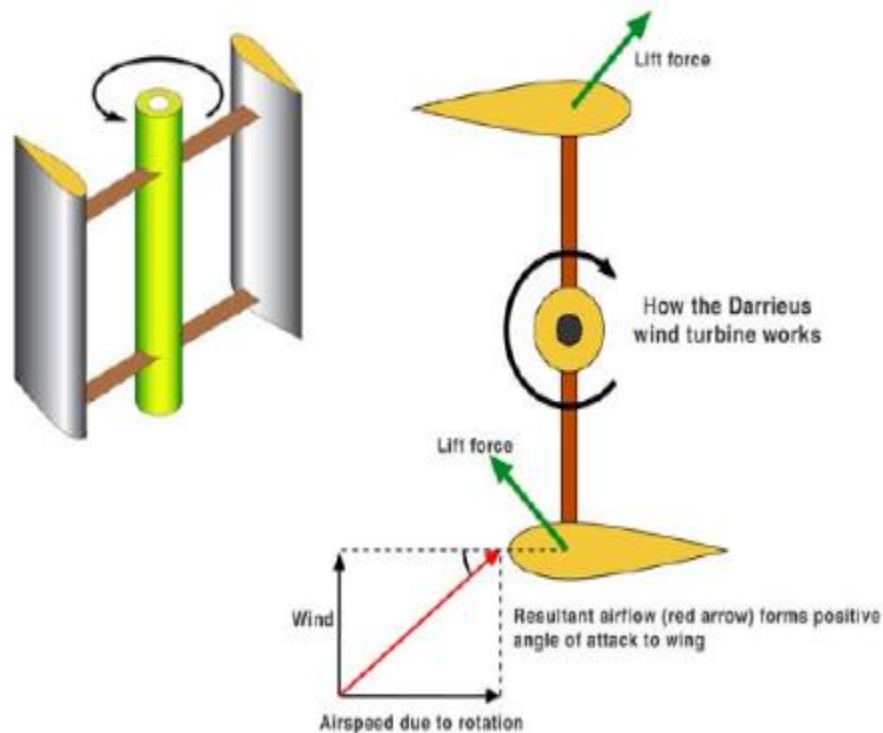


Figure 3.4. Darrieus wind turbine operating principle

The initial edition of the designs of Darrieus had no rigging angles and was symmetric. This scheme is similarly successful irrespective of the wind's path. The type of Darrieus requires an electrical support to start with and a removal rate of approximately 4 - 5 m/s, whereas the type of Savonius is 1 m/s or lower. The hybrid solution has been implemented by addressing the starting dilemma of the Darrieus turbine. This machine mixes the form of Savonius with low speeds. In high-speed winds, the type Darrieus has a powerful C_p (HP) compared to the type Savonius. The angle of attack does not exceed $\pm 20^\circ$ for the turbine blades because it is turbulent.

An appropriate high label speed is needed for the attack angle between zero and 20° . [24] The report was released. The angular angle generally raises the lift forces as well as the drag forces. Tangential lifting force part to assist blade rotation and pull force against it. When the lift to drag ratio is maximum, a wind turbine will provide its maximum output. This occurs as the angle of attack is optimal. The cross sections of Airfoil

should be oriented to an optimal attack angle. What are the issues currently being addressed by researchers.

By adding wind deflectors, current scientists are trying to increase the efficiency of Darrieus wind turbines. The deflector mechanism contains slow air stream and the rapid air stream is beyond the deflector system. If all currents are distinct from each other, they produce a fast vortex mixing. This means that a low-pressure region like atyphoon is formed by vortices. It reduces the downstream air load and increases the performance of the turbine. The wind power is notoriously commensurate with the cubic power of the wind speed reaching a wind turbine. This means that the electricity generation increases significantly even tiny amounts of the acceleration. Many academic groups have therefore sought to find a way to efficiently speed up the coming wind speed. This upstream deflector mechanism produces a huge spacing behind it, which seems to attract more wind from a very low-pressure area than a wind turbine without deflectors. This results in efficient concentration and acceleration of the flow to deflectors.

3.1.2 GIROMILL

The various shortcomings of the Darrieus wind turbine have enabled many modifications to increase output, performance and planning downtime. In comparison with curved, Giromill is a subtype of Darrieus turbine with straight blades. It uses two or three straight blades independently connected to a vertical axis (also known as an Egg-Beater windmill / H-rotor/H-bar). This kind of torque pulsation has a variable pitch along the blade. The benefits of this kind are that it has a higher torque, less fluctuating torque curve and a higher output coefficient. Due to lower rpm, the blades are under bending strain. The figure below shows the wind turbine design type Giromill.



Figure 3.5. Giromill type wind turbine

3.1.3 CYCLOTURBINES

Cycloturbines are another kind of Darrieus turbine. In this design, blades around the vertical axis are integrated to enable them to be pitched properly so that they still have an angle of attack and start at themselves – a distinct advantage over the original Darrieus design. This modification increases the turbine's total power, but its complexity increases. The Blade's angle varies at first and reduces the startup torque necessary and eliminates the need for a starter.

3.1.4 HELICAL BLADE VERTICAL-AXIS

The Helical Blade Vertical Axis Wind turbine is another kind of wind turbine Darrieus. The Gorlov Helical Water Turbine influenced this concept first. The pulsating torque, which can make the main coils fall on Darrieus designs, can be reduced by replacing the blades of a Giromill with helical blades attached on a vertical axis (as a DNA structure). The Turby, Urban Green Energy, Enessere and Quiet Revolution wind turbine brands are used for the construction of Helical blades.

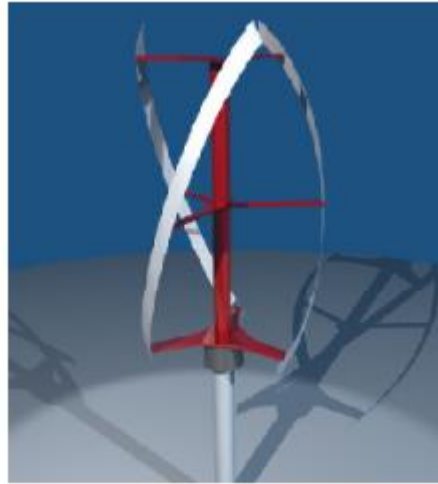


Figure 3.6. Helical Blade Vertical-Axis Wind Turbine

3.1.5 SAVONIUS TYPE VERTICAL AXIS WIND TURBINE

Sigurd Johannes Savonius from Finland invented another kind of VAWT in 1922. Savonius is known as VAWT type. The drag-mounted VAWT is the same as a cup anemometer. It works. The efficiency of wind turbines from Savonius, however, is some 15%. This means that just 15% of the wind energy that hits the rotor is kinetic. It's much less than the form of Darrieus. A Savonius wind turbine cannot spin more quickly than wind speed and has a speed ratio of 0-1. This suggests that the form Savonius rotates slowly but produces a high torque. Savonius is also not ideal for power generation, because turbine generators must be transformed into hundreds of RPM to produce high voltages and currents. A transmission can be used in torque reduction and RPM increases.

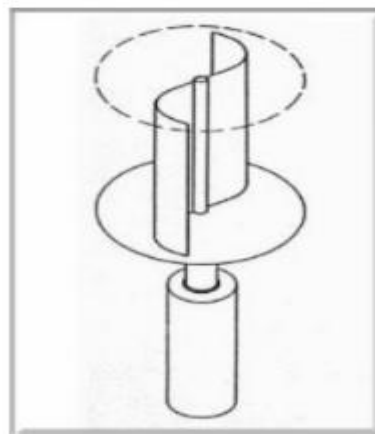


Figure 3.7.Savonius type Vertical-Axis Wind Turbine

Given the low performance of Savonius type, several researchers concentrate on improving turbine efficiency because it offers many advantages over other turbines. One of the studies is to increase the efficiency of the wind turbine Savonius by incorporating wind deflectors. The wind can be guided by a deflector device to the turbine blades.

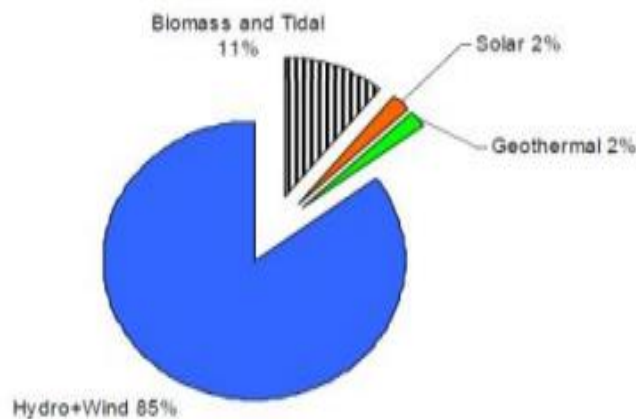
3.1.6 TWISTED SAVONIUS

Savonius twisted is a tweaked Savonius VAWT style variant. It has long hubs with a steady torque.

3.2 PHOTOVOLTAIC SYSTEM

Different fuel sources are used to supply power plants to meet demand for energy. Coal, due to availability and low cost, is the most common fuel type. The huge amount of carbon dioxide emissions from greenhouse effects is an inconvenience of fossil fuels. If several countries enact controls on pollution emissions, which could lead to decreases of the number of coal-based power plants, the aspirations of coal power production are subject for variation. In contrast, renewable energy sources are the fastest growing source of power generation with annual growth of 3 per cent, powered primarily by hydro and wind power development. All other alternative fuels, including geothermal and solar, also do not compete economically with fossil fuel production.

As seen in figures 1–3, the anticipated renewable energy production in 2035 is broken down. It is clear that hydro and wind power dominate 85% of the projected renewable energy share, while solar and geothermal energy are expected to contribute approximately 2% each. The cost per KWh of solar energy produced is high compared with fossil fuels, which makes no meaningful contribution.



Photovoltaic (PV) is an array (cell combination) containing a solar voltaic material converting solar energy into power. The photovoltaic system PV cell is a simple unit. Such systems contain several parts, such as mechanical and electrical connections and assemblies as well as various control and (if necessary) electric output modifications. Monocrystalline silicon, polycrystalline silicone, microcrystalline silicone and cadmium telluride and copper indium selenite are materials used for photovoltaics. Small loads like lighting systems or small CD motors can be supplied through the current and voltage present on PV terminals. We have to model converters so that they can monitor maximum power point to obtain the highest possible power from a pv array (MPP).

3.3 PV ARRAY

A solar array consists of several PV modules, casually known as solar panels, and converts solar (sunlight) radiation into direct current (DC), a usable energy. Photovoltaic array is also a photovoltaic array. The photovoltaic system usually includes a panoply of PV modules and one or more DC to alternative current (AC) converter (also known as inverter), monitoring system supporting solar modules, electrical wiring and interconnections and the installation of other elements. Photovoltaic systems for domestic, commercial or industrial energy supplies.

Photovoltaic (PV) is a method for generating electricity using semiconductors which exhibit a photosoltaic effect by converting solar radiation into direct current electricity. Solar panels consisting of a number of photovoltaic cells are used for the production of photovoltaic fuel. Like monocryste silicon, polycrystalline silicone, amorphous silicon, the cadmium telluride, and copper indium gallium sulphide, which are currently used in photovoltaic materials. In recent years, the development of solar cells and photovoltaic lines has progressed significantly due to increasing demand for renewable energy sources. Sustainable electricity sources are solar photovoltaics. A total of 71.1 GW was deployed by the end of 2011. And the installed capacities of 100 GW were reached by the end of 2012. About 100 countries are using solar PV. Installations may be placed on the field or installed in the roof or the wall of a house (and often mixed with farming and pasture) (either building-integrated photovoltaic or simply roof top).

A small PV system may provide sufficient power in the form of AC or DC for the operation of a single house or even an independent unit. Electric vehicles and solar tents, satellite and electric aircraft may include built in photovoltaic systems, depending on the configuration and energy demands to provide main or auxiliary power supply as AC or DC, for example, and the Earth's military and civilian observation satellite, street lights, signs for construction and transport.

Because of the low voltage of an individual solar cell (typically 0.5V), multiple cells in the production of a "laminate" are wired in series (Copper in photovoltaic power systems). The laminate is mounted into a weatherproof protective housing and is thus made of a solar panel or photovoltaic module. The photovoltaic range can then be tied together. A photovoltaic array is a series of solar panels connected together. The power of one module is rarely sufficient to satisfy the needs of a home or enterprise, so that the module form an array. The DC power produced by the modules is converted to alternating current that can be powered by lights, engines, and other loads by most PV arrays. The modules in a PV array are normally first serial connected to get the desired tension; each

string is then parallel connected to the device so the current can be produced.

3.3.1 CHARACTERISTIC OF PV ARRAY

Due to concerns about detrimental impacts on the atmosphere and energy stability of extensive fossil fuel use in recent years, photovoltaic (PV) systems have gained unparalleled interest. Photovoltaic energy is a renewable, lifecycle and reliable energy. It can thus be regarded as one of the renewable energies most competitive. These systems should be situated in or around the location of the need to prevent transmission losses and reduce CO₂ in urban centres. The photovoltaic module is the product of the association with their safety devices of a group of photovoltaic cells in series and parallel figure. Moreover, the energy generated by the photovoltaic module depends on the solar radiation, cell temp and the voltage provided.

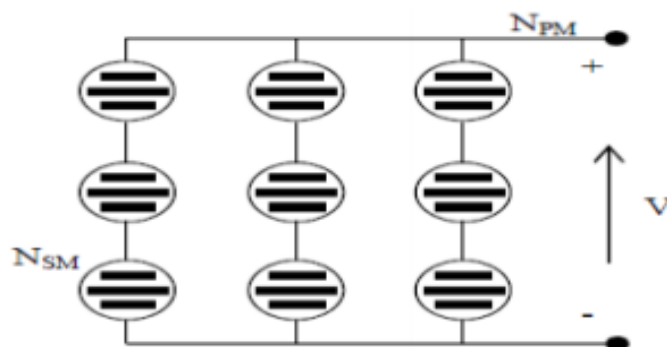


Figure 3.8.PV module cell

3.4 PV CELL EQUIVALENT CIRCUIT

In principle, a solar panel cell is a pn semiconductor interconnection. A DC current is produced when exposed to the sun. The current produced varies according to the sun's radiance. A parallel current source with a diode may be used for the equal electric circuit of an ideal solar cell shown in figure 3.9.

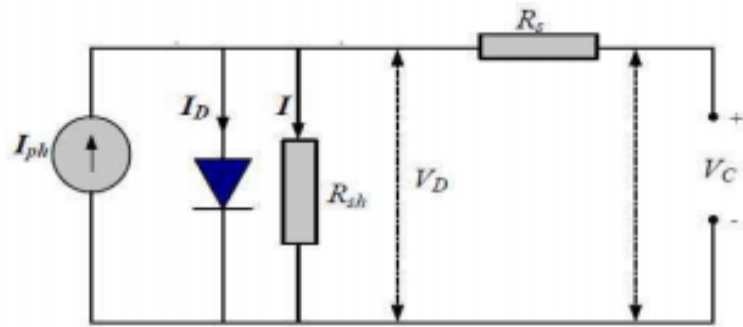


Figure 3.9. Equivalent electrical circuit of a solar cell

The current through diode is given by:

$$I_D = I_0 \left\{ \exp \left(\frac{qV_D}{A} \right) - 1 \right\}$$

Then

$$I_c = I_{ph} - I_D - I$$

where :

- I_c : Cell current (A).
- I_{ph} : Light generated current (A).
- I_0 : Reverse saturation Current.
- q : Charge of electron = 1.6×10^{-19} (coulomb)
- k : Boltzmann constant (J/K).
- A : dimensionless of the solar panel.
- T : cell temperature (K).
- R_s, R_{sh} : cell series and shunt resistance (ohms).

3.5 PV ARRAY CHARACTERISTICS

A general diagram of an MPPT computer system and a DC/DC converter is shown in figure 3.3. The DC/DC converter functions as a matching device for impedances. The MPPT computer system checks the input and input power voltage and calculates the power to manage the DC/DC converter. Either the battery or super capacitor may be used as the storage unit.

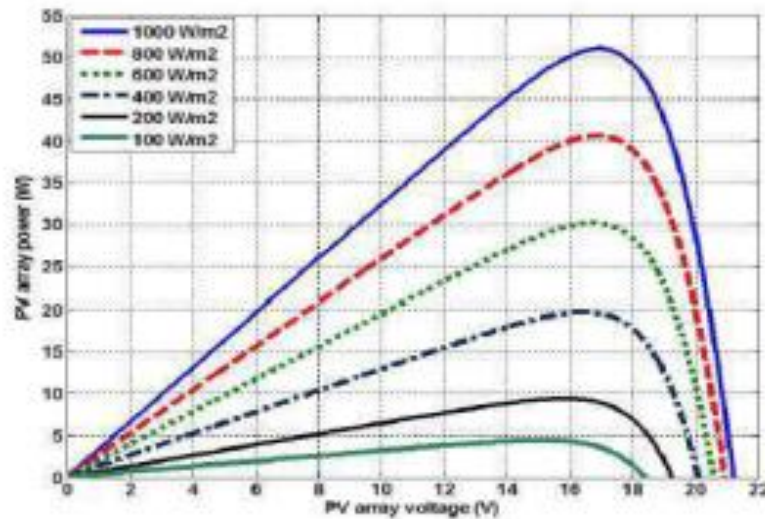


Figure 3.10. Power-voltage characteristics of photovoltaic module at different irradiance levels with constant temperature (25 °C)

3.6 BENEFITS OF PV SYSTEM

During use, solar energy is free of waste. Extended environmental controls can be used to regulate the production of waste and pollutants. The implementation of end-of-use recycling technologies and policies that allow producers to recycle are underway. After the initial operation, PV plants could run for several years under repair or intervention, so running costs are relatively low relative to conventional power technologies after the initial capital expense of constructing any solar power plant. Very little investment money has been spent in the production of solar cells, and so significant improvements are available compared to fossil and nuclear energy sources. However, high-efficiency experimental solar cells have efficiencies of more than 40%. In addition to quick electricity generation,

PV power systems have several special advantages. These are as follows:

- Social advantages for jobs, energy independence and rural growth.
- No generation of noise, noxious emissions or polluting gases as opposed to other producing power sources resulting in the production of fumes, acid rain gases, air and water pollution.
- The components used in the manufacturing process (silicon, glass, aluminium, etc.) can be recycled and therefore reused. Recycling is not only advantageous to the atmosphere, but also to contribute to reducing resources used for manufacture and thus manufacturing costs.

Maintenance of PV is minimal. Solar modules are almost maintenance-free and simple to use. PV devices are highly secure and accurate. The life of a PV module is expected to be 30 years.

CHAPTER 4

DC-DC CONVERTER

4.1 HALF-BRIDGE DC-DC CONVERTER

The Buck and the boost converter have the same configuration as the basic Boost and Buck structure, but, if they are linked in a parallel to each other, they have the additional function of a biway power flow. The following figure is a summary of the fundamental configuration of the DC-DC bidirectional non-isolated half-bridge converter.

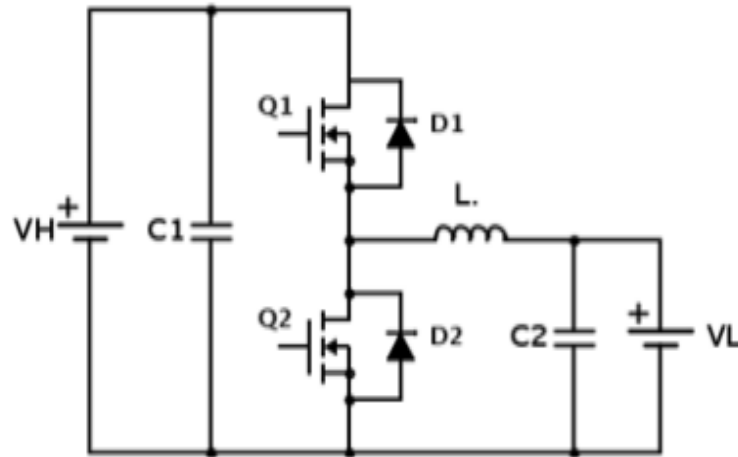


Figure 4.1. Non-Isolated Half-Bridge Bidirectional DC-DC Converter resulting out of the anti-parallel connection of the Buck and Boost converters

Depending on the flipping of MOSFETs Q1 and Q2, this circuit can be used in Buck or Boost mode. The Q1 or Q2 switches in conjunction with the D1 or D2 antiparallel diodes (acting as a freewheel diode) increase or decrease the voltage on the circuit. In the following two modes the bidirectional operation of the above circuit can be explained:

Mode 1 (Boost Mode): With this mode, the Q2 and D1 switches are conducted according to the operating period while the Q1 and D2 switches are permanently disabled. Depending on the direction of the turn Q1 and D2 as seen in the Figure, the mode can be further split into two intervals.

Interval 1 (Q2-on, D2-off ; Q1-off, D2-Off): In Q2, it is enabled and thus can be considered as a short circuit, because the battery loads lower voltage the inductor and the inductor current increases until the gate pulse from the Q2 is not stopped. As the D1 is reversed and the Q1 button is off, no current is passing through the Q1 switch.

Interval 2 (Q1-off, D1-off; Q2-off, D2-on): Both Q2 and Q1 are off in this mode and can thus be found to be circuited open. The polarity of the voltage from which the inductor flow can't change immediately, and hence begins to operate in series with the input voltage. Now it can't change

immediately. The diode D1 is thus skewed forward and therefore the current from the inducer charges the output condenser C2 to a greater voltage. The output voltage then increases.

Mode 2 (Buck Mode): The Q1 and D2 mode switch is powered based on the service period when the Q2 and D1 switches are still off. Based on the conductions on the Q2 and D1 switches as seen in Fig., this mode can also be separated into two intervals.

Interval 1 (Q2-on, D2-off; Q1-off, D2-Off): Q1 is activated and Q2 is deactivated in this mode, and thus it is equal as seen in the following Figure. Inducers are charged and the output condenser charged by the higher voltage battery.

Interval 2 (Q1-off, D1-off; Q2-off, D2-on): Both Q2 and Q1 are off in this mode. Again because the current of the inductor can't shift immediately, the freewheeling diode D2 is discharged. Compared to the input voltage, the voltage over the load is reduced.

The following has been a study of the various characteristics in the non-isolated bidirectional topologies:

1. In stepup mode, the rms value of the current through the inductor in a bidirectional buck-boost converter and the power switches are higher in comparison to the buck-boost bidirectional converter, relative to the output current. The current of the condenser rms even approaches 1/3rd of the output current of the former example. The inductor, control switches and condenser thus function under thermal and electrical tension in the two-way buck boost converter relative to the buck boost cascade converter, which results in a larger power loss and even saturation. Back-boost bidirectional converters often require power equipment with greater unit ratings, as tension on the MOSFET and diode are higher. Higher rms currents also lead to higher lead loss and thus decrease the bidirectional converter's overall performance.
2. However, the required number of devices is twice as many as in the bidirectional converter buck boost. The Half-Bridge Bidirectional DC

converter allows this issue to be resolved. It has no devices like the bidirectional buck-boost converter and can be used for applications which only need boost function in one direction and buck in the other instead of the buck-boost cascade bidirectional converter.

3. The key benefits compared with the two-way Cuk converter is that the half-bridge bidirectional converter needs only one and not two and that too half the latter value and power-switches are much smaller than the half-bridge bidirectional converter. Also, due to the low current inductor and thus lower conduction as well as lower switching losses, the performance of the half bridge converter is higher than the Cuk converter.

4.2 MULTIPLE-INPUT DC-DC CONVERTER

The single key to combining multiple input power sources, whose voltage levels vary and to obtain a regulated output voltage for charge from them, is multi-input DC-DC converters.

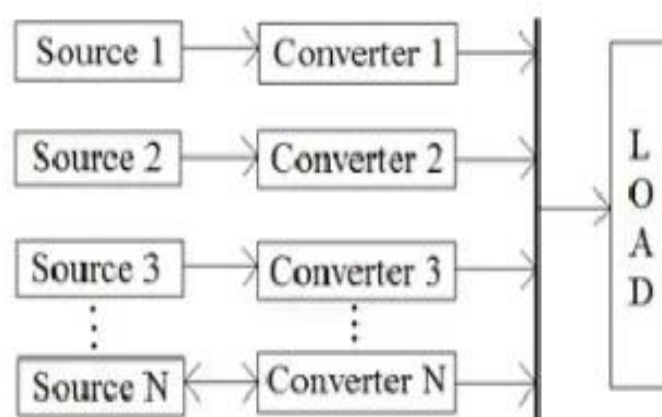


Figure 4.2.1. Separate converters for each source

In certain applications, it is necessary to link several power sources together, which provide the power for a single load. The independent converter for various sources appears in Fig 4.2. Output 1 of Source N-1 may consist of a mixture of some kind of power supply like wind turbines, modules for the photovoltaic sector, FC, micro turbine or electric grid, and the Source N may be a storage device, like a battery, ultra-capacitor, pneumatic or supranational magnetic energy storage.

Both sources of energy are unidirectional where the storage portion is two-way, capable of charging and discharging.

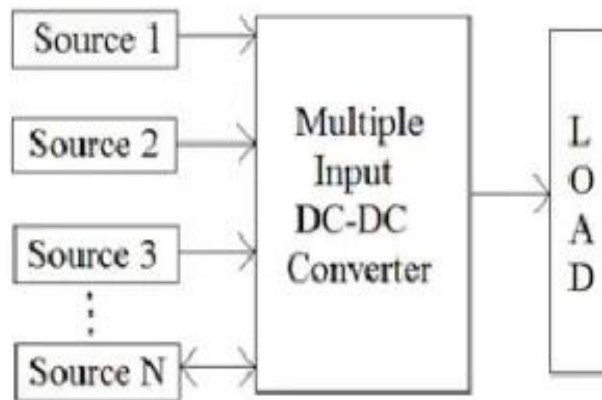


Figure 4.2.2. An MIC for all sources

A single DC-DC Multi-Input Converter substitutes for multiple parallel single converters in Fig 4.2. The four-input DC– DC boost converter structure appears in Fig 4.3. The converter uses voltage from V1, V2, V3 and V4 and the battery element storage from four input power sources.

SOFTWARE DETAILS

4.3 MATLAB\SIMULINK

MATLAB is an architecture, science and applied math applications kit. The programming language is strong, it offers excellent graphics and numerous expertise. MATLAB shall be written by The Math Works, Inc., and a patent.

MATLAB focuses not on algebra, but on calculation: It is impossible to symbolically communicate and handle (except through the optional Symbolic Toolbox, a clever interface to maple). Due to the rounding errors found in machine algebra, not just numerical figures are inexact. It is a disadvantage, but it is also a source of strength: MATLAB is much better than Maple, Mathematical, and other things in terms of numerics.

In the other hand, MATLAB is much simpler to use and features a large standard library in comparison to other numerically based languages such as C++ or FORTRAN. 1 Here's an unsatisfactory comparison of the speed difference. This difference is not often as drastic as common information does, and sometimes successful MATLAB programming can be narrowed or closed (see section 6). In addition, other codes can be linked to MATLAB or vice versa, and MATLAB supports parallel computation now, optionally. Nevertheless, MATLAB is generally not the choice method for optimal computing efficiency. The niche MATLAB is digital computing on stations for computational non-experts. This is an enormous niche – you can see the amount of books on Matlab on mathworks.com. MATLAB can also be a helpful setting for supercomputer users to explore and adjust algorithms before laborious coding in a different language. A distinctive character or community acquires the most successful programming languages and environments. In MATLAB this culture contains many aspects: an experimental and graphical bias, resulting from interactive environments and compression of the write-compile-linking cycle of analysis; focus on interactive mode-compact and interactive syntax, not strictly constrained and verbose (though not to the extent of being open source software).

Graphical versus command-line usage:-

Originally, MATLAB was fully a control line environment, which maintains this guidance. However, certain functions from graphical interfaces can now be accessed – menus, keys, etc. These interfaces are particularly helpful for beginners, since the options available are well defined. 2 In principle, for some forms of interactive work, visual interfaces may be more normal, such as annotating a graph or debugging the programme; for complicated, accurate, repetitive or reproductive work the typed commands are best kept. However, one does not really have to make a choice; for example, a figure type may be saved as a prototype and could be used by pointing and clicking on various details. In addition, your own graphic driven software can be used to distribute your package code. Ultimately, an expert user of MATLAB should be able to use all

working modes to indicate them productively. Particularly, please click (with Control-Click on Mac) to see what you can do with many items.

WHAT IS SIMULINK?

The MATLAB extensions by Math Works Inc. are Simulink (Simulations and Links). It works with MATLAB to provide dynamic system modelling, simulation and analysis in a GUI format. With click-and-drag mouse operations, model creation is streamlined. Simulink contains an extensive toolbox block library for both linear and non-linear analyses. Models are hierarchical, and make both the down and down methods. They are hierarchical. Because Simulink is part and parcel of the MATLAB it is simple to turn around and take care of the functionality provided in both environments during the review process. The main aspects of this guide are the control system as it has been written for students of my control systems.

You need to create the Matlab software first to start Simulink session. Enter from the window of the Matlab command:

```
>> Simulink
```

You can also press the Simulink button on the tool bar as illustrated.

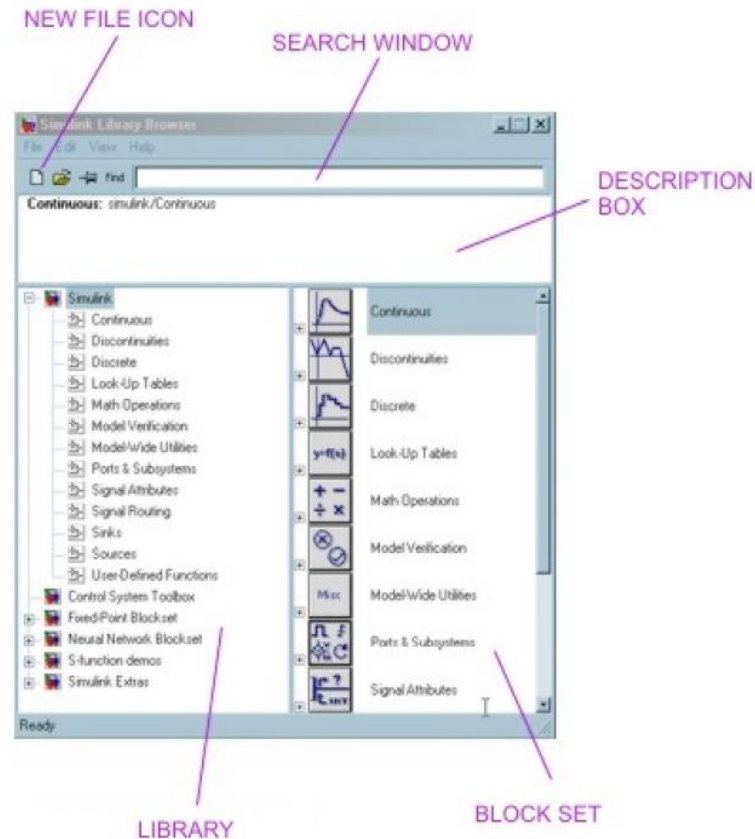


Figure 4.3.1.shows the toolbar of MATLAB

Click on the "+" sign in Figure 5.1 at the start of each toolbox to see the content of the set block. In the screenshot above you can launch a model by clicking the NEW FILE ICON. You will also use CTRL+N keystrokes.

The computer will show a new window. In this window you can create your model. The built model is also simulated in this browser. A standard operating (model) window screensaver that looks like a window shown below.

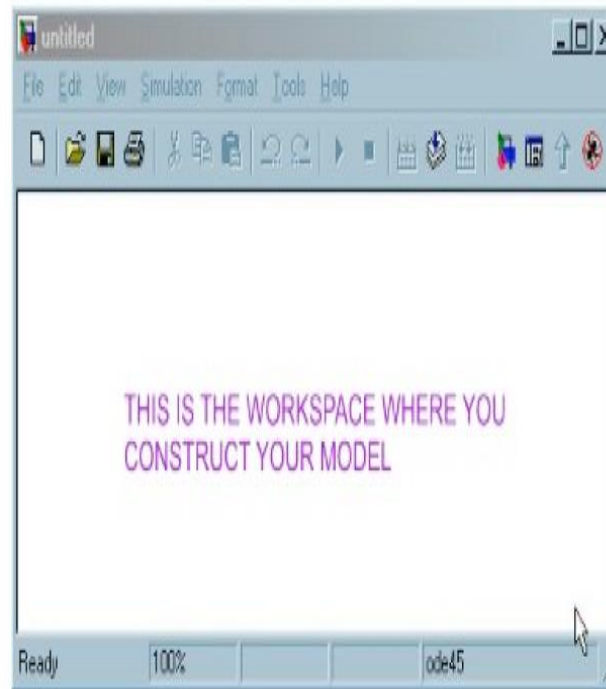


Figure 4.3.2.shows the workspace model of MATLAB

You are invited to explore the toolboxes and search their contents to become acquainted with the structure and atmosphere of Simulink.

You might not know about it all, so you may like to find out how these boxes are organised by type. For instance, the Control System Toolbox can be viewed as a system library consisting of a Linear Timing Invariant (LTI) and MATLAB functions are available under the Simulink Hauptsystem Box Feature and Tables. Train and experiment is a good way to master Simulink (or some other computer programme as a whole). Errors are part of the curve of learning. You have to be, then, fear not.

INTRODUCTION

Together with Simulink®, Sim Power Systems and other products in the product family Physical Modelling are working to model power, mechanical and control systems.

In the simulink area, Sim Power Systems operates. Therefore, you should know Simulink before beginning this user guide. See the Simulink report for assistance with Simulink. In the Signal Processing Block collection documentation, please see how you are applying Simulink on signal processing and coordination tasks (instead of control creation tasks).

Electrical power systems are electrical circuit combinations of electromechanical instruments such as engines and generators. Engineers in this field improve the efficiency of the devices continuously. Performance requirements have obliged power system designers and advanced control systems principles to use the power electronic equipment that tax instruments and techniques of conventional research. The fact that the method is always so non-linear that the best way to explain this is by simulation complicates the position of the observer.

Not the only application of electricity systems is land based power generation from hydroelectric, steam and some other unit. Their use of electronic power and control systems to meet their success goals is a typical feature of these systems.

What are the power systems of Sim?

Sim Power Systems is a modern modelling technique that enables scientists and engineers to create models simulating power systems quickly and easily. With the Simulink environment, SIM Power Systems allows you to create a model with easy clicking and dragging. The circuit topology cannot only be drawn quickly, but its relationships with mechanical, thermal, control and other disciplines can be included. This is possible because the whole electrical components of the simulation associate with the large modelling library of Simulink. As the designer uses MATLAB® for its computer processor, MATLAB toolboxes and simulink block sets can be used by the designer. A special physical modelling block and a connection line connection interface share Sim Power Systems and Sim Mechanics.

Libraries for Sim Power Systems

Sim Power Systems can be used quickly. The bookshops have models of traditional power supplies like transformers, lines, computers and electronics of power. Their legitimacy is focused on the Power Systems Testing and Simulation Laboratory's experience in Hydro-Québec, a major North American service provider headquartered in Canada and on the experience of the École de Technologies Supérieure and Laval. Sim Power Systems has the capability to model a modern electrical device in demonstration archives. And case studies are also available for consumers who wish to further their understanding of power system theory.

In accordance with its conduct, the main library of the Sim Power Systems, power lib, organises blocks into libraries. The window in the Power Library shows the icons and names of the block library. To open the library and view the blocks, double-click a library icon. The main library window of Sim Power Systems also includes the power gui block which opens a graphical user interface for steady-state electrical circuit analysis. Sim Power Systems Models non-linear simulink blocks In a special repository called power library models, the non-linear Simulink blocks of the power library are stored. Sim Power Systems uses these masked Simulink models to create the same Simulink model as your circuit. For an overview of the power laboratory model library, see Chapter 3, "Enhancing Simulation Efficiency"

To use Sim Power Systems, you must have the following items installed:

- Matlab
- Simulink

4.4 PROPOSED SYSTEM

4.4.1 BLOCK DIAGRAM

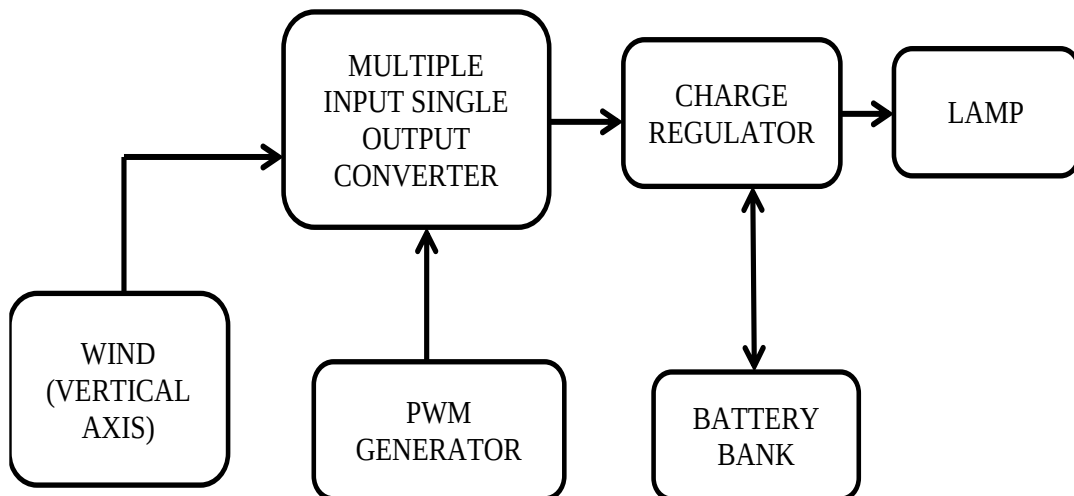


Figure 4.4.1. Block diagram

4.4.2 DESCRIPTION

- Generated Hybrid energy were the input of multi input single output converter .it will boost the voltage from the hybrid source.
- Voltages from the hybrid source were fed to the Multi input single output converter. in this technique separate slot for each source so stress of the switch is reduced.
- Converter output is going to charge a battery through charger regulator.
- PWM pulses were generated from the PWM generator.

4.5 ADVANTAGES

- Easy to install and repair.
- Life time of lighting system is increased.
- Hybrid source occupy only less space.
- Mechanical stability is high.

HARDWARE IMPLEMENTATION

4.6 POWER MOSFET

The Field Effect Transistor is the most frequent field effect transistor on optical and analogue circuits, by far. MOSFET is the Metal oxide semiconductor. The MOSFET consists of a semiconductor material type n or P channel and is also referred to as an NMOSFET or PMOSFET. Sadly, certain semiconductor systems, such as arsenide gallium, do not form strong gate oxides, and thus cannot be used for MOSFETs. Unfortunately, these are better than silicones.

A polysilicon (polycrystalline silicone) or aluminium film on the tube, but with a thin layer of isolating silicon dioxide, is isolated from the channel.

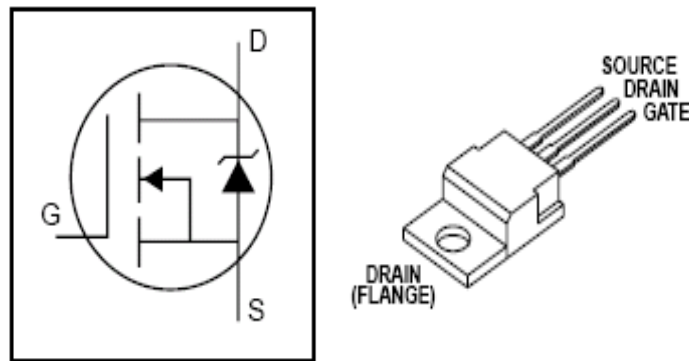


Figure 4.6. Power MOSFET

4.6.1 POWER MOSFET FEATURES:

- Power MOSFET has smaller loss of switching but on and driving losses are greater.
- A voltage driven instrument is MOSFET.
- The temperature coefficient for resistance is positive for MOSFET. This facilitates MOSFET parallel running. When a MOSFET shares initially increase current, its resistance increases faster and this increase allows this current to move in parallel to other equipment.
- A secondary rupture is not occurring in MOSFET because it has a coefficient of positive temperature.

- MOSFETs have more conductance losses in higher voltage ratings. The state of the art MOSFET's are available with ratings up to 500V, 140A.

Figure 7.1 presents a simplified diagram of a MOSFET N-channel enhancement. Connections to drain and source in higher-level high-doped regions are created. A non-conductive film of silicon oxide is electrically isolated from the type substrate (SiO_2). As a positive voltage in relation to the source is applied to the door, an electric field is generated that is directly under the base from the base and around the P-area. In the P region, the electric field is subject to positive charges, which induce or enhance a N region in its position to travel away from the origin. Driving between the N^+ (drain) N (enhanced region) N^+ can take place (sources). The increase or decline in the voltage of the gate means that the triggered N channel is either bigger or smaller and thus controls the conduction. Varying the Voltage between the gate and the body makes it possible to regulate the conductivity of this layer and the flow from the drain to the source.

In practise the gate capacity at turn ON can be charged with a very high current between 1 and 6A to make sure the time of switching is short. Because of the current of the door leakage, nanometers are needed to keep the door voltage while the system is on.

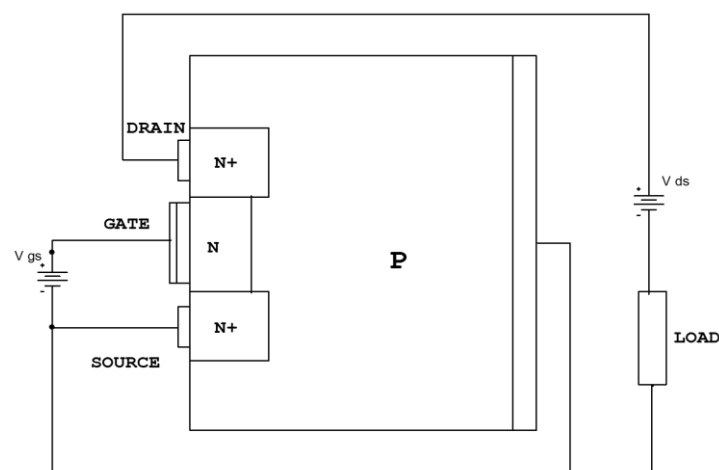


Figure 4.6.1.N-channel enhancement type MOSFET

The gate is also discharged to accelerate the turning OFF by a negative voltage on the turn OFF. Faster speed switching with well-designed gate driver circuit will obviously be achieved.

4.6.2. CHARACTERISTICS OF MOSFET:

The transfer characteristic of an N-channel MOSFET is shown in fig below

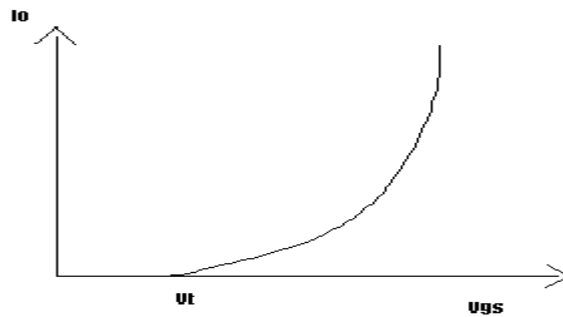


Figure 4.6.2. Transfer characteristic

Threshold V_{T6} is known as the minimum electrode gate bias needed to rotate the surface heavily under the polymer and to form a conducting channel from the source to the drain regions. V_t is normally estimated at a 650mA drainage current. Common values are 6-4V for high tension systems with the oxides of thicker doors, and 1-6V for lower tension software with the oxides of thinner doors. Generally, somewhere in the linear region of transference features is the gate-source voltage selected.

The MOSFET operates in three modes, one as an off button and another as a on. This is done by the MOSFET. The modes are: for the NMOSFET:

- **Cut-off:** If the voltage of the unit is the V_{th} $V_{GS} < V_{th}$. There is no pipe between the drain and source, but the valve is switched off. While the current between the drain and the source should preferably be 0 because the switch is off, the current or under threshold leakage is low for the reverse.
- **Triode:** Once $V_{GS} > V_{th}$ and $V_{DS} < V_{GS} - V_{th}$ is enabled the switch would cause a channel to flow between the source and drain. The MOSFET is resistor-like.
- **Saturation:** The $V_{GS} > V_{th}$ and $V_{DS} > V_{GS} - V_{th}$ switches on and a channel is set that allows current to flow from the drain and source, but current does not act

as a result of the channel voltage differential, so that the MOSFET is not a resistor, but acts as an amplifier.

4.7 PIC 16F877A MICROCONTROLLER

PIC Microcontrollers are a specialised family of microcontroller chips manufactured in Chandler, Arizona by Microchip technology. The PIC is a "peripheral interface controller," although it is hardly used at present. A microcontroller has been developed to handle the use of integrated systems in motor vehicles, robotics, office machinery, medical equipment, handheld radio equipment, sales equipment, home equipment and other appliances. A standard microcontroller has a cpu, memory and devices

4.7.1. FEATURES

High – Performance RISC CPU:

- Just 35 one word learning guides.
- All single-cycle guidelines except for two-cycle programme divisions.
- Operating speed: DC -200 ns instruction loop 20 MHz clock input.
- Flash Memory up to 8K X 14 words; Data memory bytes to 368 X 8 bytes (RAM), EEPROM data memory up to 256 X 8 bytes.
- Other 28-pin or 44/44-pin pin compatible pin.
- P1C16CXXX P1C16FXXX microcontrollers.

Peripheral Features:

- **Timer 0:** Timer/counter 8-bit prescaler of 8-bit
- **Timer 1:** Sleep can be increased by external crystal/clock in the Timer/Counter 16- bit.
- **Timer 2:** Bit 8 – Track, pre-scaler and post-scaler Timer/Counter 8 – bit duration.
- The max. resolution of PWM is 10 bit.

- Universal Synchronous 9 bit address detector asynchronous receiver (USART/SCI).
- Brown – Brown off circuit identification – reset off (BOR).

Analog Features:

- 10 – up to 8 – Analog service – up to the Digital A/D channel.
- Brown - Reset • Brown (BOR).

Analog Comparator module with:

- Two similar benchmarks.
- Chip voltage (VREF) module programmable.
- Externally open outputs are compared.

Special Microcontroller Features:

- 100,000 deletion/writing loop. Improved typical memory of the Flash programme.
- rounds of deletion/writing. Typical EEPROM data storage
- EEPROM Data > 40 years of data retention.
- Software-controlled self-programmable.
- Single – Serial programming supply 5V in circuit
- Security programmable code.
- Sleep function power saving.

4.7.2. PIC ARCHITECTURE:

CPU:

Figure 4.7.2 does not distinguish CPU from other CPU microcontrollers. The CPU consists of a PIC microcontroller composed of a Logic Unit (ALU), a Control Unit (CU), an Accumulator, etc.

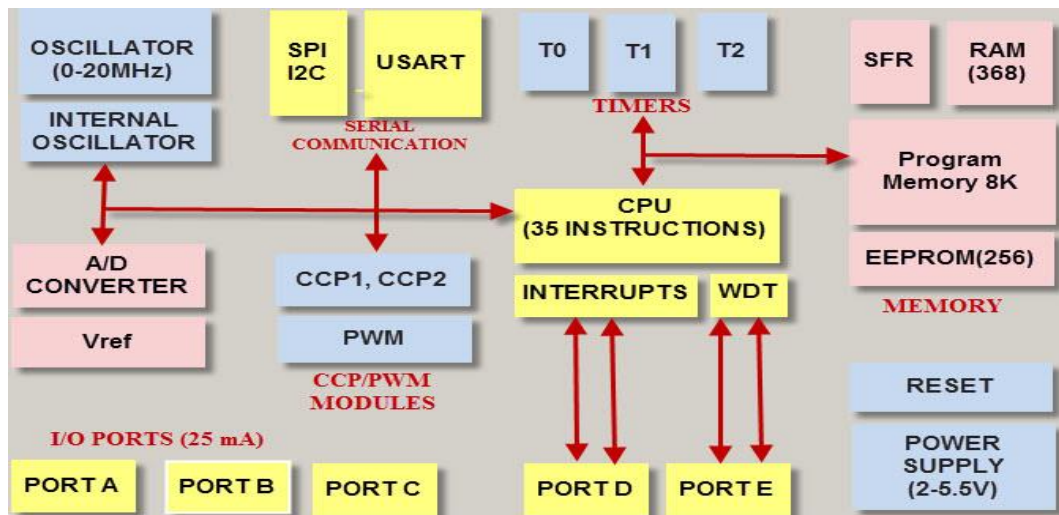


Figure 4.7.2. Architecture of PIC

The Control Unit is used primarily to control all the peripherals associated with the CPU, including internal peripherals and external peripherals. We know that ALU mainly used for arithmetic operations and logical decisions, stores the instruction that is to be processed as well as saves the instructions after processing Accumulator is used to store the results and to process them further.

1) **Memory:**

The RAM, ROM and STACK Memory Modul in the PIC is

a. **RAM:**

We recognise the RAM, a volatile store used to temporarily store the data in its registers. The memory of RAM is split into banks and we have numbers of registers in each row. There are 2 kinds of RAM register. There are registers of general use (GPR) and registers of special purposes (SPR).

b. **ROM:**

We know that ROM is an unvolatile memory used to permanently store the data. The full instructions or software are stored on the ROM microcontroller according to the programme microcontroller. Rom is often referred to as the programme memory, where the microcontroller programme is written and saved and run through the CPU indefinitely. The PIC microcontroller performs the duty according to the instructions

performed by the CPU. In ROM, the various types of PIC microcontrollers are being used.

c. Stack:

When an interrupt occurs, the PIC must perform the interrupt first and the stack stores the original process address. After the interrupt execution is complete, PIC will call the process using the stacked address and execute the process.

2) Bus:

Bus will be used mostly to transmit and receive data from one peripheral to the next. Two kinds of buses exist.

a. Data Bus: It is only used for data transmission/reception.

b. Address Bus: The memory address from the peripherals to the CPU is transferred.

The serial networking protocol used for interacting serial devices like GPS, GSM, IR, Bluetooth, etc., UART, USART was used to interface external peripherals.

4.7.3. PIN DIAGRAM

This is an 8 bit PIC 16 family micro controller built on a 16 bit architecture instruction set. The PIC controller, consisting of 5 input/output ports, is composed of 32 kB of Flash Memory of 40 pin and 256 byte EEPROM.

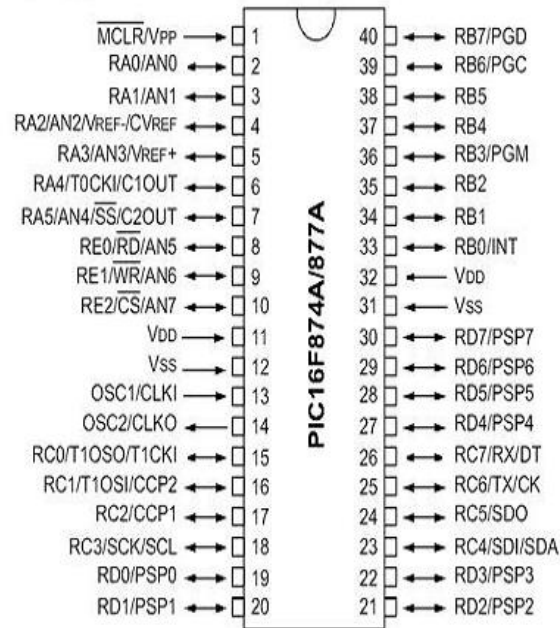


Figure 4.7.3. Pin diagram of PIC16FF77A

PIC Microcontroller's pin outline in this paper is seen in Fig 4.14. It can run on different frequency ranges between 31 KHz and 48 MHz and has 4 built-in timers, there are different peripherals in the construction, such as ADC and comparators.

4.7.4. PWM Mode (PWM)

The CCPx pin outputs a 10-bit resolution PWM display in pulse width modulation mode. The TRISC<2> bit is to be cleared to make the CCP1 pin an output, given that the CCP1 pin is multiplied by the PORTC data latch. A simpler CCP module block diagram is seen in PWM mode in this figure.

PWM operation configuration

When configuring the PWM CCP module, the following steps should be taken:

1. By writing to the PR2 Register, set the PWM timeframe.

2. Set the PWM service cycle to the CCPR1L and CCP1CON<5:4> bits register.
3. Clear the CCP1 by removing the TRISC<2> bit to the output.
4. Set the value of TMR2 and enable Timer2 to be sent to T2CON in writing.
5. For PWM service, configure the CCP1 module.

The following table shows CCP timer1/2 modules and registers PWM FREQUENCIES and RESOLUTIONS AT 20 MHz.

4.7.5. ADVANTAGES

The 16F877A has a 40 pin DIP pin, and has several internal peripherals. This is one of the most common PIC microcontroller and you can easily see why. The 40 pins simplify the use of the peripherals, since the work is scattered over the pins. One of the major benefits is that only two to three functions share each pin so it is easier to determine the functions of the pin (other devices have up to 5 functions for a pin).

4.7.6 DISADVANTAGE

The device's benefit is that there is no internal oscillator, so you need another clock source's external crystal

4.8 DRIVE CIRCUIT (IR2110)

The IR2110/IR2113 are high voltage, MOSFET and IGBT high speed drivers with independently referenced high and low side performance channels. HVIC and CMOS proprietary technology allow a robust monolithic design. Logic entries are down to 3.3V logic with CMOS or LSTTL standard output. The output drivers are equipped with a high pulse current buffer stage engineered for minimal control. Delays in propagation are matched for simplification of applications of high frequency. In high-sided configuration that runs up to 500 or 600 volts,

the floating channel can be used to control the N-channel MOSFET or IGBT.

FEATURES

- Bootstrap-designed floating channel
- Completely +500V or +600V operating
- Negative transition tension tolerant
- dV/dt immune
- Gate pull range between 10 and 20V availability.
- Under all channels voltage lockout
- 3.3V logic compatible
- Separate set of logic between 3.3V and 20V supplies
- Offset of logic and power of ±5V
- Pull-down inputs CMOS Schmitt activated
- Shutdown logic triggered by cycle edge
- Matched delay in both channels propagation
- Input outputs in the input step

Figure 4.8.1. Pin Configuration

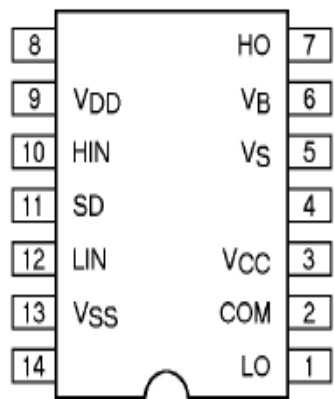


Table 4.8.1.Description Table

Symbol	Description
--------	-------------

VDD	Logic Supply
HIN	High side gate output logic Input (HO), phase by phase
SD	Logic input for shut down
LIN	Low-side gate output logic input (LO) in phase
VSS	Logic ground
VB	Floating supply on the high side
HO	Production of high side gate
VCC	Low side supply
LO	Production of the low side gate
COM	Low side return

4.9. STEP DOWN TRANSFORMER

When AC is used for the main winding of the transformer, it can either be downgraded or upgraded according to the DC value needed. The transformer of 230v/0-12v is used on our circuit for step-overs while a 230V AC through the secondary winding is shown as 12V AC. A change in the feedback leads to positive and negative changes in the top of the transformer. The next change would trigger the reversal temporarily. The transformer used in our project is currently rated as 1A. In addition to downgrading AC voltages, the power source and power supply circuits are insulated.

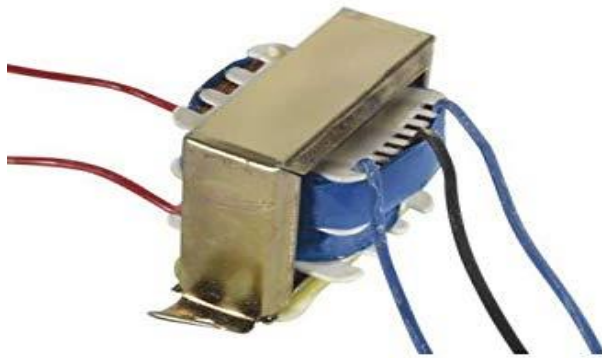


Figure 4.9.STEP DOWN TRANSFORMER

4.10. VOLTAGE REGULATORS

In every power supply unit, the voltage regulators play a major role. A controller's principal function is to help the filter and correction circuit to ensure the system receives a steady DC voltage. Power supplies without controllers present an intrinsic issue of shifting DC tension values due to load differences or fluctuations in the AC line voltage. The voltage may be retained within the tolerant area of the desired output through a regulator connected to the DC output. IC7805 for +12v and -12v DC is included in this project.



Figure 4.10.LM7805

4.11. DIODE RECTIFIER-IN4007

AC is converted to DC with the diodes. Both are used to rectify the half wave or the full wave corrector. He must keep three points in mind during the use of any diode.

- Maximum forward current capacity
- Maximum reverse voltage capacity
- Maximum forward voltage capacity

GENERAL DESCRIPTION

The diode corrector is used in the main circuit in this project. In general, a diode rectifier is given on all power electronic circuits. The 12V AC voltage is converted to DC voltage. At the output of the input filters they are related.

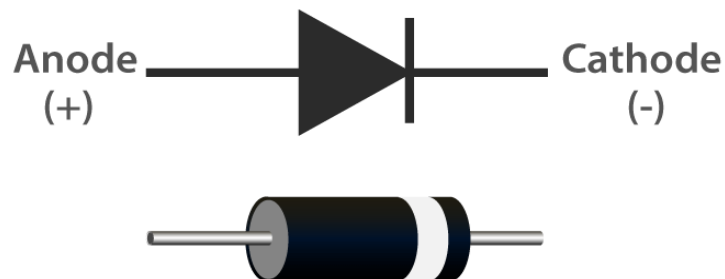


Figure 4.11.Diode

FEATURES

- Wide junction
- High Current Capability
- Low Forward Voltage Drop
- Overload surge rate 30A peak
- Current low backward leakage

- Plastic Material: UL Flammability
- RATING 94V-0 CLASSIFICATION

MECHANICAL DATA

- Plastic Molded
- Terminals: Plated Leads Solderable per
- Polarity: Cathode Band
- Marking: Type Number
- MIL-STD-202, Method 208
- Weight: DO-41 0.30 grams (approx) A-405 0.20 grams (approx)
- Mounting Position: Any

4.12 INDUCTORS

A passive electric part is an inductor or reactor that can store energy in a magnetic field generated by the transmitting electric current. By its inductivity in units of henries, an inductor can store magnetic energy. Typically, an inducer is a conducting wire shaped like a spiral, because of Faraday's induction law, the loops help generate a solid internal magnetic field.

Inductors represent one of the fundamental electrical components for electronics as current and voltage vary over time because inductors are capable of delaying and reshaping alternating currents. An "ideal inductor" does not have inductance but no strength or capacity and dissipates electricity. A true inductor is equal to a mixture of inductance, resistance and capacity due to the wire's resistivity. A true inducer acts as a resonant circuit at any frequency, generally much more than the working frequency (due to its self capacitance). In addition to the dissipation of energy in the wire resistance, magnetic core inducers can

dissipate energy in the centre due to hysteresis, and other variations in the optimal behaviour due to nonlinearity can occur in high currents.



Figure 4.12. Inductor

4.12.1 TYPES OF INDUCTORS USED IN CIRCUIT

- Filter Inductor
- Boost Inductor
- Resonant Inductor

4.13 CAPACITOR

The condenser is a component that can store energy in the form of an electrical charge that produces the potential difference (static voltage) between its surfaces, much like a small battery that can be re-charged. A wide variety of condensers are available, from very small condenser beads to massive power factor corrections condensers, but they all do the same thing and store load. The condenser in its fundamental nature consists of two or more parallel (metal) conduction plate, which are not bound or touched, but electrically independent, as found in electrolytic condensers, either by air or in a form of strong insulating material, such as waxed paper, mica, ceramic and plastic or in some form a fluid gel. A generally referred to as the dielectrical isolation layer between a condenser wall.

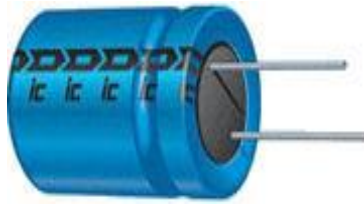
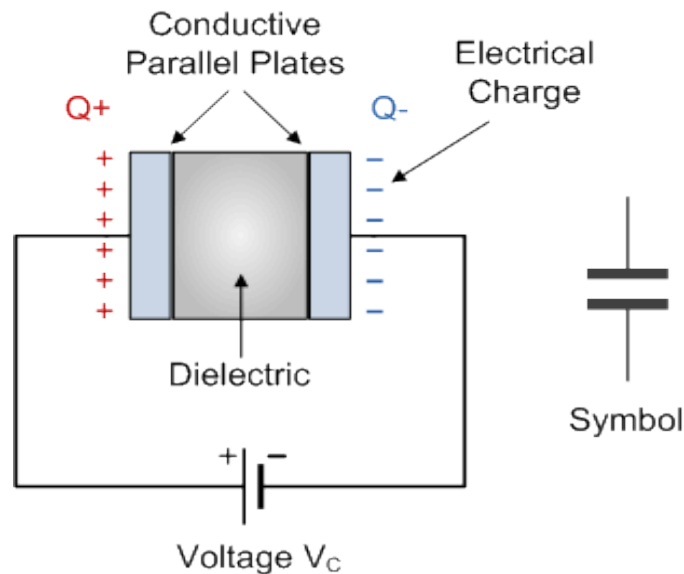


Figure 4.13.A Typical Capacitor

This isolation layer prevents the DC current from flowing through the condenser, which blocks the voltage from being present in an electric charge through the plate. A condenser's conducting metal plates can be square, circular or rectangular. Depending on the use and the voltage rating, they can also have a cylindrical or spherical shape for the overall form, scale and construction of the parallel plate capacitor. A condenser charges up to a supply voltage as used in a direct current or DC circuit, but blocks the current flow into it because the dielectric of the condenser is non conductive and essentially the insulator. But the present flow seems to be passed directly by the condenser with little or no resistance when attached to an alternation current or a CC circuit.

There are two different kinds of electrical load, one in the form of protons and one in the form of electrons. When a DC tension passes over a condenser, the positive load (+ve) accumulates rapidly on one plate and a negative load on the other plate is accumulated on the other plate. The charge with the same sign departs from the -ve plate for any +ve-load particle that arrives on a single plate. Then the plates are neutral and a potential difference is formed between the two plates due to this charge. As soon as the condenser enters its constant state, an electric current cannot pass between the condenser itself and the circuit due to the dielectric isolating properties used to distinguish the panels. The electron stream to the panels is known as the charging current condenser that tends to flow until the voltage is equal to the voltage used V_c on each panel (and hence the condenser). The condenser is called "completely charged" by electrons at this stage. As the discs are completely

discharged (initial condition) the force or speed of the charging current is at its highest value and progressively decreases the value to null as the discs charge to a possible difference around the condenser plate proportional to the source tension. The amount of variation that may occur through the condenser depends on when the work is carried out by the source voltage and how much capacity the condenser has, and this is explained below.



The condenser is the most straightforward version of the condenser. It can be made using two parallel distance metal or metallized foil plates, with a capacitance of Farads, fixed by the surface of the conductive plates and the distance between them. Changing two of them changes the importance of their capacity, which forms the basis for the function of the variable condensers. Furthermore, when electrical condensers store energy for the electrons on the plates, the larger the plates and/or the smaller their distance, the greater is the charge the condenser retains on its plates for any given voltage. In other words, bigger plates, narrower lengths, more space. The ratio of charge Q to voltage V would have the capacitance value of the condenser by adding a voltage to a condenser and by calculating the charge to a plate: $c = Q/V$. The famous formula for the quantity of charge on the plates can also have this equation restructured in: $Q = C \times V$. And if we said that the load

is deposited on the plates in a condenser, the energy in the load is stored on the two plates in a "electrostatic field." When a current flows through the condenser, the electrostatic field is loaded, so the energy is stored within plates. As the current flowing from the condenser, the potentially disparity between the two plates reduces, as the electricity travels from the plates, and the electrostatic field decreases. Capacity of the condenser is the property of a condenser for storing charge in its plates in the form of an electrostatic field. Not only that, but even capacity is the property of a condenser that is resistant to voltage change through it.

CHAPTER 5

CONCLUSION

This project work has given us an outstanding opportunity to use our skills and expertise. While doing this project, we have acquired extensive practical expertise in terms of planning, procurement, assembly and machining. We believe that the project work is a successful option for bridging institution-industry door. There is much optimism and promise with regard to the wind turbine at this early stage of the production, but turbines will remain as possible until the built costs reach target prices. The "Generation of Vertical Axis Windmill Power" works under good conditions. We understand the challenges of managing tolerances and consistency. We understand. We have made full use of the equipment we have at our disposal. Thus, a vertical axis windmill has been planned and built, which helps know how to generate non-conventional electricity. Our model is simple to model and generate electricity, compared with the Horizontal Axis windmill. For the same power generation from horizontal wind turbine, the vertical axis windmill delivers lower costs and allows low winds. This will respond from either direction to the storm, and less

structural assistance is required. Installation and repair is also easier. Therefore, when using the pulley and belt system, the power voltage from the generator can be increased. The produced power can be used for windmills in housing, street lights, highways etc. For different applications.

CHAPTER 6

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PLAGIARISM REPORT

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CHAPTER 1

INTRODUCTION

For our daily lives, electricity is most necessary. Electricity is produced by traditional or non-conventional energy sources in two ways. The world's demand for electricity is growing, so electricity has to be generated to meet the demand. The conventional energy supplies such as coal, diesel and nuclear etc. provide electrical energy today. The biggest downside is that waste like ash is generated in the coal-fired power plant, and radioactive waste is very expensive to take care of. And it destroys nature as well. Atomic pollution is also very toxic to people. The traditional energy supplies are diminishing daily. Soon it will disappear from the planet entirely so we must find some means of generating energy. The new source must be safe, emission free and cost-effective. Strong renewable energy options for traditional energy sources should be non-conventional energy resources. The tidal energy has disadvantages as it can only be applied on the coast of the sea; there are other non-conventional sources, such as geothermal, tidal, wind. Along with geothermal energy, heat extraction from earth requires very much lagging phase. In all conditions solar and wind are readily accessible. Winds can be strong renewable fuels as non-conventional energies such as solar panels. Solar power has a disadvantage in that in rainy and cloudy seasons it couldn't provide electricity, and we must address this disadvantage by using two energy supplies to keep a supply that does not generate power from any other source. And we can mix both outlets in good weather conditions.

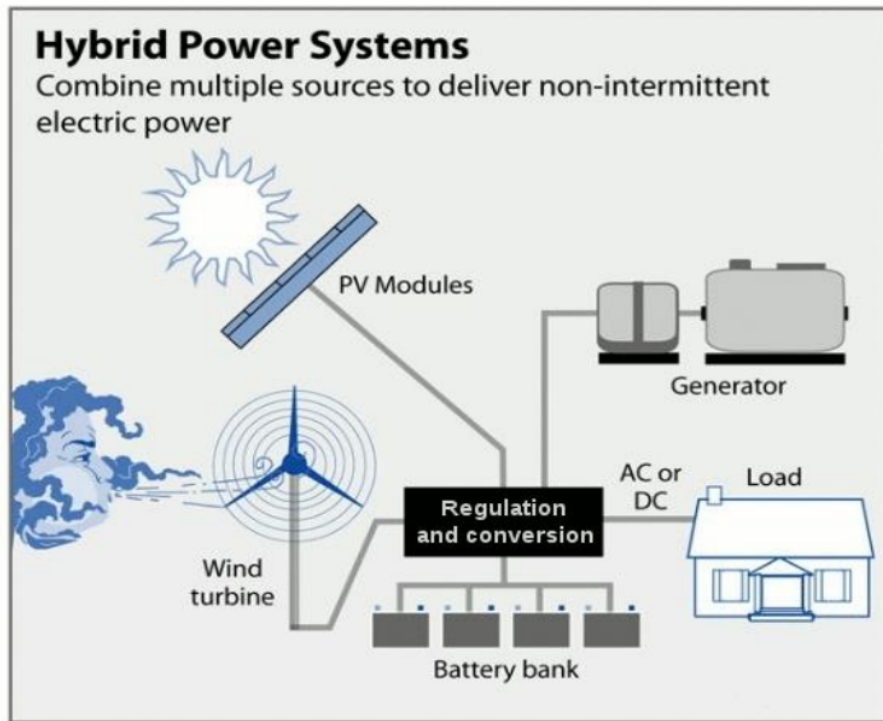
1.1 Wind Energy

By improving the performance of a wind turbine, more power can be produced, reducing the need for costly energy generators which pollute. The costs of electricity will thus be reduced for the general public. The wind is there simply and it costs no fuel. The wind turbine with little to no emissions will produce and store power. The average people will cut their power costs enormously if the performance of the common wind turbine is increased and widened. Wind turbines are types: wind turbines on the horizontal axis, vertical axis. The wind turbines of the vertical axis are solely dependent on drag power. But the wind turbines in the horizontal axis play a part in lifting and dragging forces. The wind turbines on the vertical axis are less efficient than wind turbines on horizontal axis. But it's very costly to maintain and spend. The vertical axis wind turbines are the best option for low-cost production of wind energy to solve these problems.

1.2 Solar Energy

"Photovoltaic" is a marriage of two terms: "photo," which means "light" and "voltaic." The scientific term used for the transformation of solar energy into electricity, photo-voltaic processing, produces light electricity. We use a semiconductor material that can be adapted to unleash the electrons that form the source of electricity and the negative charged particles. Different forms of photovoltaic panels include mono, poly, thin foil, silicon plates.

1.3 Hybrid Energy System



8
Figure 1.1. Block Diagram of Hybrid System

The fusion of two energy sources provides fuel for the load, the hybrid energy system. It may also be described as "the hybrid energy system," an energy system that is manufactured or engineered to produce power from two energy sources. The hybrid power system is reliable, efficient, emission-efficient and cost efficient. Solar and wind energy are used for power generation in this proposed scheme. Sun and wind have several benefits over other unconventional sources of electricity. Both sources of electricity are more accessible in all regions. It has to be lowered. To mount this device, there is no need for a specific spot.

CHAPTER 2

LITERATURE SURVEY

2.1 “A Family of Three-Port Half-Bridge Converters for a Stand Alone Renewable Power System” This paper is available in: IEEE power electronics transactions, vol. 26, no 9, Sep 2020. IEEE, Junjun Zhang, Yan Xing, member, IEEE and IEEE Member. Hongfei Wu, student member, IEEE. Runruo Chen.

A systemic approach is suggested, for stand-alone renewable power grid implementation for three-port Half Bridge Converter (TPHBC), interfacing a renewable source, a stored battery and a load. The primary circuit of a half bridge converter allows the dc bias in the transformer to operate a synchronous buck converter that can be used to configure a power flow path from the renewable source to the battery, which is attached parallel to a condenser split. A post-regulation and synchronous regulation for different implementations would be proposed to make the voltage separately controlled on every two of the three ports. The consequence is the presentation of a family of TPHBCs that have basic topology and control merits, reduced unit number and a single stage power transfer among all two of the three ports.

2.2 “A Review on Multiport DC-DC Converter for Different Renewable Energy Sources” Ruchika Sharma; Kuldeep Thakur, Engineering and Technology Research Journal (IRJET) e-ISSN: 2395 -0056 Volume: 31 Edition: 08 | Aug-2020.

This paper focuses on the multiport dc–dc converter for the simultaneous power control of multiple renewable energy sources of related kinds. In each port to which a source is connected the implemented dc–dc converter uses only one controllable switch. The setup is basic and the power switches are minimum. A wind/solar hybrid power generation system comprising one wind turbine generator (WTG) and two separate panels in photovoltaics is supplied by the introduced converter for simultaneous maximum power point (MPPT) piloting.

2.3 “An Isolated Multiport DC-DC Converter for Different Renewable Energy Sources” K.Pradeepkumar, J.SudeshJohny; Vol. 3, Issue 12, December 2020 10.15662/ijareeie.2014.0310033

This article introduces a new isolated DC-DC multi-port converter to handle multiple renewable energy sources simultaneously, and of related forms. In any port to which a source is connected, the proposed dc-dc transformer uses only one controllable switch. The setup is basic and the power switches are minimum. A wind/solar hybrid generating system consisting of one Wind turbine generator (WTG) and two separate PV panels shall be used in the simultaneous maximum power point monitoring (MPPT). The conversion device is used. The experimental results are given to confirm the incisiveness of the suggested converter for the WTG and both PV panels to achieve MPPT simultaneously.

2.4 “An Isolated Three-Port Bidirectional DC-DC Converter with Decoupled Power Flow Management” This paper is available in: IEEE power electronics transactions, vol. 23, no 9, September 2020. Senior Member of the IEEE, Chuanhong Zhao, IEEE student, Simon D. Round.

This paper proposes an isolated three-port, two-way dc-dc converter consisting of three full-bridge cells and a high-frequency transformer. Apart from the phase change regulation of the power flow between ports the duty cycle control is also addressed in order to optimise the system behaviour and the control legislation is also examined, which ensures minimal total system failure. The complex analysis and the corresponding control design are also discussed. A control-oriented converter model is built and the control output conversion functions are seen in the Bode plots. To achieve a quick dynamic response, a control strategy is applied with decoupled power flow management.

2.5 “Hybrid Energy Generation Through Vertical Axis Savonius Wind Turbine and Solar Panel” Ragunath L, Senthilvel S, Dr. P. Ilamathi; IJRST – IJRST – ISSN, Volume 2 | Issue 11 | April 2020 IDR (online): 2349-6010 Innovating Research in Science & Technology Www.ijrst.org reserved all rights Thirty-four

The demand for electricity in our country has been raised to reduce power in rural areas consistently. This is because factories use a high amount of electricity and because non-renewable energy supplies are less available. It is also well recognised that the use of the hybrid solar power system to produce electricity to meet rural household energy requirements economically, quickly and reliably. It will substantially reduce the power demand of our solar-wind energy grid in rural areas. However, the wind speed of the energy generated by the horizontal wind turbine varies by day and night. Think of the vertical axis to solve this For the production of electricity in a low wind speed (course cut at around 3 m/s), the Savonius Wind Turbine (SWT), with guided vanes was introduced, in which both the solar photovoltaic (PV) and the SWT were combined. The hybrid construction was made. For the rated power output of the proposed device, the hybrid controller was chosen. The total energy efficiency of 22% in this analysis for the stand alone electric generation system was obtained by the VASWT Vertical and the PV Hybrid System. This study selected the optimised design of VASWT and the efficiency study was performed by adding the PV panel and updated car alternator.

2.6 “Hybrid Power Generation System Using Vertical Axis Wind Turbine And Solar Panel” ChetanSonawane, ManavVelani, Akash Singh and VikaskumarTripathi; International Journal Of Advanced Researches-April 2020.

The energy use & electricity demand in countries around the world is one of the most important things in the world. The growth in electricity demand leads to the diminishing daily use of traditional energy supplies.

Due to this and the problem of global warming and deforestation, there is a growing urgency for unconventional energy options. Clean and continuous power supplies are also essential. Wind turbine and solar energy hybrid energy system gives continuous power. The energy from a device like this can be used for different purposes. This paper deals with power generation by wind turbine and solar panels on a vertical axis at affordable costs with no effect on the balance in the environment.

⁸
2.7 Ashish S. Ingole, S.Rakhonde, International Journal of Research and Scientific Publications (Volume 5, issue 3, March 2020, pp. 2250-3153). Hybrid Energy Generating System for the Use of Wind Energy and Solar Energy, Volume 3.

The energy of one day is the human being's most necessary device. Each day, all traditional energy supplies are diminishing. We would then shift from conventional to unconventional energy supplies. The integration of two energy options, wind and solar, takes place. Sustainable energy supplies are reviled without harming nature. By using a hybrid energy system, we can have continuous power. Basically, this method includes the convergence of two continuous power systems. Solar panels used in solar energy conversion and wind turbines are used for electricity conversion of wind power. This electricity can be used for different purposes. Electricity generation can occur at an acceptable price. This paper discusses energy generation from two combined streams, leading to electricity generation at competitive costs without compromising design.

2.8 B. Sahan, S. V. Araujo, C. Noding, P. Zacharia, "Comparative assessment of the grid interface of distributed and renewable energy networks with current source inverters in three stages," IEEE Trans. Power Electron., vol. 26, no. 8, pp. 2304–2318, August 2011.

IEEE student member Hongfei Wu, IEEE member Kai Sun, IEEE member Runruo Chen, IEEE member Haibing Hu, Yan Xing and IEEE member. This report proposes a systematic approach for the derivation of a full-bridge converter (FBC) from the three-port converters (TPCs). The procedure is used in splitting the two switching legs of the FBC into two switching cells from separate outlets. A new Complete Bridge TPC (FB-TPC) is built with this systematic approach for applications involving renewable power systems which include simple topologies and controls, a reduced number of appliances and a single stage power conversion between two or more three ports. The FB-TPC is suggested with two bidirectional ports and a separate output port.

CHAPTER 3

AIM AND SCOPE OF THE PRESENT INVESTIGATION

3. RENEWABLE ENERGY SOURCES

3.1 VERTICAL AXIS WIND TURBINE

In comparison with conventional horizontal wind turbines, VAWTs deliver some advantages (HAWTs). In wind farms they can be packaged more closely, allowing for more in a particular space. They are silent, all-directional, and the support system generates lower powers. They don't have the wind to produce electricity so that they can get closer to the earth

at a lower wind. They are conveniently preserved and placed on fireplaces and similar large structures by being closer to the earth.

Both of them contribute to energy generation as the wind goes through the blades of a HAWT. Just a fraction of the blades create torque as the wind moves through a VAWT, while the other pieces simply 'turn around.' As a consequence, the productivity of electricity production is comparatively diminished. It is very difficult to achieve high performance from limited VAWT size. It is very responsive to the lift/drag ratio of the blade because of the VAWT efficiency and it is not good in small applications due to the low numbers of Reynolds. In scaling VAWTs to commercial scale, many obstacles exist. First, they are not as robust as a HAWT by nature. This is due to the HAWT's tension in comparison to common VAWT models. Only in niche settings is the benefit of VAWTs. VAWTs still do not produce enough power to be cost-effective or material-based compared to HAWTs of complete cycle accounting. VAWT designs have blades far nearer to the ground than HAWTs, meaning large quantities of wind are being lost.

The Drag-Driven VAWT (Savonius type) and the lifting driven VAWT are two major type of VAWT (Darrieus type). Form Savonius works like a water wheel with drag powers. The Darrieus kind, on the other hand, contains HAWT-like blades. Vertically positioned is the VAWT main rotor shaft. By using this axis shaft the generator can be attached. For this sort of wind turbine, the rudder is not required since the wind is acceptable from all directions. Lift-powered turbines provide greater performance than tractor-powered turbines, the major emphasis today is on lift-powered turbines. G.J.M. Darrieus invented the first turbine of this design in 1931.

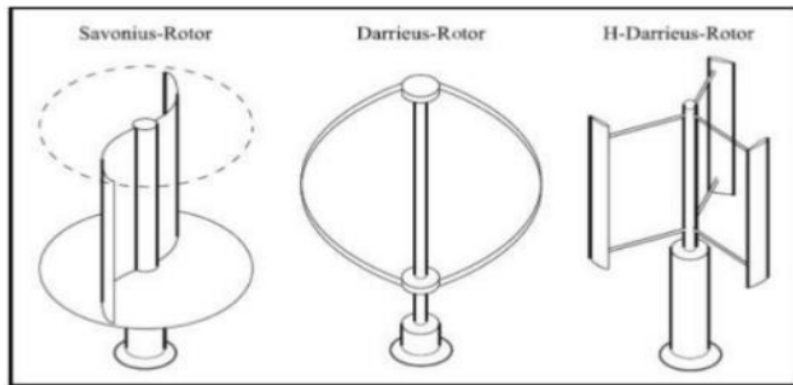


Figure 3.1. shows that main Types of Vertical Axis Wind Turbines

Important torque changes at every turn and the large bending time on the blades were the biggest disadvantages for the original prototypes (Savonius, Darrieus and Giromill). The following projects deal with the problem of the torque torsion by helically balancing the blades. Power coefficient (C_p) is a wind turbine performance indicator. C_p is the real electricity ratio generated by a wind turbine separated into turbine blades with a defined wind speed by the overall wind power. The power of the various VAWTs is seen in the figure below.

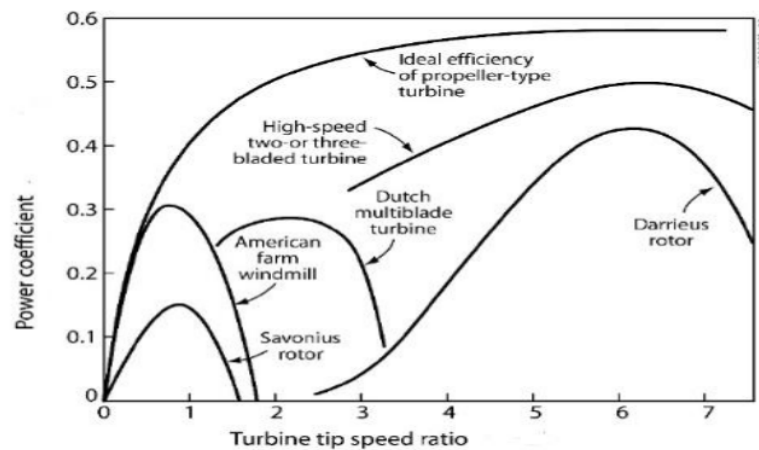


Figure 3.2. Power coefficient of different VAWTs

A large survey of VAWT's current technical states found that in recent years China has been the leading investigator in the region. The

graph below illustrates the interest in VAWT study in European countries from 2010 to 2014.

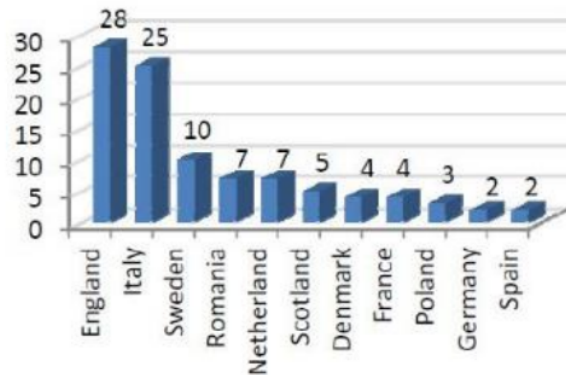


Figure 3.3. Research publications on VAWTs in European countries (2010-2014)

"Espacenet" is a free website that contains more than 95 million patents worldwide. A worldwide patent quest (up to 15 July 2017) in the VAWT area has been conducted in the global database for 1603 patents in recent years.

3.1.1 DARRIEUS TYPE VERTICAL AXIS WIND TURBINE

⁹ Georges Jean Marie Darrieus invented and first patented wind turbine in 1927. Blades are aerodynamically shaped with various layouts and a certain distance from the rotation axis, normally NACA-style. When defending the Darrieus turbine from harsh wind conditions and as a self-starter, there are so many problems. This wind turbine is a high speed turbine and low torque, ideal for alternatives (AC). In Cap-Chat, Québec, is the biggest Darrieus wind turbine. It is 60 metres wide and nearly 100 metres high. It has a power of 3.8 MW on the plate.

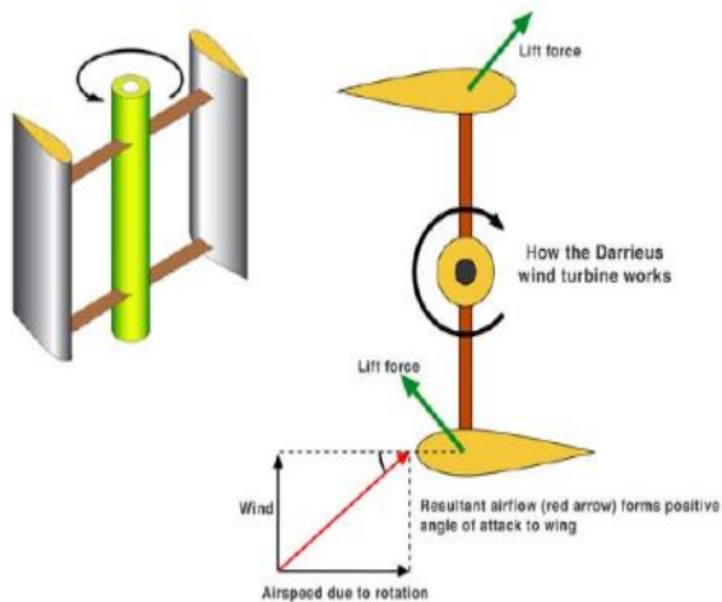


Figure 3.4. Darrieus wind turbine operating principle

The initial edition of the designs of Darrieus had no rigging angles and was symmetric. This scheme is similarly successful irrespective of the wind's path. The type of Darrieus requires an electrical support to start with and a removal rate of approximately 4 - 5 m/s, whereas the type of Savonius is 1 m/s or lower. The hybrid solution has been implemented by addressing the starting dilemma of the Darrieus turbine. This machine mixes the form of Savonius with low speeds. In high-speed winds, the type Darrieus has a powerful C_p (HP) compared to the type Savonius. The angle of attack does not exceed $\pm 20^\circ$ for the turbine blades because it is turbulent.

A appropriate high label speed is needed for the attack angle between zero and 20° . [24] The report was released. The angular angle generally raises the lift forces as well as the drag forces. Tangential lifting force part to assist blade rotation and pull force against it. When the lift to drag ratio is maximum, a wind turbine will provide its maximum output. This occurs as the angle of attack is optimal. The cross sections of Airfoil

should be oriented to an optimal attack angle. What are the issues currently being addressed by researchers.

By adding wind deflectors, current scientists are trying to increase the efficiency of Darrieus wind turbines. The deflector mechanism contains slow air stream and the rapid air stream is beyond the deflector system. If all currents are distinct from each other, they produce a fast vortex mixing. This means that a low-pressure region like atyphoon is formed by vortices. It reduces the downstream air load and increases the performance of the turbine. The wind power is notoriously commensurate with the cubic power of the wind speed reaching a wind turbine. This means that the electricity generation increases significantly even tiny amounts of the acceleration. Many academic groups have therefore sought to find a way to efficiently speed up the coming wind speed. This upstream deflector mechanism produces a huge spacing behind it, which seems to attract more wind from a very low-pressure area than a wind turbine without deflectors. This results in efficient concentration and acceleration of the flow to deflectors.

3.1.2 GIROMILL

The various shortcomings of the Darrieus wind turbine have enabled many modifications to increase output, performance and planning downtime. In comparison with curved, Giromill is a subtype of Darrieus turbine with straight blades. It uses two or three straight blades independently connected to a vertical axis (also known as an Egg-Beater windmill / H-rotor/H-bar). This kind of torque pulsation has a variable pitch along the blade. The benefits of this kind are that it has a higher torque, less fluctuating torque curve and a higher output coefficient. Due to lower rpm, the blades are under bending strain. The figure below shows the wind turbine design type Giromill.



Figure 3.5. Giromill type wind turbine

3.1.3 CYCLOTURBINES

Cycloturbines are another kind of Darrieus turbine. In this design, blades around the vertical axis are integrated to enable them to be pitched properly so that they still have an angle of attack and start at themselves – a distinct advantage over the original Darrieus design. This modification increases the turbine's total power, but its complexity increases. The Blade's angle varies at first and reduces the startup torque necessary and eliminates the need for a starter.

3.1.4 HELICAL BLADE VERTICAL-AXIS

The Helical Blade Vertical Axis Wind turbine is another kind of wind turbine Darrieus. The Gorlov Helical Water Turbine influenced this concept first. The pulsating torque, which can make the main coils fall on Darrieus designs, can be reduced by replacing the blades of a Giromill with helical blades attached on a vertical axis (as a DNA structure). The Turby, Urban Green Energy, Enessere and Quiet Revolution wind turbine brands are used for the construction of Helical blades.

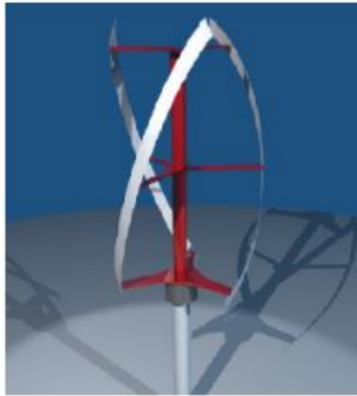


Figure 3.6. Helical Blade Vertical-Axis Wind Turbine

3.1.5 SAVONIUS TYPE VERTICAL AXIS WIND TURBINE

Sigurd Johannes Savonius from Finland invented another kind of VAWT in 1922. Savonius is known as VAWT type. The drag-mounted VAWT is the same as a cup anemometer. It works. The efficiency of wind turbines from Savonius, however, is some 15%. This means that just 15% of the wind energy that hits the rotor is kinetic. It's much less than the form of Darrieus. A Savonius wind turbine cannot spin more quickly than wind speed and has a speed ratio of 0-1. This suggests that the form Savonius rotates slowly but produces a high torque. Savonius is also not ideal for power generation, because turbine generators must be transformed into hundreds of RPM to produce high voltages and currents. A transmission can be used in torque reduction and RPM increases.

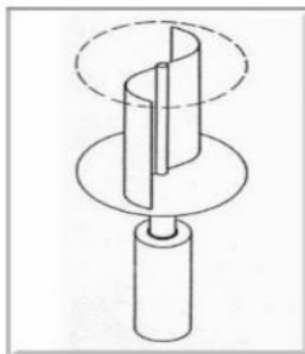


Figure 3.7. Savonius type Vertical-Axis Wind Turbine

Given the low performance of Savonius type, several researchers concentrate on improving turbine efficiency because it offers many advantages over other turbines. One of the studies is to increase the efficiency of the wind turbine Savonius by incorporating wind deflectors. The wind can be guided by a deflector device to the turbine blades.

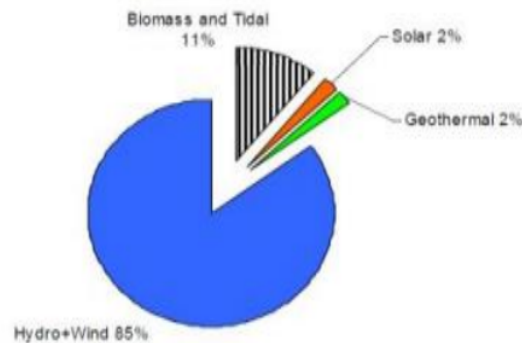
3.1.6 TWISTED SAVONIUS

Savonius twisted is a tweaked Savonius VAWT style variant. It has long hubs with a steady torque.

3.2 PHOTOVOLTAIC SYSTEM

Different fuel sources are used to supply power plants to meet demand for energy. Coal, due to availability and low cost, is the most common fuel type. The huge amount of carbon dioxide emissions from greenhouse effects is an inconvenience of fossil fuels. If several countries enact controls on pollution emissions, which could lead to decreases of the number of coal-based power plants, the aspirations of coal power production are subject for variation. In contrast, renewable energy sources are the fastest growing source of power generation with annual growth of 3 per cent, powered primarily by hydro and wind power development. All other alternative fuels, including geothermal and solar, also do not compete economically with fossil fuel production.

As seen in figures 1–3, the anticipated renewable energy production in 2035 is broken down. It is clear that hydro and wind power dominate 85% of the projected renewable energy share, while solar and geothermal energy are expected to contribute approximately 2% each. The cost per KWh of solar energy produced is high compared with fossil fuels, which makes no meaningful contribution.



Photovoltaic (PV) is an array (cell combination) containing a solar voltaic material converting solar energy into power. The photovoltaic system PV cell is a simple unit. Such systems contain several parts, such as mechanical and electrical connections and assemblies as well as various control and (if necessary) electric output modifications. Monocrystalline silicon, polycrystalline silicone, microcrystalline silicone and cadmium telluride and copper indium selenite are materials used for photovoltaics. Small loads like lighting systems or small CD motors can be supplied through the current and voltage present on PV terminals. We have to model converters so that they can monitor maximum power point to obtain the highest possible power from a pv array (MPP).

3.3 PV ARRAY

A solar array consists of several PV modules, casually known as solar panels, and converts solar (sunlight) radiation into direct current (DC), a usable energy. Photovoltaic array is also a photovoltaic array. The photovoltaic system usually includes a panoply of PV modules and one or more DC to alternative current (AC) converter (also known as inverter), monitoring system supporting solar modules, electrical wiring and interconnections and the installation of other elements. Photovoltaic systems for domestic, commercial or industrial energy supplies.

Photovoltaic (PV) is a method for generating electricity using semiconductors which exhibit a photosoltaic effect by converting solar radiation into direct current electricity. Solar panels consisting of a number of photovoltaic cells are used for the production of photovoltaic fuel. Like monocryste silicon, polycrystalline silicone, amorphous silicon, the cadmium telluride, and copper indium gallium sulphide, which are currently used in photovoltaic materials. In recent years, the development of solar cells and photovoltaic lines has progressed significantly due to increasing demand for renewable energy sources. Sustainable electricity sources are solar photovoltaics. A total of 71.1 GW was deployed by the end of 2011. And the installed capacities of 100 GW were reached by the end of 2012. About 100 countries are using solar PV. Installations may be placed on the field or installed in the roof or the wall of a house (and often mixed with farming and pasture) (either building-integrated photovoltaic or simply roof top).

A small PV system may provide sufficient power in the form of AC or DC for the operation of a single house or even an independent unit. Electric vehicles and solar tents, satellite and electric aircraft may include built in photovoltaic systems, depending on the configuration and energy demands to provide main or auxiliary power supply as AC or DC, for example, and the Earth's military and civilian observation satellite, street lights, signs for construction and transport.

Because of the low voltage of an individual solar cell (typically 0.5V), multiple cells in the production of a "laminare" are wired in series (Copper in photovoltaic power systems). The laminare is mounted into a weatherproof protective housing and is thus made of a solar panel or photovoltaic module. The photovoltaic range can then be tied together. A photovoltaic array is a series of solar panels connected together. The power of one module is rarely sufficient to satisfy the needs of a home or enterprise, so that the module form an array. The DC power produced by the modules is converted to alternating current that can be powered by lights, engines, and other loads by most PV arrays. The modules in a PV array are normally first serial connected to get the desired tension; each

string is then parallel connected to the device so the current can be produced.

3.3.1 CHARACTERISTIC OF PV ARRAY

Due to concerns about detrimental impacts on the atmosphere and energy stability of extensive fossil fuel use in recent years, photovoltaic (PV) systems have gained unparalleled interest. Photovoltaic energy is a renewable, lifecycle and reliable energy. It can thus be regarded as one of the renewable energies most competitive. These systems should be situated in or around the location of the need to prevent transmission losses and reduce CO₂ in urban centres. The photovoltaic module is the product of the association with their safety devices of a group of photovoltaic cells in series and parallel figure. Moreover, the energy generated by the photovoltaic module depends on the solar radiation, cell temp and the voltage provided.

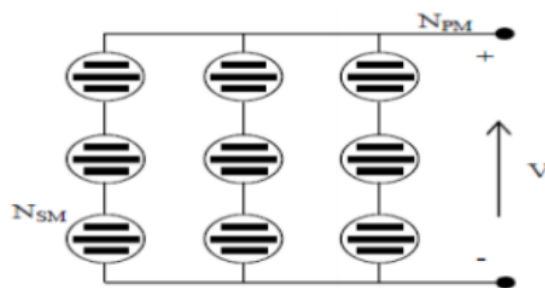


Figure 3.8.PV module cell

3.4 PV CELL EQUIVALENT CIRCUIT

In principle, a solar panel cell is a pn semiconductor interconnection. A DC current is produced when exposed to the sun. The current produced varies according to the sun's radiance. A parallel current source with a diode may be used for the equal electric circuit of an ideal solar cell shown in figure 3.9.

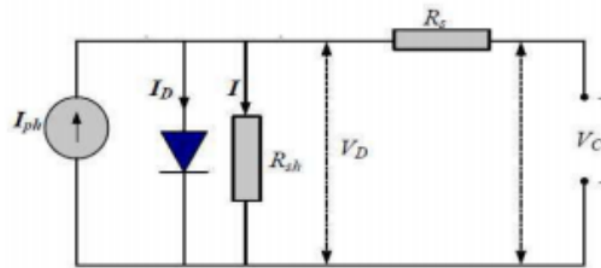


Figure 3.9. Equivalent electrical circuit of a solar cell

The current through diode is given by:

$$I_D = I_0 \left\{ \exp \left(\frac{\alpha V_D}{A} \right) - 1 \right\}$$

Then

$$I_c = I_{ph} - I_D - I$$

where :

- I_c : Cell current (A).
- I_{ph} : Light generated current (A).
- I_0 : Reverse saturation Current.
- e_0 : Charge of electron = 1.6×10^{-19} (coulomb)
- K : Boltzmann constant (J/K).
- A : dimensionless of the solar panel.
- T : cell temperature (K).
- R_s, R_{sh} : cell series and shunt resistance (ohms).

3.5 PV ARRAY CHARACTERISTICS

A general diagram of an MPPT computer system and a DC/DC converter is shown in figure 3.3. The DC/DC converter functions as a matching device for impedances. The MPPT computer system checks the input and input power voltage and calculates the power to manage the DC/DC converter. Either the battery or super capacitor may be used as the storage unit.

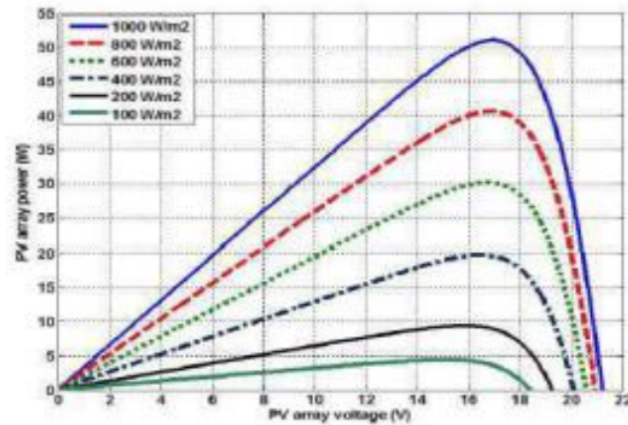


Figure 3.10. Power-voltage characteristics of photovoltaic module at different irradiance levels with constant temperature (25 °C)

3.6 BENEFITS OF PV SYSTEM

During use, solar energy is free of waste. Extended environmental controls can be used to regulate the production of waste and pollutants. The implementation of end-of-use recycling technologies and policies that allow producers to recycle are underway. After the initial operation, PV plants could run for several years under repair or intervention, so running costs are relatively low relative to conventional power technologies after the initial capital expense of constructing any solar power plant. Very little investment money has been spent in the production of solar cells, and so significant improvements are available compared to fossil and nuclear energy sources. However, high-efficiency experimental solar cells have efficiencies of more than 40%. In addition to quick electricity generation,

PV power systems have several special advantages. These are as follows:

- Social advantages for jobs, energy independence and rural growth.
- No generation of noise, noxious emissions or polluting gases as opposed to other producing power sources resulting in the production of fumes, acid rain gases, air and water pollution.
- The components used in the manufacturing process (silicon, glass, aluminium, etc.) can be recycled and therefore reused. Recycling is not only advantageous to the atmosphere, but also to contribute to reducing resources used for manufacture and thus manufacturing costs.

Maintenance of PV is minimal. Solar modules are almost maintenance-free and simple to use. PV devices are highly secure and accurate. The life of a PV module is expected to be 30 years.

CHAPTER 4

DC-DC CONVERTER

4.1 HALF-BRIDGE DC-DC CONVERTER

The Buck and the boost converter have the same configuration as the basic Boost and Buck structure, but, if they are linked in a parallel to each other, they have the additional function of a biway power flow. The following figure is a summary of the fundamental configuration of the DC-DC bidirectional non-isolated half-bridge converter.

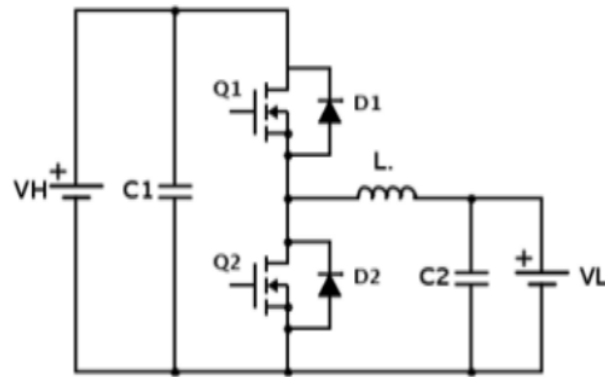


Figure 4.1. Non-Isolated Half-Bridge Bidirectional DC-DC Converter resulting out of the anti-parallel connection of the Buck and Boost converters

Depending on the flipping of MOSFETs Q1 and Q2, this circuit can be used in Buck or Boost mode. The Q1 or Q2 switches in conjunction with the D1 or D2 antiparallel diodes (acting as a freewheel diode) increase or decrease the voltage on the circuit. In the following two modes the bidirectional operation of the above circuit can be explained:

Mode 1 (Boost Mode): With this mode, the Q2 and D1 switches are conducted according to the operating period while the Q1 and D2 switches are permanently disabled. Depending on the direction of the turn Q1 and D2 as seen in the Figure, the mode can be further split into two intervals.

Interval 1 (Q2-on, D2-off ; Q1-off, D2-Off): In Q2, it is enabled and thus can be considered as a short circuit, because the battery loads lower voltage the inductor and the inductor current increases until the gate pulse from the Q2 is not stopped. As the D1 is reversed and the Q1 button is off, no current is passing through the Q1 switch.

Interval 2 (Q1-off, D1-off; Q2-off, D2-on): Both Q2 and Q1 are off in this mode and can thus be found to be circuited open. The polarity of the voltage from which the inductor flow can't change immediately, and hence begins to operate in series with the input voltage. Now it can't change

immediately. The diode D1 is thus skewed forward and therefore the current from the inducer charges the output condenser C2 to a greater voltage. The output voltage then increases.

Mode 2 (Buck Mode): The Q1 and D2 mode switch is powered based on the service period when the Q2 and D1 switches are still off. Based on the conduction on the Q2 and D1 switches as seen in Fig., this mode can also be separated into two intervals.

Interval 1 (Q2-on, D2-off; Q1-off, D2-Off): Q1 is activated and Q2 is deactivated in this mode, and thus it is equal as seen in the following Figure. Inducers are charged and the output condenser charged by the higher voltage battery.

Interval 2 (Q1-off, D1-off; Q2-off, D2-on): Both Q2 and Q1 are off in this mode. Again because the current of the inductor can't shift immediately, the freewheeling diode D2 is discharged. Compared to the input voltage, the voltage over the load is reduced.

The following has been a study of the various characteristics in the non-isolated bidirectional topologies:

1. In stepup mode, the rms value of the current through the inductor in a bidirectional buck-boost converter and the power switches are higher in comparison to the buck-boost bidirectional converter, relative to the output current. The current of the condenser rms even approaches 1/3rd of the output current of the former example. The inductor, control switches and condenser thus function under thermal and electrical tension in the two-way buck boost converter relative to the buck boost cascade converter, which results in a larger power loss and even saturation. Buck-boost bidirectional converters often require power equipment with greater unit ratings, as tension on the MOSFET and diode are higher. Higher rms currents also lead to higher lead loss and thus decrease the bidirectional converter's overall performance.
2. However, the required number of devices is twice as many as in the bidirectional converter buck boost. The Half-Bridge Bidirectional DC

converter allows this issue to be resolved. It has no devices like the bidirectional buck-boost converter and can be used for applications which only need boost function in one direction and buck in the other instead of the buck-boost cascade bidirectional converter.

3. The key benefits compared with the two-way Cuk converter is that the half-bridge bidirectional converter needs only one and not two and that too half the latter value and power-switches are much smaller than the half-bridge bidirectional converter. Also, due to the low current inductor and thus lower conduction as well as lower switching losses, the performance of the half bridge converter is higher than the Cuk converter.

4.2 MULTIPLE-INPUT DC-DC CONVERTER

The single key to combining multiple input power sources, whose voltage levels vary and to obtain a regulated output voltage for charge from them, is multi-input DC-DC converters.

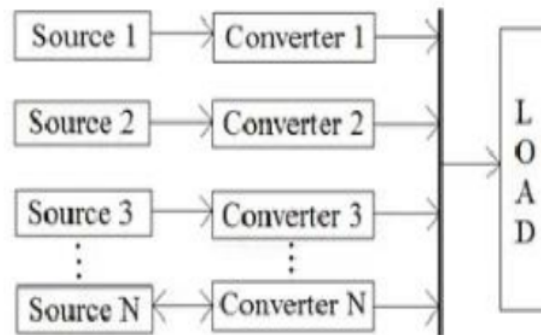


Figure 4.2.1. Separate converters for each source

In certain applications, it is necessary to link several power sources together, which provide the power for a single load. The independent converter for various sources appears in Fig 4.2. Output 1 of Source N-1 may consist of a mixture of some kind of power supply like wind turbines, modules for the photovoltaic sector, FC, micro turbine or electric grid, and the Source N may be a storage device, like a battery, ultra-capacitor, pneumatic or supranational magnetic energy storage.

Both sources of energy are unidirectional where the storage portion is two-way, capable of charging and discharging.

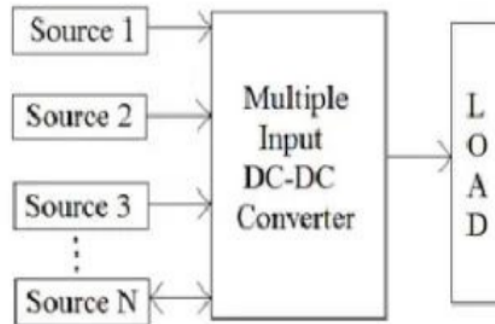


Figure 4.2.2. An MIC for all sources

A single DC-DC Multi-Input Converter substitutes for multiple parallel single converters in Fig 4.2. The four-input DC– DC boost converter structure appears in Fig 4.3. The converter uses voltage from V1, V2, V3 and V4 and the battery element storage from four input power sources.

SOFTWARE DETAILS

4.3 MATLAB\SIMULINK

MATLAB is an architecture, science and applied math applications kit. The programming language is strong, it offers excellent graphics and numerous expertise. MATLAB shall be written by The Math Works, Inc., and a patent.

MATLAB focuses not on algebra, but on calculation: It is impossible to symbolically communicate and handle (except through the optional Symbolic Toolbox, a clever interface to maple). Due to the rounding errors found in machine algebra, not just numerical figures are inexact. It is a disadvantage, but it is also a source of strength: MATLAB is much better than Maple, Mathematical, and other things in terms of numerics.

In the other hand, MATLAB is much simpler to use and features a large standard library in comparison to other numerically based languages such as C++ or FORTRAN. 1 Here's an unsatisfactory comparison of the speed difference. This difference is not often as drastic as common information does, and sometimes successful MATLAB programming can be narrowed or closed (see section 6). In addition, other codes can be linked to MATLAB or vice versa, and MATLAB supports parallel computation now, optionally. Nevertheless, MATLAB is generally not the choice method for optimal computing efficiency. The niche MATLAB is digital computing on stations for computational non-experts. This is an enormous niche – you can see the amount of books on Matlab on mathworks.com. MATLAB can also be a helpful setting for supercomputer users to explore and adjust algorithms before laborious coding in a different language. A distinctive character or community acquires the most successful programming languages and environments. In MATLAB this culture contains many aspects: an experimental and graphical bias, resulting from interactive environments and compression of the write-compile-linking cycle of analysis; focus on interactive mode-compact and interactive syntax, not strictly constrained and verbose (though not to the extent of being open source software).

Graphical versus command-line usage:-

Originally, MATLAB was fully a control line environment, which maintains this guidance. However, certain functions from graphical interfaces can now be accessed – menus, keys, etc. These interfaces are particularly helpful for beginners, since the options available are well defined. 2 In principle, for some forms of interactive work, visual interfaces may be more normal, such as annotating a graph or debugging the programme; for complicated, accurate, repetitive or reproductive work the typed commands are best kept. However, one does not really have to make a choice; for example, a figure type may be saved as a prototype and could be used by pointing and clicking on various details. In addition, your own graphic driven software can be used to distribute your package code. Ultimately, an expert user of MATLAB should be able to use all

working modes to indicate them productively. Particularly, please click (with Control-Click on Mac) to see what you can do with many items.

WHAT IS SIMULINK?

The MATLAB extensions by Math Works Inc. are Simulink (Simulations and Links). It works with MATLAB to provide dynamic system modelling, simulation and analysis in a GUI format. With click-and-drag mouse operations, model creation is streamlined. Simulink contains an extensive toolbox block library for both linear and non-linear analyses. Models are hierarchical, and make both the down and down methods. They are hierarchical. Because Simulink is part and parcel of the MATLAB it is simple to turn around and take care of the functionality provided in both environments during the review process. The main aspects of this guide are the control system as it has been written for students of my control systems.

You need to create the Matlab software first to start Simulink session. Enter from the window of the Matlab command:

```
>> Simulink
```

You can also press the Simulink button on the tool bar as illustrated.

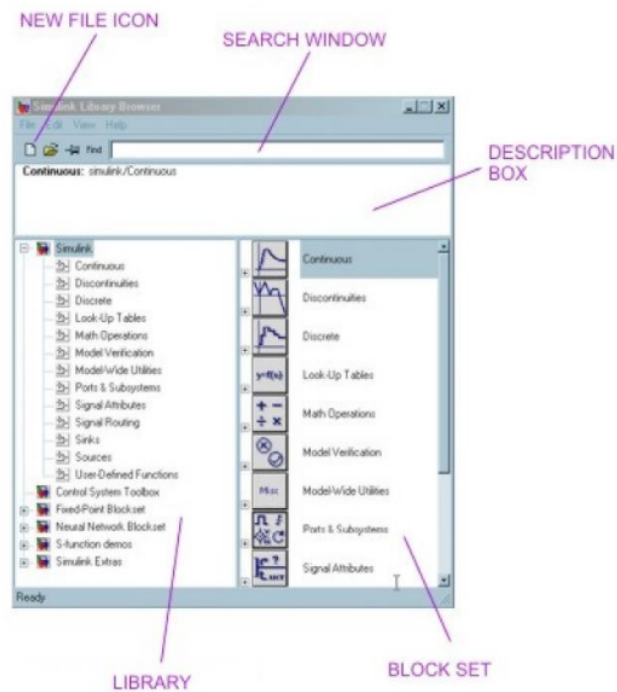


Figure 4.3.1.shows the toolbar of MATLAB

Click on the "+" sign in Figure 5.1 at the start of each toolbox to see the content of the set block. In the screenshot above you can launch a model by clicking the NEW FILE ICON. You will also use CTRL+N keystrokes.

The computer will show a new window. In this window you can create your model. The built model is also simulated in this browser. A standard operating (model) window screensaver that looks like a window shown below.

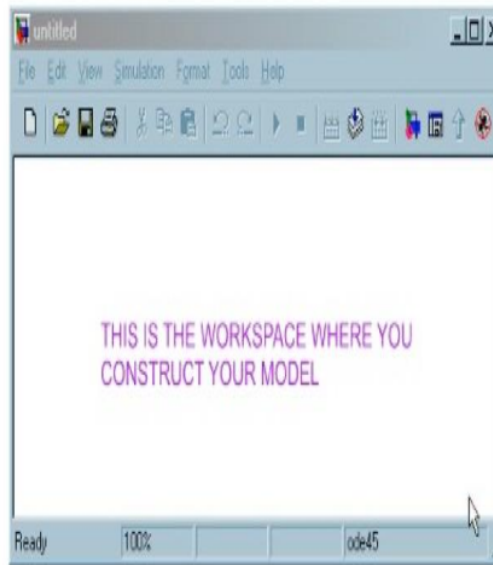


Figure 4.3.2. shows the workspace model of MATLAB

You are invited to explore the toolboxes and search their contents to become acquainted with the structure and atmosphere of Simulink.

You might not know about it all, so you may like to find out how these boxes are organised by type. For instance, the Control System Toolbox can be viewed as a system library consisting of a Linear Timing Invariant (LTI) and MATLAB functions are available under the Simulink Hauptsystem Box Feature and Tables. Train and experiment is a good way to master Simulink (or some other computer programme as a whole). Errors are part of the curve of learning. You have to be, then, fear not.

INTRODUCTION

Together with Simulink®, Sim Power Systems and other products in the product family Physical Modelling are working to model power, mechanical and control systems.

In the simulink area, Sim Power Systems operates. Therefore, you should know Simulink before beginning this user guide. See the Simulink report for assistance with Simulink. In the Signal Processing Block collection documentation, please see how you are applying Simulink on signal processing and coordination tasks (instead of control creation tasks).

Electrical power systems are electrical circuit combinations of electromechanical instruments such as engines and generators. Engineers in this field improve the efficiency of the devices continuously. Performance requirements have obliged power system designers and advanced control systems principles to use the power electronic equipment that tax instruments and techniques of conventional research. The fact that the method is always so non-linear that the best way to explain this is by simulation complicates the position of the observer.

Not the only application of electricity systems is land based power generation from hydroelectric, steam and some other unit. Their use of electronic power and control systems to meet their success goals is a typical feature of these systems.

What are the power systems of Sim?

Sim Power Systems is a modern modelling technique that enables scientists and engineers to create models simulating power systems quickly and easily. With the Simulink environment, SIM Power Systems allows you to create a model with easy clicking and dragging. The circuit topology cannot only be drawn quickly, but its relationships with mechanical, thermal, control and other disciplines can be included. This is possible because the whole electrical components of the simulation associate with the large modelling library of Simulink. As the designer uses MATLAB® for its computer processor, MATLAB toolboxes and simulink block sets can be used by the designer. A special physical modelling block and a connection line connection interface share Sim Power Systems and Sim Mechanics.

Libraries for Sim Power Systems

Sim Power Systems can be used quickly. The bookshops have models of traditional power supplies like transformers, lines, computers and electronics of power. Their legitimacy is focused on the Power Systems Testing and Simulation Laboratory's experience in Hydro-Québec, a major North American service provider headquartered in Canada and on the experience of the École de Technologies Supérieure and Laval. Sim Power Systems has the capability to model a modern electrical device in demonstration archives. And case studies are also available for consumers who wish to further their understanding of power system theory.

In accordance with its conduct, the main library of the Sim Power Systems, power lib, organises blocks into libraries. The window in the Power Library shows the icons and names of the block library. To open the library and view the blocks, double-click a library icon. The main library window of Sim Power Systems also includes the power gui block which opens a graphical user interface for steady-state electrical circuit analysis. Sim Power Systems Models non-linear simulink blocks In a special repository called power library models, the non-linear Simulink blocks of the power library are stored. Sim Power Systems uses these masked Simulink models to create the same Simulink model as your circuit. For an overview of the power laboratory model library, see Chapter 3, "Enhancing Simulation Efficiency"

To use Sim Power Systems, you must have the following items installed:

- Matlab
- Simulink

4.4 PROPOSED SYSTEM

4.4.1 BLOCK DIAGRAM

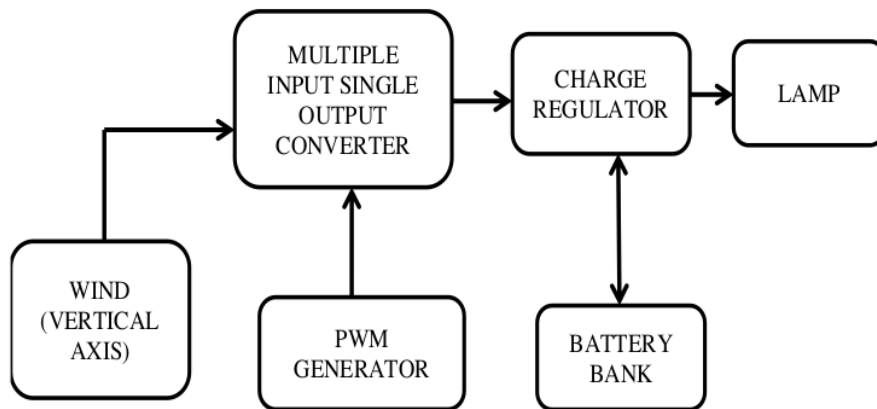


Figure 4.4.1. Block diagram

4.4.2 DESCRIPTION

- Generated Hybrid energy were the input of multi input single output converter .it will boost the voltage from the hybrid source.
- Voltages from the hybrid source were fed to the Multi input single output converter. in this technique separate slot for each source so stress of the switch is reduced.
- Converter output is going to charge a battery through charger regulator.
- PWM pulses were generated from the PWM generator.

4.5 ADVANTAGES

- Easy to install and repair.
- Life time of lighting system is increased.
- Hybrid source occupy only less space.
- Mechanical stability is high.

HARDWARE IMPLEMENTATION

4.6 POWER MOSFET

The Field Effect Transistor is the most frequent field effect transistor on optical and analogue circuits, by far. MOSFET is the Metal oxide semiconductor. The MOSFET consists of a semiconductor material type n or P channel and is also referred to as an NMOSFET or PMOSFET. Sadly, certain semiconductor systems, such as arsenide gallium, do not form strong gate oxides, and thus cannot be used for MOSFETs. Unfortunately, these are better than silicones.

A polysilicon (polycrystalline silicone) or aluminium film on the tube, but with a thin layer of isolating silicon dioxide, is isolated from the channel.

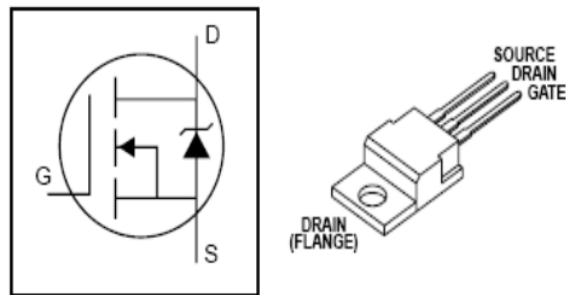


Figure 4.6. Power MOSFET

4.6.1 POWER MOSFET FEATURES:

- Power MOSFET has smaller loss of switching but on and driving losses are greater.
- A voltage driven instrument is MOSFET.
- The temperature coefficient for resistance is positive for MOSFET. This facilitates MOSFET parallel running. When a MOSFET shares initially increase current, its resistance increases faster and this increase allows this current to move in parallel to other equipment.
- A secondary rupture is not occurring in MOSFET because it has a coefficient of positive temperature.

- MOSFETs have more conductance losses in higher voltage ratings. The state of the art MOSFET's are available with ratings up to 500V, 140A.

Figure 7.1 presents a simplified diagram of a MOSFET N-channel enhancement. Connections to drain and source in higher-level high-doped regions are created. A non-conductive film of silicon oxide is electrically isolated from the type substrate (SiO₂). As a positive voltage in relation to the source is applied to the gate, an electric field is generated that is directly under the base from the base and around the P-area. In the P region, the electric field is subject to positive charges, which induce or enhance a N region in its position to travel away from the origin. Driving between the N+ (drain) N (enhanced region) N+ can take place (sources). The increase or decline in the voltage of the gate means that the triggered N channel is either bigger or smaller and thus controls the conduction. Varying the Voltage between the gate and the body makes it possible to regulate the conductivity of this layer and the flow from the drain to the source.

In practise the gate capacity at turn ON can be charged with a very high current between 1 and 6A to make sure the time of switching is short. Because of the current of the door leakage, nanometers are needed to keep the door voltage while the system is on.

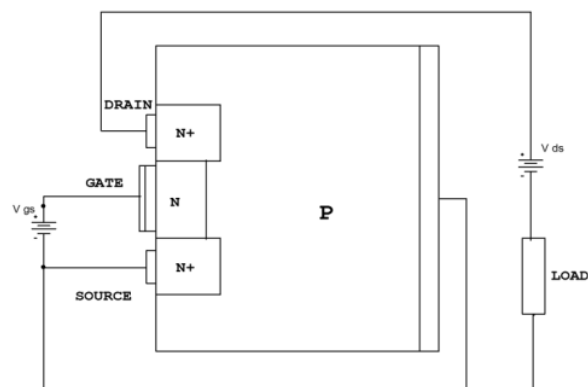


Figure 4.6.1.N-channel enhancement type MOSFET

The gate is also discharged to accelerate the turning OFF by a negative voltage on the turn OFF. Faster speed switching with well-designed gate driver circuit will obviously be achieved.

4.6.2. CHARACTERISTICS OF MOSFET:

The transfer characteristic of an N-channel MOSFET is shown in fig below



Figure 4.6.2. Transfer characteristic

Threshold V_{th} is known as the minimum electrode gate bias needed to rotate the surface heavily under the polymer and to form a conducting channel from the source to the drain regions. V_t is normally estimated at a 650mA drain current. Common values are 6-4V for high tension systems with the oxides of thicker doors, and 1-6V for lower tension software with the oxides of thinner doors. Generally, somewhere in the linear region of transference features is the gate-source voltage selected.

The MOSFET operates in three modes, one as an off button and another as a on. This is done by the MOSFET. The modes are: for the NMOSFET:

- **Cut-off:** If the voltage of the unit is the V_{th} $V_{GS} < V_{th}$. There is no pipe between the drain and source, but the valve is switched off. While the current between the drain and the source should preferably be 0 because the switch is off, the current or under threshold leakage is low for the reverse.
- **Triode:** Once $V_{GS} > V_{th}$ and $V_{DS} < V_{GS} - V_{th}$ is enabled the switch would cause a channel to flow between the source and drain. The MOSFET is resistor-like.
- **Saturation:** The $V_{GS} > V_{th}$ and $V_{DS} > V_{GS} - V_{th}$ switches on and a channel is set that allows current to flow from the drain and source, but current does not act

as a result of the channel voltage differential, so that the MOSFET is not a resistor, but acts as an amplifier.

4.7 PIC 16F877A MICROCONTROLLER

PIC Microcontrollers are a specialised family of microcontroller chips manufactured in Chandler, Arizona by Microchip technology. The PIC is a "peripheral interface controller," although it is hardly used at present. A microcontroller has been developed to handle the use of integrated systems in motor vehicles, robotics, office machinery, medical equipment, handheld radio equipment, sales equipment, home equipment and other appliances. A standard microcontroller has a cpu, memory and devices

4.7.1. FEATURES

High – Performance RISC CPU:

- Just 35 one word learning guides.
- All single-cycle guidelines except for two-cycle programme divisions.
- Operating speed: DC -200 ns instruction loop 20 MHz clock input.
- Flash Memory up to 8K X 14 words; Data memory bytes to 368 X 8 bytes (RAM), EEPROM data memory up to 256 X 8 bytes.
- Other 28-pin or 44/44-pin pin compatible pin.
- P1C16CXXX P1C16FXXX microcontrollers.

Peripheral Features:

- **Timer 0:** Timer/counter 8-bit prescaler of 8-bit
- **Timer 1:** Sleep can be increased by external crystal/clock in the Timer/Counter 16- bit.
- **Timer 2:** Bit 8 – Track, pre-scaler and post-scaler Timer/Counter 8 – bit duration.
- The max. resolution of PWM is 10 bit.

- Universal Synchronous 9 bit address detector asynchronous receiver (USART/SCI).
- Brown – Brown off circuit identification – reset off (BOR).

Analog Features:

- 10 – up to 8 – Analog service – up to the Digital A/D channel.
- Brown - Reset • Brown (BOR).

Analog Comparator module with:

- Two similar benchmarks.
- Chip voltage (VREF) module programmable.
- Externally open outputs are compared.

Special Microcontroller Features:

- 100,000 deletion/writing loop. Improved typical memory of the Flash programme.
- rounds of deletion/writing. Typical EEPROM data storage
- EEPROM Data > 40 years of data retention.
- Software-controlled self-programmable.
- Single – Serial programming supply 5V in circuit
- Security programmable code.
- Sleep function power saving.

4.7.2. PIC ARCHITECTURE:

CPU:

Figure 4.7.2 does not distinguish CPU from other CPU microcontrollers. The CPU consists of a PIC microcontroller composed of a Logic Unit (ALU), a Control Unit (CU), an Accumulator, etc.

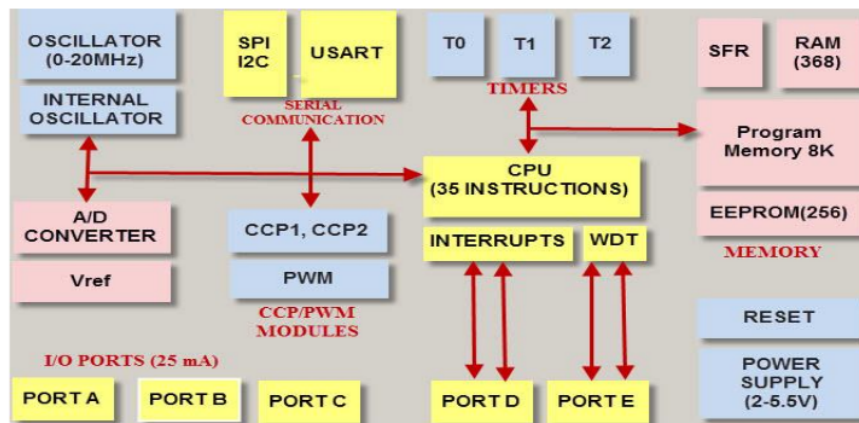


Figure 4.7.2. Architecture of PIC

The Control Unit is used primarily to control all the peripherals associated with the CPU, including internal peripherals and external peripherals. We know that ALU mainly used for arithmetic operations and logical decisions, stores the instruction that is to be processed as well as saves the instructions after processing Accumulator is used to store the results and to process them further.

1) Memory:

The RAM, ROM and STACK Memory Modul in the PIC is

a. RAM:

We recognise the RAM, a volatile store used to temporarily store the data in its registers. The memory of RAM is split into banks and we have numbers of registers in each row. There are 2 kinds of RAM register. There are registers of general use (GPR) and registers of special purposes (SPR).

b. ROM:

We know that ROM is an unvolatile memory used to permanently store the data. The full instructions or software are stored on the ROM microcontroller according to the programme microcontroller. Rom is often referred to as the programme memory, where the microcontroller programme is written and saved and run through the CPU indefinitely. The PIC microcontroller performs the duty according to the instructions

performed by the CPU. In ROM, the various types of PIC microcontrollers are being used.

c. Stack:

When an interrupt occurs, the PIC must perform the interrupt first and the stack stores the original process address. After the interrupt execution is complete, PIC will call the process using the stacked address and execute the process.

2) Bus:

Bus will be used mostly to transmit and receive data from one peripheral to the next. Two kinds of buses exist.

a. Data Bus: It is only used for data transmission/reception.

b. Address Bus: The memory address from the peripherals to the CPU is transferred.

The serial networking protocol used for interacting serial devices like GPS, GSM, IR, Bluetooth, etc., UART, USART was used to interface external peripherals.

4.7.3. PIN DIAGRAM

This is an 8 bit PIC 16 family micro controller built on a 16 bit architecture instruction set. The PIC controller, consisting of 5 input/output ports, is composed of 32 kB of Flash Memory of 40 pin and 256 byte EEPROM.

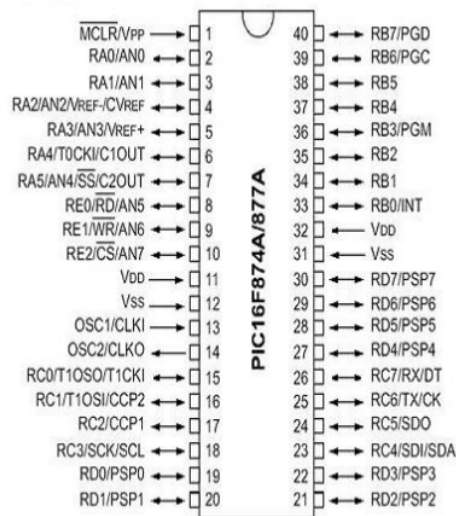


Figure 4.7.3. Pin diagram of PIC16FF77A

PIC Microcontroller's pin outline in this paper is seen in Fig 4.14. It can run on different frequency ranges between 31 KHz and 48 MHz and has 4 built-in timers, there are different peripherals in the construction, such as ADC and comparators.

4.7.4. PWM Mode (PWM)

The CCPx pin outputs a 10-bit resolution PWM display in pulse width modulation mode. The TRISC<2> bit is to be cleared to make the CCP1 pin an output, given that the CCP1 pin is multiplied by the PORTC data latch. A simpler CCP module block diagram is seen in PWM mode in this figure.

PWM operation configuration

When configuring the PWM CCP module, the following steps should be taken:

1. By writing to the PR2 Register, set the PWM timeframe.

2. Set the PWM service cycle to the CCPR1L and CCP1CON<5:4> bits register.
3. Clear the CCP1 by removing the TRISC<2> bit to the output.
4. Set the value of TMR2 and enable Timer2 to be sent to T2CON in writing.
5. For PWM service, configure the CCP1 module.

The following table shows CCP timer1/2 modules and registers PWM FREQUENCIES and RESOLUTIONS AT 20 MHz.

4.7.5. ADVANTAGES

The 16F877A has a 40 pin DIP pin, and has several internal peripherals. This is one of the most common PIC microcontroller and you can easily see why. The 40 pins simplify the use of the peripherals, since the work is scattered over the pins. One of the major benefits is that only two to three functions share each pin so it is easier to determine the functions of the pin (other devices have up to 5 functions for a pin).

4.7.6 DISADVANTAGE

The device's benefit is that there is no internal oscillator, so you need another clock source's external crystal

4.8 DRIVE CIRCUIT (IR2110)

The IR2110/IR2113 are high voltage, MOSFET and IGBT high speed drivers with independently referenced high and low side performance channels. HVIC and CMOS proprietary technology allow a robust monolithic design. Logic entries are down to 3.3V logic with CMOS or LSTTL standard output. The output drivers are equipped with a high pulse current buffer stage engineered for minimal control. Delays in propagation are matched for simplification of applications of high frequency. In high-sided configuration that runs up to 500 or 600 volts,

the floating channel can be used to control the N-channel MOSFET or IGBT.

FEATURES

- Bootstrap-designed floating channel
- Completely +500V or +600V operating
- Negative transition tension tolerant
- dV/dt immune
- Gate pull range between 10 and 20V availability.
- Under all channels voltage lockout
- 3.3V logic compatible
- Separate set of logic between 3.3V and 20V supplies
- Offset of logic and power of $\pm 5V$
- Pull-down inputs CMOS Schmitt activated
- Shutdown logic triggered by cycle edge
- Matched delay in both channels propagation
- Input outputs in the input step

Figure 4.8.1. Pin Configuration

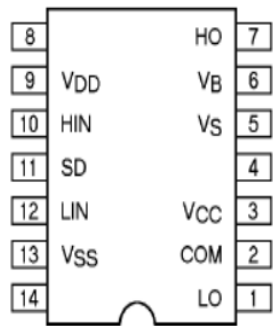


Table 4.8.1.Description Table

Symbol	Description
--------	-------------

VDD	Logic Supply
HIN	High side gate output logic Input (HO), phase by phase
SD	Logic input for shut down
LIN	Low-side gate output logic input (LO) in phase
VSS	Logic ground
VB	Floating supply on the high side
HO	Production of high side gate
VCC	Low side supply
LO	Production of the low side gate
COM	Low side return

4.9. STEP DOWN TRANSFORMER

When AC is used for the main winding of the transformer, it can either be downgraded or upgraded according to the DC value needed. The transformer of 230v/0-12v is used on our circuit for step-overs while a 230V AC through the secondary winding is shown as 12V AC. A change in the feedback leads to positive and negative changes in the top of the transformer. The next change would trigger the reversal temporarily. The transformer used in our project is currently rated as 1A. In addition to downgrading AC voltages, the power source and power supply circuits are insulated.

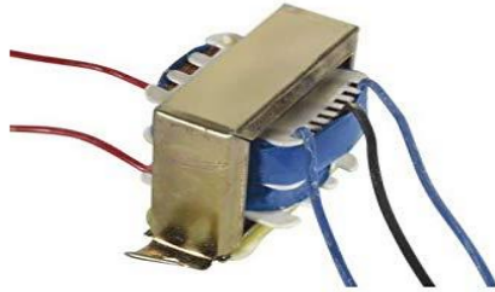


Figure 4.9. STEP DOWN TRANSFORMER

4.10. VOLTAGE REGULATORS

In every power supply unit, the voltage regulators play a major role. A controller's principal function is to help the filter and correction circuit to ensure the system receives a steady DC voltage. Power supplies without controllers present an intrinsic issue of shifting DC tension values due to load differences or fluctuations in the AC line voltage. The voltage may be retained within the tolerant area of the desired output through a regulator connected to the DC output. IC7805 for +12v and -12v DC is included in this project.



Figure 4.10.LM7805

4.11. DIODE RECTIFIER-IN4007

AC is converted to DC with the diodes. Both are used to rectify the half wave or the full wave corrector. He must keep three points in mind during the use of any diode.

- Maximum forward current capacity
- Maximum reverse voltage capacity
- Maximum forward voltage capacity

GENERAL DESCRIPTION

The diode corrector is used in the main circuit in this project. In general, a diode rectifier is given on all power electronic circuits. The 12V AC voltage is converted to DC voltage. At the output of the input filters they are related.

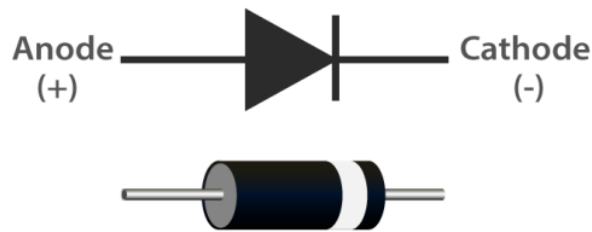


Figure 4.11.Diode

FEATURES

- Wide junction
- High Current Capability
- Low Forward Voltage Drop
- Overload surge rate 30A peak
- Current low backward leakage

- Plastic Material: UL Flammability
- RATING 94V-0 CLASSIFICATION

MECHANICAL DATA

- Plastic Molded
- Terminals: Plated Leads Solderable per
- Polarity: Cathode Band
- Marking: Type Number
- MIL-STD-202, Method 208
- Weight: DO-41 0.30 grams (approx) A-405 0.20 grams (approx)
- Mounting Position: Any

4.12 INDUCTORS

A passive electric part is an inductor or reactor that can store energy in a magnetic field generated by the transmitting electric current. By its inductivity in units of henries, an inductor can store magnetic energy. Typically, an inducer is a conducting wire shaped like a spiral, because of Faraday's induction law, the loops help generate a solid internal magnetic field.

Inductors represent one of the fundamental electrical components for electronics as current and voltage vary over time because inductors are capable of delaying and reshaping alternating currents. An "ideal inductor" does not have inductance but no strength or capacity and dissipates electricity. A true inductor is equal to a mixture of inductance, resistance and capacity due to the wire's resistivity. A true inducer acts as a resonant circuit at any frequency, generally much more than the working frequency (due to its self capacitance). In addition to the dissipation of energy in the wire resistance, magnetic core inducers can

dissipate energy in the centre due to hysteresis, and other variations in the optimal behaviour due to nonlinearity can occur in high currents.



Figure 4.12. Inductor

4.12.1 TYPES OF INDUCTORS USED IN CIRCUIT

- Filter Inductor
- Boost Inductor
- Resonant Inductor

4.13 CAPACITOR

The condenser is a component that can store energy in the form of an electrical charge that produces the potential difference (static voltage) between its surfaces, much like a small battery that can be re-charged. A wide variety of condensers are available, from very small condenser beads to massive power factor corrections condensers, but they all do the same thing and store load. The condenser in its fundamental nature consists of two or more parallel (metal) conduction plate, which are not bound or touched, but electrically independent, as found in electrolytic condensers, either by air or in a form of strong insulating material, such as waxed paper, mica, ceramic and plastic or in some form a fluid gel. A generally referred to as the dielectrical isolation layer between a condenser wall.

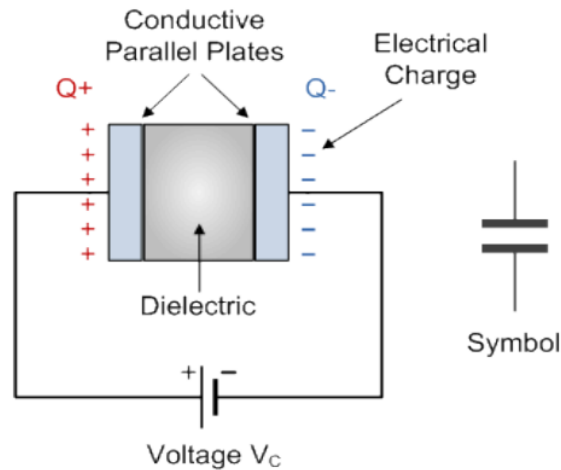


Figure 4.13.A Typical Capacitor

This isolation layer prevents the DC current from flowing through the condenser, which blocks the voltage from being present in an electric charge through the plate. A condenser's conducting metal plates can be square, circular or rectangular. Depending on the use and the voltage rating, they can also have a cylindrical or spherical shape for the overall form, scale and construction of the parallel plate capacitor. A condenser charges up to a supply voltage as used in a direct current or DC circuit, but blocks the current flow into it because the dielectric of the condenser is non conductive and essentially the insulator. But the present flow seems to be passed directly by the condenser with little or no resistance when attached to an alternation current or a CC circuit.

There are two different kinds of electrical load, one in the form of protons and one in the form of electrons. When a DC tension passes over a condenser, the positive load (+ve) accumulates rapidly on one plate and a negative load on the other plate is accumulated on the other plate. The charge with the same sign departs from the -ve plate for any +ve-load particle that arrives on a single plate. Then the plates are neutral and a potential difference is formed between the two plates due to this charge. As soon as the condenser enters its constant state, an electric current cannot pass between the condenser itself and the circuit due to the dielectric isolating properties used to distinguish the panels. The electron stream to the panels is known as the charging current condenser that tends to flow until the voltage is equal to the voltage used V_c on each panel (and hence the condenser). The condenser is called "completely charged" by electrons at this stage. As the discs are completely

discharged (initial condition) the force or speed of the charging current is at its highest value and progressively decreases the value to null as the discs charge to a possible difference around the condenser plate proportional to the source tension. The amount of variation that may occur through the condenser depends on when the work is carried out by the source voltage and how much capacity the condenser has, and this is explained below.



The condenser is the most straightforward version of the condenser. It can be made using two parallel distance metal or metallized foil plates, with a capacitance of Farads, fixed by the surface of the conductive plates and the distance between them. Changing two of them changes the importance of their capacity, which forms the basis for the function of the variable condensers. Furthermore, when electrical condensers store energy for the electrons on the plates, the larger the plates and/or the smaller their distance, the greater is the charge the condenser retains on its plates for any given voltage. In other words, bigger plates, narrower lengths, more space. The ratio of charge Q to voltage V would have the capacitance value of the condenser by adding a voltage to a condenser and by calculating the charge to a plate: $c = Q/V$. The famous formula for the quantity of charge on the plates can also have this equation restructured in: $Q = C \times V$. And if we said that the load

is deposited on the plates in a condenser, the energy in the load is stored on the two plates in a "electrostatic field." When a current flows through the condenser, the electrostatic field is loaded, so the energy is stored within plates. As the current flowing from the condenser, the potentially disparity between the two plates reduces, as the electricity travels from the plates, and the electrostatic field decreases. Capacity of the condenser is the property of a condenser for storing charge in its plates in the form of an electrostatic field. Not only that, but even capacity is the property of a condenser that is resistant to voltage change through it.

CHAPTER 5

CONCLUSION

This project work has given us an outstanding opportunity to use our skills and expertise. While doing this project, we have acquired extensive practical expertise in terms of planning, procurement, assembly and machining. We believe that the project work is a successful option for bridging institution-industry door. There is much optimism and promise with regard to the wind turbine at this early stage of the production, but turbines will remain as possible until the built costs reach target prices. The "Generation of Vertical Axis Windmill Power" works under good conditions. We understand the challenges of managing tolerances and consistency. We understand. We have made full use of the equipment we have at our disposal. Thus, a vertical axis windmill has been planned and built, which helps know how to generate non-conventional electricity. Our model is simple to model and generate electricity, compared with the Horizontal Axis windmill. For the same power generation from horizontal wind turbine, the vertical axis windmill delivers lower costs and allows low winds. This will respond from either direction to the storm, and less

structural assistance is required. Installation and repair is also easier. Therefore, when using the pulley and belt system, the power voltage from the generator can be increased. The produced power can be used for windmills in housing, street lights, highways etc. For different applications.

CHAPTER 6

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