

# WIND ENERGY STORAGE SYSTEM WITH MPPT TECHNIQUES FOR VARIABLE FREQUENCY DRIVE CONTROL

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## ABSTRACT

Renewable wind energy has become the most important energy source for the power generation. The main objective of the project is to generate energy, reduced the power loss of wind energy conversion system. The proposed conversion system deals with wind turbine, variable frequency inverter, MPPT techniques and induction motor with dc to dc converter. A wind turbine provides dc supply and is converted to pure dc supply. DC to DC converter is same for constant voltage and current. MPPT technique is used as control strategy to extract maximum power from wind. Maximum power point tracking algorithms for wind energy systems due to the instantaneous changing nature of the wind. It is essential to include a controller that can track the maximum peak regardless of wind speed.

MPPT algorithms on the basis of various speed response and ability to achieve the maximum energy yield. MPPT algorithms are using fuzzy and neuro. The efficiency and the energy capture capacity of the energy conversion system are also improved. A variable-frequency drive (VFD) also termed adjustable-frequency drive, variable speed drive, AC drive, micro drive or inverter drive is a type of adjustable-speed drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage to rotate the induction motors are used extensively for smaller loads, such as household appliances

like fans. Used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives (VFDs) in variable-speed service.

**Keywords:** Wind turbine, Boost Converter, variable frequency inverter, MPPT (Maximum Power Point Tracking)

## 1. INTRODUCTION

Wind turbine converts the kinetic energy of wind into mechanical energy by means of producing torque. In wind gear motor dc supply is produced at forward direction and its goes dc to dc converter. Dc to dc converter is otherwise known as chopper, boost converter the use of converter is to reduce the fluctuation and boost the voltage also. Then the pure dc supply pass to MPPT techniques. The purpose of MPPT is a type of charge controllers that track the power for the maximum power point. They maintain the constant voltage and current. Thus the electronic tracking convert it best voltage to get maximum ampere into battery. In battery it's stored the maximum dc supply charged. Boost converter produce 12V, 1A it is not possible to store in battery. So we are using MPPT techniques. Then the pure dc supply pass to MPPT techniques. The purpose of MPPT is a type of charge controllers that track the power for the maximum power point. They maintain the constant voltage and current. Variable frequency inverter (VFD) can be used to control both the speed and torque of a standard induction motor. It varies both the frequency and ampere of the

AC waveform being delivered to the motor saving cost in electricity. VFD is soft starting, by varying the pulse induction motor frequency also varied. Single-phase induction motors are used extensively for smaller loads, such as household appliances like fans. Although traditionally used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives (VFDs) in variable-speed service.

## 2. EXISTING SYSTEM

A drive control is implemented for the induction motor is a low power level. The voltage drop on the stator resistance and the minimum magnetic field inside the machine at starting. A too high flux value results in a saturation of magnetic core, high magnetization current and an increase of iron losses, while a too low flux results in a high rotor current giving a high slip speed, especially when the motor is loaded, increasing rotor copper losses. Without a proper magnetic field selection, losses of the induction motor are of high values and this fact leads to poor efficiency of the whole system. The speed variation has a direct effect on the pump's efficiency, which is very poor at low speeds. Pump's efficiency in variable speed conditions is low, especially in the low speed region.

### DRAWBACKS:

- Fixed frequency only used
- MPPT not used
- Power wastage is high
- Low efficiency
- Pump efficiency is low
- Iron losses in rotor

## 3. PROPOSED SYSTEM

The proposed wind energy conversion system is based on induction motor. This type of machine has main features which are relevant for wind power

applications such as no significant losses generated in the rotor, allows soft start and magnetization provided by the induction motor. DC-DC Boost converter is used to reduce the fluctuation at the output of rectifier and constant voltage, current. MPPT control signal is given to the boost converter which boosts the voltage across load. The control method to capture the maximum power from wind turbines in the variable speed region is called a maximum power point tracking (MPPT) control. The classic control is variable frequency for which the magnetic field inside the machine is constant, fact that takes place by keeping a constant ratio between the stator voltage and frequency. In Variable frequency drive (VFD) gate drive control is capable of exploiting the low wind speeds, and also of reaching higher power is given to induction motor.

## 4. BLOCK DIAGRAM

Wind turbine converts the kinetic energy of wind into mechanical energy by means of producing torque. In wind gear motor diode is using in forward direction . Dc supply is produced at forward direction and its goes dc to dc converter. When in reverse direction voltages not charge. Dc to dc converter is otherwise known as chopper, boost converter the use of converter is to reduce the fluctuation and boost the voltage also. The purpose of MPPT is a type of charge controllers that track the power for the maximum power point. They maintain the constant voltage and current. Thus the electronic tracking convert it best voltage to get maximum ampere into battery. In battery it's stored the maximum dc supply charge. They maintain the constant voltage and current. Variable frequency inverter (VFD) can be used to control both the speed and torque of a standard induction motor. It varies both the frequency and ampere of the AC waveform being delivered to the motor

saving cost in electricity. VFD is soft starting, by varying the pulse induction motor frequency also varied.

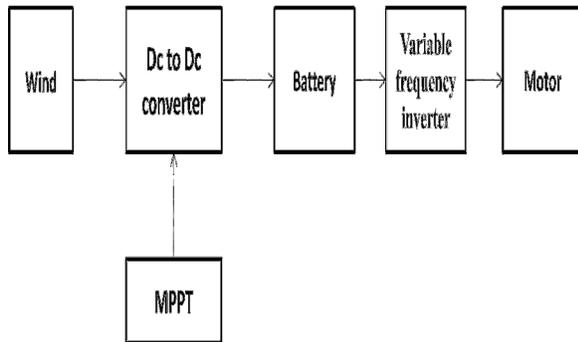


Fig 1: BLOCK DIAGRAM

### 5. CIRCUIT DIAGRAM

Wind gear motor is connected to dc to dc converter and MPPT. MPPT techniques is using in the dc to dc converter to provide fixed and boost 12v supply is stored in battery. Then the 12v is given to the PIC microcontroller. The microcontroller is connected with the gate pulse driver circuit. The microcontroller is to provide low current and it is not enough to create the gate pulse. So, the 12v supply from the battery is given to the driver circuit for generating the gate pulses. Then the high voltage is produced from gate pulse driver circuit, which is used to continuously ON and OFF switch.



Fig 2: CIRCUIT DIARAM

Here we obtain the pulsating DC voltage to the coupling transformer which converts the DC pulse to AC. In an output

side induction motor start to rotate and by varying the pulse frequency, the motor rotate at different speed.

### 6. SYSTEM DESCRIPTION

#### WIND TURBINE:

A wind turbine is a device that converts kinetic energy from the wind into electricity. A gearbox is typically used in a wind turbine to increase rotational speed from a low-speed rotor to a higher speed electrical generator. The design of a wind turbine gearbox is challenging due to the loading and environmental conditions in which the gearbox must operate.

#### DC to DC CONVERTER:

A DC-to-DC converter is an electronic circuit or electromechanical device that converts a source of direct current (DC) from one voltage level to another. They are used to increase or decrease the voltage level. The dc to dc converter inductor used to boost and buck operation. In continuous inductor current mode, current flows continuously in the inductor during the entire switching cycle in steady-state operation. In discontinuous inductor current mode, inductor current is zero for a portion of the switching cycle. It starts at zero, reaches peak value, and return to zero during each switching cycle. It is a type of electric power converter. In boost converter reduce the fluctuation and boost the voltage from the wind storage.

#### MPPT TECHNIQUES:

MPPT is charge controllers are a type of charge controllers that track the power for the maximum power point. Thus the electronic tracking convert it best voltage to get maximum ampere into battery. We have using algorithm coding are Fuzzy, Neuro. The MPPT adjusts the angular velocity of the rotor to an optimum speed, corresponding to the wind speed, for

maximizing the active power output, while the wind speed fluctuates. However, the active power fluctuates as the wind speed varies, which may lead to power quality and the power system stability issues.

### VARIABLE FREQUENCY INVERTER

A Variable Frequency Drive (VFD) is a type of motor controller that drives an electric motor by varying the frequency and voltage supplied to the electric motor. Other names for a VFD are variable speed drive, adjustable speed drive, adjustable frequency drive, AC drive, micro drive. Pulse Width Modulated Variable Frequency Drives. When operated from a constant frequency power source (typically 60Hz), AC induction motors are fixed speed devices.

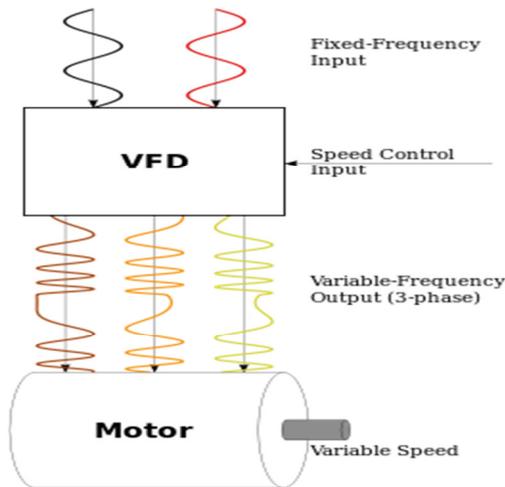


Fig 3: VARIABLE FREQUENCY DRIVE

A variable frequency drive controls the speed of an AC motor by varying the frequency supplied to the motor. This DC voltage is then converted back into AC.

A VFD Drive starts a motor at zero frequency and voltage. The AC-induction motor can have its speed changed by changing the frequency of the voltage used to power it. This means that if the voltage applied to an AC motor is 50 Hz (used in

countries like China), the motor works at its rated speed. If the frequency is increased above 50 Hz, the motor will run faster than its rated speed, and if the frequency of the supply voltage is less than 50 Hz, the motor will run slower than its rated speed.

### MICROCONTROLLER:

Microcontroller is a complete microprocessor system built on single Microcontrollers was developed to meet a need for standard CLOCK, TIMERS, and it consists also SERIAL Port. The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. This makes it easier to decide what external devices to attach without worry too much if there are enough pins to do the job. Main advantages are that each pin is only shared between two or three functions so it's easier to decide the pin function.



Fig 4: MICROCONTROLLER

### GATE DRIVER:

A gate driver is a power amplifier that accepts a low-power input from a controller IC and produces a high-current drive input for the gate of a high-power transistor such as an IGBT or power MOSFET. Gate drivers can be provided either on-chip or as a discrete module. A gate driver is a power amplifier that accepts a low-power input from a controller IC and produces a high-current drive input for the gate of a high-power transistor such as an IGBT or power

MOSFET. Gate drivers can be provided either on-chip or as a discrete module. In essence, a gate driver consists of a level shifter in combination with an amplifier.

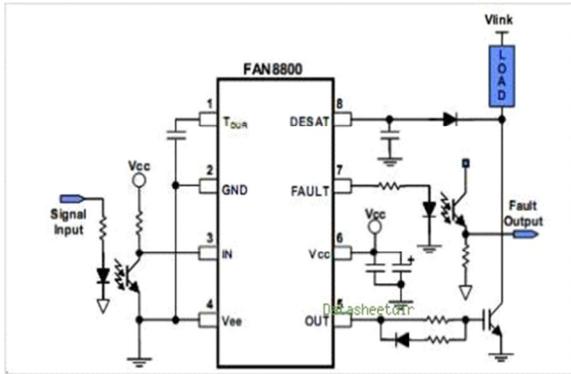


Fig 5: GATE DRIVER

The switching signal for a transistor is usually generated by a logic circuit or a microcontroller, which provides an output signal that typically is limited to a few milliamperes of current. Consequently, a transistor which is directly driven by such a signal would switch very slowly. During switching, the gate capacitor of the transistor may draw current so quickly that it causes a current overload in the logic circuit or microcontroller, causing overheating which leads to permanent damage or even complete destruction of the chip. To prevent this from happening, a gate driver is provided between the microcontroller output signal and the power transistor.

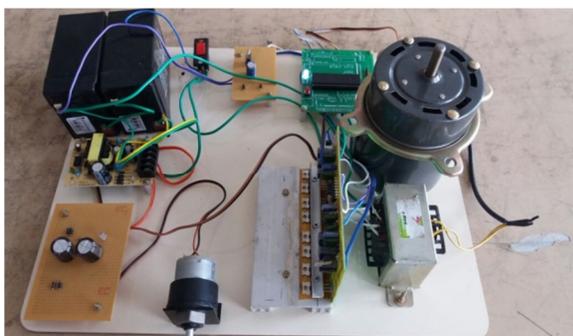


Fig 6: HARDWARE RESULT

## 7. CONCLUSION

In this paper, a new control strategy is proposed to boost the voltage from wind gear motor using MPPT. Variable frequency drive is used to drive the induction motor at variable frequency. Moreover, an optimized control for the motor driving at variable frequency drive is achieved.

Then, efficiency increases at motor. This obviously leads to high power available for driving the motor contrast to classic control, for the same input power from the wind turbine drive the frequency in different speed.

## 8. REFERNCES

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