

MPPT BASED RENEWABLE ENERGY TRACKING WITH DC-DC CONVERTER FOR END USER APPLICATION

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Abstract: The renewable energy sources such as Solar energy and Wind energy are complementary by nature. Utilizing these natural resources to produce power will reduce the power demand on the conventional power generation sector. One of the applications of Solar-Wind hybrid power system (SWHPS) is to reduce the amount of power consumed from the conventional power generation to charge the storage reserves present in the system. The Photovoltaic (PV) and wind power generation system to operate at its maximum power. In PV and wind system Perturb & Observe (P&O) algorithm is used as control logic for the Maximum Power Point Tracking.

1. Introduction

The objective of this project is to “Implementation of MPPT Control Using Fuzzy Logic in Solar-Wind Hybrid Power System” Present industry is increasing shifting towards automation. Two principle components of today’s industrial automations are programmable controllers and robots. In order to aid the tedious work and to serve the mankind, today there is a general tendency to develop an intelligent operation[1-4].

The proposed system “Implementation of MPPT Control Using Fuzzy Logic in Solar-Wind Hybrid Power System” is designed and developed to accomplish the various tasks in an adverse environment of an industry. The intelligent machine is loaded with several units such as LCD, microcontroller, relay, potential transformer, current transformer which synchronously works with the help of a start-of-the-art PIC microcontroller[5-9].

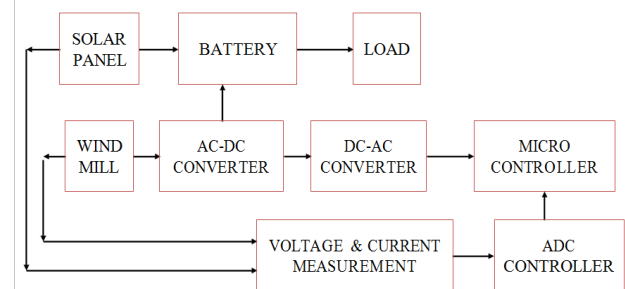
This “Implementation of MPPT Control Using Fuzzy Logic in Solar-Wind Hybrid Power System” is to the technical advancement. This prototype system can be applied effectively and efficiently in an expanded dimension to fit for the requirement of industrial, research and commercial applications[10-14].

2. Existing Approach

Renewable energy sources (RES) such as Solar, Wind, Geothermal, Tidal, Hydro etc. are inexhaustible by

nature[15-19]. Due to the limitation of conventional resources of fossil fuels, it has compelled the evolution of hybrid power system. PV system consisting of PV array, Maximum Power Point Tracking (MPPT) boost converters, and Wind power system consisting of wind turbine, PMSG, rectifier and MPPT boost converter is integrated into Solar Wind hybrid power system (SWHPS). The efficiency and reliability of the SWHPS mainly depends upon the control strategy of the MPPT boost converter[20-26].

EXISTING SYSTEM BLOCK DIAGRAM



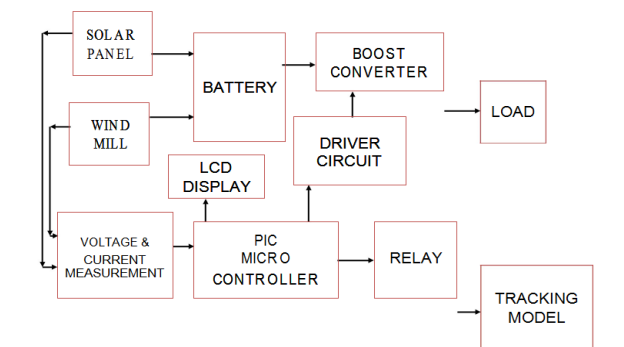
The solar and wind power generation cannot operate at Maximum power point (MPP) without proper control logic in the MPPT boost converter. If the MPP is not tracked by the controller the power losses will occur in the system and in spite of wind and solar power availability, the output voltage of the hybrid system will not boost up to the required value. The output voltage of the PV and Wind power generation are quite low as compared with the desired operating level[27-30].

3. Proposed System

The Photovoltaic (PV) and wind power generation system to operate at its maximum power. In PV system Perturb & Observe (P&O) algorithm is used as control logic for the Maximum Power Point Tracking. In our project we get power from solar and wind mill current is stored in the battery. From the battery we are boosting the voltage by using DC-DC converter. Microcontroller is used to generate the PWM pulse to

convert the DC voltage. Voltage and current measurement circuit is used to measure the total power of the solar panel. According to the power we can track the panel to get the maximum power.

PROPOSED SYSTEM BLOCK DIAGRAM



4. Components Required

1. Solar Panel

Photovoltaic systems are designed to perform the following functions:

- Convert solar energy to direct current electrical energy.
- Regulate the electrical energy output.
- Store the electrical energy in a battery subsystem for later use.

2. Wind Turbine

- Wind energy is created when the atmosphere is heated unevenly by the Sun, some patches of air become warmer than others.
- A wind turbine extracts energy from moving air and transferring this energy into a spinning shaft, which usually turns a generator to produce electricity.

3. Pic Microcontroller (16F877A)

- Microcontroller is a general purpose device, which integrates a number of the components of a microprocessor system on to single chip.
- It has inbuilt CPU, memory and peripherals to make it as a minicomputer.

4. Liquid Crystal Display (LCD)

- The power in the wind that's available for harvest Liquid crystal displays (LCD's) have materials, which combine the properties of both liquids and crystals.
- They are use in the voltage and current, wind speed, are in the display.

5. MPPT

- The solar inverters implement MPPT algorithms to maximize the power generated by photovoltaic (PV) systems. The algorithms control the voltage to ensure that the system operates at "maximum power point" (or peak voltage) on the power voltage curve, as shown below.
- MPPT algorithms are typically used in the controller designs for PV systems. The algorithms account for factors such as variable irradiance (sunlight) and temperature to ensure that the PV system generates maximum power at all times.

6. Fuzzy Logic Control

Microcontrollers have made using fuzzy logic control popular for MPPT over last decade. Fuzzy logic controllers have the advantages of working with imprecise inputs, not needing an accurate mathematical model, and handling nonlinearity.



5. Advantages

- Conventional Power Generation was based on PWM technique. But the proposed system is based on MPPT for power generation. This proposed method makes zero voltage loss.
- MPPT solar controller reduces complexity of system while output of system is high efficiency.
- MPPT solar controller is necessary for any solar power systems need to extract maximum power from PV module it forces PV module to operate at voltage close to maximum power point to draw maximum available power.
- MPPT solar controller allows users to use PV module with a higher voltage output than operating voltage of battery system.

6. Conclusion

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. The proposed system based on microcontroller is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology (pic microcontroller) used this “MPPT BASED RENEWABLEENERGY TRACKING WITH DC-DC CONVERTER FOR ENDUSER APPLICATION” system is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems. The principle of the development of science is that “nothing is impossible”. So we shall look forward to a bright & sophisticated world.

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