A Review on Fault Detection and Monitoring of Hybrid Power Plant by Using IOT

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ABSTRACT

With the rapid development of wind power and solar capacity, from which we need to deduce the total operating time, the maintenance of wind turbines and solar power plants is becoming increasingly important, so we urgently need to develop fast and efficient fault detection and monitoring. So, in this project, we are using an IoT (Internet of Things) technology modem for the interface. At the same time, we will detect and monitor faults so that the time required for this process (fault detection and monitoring) is reduced and we improve the stability of the hybrid power plant. The discussion in this review article is based on IoT remote monitoring of hybrid power plants for performance evaluation.

Keywords: Aurdino UNO, IOT Modem, UART, Wind turbine, solar panel.

INTRODUCTION

Facing the enormous increase in the world's energy demand and to demand energy reserves against rising prices of energy resources from fossil fuels and then reversing their depletion in the long run. The development of this alternative is encouraged because it is a natural, economical, clean and safe resource. Monitoring and diagnosis become essential to reduce maintenance costs and ensure continuity of production, because stopped a Hybrid installation for unexpected failures could lead to expensive repair and to lost production. This outdated operating system has become critical and incurs very significant losses, so there is a growing need to implement highly effective maintenance, online monitoring. Allows a regular early detection mechanical and electrical fault; it must able to prevent major component failures the Hybrid becomes an important topic in scientific research and industries. The main objective of this project is to study the design of a real time monitoring and controlling system for state supervision of hybrid generator machine.

EXISTING SYSTEM

"Energy can neither be created nor destroyed" Due to the growth of human resources, the demand for energy resources is increasing nowadays. The excessive quantity of resources has been decreasing. Hence there is an urge to find any alternate resources .Energy can be renewable and nonrenewable. The use of non-renewable energy resources has reached a special level. It is better to use all forms of renewable energy sources. Among the renewable energy resources hybrid energy is widely used. It has advantages such as availability, non-pollution; no greenhouse gas emissions etc. hybrid energy can be converted to a useful form of electrical energy using wind turbines and solar panels. For any process to get the perfect results the process should be controlled and monitored at regular interval of times. The importance of instrumentation system points here. The various parameters like wind speed, temperature, direction, humidity, current, voltage is measured periodically and monitored to check if any deflection occur.

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PROPOSED SYSTEM

In order to avoid economic problems and provide more convenience to users, we use a microcontroller as a data acquisition system. As usual the control and monitoring process is carried out. The software includes a web server for real time monitoring of each system. The programming part is much easier than other tools. The programming part is much simpler when compared to other tools. Sensors are used to collect various information and send it to the controller. The sensor used to measure temperature is LM35 temperature sensor, current sensor, voltage sensor, vibration sensor, humidity sensor& speed sensor. By using Universal asynchronous receiver/transmitter interfacing connecting both Aurdino and Internet of things. IoT consists of the one Aurdino which is used to control the relay. An up-to-date review of software tools available for the objectives of the proposed system are, for remote monitoring of hybrid plant and fault detection and to constantly monitor the hybrid plant and transmit the power output to IoT system through Wi-Fi module. The below block diagram shows the block diagram of IoT monitoring of hybrid plant. The power generated by the solar panels is measured by current and voltage sensors. These reported values are mapped using IoT. And in the wind turbine sensed highest speed, temperature, current and voltage is sensed by various sensors this sensed value is recorded as a graph using IOT.

Block diagram:-Fault detection and monitoring of hybrid power plant by using IOT.

Current Sensor

Current sensor is a device that detects electrical current in a wire and generates a signal proportional to it. Measures current from 1 to 10Amp.

Voltage Sensor

A voltage sensor is a device that converts the measured voltage between two points in a circuit into a physical signal that is proportional to the voltage monitor input voltage in the range of 3 to 500 V DC

Temperature Sensor

A temperature sensor is a device that produces an electrical voltage that is directly proportional to the change in temperature to measure temperature. The LM35 is a precision IC temperature sensor with a temperature proportional output. Temperature sensors are often included in ICs to detect when operating temperature limits are exceeded. Temperature can be measured more accurately than with a thermostat.

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Speed Formulation

Speed / RPM sensors are based on various principles to determine Hall Effect, magneto resistive, inductive sensing without delay in sonic rotary motion or gears and usually on ferrous material rotary devices equipped with slots or interfering parts. They provide a digital frequency output signal for the Hall Effect variant or the magneto resistive version, or a sinusoidal signal for the inductive version, which precisely follows the alternating order of presence and absence of ferrous material represented by a particular device.

Speed = RPM / V
Where V - Voltage
RPM- RPM

AURDINO UNO

Aurdino Uno is a microcontroller board based on the ATmega328P processor. It can be coded freely in C/C++ using the Arduino IDE and uploaded directly to the board. These boards have many applications in the field of embedded electronics. Here it is decided whether the values obtained from different sensors are within the range depending on the logic code specified on the Arduino board. 621 It processes the input data from various sensors and sends it to the GSM module via the serial communication protocol along with various AT commands required for the operation of the GSM module.

BATTERY

Electricity is usually converted from mechanical energy, solar energy and chemical energy etc. A battery is a device that converts chemical energy into electrical energy. The battery is the most popular power source in many everyday applications. In our daily life, we usually use two types of batteries; one is one that can be used once before being completely diluted. Another type of battery is a rechargeable battery, which means it can be used over and over again by being charged externally. The first is called the primary battery and the second is called the secondary battery. Batteries come in a variety of sizes. Batteries can be as small as a button's shirt or so large that they require an entire room to fit the battery. With this size variation, the battery finds application in everything from small clocks to large ships. This is the most popular symbol for the battery. The larger line represents the positive pole of the cell and the smaller line represents the negative pole of the cell connected to the battery.

RELAY

A relay is an electromagnetic switch controlled by a relatively small electric current that can turn on or off a much larger electric current. The heart of the relay is an electromagnet (a coil of wire that becomes a temporary magnet when current passes through it). The relay turns on at a low current and turns on another device with a much higher current.

UART

UART is a type of "asynchronous receiver/transmitter", computer hardware that translates data between parallel and serial forms. UART is usually used in conjunction with other communication standards such as EIA RS-232. A UART is usually a separate (or part of) integrated circuit used for serial communication via a serial port on a computer or peripheral. UARTs are now commonly included in microcontrollers. A dual UART or DUART combines two UARTs into a single chip. Many modern IPs now come with a UART, which can also communicate synchronously; this device is called USART. The universal asynchronous receiver/ transmitter controller is a key component of the PC serial communication subsystem. UART receives data bytes and sends individual bits sequentially. At the destination, the second UART reassembles the bits into full bytes. Serial transmission of digital information (bits) over one cable or other medium is much more useful than parallel transmission over multiple cables. A UART is used to convert the transmitted information between its

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sequential and parallel form at each end of the link. Each UART contains a shift register which is the fundamental method of conversion between serial and parallel forms. X.

IOT (INTERNET OF THINGS)

The term Internet of Things typically refers to scenarios where network connectivity and computing capabilities extend to everyday objects, sensors, and objects not normally considered computers, enabling these devices to exchange and use data with minimal human intervention. However, there is no universal definition. Devices have been around for decades. However, the amalgamation of several recent technology market trends is bringing the Internet of Things closer to a widespread reality. These include ubiquitous connectivity, widespread adoption of IP-based networks, economics, miniaturization, advances in data analytics, and the advent of cloud computing.

COMPUTING

Working of Hybrid Power Plant by Using IOT

The main task of this system is to send data to the Internet via a modem with UART enabled. The UART (Universal Asynchronous Receiver and Transmitter) modem service is initiated using the AT command along with the appropriate IP address and port. The values from the various sensors are received by the Aurdino card and sent to the modem as a single string, the length of which must be less than 150 bytes.

TURBINE:-

A mechanical device that converts rotational energy into electrical energy using a generator. Turbines have blades or rotors that convert wind energy into rotating wave energy. The drive mostly consists of a gearbox and a generator. A tower supporting the rotor and propulsion mechanisms and other equipment, including controls, electrical wiring, grounding equipment, and connecting equipment.

THE BLADES

Modern wind turbine blades are shaped like the wings of an airplane and use lift to capture wind energy. Due to the special shape of the blade, the wind creates a pressure pocket behind the blade as it passes through it. This pressure pulls on the blades, causing the turbine to spin. The blade rotates at a slow speed of about 20 rpm (RPM), although the speed at the tip of the blade can be more than 150 miles per hour.

THE NACELLE

The nacelle houses the generator and gearbox. The rotating propeller is attached to the generator by a series of gears. The gear increases the rotational speed of the blades to a generator speed of over 1500 rpm. When the generator rotates, electricity is generated. Generators can have variable or fixed speed. Variable speed generators generate electricity at different frequencies, which must be corrected to 60 Hz before being fed to the grid. The gears also help prevent the blades from turning.

FAULT DETECTION

Failure is defined as ending an object's ability to complete a function. If the damage occurs inside the wind turbine, e.g. B. Abnormal speed, temperature, voltage, current. It records the consequences of the disturbance and reacts depending on the type of disturbance. To avoid a safety hazard or damage to the main generator, the turbine must be turned off. They are often restarted due to faulty detection of damage which can be caused by noise in the system and hence these errors are not considered a critical issue. In case of severe damage, a visual inspection should be carried out, which may be carried out by the operator or authorized personnel? Finally, in case of serious damage, a report is documented. High and low speed shaft failures are the most common failures in wind turbines. The temperature rises and solar cell death malfunctions mostly occur in the solar panels. In particular, faults in wind turbines and solar panels can be detected by measuring the current.

FEATURES

A hybrid energy system is defined as the integration of several types of energy production equipment such as electric generators, electricity storage systems, and renewable energy sources. The hybrid power system can be used in grid-tied, grid-isolated and special modes.

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CONCLUSION

Fault identification is performed and parameters are measured and the monitored data is analyzed and sent to the computer via UART. The hybrid transmits the location and type of fault to the controller via IoT. The influence of harsh conditions and the large nature of the electromechanical system is the cause of malfunctions in hybrid installations. It is very important to monitor and diagnose faults in the parameters of wind turbines, as well as solar power plants. UART is used for serial communication which offers high data speed and reliability. Hence the design of a UART based remote monitoring and fault diagnosis system. Finally, the system works effectively. Our future work in this project is to notify users of abnormal conditions via automated voice calls.

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