# POWER GENERATION MONITORING USING GSM & IOT TECHNOLOGY

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***Abstract*—** As we talk about the power generation, it is very complicated and huge system. The paper is based on the GSM module which is connected to the microcontroller. The microcontroller is detecting the weather the power generation is ON or defaulted due to some technical reasons (like the steam generation fault or some mechanical faults). After finding generating default of the power generation in the system (current through Ig =0). Then the GSM module communicate with the senior Executive Engineer so that as soon as the possible fault detection and repair takes place and the power generation continues. On the other hand, after the power generation the voltage is step up with the help of the power transformer and the power is to be transmitted. In the addition to that here we will use IOT (internet of things) to control the power generation by the application of android smartphone

***Keywords— IOT controller; GSM module; Power plant; Monitoring System.***

## INTRODUCTION

Maintaining power system operational parameters is very important for the health of the power generating equipment and the utilization equipment the customers and the power plant require continuously monitoring and inspection at the frequent intervals. The timely information about the variation in the parameters like the boiler drum level and the steam temperature can received from various device by using embedded system. If the values of the parameters are increased or decreased than the reference value it will be known by the GSM module.

The GSM module is used to intimate the values of the parameters varied from set values through SMS. In the type of monitoring system if there is a chance of the fault it can come to knowledge before the occurrence of fault. GSM technology is used to intimate the person in charge about the fault occurred. The power plant monitoring system adopted GSM technology and embedded system. This is mainly discussing the hardware and the software of the embedded components used in the system.

It improves the safety and the reliability of the system. The system can monitor from anywhere in the plant and outside of the plant. Over the past twenty years the need for power is increasing rapidly. To overcome this demand many power plants are built of which Thermal power Plants are common. In Power plant continuous monitoring is required for safe operation. By using manual power, we cannot continuously monitor for 24x7. So, some methods are involved for automatic monitoring. Most of the traditional methods used for monitoring have high operating and maintenance cost. In order to overcome this drawback, we are using Arduino (Atmega 2560) for automatic monitoring. In this setup we are giving set point to various parameters such as power. It will automatically monitor all parameters and also, we can monitor view the parameters value such as voltage, current by using display module. If any parameter value reach above the set point value it will automatically intimate to higher authority with that parameter description by using GSM (Global System for Mobile Communication) technology.

## 1. RELATED WORK

In this section we design structure of the system before implementation of circuit. we use advanced microcontroller called Arduino (ATmega8). It has in built with many components like analog to digital converter, clock of 16 MHz, shift registers. In this system we use GSM module and IoT, to use to detect whether the system is working condition (i.e., monitoring power generation) and heart beat into appropriate voltage. This voltage is given to Arduino. According to program it processes the analog signal into digital and send it via SMS to the concerned people as output, if power generation is stop. Regards here we used a display which monitor a electrical parameter, other component which is used in system is inverter and step up transformer to convert DC into AC and step up a voltage respectively.

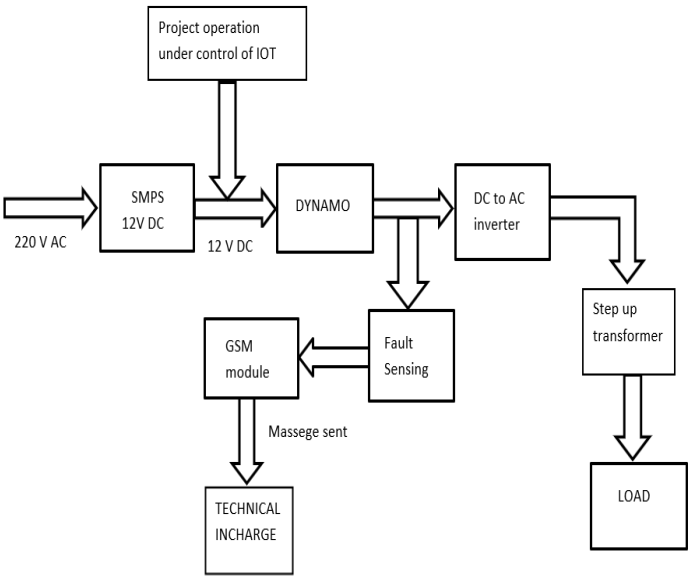


Fig 1: block representation of project work

## 2. POWER FAILURE IN PLANT:

### A. Generator *Failure*

The generator in a wind turbine is responsible for creating the electricity by converting mechanical energy into electrical energy. When the generator fails, no power is produced, costing the wind farm operator valuable revenue. There are several reasons why the generator can fail, including wind loading, weather extremes, and thermal cycling. Mechanical or electrical failure of the bearings, excessive vibration, voltage irregularities, and cooling system failures can lead to excessive heat and fire. Lastly, manufacturing or design faults, improper installation, lubricant contamination, and inadequate electrical insulation can also cause the generator to fail. A comprehensive maintenance and repair program will improve the reliability and longevity of the generator, avoiding costly shutdowns and unexpected repairs.

### *B. Turbine Blade Failure*

As the demand for energy grows, the power industry is finding ways to boost the energy output of turbines. One way to increase energy from turbines is to increase the size of the rotor blades. Larger blades produce more power. Rotor blade arcs are now reaching up to 262 feet or 80 meters. With the sizes of blades increasing, it can put additional pressure on the structure and other components in the turbine. It is estimated that there are 3,800 incidents of blade failure each year. Common flaws to look out for include debonding, joint failure, splitting along fibres, gel coat cracks, and erosion. Contributing factors for blade failure include material or power regulator failure, damage, and poor design. Blade failure is the most common failure in power turbines and can lead to costly repairs and revenue lost from being shut down.

### *C. Gearbox Failure*

While gearboxes are designed to meet the harsh operational conditions, most do not make it past ten years, falling short of their 20-year design lifespan. Each year there are approximately 1,200 gearbox failures. The bearings and gears make up 96 percent of the failing components within the gearbox. Some contributing factors of failure include dirty or water-contaminated lubrication, improper bearing settings, significant temperature fluctuations, improper or infrequent maintenance and servicing, and transient loads leading to sudden accelerations and load-zone reversals. When a gearbox fails, it is a costly incident. The gearbox is 13 percent of the overall cost of the turbine and is an expensive component to replace. Also, during replacement, the turbine will be taken offline for as little as a few days, or it could be up to a couple of months based on the availability of parts. Any time the turbine is not spinning, means it is not generating revenue.

## 3. SYSTEM STRUCTURE:

The system structure mainly consists of Transmitter Section and Receiver Section. Transmitter section mainly consists of Arduino uno, Node McU, Relay Etc. In this system which senses various parameters in Power plant. As the output through these sensors is a physical quantity, they are connected to ADC (Analog to Digital Converter) to convert this analog information to digital format and then this digital information is processed using PIC microcontroller.

The controlling section of this system is of great interest. The entire sensor's data are stored in the processor memory and continuously monitored. If any of the sensor's data exceeds or below its threshold level, it indicates the workers through a display device like PC in work place and through a GSM receiver in remote place which have connections to the microcontroller.

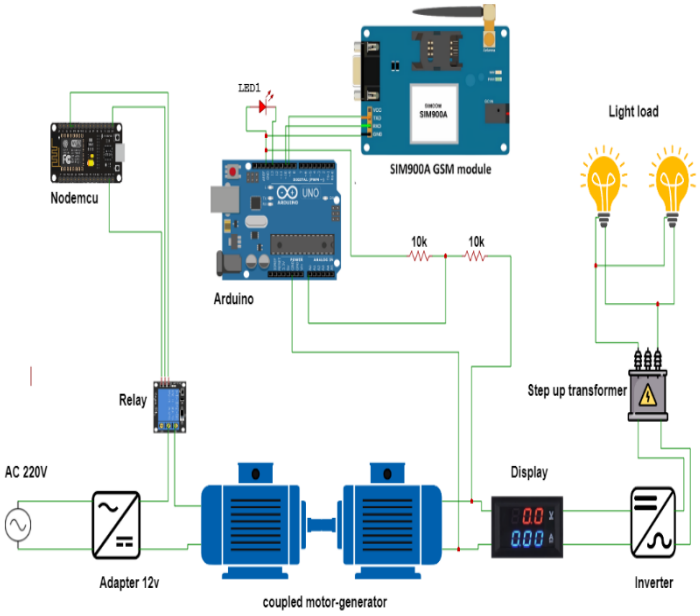


Fig 2: Electronic wiring diagram of System

### *A. Function of GSM:*

digital communication system used for mobile technology is the Global System for Mobile Communication (GSM), which is the most popular standard for mobile phones today. The GSM system transmits the digital information through the atmosphere by conveying the information to an analog waveform. The GSM Receiver is used to receive the digital data in remote area from work place. The digital data contains information about various parameters measured by the sensors in the work place. A GSM transmitter module is used at the transmitter side which is connected to the PIC controller and a GSM receiving module like mobile phone is used to receive the digital information in remote area.

Fig 3: GSM module

### *B. Function of Arduino uno:*

We using Arduino uno as micro-controller to detect the power cut in main power supply. The microcontroller board will need a separate power supply of 9v from a battery to work. instead, you can use any of Arduino board

The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

Fig 4: Arduino Uno

*C. Function of Node MCU:*

The Node MCU (***N***ode ***M***icro***c***ontroller ***U***nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WIFI), and even a modern operating system and SDK. That makes it an excellent choice for the Internet of Things (IoT) projects of all kinds.

Fig 5: Node MCU

There are many types of ESP8266 module available ranging from ESP8266-01 to ESP8266-12. The one that we are using in the tutorial is the ESP8266-12. We already covered ESP8266-01 in our previous article. However, all the ESP modules have only one type of ESP processor, what differs is only the type of breakout bard used. The breakout board of ESP8266-01 will have only 2 GPIO pins whereas ESP-12 has 16 GPIO Pins.

*D. Function of Relay module:*

First is, the current required to activate the relay is much smaller than the current that relay contacts are capable of switching, and second, the coil and the contacts are galvanically isolated, meaning there is no electrical connection between them. This means that the relay can be used to switch mains current through an isolated low voltage digital system like a microcontroller.


Fig 6: Relay Module

E. *DSN VC288 Display:*


Fig 7: DSN VC 288 Display

The Digital Volt Ampere Meter has 5 wires.

1. Red thin wire – Positive for the power for meter
2. Black thin wire – Negative for power to meter

The thin black wire is not *used in most case* if the meter is connected to Charger. It is used to power the meter separately using battery or power supply to make it as Volt / Ampere meter tester.

3. Red thick wire – This is for current measurement. Connected to Positive of Charger and Positive of load (Battery). The Red thin wire of meter can be connected to it to power the meter from same power source (charger).
4. Black thick wire – It is connected to the Negative of Charger.
5. Yellow / Blue / White thick wire – Connected to the Negative of battery.

4. EXPERIMENTAL RESULT:

If the power generation in the system are stops, due to some technical reason then system automatically generate a SMS to the technical in charge (Shown in fig 8) other parameter are also monitored through display module. Regards that, the generation system is under control of the android smartphone by using WIFI module Node McU

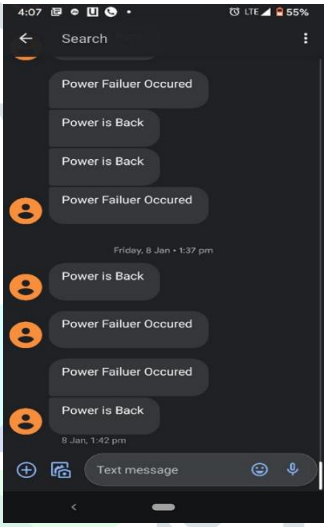


Fig 8: SMS generation in smartphone

5. CONCLUSION:

The hardware and software design of an embedded monitoring system for real time applications is presented in this paper. By using this technology, safety of plant and Efficiency can be increased. The proposed system suggested power generation monitoring using GSM technology is verified with different levels. System can be monitored from anywhere in the plant and outside of the plant like canteen, meeting hall, etc. This proposed system, fault monitoring is implemented in the one of the units. In future we can develop for all the units which is included in generation plant.

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