INTELLIGENT SMART FAULT MONITORING SYSTEM FOR GENERATOR

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ABSTRACT

The electrical power systems are highly non-linear , extremely huge and complex network. On other hand, all the developed countries don't have sufficient supply of power. At such emergencies generators are used for power supply. Our project here monitors all the parameters such as Temperature, Oil level, Humidity of generator and provides details to the authorized person in real time. The acquired parameters are processed and monitored. If there is a abnormality in the process, according to some predefined instructions and values stored on the Raspberry pi system then concerned person is alerted immediately.

Keywords:- *Raspberry pi, Bluetooth module, Temperature sensor, Oil level sensor, Fire sensor, Relay drive circuit.*

1. INTRODUCTION

The use of Generators has become a very common in almost every passive infrastructure companies, Industries, hospitals, Townships etc. while using these Generators a number of challenges are faced by the user such as maintaining the Quality of grid power, asset protections, generator maintenance, capturing real time data, Remotely monitoring of the generator, fuel theft monitoring, Data collection Analysis issues, Human dependency etc. The Generator Monitoring System (GMS) is designed specifically for emergency power generators to monitor engine operations and detect pre-alarms or failures. This insures you of increased generator availability and a rapid response to service problems. The GMS monitors the power generators placed at the remote areas and increases its Efficiency by monitoring the various parameters of generator, Reporting critical Problems minimizes downtime and maximizes availability by sending generator failure messages instantly to you for diagnosis and emergency service dispatch if required. It works on Raspberry pie system, GMS can monitor various parameters such as Temperature, Oil level.. Humidity, Fire resistance capacity of the generator. This system provides ideal solution to the problems caused in situations when a wired connection between a remote appliance/device and the control unit might not be feasible. The project is aimed to analyzing and testing the use of mobile phones to remotely monitor an appliance control system through GSM based wireless communication. Present electric monitoring systems allow optimizing maintenance resources by using information regarding machine operation variables. The aim is to detect faults

evolution in early stages, before the failure forces the system to shut down. There are guidelines for on-line monitoring of large synchronous generators described, which proposed monitoring methods .The condition monitoring provides information for the predictive maintenance or maintenance based on condition. Predictive diagnosis techniques are oriented towards the identification of faults evolution and they are of particular relevance because a fault is very expensive, since daily production costs of a generator of 300 MW is about $1,000,000 USD, without considering the costs associated with its repair.
To provide early warning of potential failures, efforts on the design of monitoring systems to analyze machine operation variable have been carried out.

2. LITERATURE REVIEW

Amit sachen have discussed the user can send commands in the form of SMS messages to read the remote electrical parameters. This system also can automatically send the real time electrical parameters periodically in the form of SMS. This system can be designed to send SMS alerts whenever the Circuit Breaker trips or whenever the Voltage or Current exceeds the predefined limits. This project makes use of an onboard computer which is commonly termed as microcontroller [1].
Mallikarjun proposed this system is a specially designed computer system that is completely encapsulated by the device it controls. The embedded system has specific requirements and performs pre-defined tasks. The diesel generator is used when electricity is not readily available, or when power failures occur due to natural disasters such as typhoons or floods, or during other unexpected crises. The analog type controller cannot be processed precisely due to the distortions and noises coming from the data. In order to increase data accuracy, the controller needs to be digitalized [2]
Vimalraj have described a distribution transformers have a long service life if they are operated under good and rated conditions. However, their life is significantly reduced if they are overloaded, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability. This system provides flexible control of load parameters accurately and also provides effective means for rectification of faults if any abnormality occurs in power lines using SMS through GSM network [3].
Andriy Palamar proposed the system the Cellular phone containing SIM (Subscriber's Identifying Module) card has a specific number through which communication takes place. The mode of communication is wireless and mechanism works on the GSM (Global System for Mobile communication) technology. Here, the communication is made bi- directional where the user transmits and also receives instructions to and from the system in the form of SMS [4].
Kwang Seon Ahn have discussed the Using remote management; you can check operating hours, oil pressure, battery status, coolant temperatures, generated power output, fuel level, GPS position and more. A notification also could be generated whenever a critical level has been reached, such as when a generator has been running more than expected, or when the running hours exceed the service interval [5].
Henrik Arleving proposed system by using a cloud-based remote management solution with a communication gateway can help reduce costs, avoid fuel theft and improve power generator control. It can be difficult to focus on the right actions, simply because there isn't enough information on fuel levels, oil pressure or battery status for each generator. With a cloud-based remote management solution, we can have immediate access to generator parameters via a regular web browser being able to analyse each generator remotely enables you to better understand their health and more efficiently schedule field service visits and Fuel theft can be a significant problem[6].
Chetan Patil have discussed the design of BTS safety and fault management system the measures are taken to rectify these problems. The method makes use of GSM modem which gives the instant message about the each activity happening in the site. The temperature sensors will sense the temperature of the room and if it rises above the threshold value the GSM module will send the message to the master mobile which is already set in the system [7].
Y Jaganmohan Reddy have discussed the model of combination of Photo Voltaic (PV) cell System, Wind turbine system, Fuel cell (FC), and Battery systems for power generation, and to improve power quality they proposing Motor-Generator model instead of using static converters, and an energy management and control unit using Programmable Logic Controller (PLC). This system facilitates improvement in power quality, which ensures continuous and reliable supply to loads. The power transformer is regarded as the heart of any electrical transmission and distribution system. At the output of the generator, they are used for stepping up voltage for transmission[8].

3. PROPOSED SYSTEM

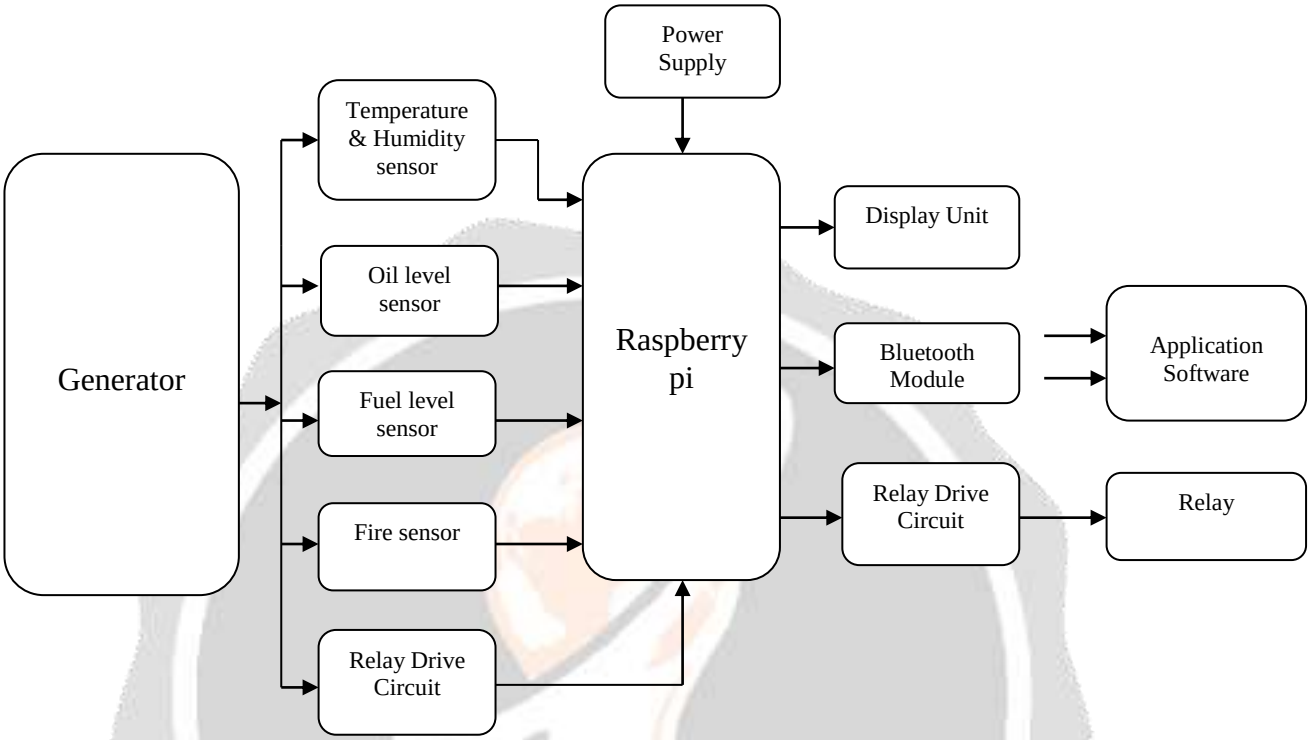

Fig -1: Proposed System

4. WORKING PROCEDURE

4.1 Raspberry Pi:-

The Raspberry Pi 2 delivers six times the processing capacity of previous models. The second generation Raspberry Pi has an upgraded Broadcom BCM2836 processor, which is a powerful ARM Cortex-A7 based quad-core processor that runs at 900 MHz. The board also features an increase in memory capacity to 1Gbyte.

4.2 Temperature & Humidity Sensor :-

The sensor used to measure the temperature and humidity is the DHT11 sensor. This sensor features a temperature & humidity sensor complex with a calibrated digital signal output. It makes use of the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology and ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component and provides a calibrated digital signal output.

4.3 Fire Sensor:-

This fire sensor circuit exploits the temperature sensing property of an ordinary signal diode IN 34 to detect heat from fire. At the moment it sense heat, a loud alarm simulating that of fire brigade will be produced. The circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity. Ordinary signal diodes like IN 34 and OA 71 exhibits this property and the internal resistance of these devices will decrease when temperature rises.

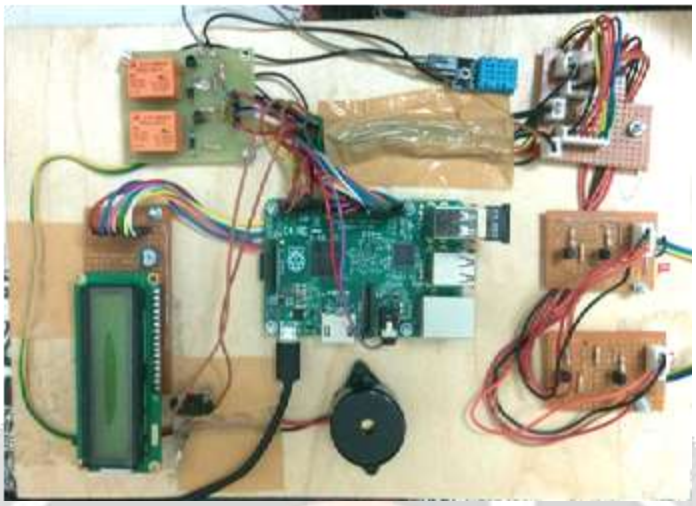

Fig -2: Working System

4.4 Fuel Level Sensor:-

PH606 liquid level sensor measures different kinds of liquid level by utilizing capacitive technology. The fuel level sensor using to monitoring the fuel level of generator. The generator to maintain the level of fuel and an abnormal decrease in content could indicate fuel is being stolen. With a remote monitoring system that supports alarms, a notification is sent immediately when the theft occurs. Even if it's difficult to catch the thieves, you're at least aware of the situation and can schedule a refill to ensure the generators have the fuel needed to operate. In cases where organized theft is common, awareness of the tank's fuel level might help you detect patterns and take action.

4.5 Relay Driver Circuit:-

Relays are components which allow a low-power circuit to switch a relatively high current on and off, or to control signals that must be electrically isolated from the controlling circuit itself. To make a relay operate, we have to pass a suitable pull-in and holding current (DC) through its energizing coil. And generally relay coils are designed to operate from a particular supply voltage, often 12V, in case of many small relays used for electronics work. We have to provide enough base current to turn the transistor on and off.NPN transistor BC547 is used to control a Relay with a 12V coil, operating from a +12V supply. Series base resistor R1 is used to set the base current for transistor, so that the transistor is driven into saturation (fully turned on) when the relay is to be energized. Thus the transistor will have minimal voltage drop, and hence dissipate very little power as well as delivering most of the 12V to the relay coil.

4.6 Bluetooth:-

Bluetooth Smart technology is a wireless communications system intended to replace the cables connecting many types of devices, from mobile phones and headsets to hear monitors and medical equipment. Wireless technology for short-range voice and data communication.

4.7Android App:-

Starting at the bottom is the Linux Kernel. Android uses Linux for its device driver, memory management, process management and networking. Here our app will show the parameters of the circuit such as Temperature, Oil Level, Fuel Level, Humidity and Fire Detection. On detecting malfunction in the parameters of the generator, authorized person can cut off the supply by pressing Emergency button.

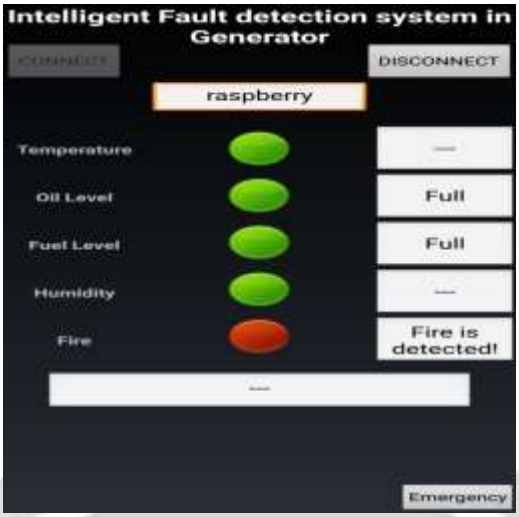

Fig -3: Android App for Monitoring

5. FLOWCHART

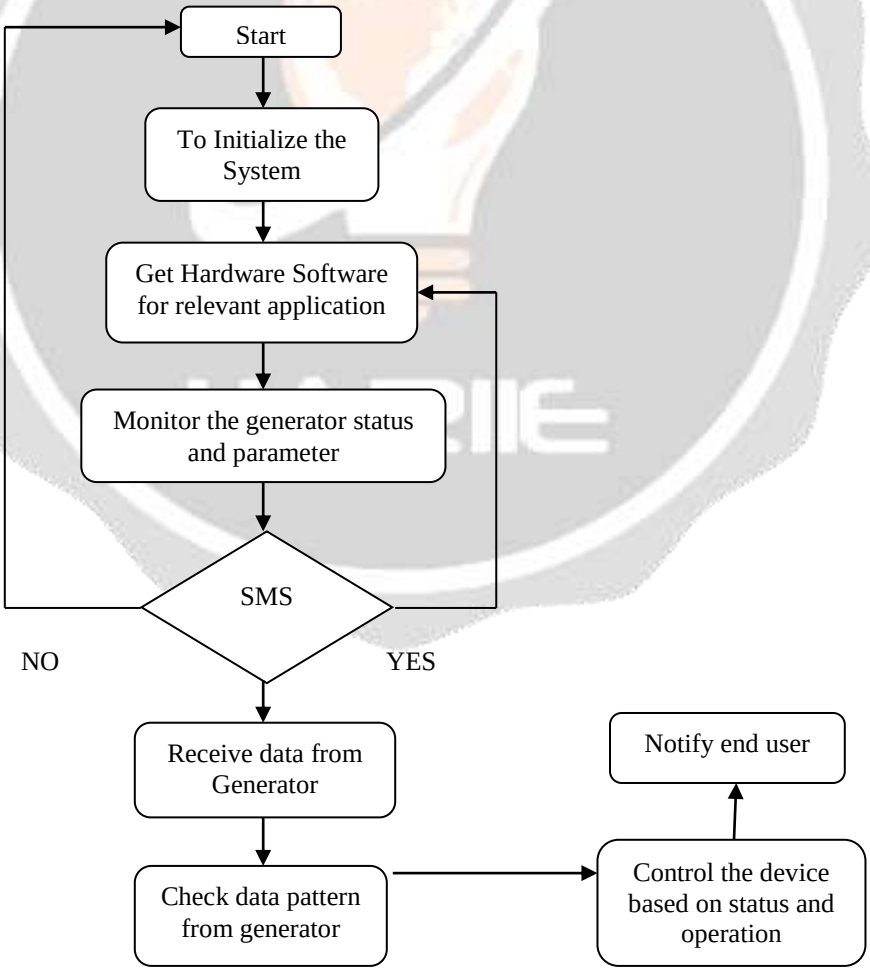

Fig -4: Flowchart

6. CONCLUSION

This project is aimed to provide detecting various parameters such as Oil level, Temperature, Humidity of the generator. By using this system we can provide specific information about generator. By noticing the provided various parameters of the generator we can conclude how long the generator will work. Also using these parameter we can monitor the processing condition of the generator. The project serves as valuable tool for various purposes as different sensors will be used which will be most efficient.

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