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Smart generator monitoring and control system in industry using microcontroller and GSM

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I.ABSTRACT

The electrical power systems are highly non-linear, extremely huge and complex networks. On the other hand, all the developed countries have not sufficient supply of power. This paper focuses the detection of power failure and takesreflex action to solve the problem with help of GSM communication. The power failure will be detect by relay, and itcommunicates to Microcontroller to alerts the authorized person. In addition to that, parameters of Generator like Fuel level Oil level, Temperature, battery status, etc., are monitored and communicated to authorized person. The acquired parameters areprocessed and recorded in the system memory. If there is any abnormality in their process, according to some predefinedinstruction and policies that are stored on the embedded system EEPROM then GSM alerts to concerned person immediately

II.INTRODUCTION

The use of Generators has become a very common inalmost 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 GSM technology, GMS can monitor various parameters such as external power supply, the battery voltage, fuel level, etc. This system provides ideal solution to the problems caused in situations when a wired connection between a remoteappliance/device and the control unit might not be feasible. The project is aimed to analysing and testing the use of mobile phones to remotely monitor an appliance control system through GSM based wireless communication.

III. BLOCK DIAGRAM

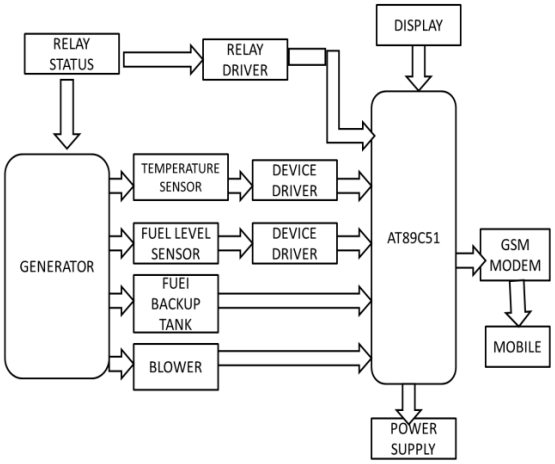

Fig.1 BlockDiagram.

IV.CIRCUIT DIGRAM

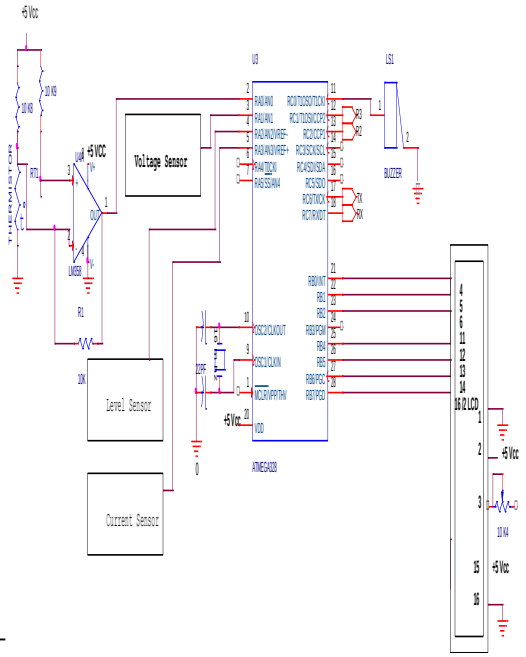

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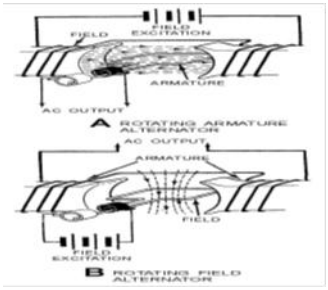
Fig.2 Circuit Diagram.

V.AC GENERATOR



AC generators, generally called alternators, vary greatly in size depending upon the load to which they supply power. For example, the alternators in use at hydroelectric plants, such as Hoover Dam, are tremendous in size, generating thousands of kilowatts at very high voltage levels. Another example is the alternator in atypical automobile, which is very small by comparison. It weighs only a few pounds and produces between 100 and 200 watts of power, usually at a potential of 12 volts.

VI. CONSTRUCTION OF GENERATOR

Regardless of size, all electrical generators, whether dc or ac, depend upon the principle of magnetic induction. An EMF is induced in a coil as a result of a coil cutting through a magnetic field, or a magnetic field cutting through a coil. As long as there is relative motion between a conductor and a magnetic field, a voltage will be induced in the conductor. This part of a generator that produces the magnetic field. That part in which the voltage is induced is called the armature. For relative motion to take place between the conductor and the magnetic field, all generators must have two mechanical parts a rotor and a stator. The ROT or is the part that rotates; the STAT or is the part that remains stationary. In a dc generator, the armature is always the rotor. In alternators, the armature may be either the rotor or stator

VII. ROTATING-ARMATURE ALTERNATORS

The rotating-armature alternator is similar in construction to the dc generator in that the armature rotates in a stationary magnetic field as shown in figure 3, view A. In the dc generator, the EMF generated in the armature windings is converted from ac to dc by means of the commutator. In the alternator, the generated ac is brought to the load unchanged by means of slip rings. The rotating armatureis found only in alternators of low power rating and generally is not used to supply electric power in large

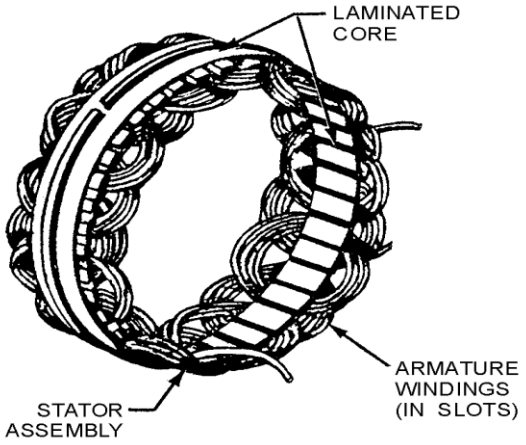


Fig 3. Armature and field winding

VIII.PRACTICAL ALTERNATORS

The alternators described so far in this elementaryin nature; they are seldom used except as examples to aid in understanding practical alternators. The principles of the elementary alternator to the alternators actually in use in the civilian community, as well as aboard Navy ships and aircraft.

IX. FUNCTIONS OF ALTERNATOR COMPONENTS

A typical rotating-field ac generator consists of an alternator and a smaller dc generator built into a single unit. The output of the alternator section supplies alternating voltage to the load. The only purpose for the dc exciter generator is to supply the direct current required to maintain the alternator field. This dc generator is referred to as the exciter.

X.PRIME MOVERS

All generators, large and small, ac and dc, require a source of mechanical power to turn their rotors. This source of mechanical energy is called a prime mover. Prime movers are divided into two classes for generators-high-speed and low-speed. Steam and gas turbines are high-speed prime movers, while internal-combustion engines, water, and electric motors are considered low-speed prime movers. The type of prime mover plays an important part in the design of alternators since the speed at which the rotor is turned determines certain characteristics of alternator construction and operation.

XI.ALTERNATOR ROTORS

There are two types of rotors used in rotating-field alternators. They are called the turbine-driven and salient-pole rotors. As you may have guessed, the turbine-driven rotor is used when the prime mover is a high-speed turbine. The windings in the turbine-driven rotor are arranged to form two or four distinct poles. The windings are firmly embedded in slots to withstand the tremendous centrifugal forces encountered at high speeds.

XII.ALTERNATOR LIMITATIONS

Alternators are rated according to the voltage they are designed to produce and the maximum current they are capable of providing. The maximum current that can be supplied by an alternator depends upon the maximum heating loss that can be sustained in the armature. This heating loss (which is an I^2R power loss) acts to heat the conductors, and if excessive, destroys the insulation. Thus, alternators are rated in terms of this current and in terms of the voltage output the alternator rating in small units is in voltamperes; in large units it is kilovolt-amperes. When an alternator leaves the factory, it is already designed to do a very specific job. The speed at which

it is designed to rotate, the voltage it will produce, the current limits, and other operating characteristics are built in. This information is usually stamped on a nameplate on the case so that the user will know the limitations.

XIII.MICRO CONTROLER

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the industry-standard MCS-51 instruction set in the memory. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

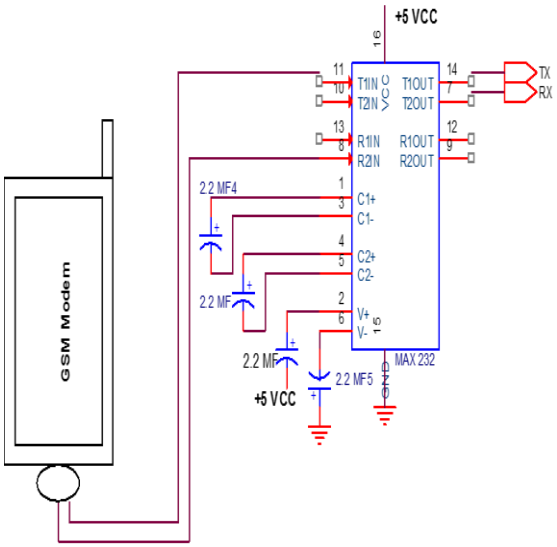


Fig.4 GSM circuit

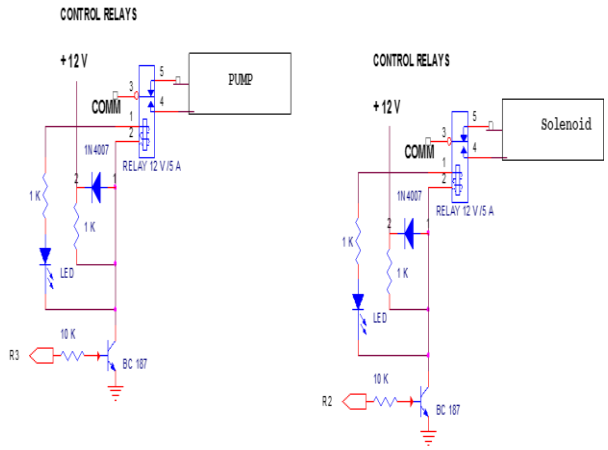


Fig.5 Relay circuit

XIV.FEATURES

Compatible with MCS-51™ Products

• 4K Bytes of In-System Reprogrammable Flash Memory

– Endurance: 1,000 Write/Erase Cycles

• Fully Static Operation: 0 Hz to 24 MHz

• Three-level Program Memory Lock

• 128 x 8-bit Internal RAM

• 32 Programmable I/O Lines

• Two 16-bit Timer/Counters

• Six Interrupt Sources

• Programmable Serial Channel

• Low-power Idle and Power-down Mode

XV.CONCLUSION

The much delineated of this paper is immense in the ever changing technological world. It allows a greater degree of freedom to an individual to way via GSM. In particular the suggested system will be a powerful, flexible and secure tool that will offer this service at any time, and from anywhere with the constraints of the technologies being applied. The embedded controllers are capable of sensing and controlling the various parameter of generator in normal and abnormal condition to this proposed

system provides the immediate solution for catastrophic failure of generator using GSM communication. The embedded controller offers a wide scope of application in the field of remote digital controllers in the diesel generator industry.

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