Gsm Based Controlled Switching Circuit Between Supply Mains and Captive Power Plant

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Abstract

In the present scenario, the requirement of surplus electrical energy in case of power failure is met by generators. In this paper, the remote management of the generator done by a specific SMS with an authenticated mobile phone is elucidated. This system is extremely handy at places where we have to control the switching of the machine but no wired connection to that place is available. To implement this, a GSM modem is connected to a programmed microcontroller. Commands were used for controlling the functionality of GSM modem in both transmitter and receiver design, operating at 900 or 1800MHZ band. The GSM technology also enables the user to know about the various parameters like temperature of the coolant, pressure of lubricant, fuel level, speed of the generator and to control the machine. This system is low cost, secure, ubiquitously accessible, remotely controlled solution for automation of power plant. The extensive capabilities of this system are what make it so interesting.

Index Terms *- Short Message Service (SMS), Global Systems for Mobile Communication (GSM), Radio frequency (RF), Cranking, diesel plant.*

FIELD OF CONTRIVE: This conception relates to a communication system and to a method for remotely regulating and switching of the captive diesel plant.

I. INTRODUCTION

Real-time point-to-point data reporting architecture is useful for remote surveillance and control, if communication network can be convenient to access. In the new age of technology, mobile phone redefines communication. The worldwide trend for wireless communication has elevated into wide band data instead of voice only. Sending written text messages is very popular among mobile phone users. We have used the very concept to control the captive diesel plant from a remote area. Remotely the user can establish effective monitor and control via the mobile phone set by sending commands in the form of SMS. 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.

II. SYSTEM DESCRIPTION

The system has two parts, namely; hardware and software. The hardware architecture consists of a stand-alone embedded system that is based on PIC microcontroller, a GSM handset with GSM Modem and a driver circuit. The GSM modem provides the communication by means of SMS messages. The SMS message consists of commands to be executed. The format of the message is predefined. The SMS message is sent to the GSM modem via the GSM public networks as a text message with a definite predefined format. Once the GSM modem receives negative signal from the EB supply, it sends the SMS to the user consisting of non-availability of power supply, fuel level, temperature of the coolant, etc..

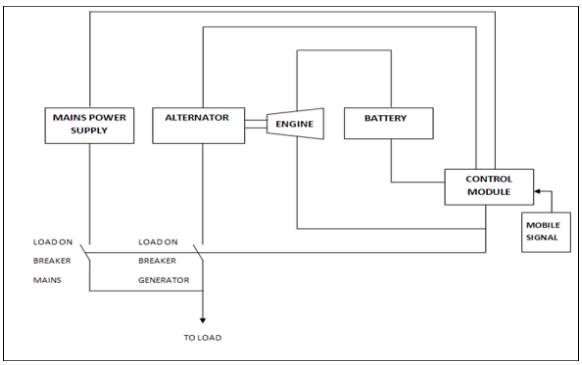

Fig:1.Block Diagram of the System

The user can decide whether to switch the generator on/off and issue the command. Based on the message, the commands sent will be extracted and executed by the microcontroller. In this case, if the EB power supply resumes, again the user is made to know the status of on-site. Even then the user can decide about the switching. If the command is successfully executed, an intimation will be sent to the user. Thus, the communication is made bi-directional. The detailed description of individual modules in the system are as follows.

2.1. CIRCUIT CHANGE-OVER UNIT

This unit adjudicates the take over of the load during switching conditions. The functionality of this unit relies upon the command/control signal received over the SMS via GSM.

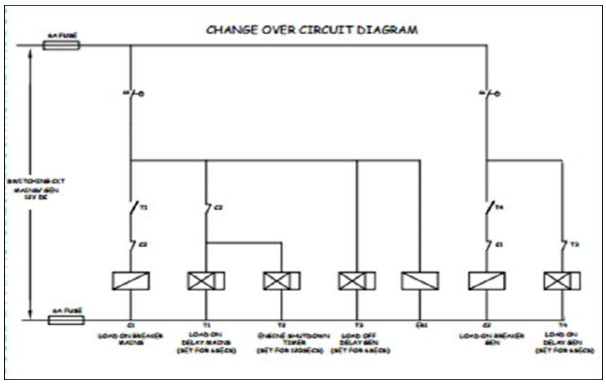

Fig:2. Change over circuit Diagram

To ensure safer switching between the plant and mains supply, the electrical inter-locking amidst the two circuit breakers is needed. It is also to be noted that some time delay will be there as soon as the plant gets switched on for voltage build-up,which is known as a dark time.

2.2. ENGINE CRANKING CONTROL

Whenever the plant has to be initiated, the engine needs to be cranked.i.e., the fuel(diesel) has to be supplied to the generator and the dc supply is to be given to the auxillary contactor resulting in the take over of the load by generator.

2.3.FAULT ISOLATION UNIT

This block is concerned for the safety operation of the system. This unit enables the monitoring of various parameters like fuel level, Lubricant oil pressure, High coolant temperature, Engine over speed, Engine belt failure and Momentary fault. The input from different sensors are feed to micro-controller and processed to operate respective task autonomously. The above mentioned conditions can also be received in the authenticated mobile.

Fig:3.Part of the Control Module

2.4.GSM IMPLEMENTATION

2.5 AUTHENTICATED MOBILE

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.

2.6 GSM TRANSMITTER

This GSM transmitter handset is used to send the status signal regarding the availability of supply, status of the generator, fuel and temperature details to the authenticated end user. While considering the remote area, this transmitter is used to send the control signal to the on-site plant whether to on/off.

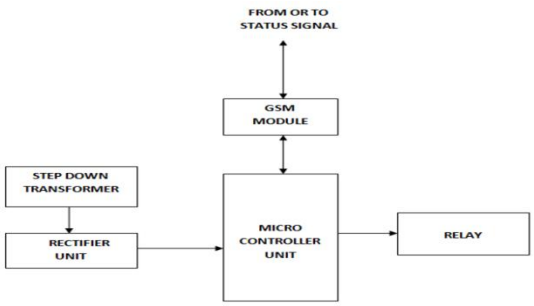

Fig:4. GSM Block Diagram

2.7 GSM RECEIVER

This GSM receiver handset is used to receive the SMS sent by the user and then to transmit an acknowledgement or status to the user's mobile. The receiver handset has to be equipped with a Modem and a valid SIM card. This is the main module of the system. On receipt of the SMS message, text words are checked with predetermined format which includes desired device ON/OFF commands. The microcontroller then processes the command and sends the appropriate controlling signal to the switching module.

Fig:5.Gsm Technology

III. TECHNOLOGY CONSIDERATIONS

The considerations for this system are:

[1] Cellular Networks: The widely available networks are based on GSM. This network provides wide area coverage and can be utilized more cost-effective. In addition the power of the GSM mobiles is closely controlled so that the battery of the mobile is conserved, and also the levels of interference are reduced and performance of the base station is not compromised by high power local mobiles.

[2] Communication Protocols: The available communication protocol that we have used is SMS. The SMS is the most efficient because this project requires a cellular communication and limited data to be sent. SMS Messages can be sent and read at any time. SMS Message can be sent to an offline Mobile Phone.

[3] I/O interfaces between microcontroller and devices: Serial I/O is considered as options for connection between the GSM receiver and the microcontroller. Using the microcontroller, a control circuit will be implemented to control the electrical appliances.

[4] Choice of controllers: The PIC micro controller is being used because it is popular with both industrial developers and educationalists due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability. The Harvard architecture of PIC in which instructions and data come from separate sources—simplifies timing and microcircuit design greatly, and this benefits clock speed, price, and power consumption.

IV. ALGORITHM

Once the GSM modem is initiated, the status signal of the EB mains supply is continuously monitored by sensing unit present in the control module. If the EB supply is found to be healthy, then the load is being supplied by the mains supply. In case of weaker EB supply, the status signal is sent to the user that there is no power supply from Electricity Board. If the necessity for the user regarding power requirement arises, then, at that instant, the authenticated user sends message to switch on the generator set

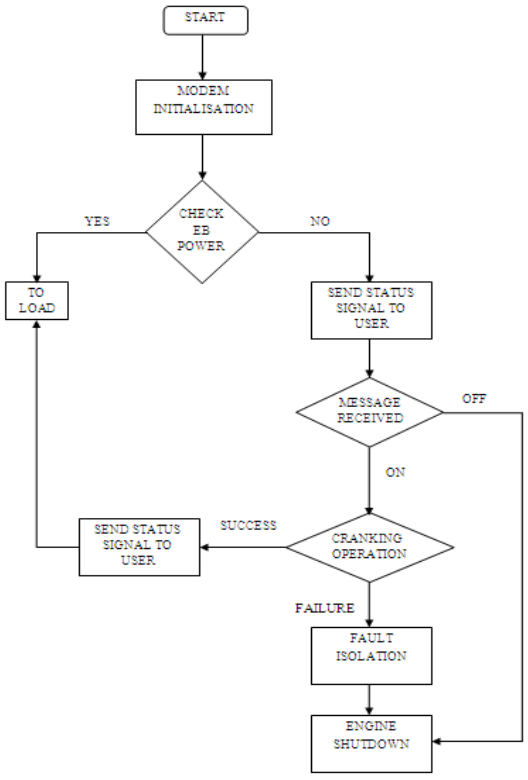

Fig:6. System Operation Flow Diagram

. After the reception of the required message, control goes to the cranking unit initiating the cranking operation. The cranking process enables the engine to start so as the generator starts generating the power. The success of the cranking operation results in sending message regarding the status signal to the user and hence the load is taken-over by the generator.

If the cranking process fails, the control goes to the fault isolation circuit. In this circuit, based upon the varioustypes of faults the corresponding relays are closed. Once the faults are resolved the fuel pump of the generator is opened and cranking process initiates, as a result of which the load is undertaken by the generator. In case of not clearing the faults in the respective unit, the engine gets shutdown. If the mains supply resumes, the user receives the status signal accordingly and hence the user sends message to the control module to switch-off the generator. As the control module receives the off signal, the generator breaker is switched to mains breaker. Hence the load is taken over by the EB supply.

V. ASSUMPTIONS

Certain assumptions have to be made in order to implement our project. The list of assumptions for our project is:

- The user and control unit will establish communication via GSM
- The cell phone and service provider chosen will support text messaging service.
- The user is familiar with the text messaging program on their cell phone.
- All service charges (standard messaging rates) from the service provider apply.
- The controlled appliances can and will have to have an electrical interface in order to be controlled by the microcontroller.

VI. EXPECTED OUTPUT

The outcome of the system would be bidirectional reception of signals to the authenticated mobile and control module to control the generator in switching. Also monitoring of the diesel generator can be done by notifications sent to the user about the various parameters like temperature of the coolant, pressure of lubricant, fuel level, speed of the generator through GSM technology. Such monitoring ensures the proper functioning of generator

VII. ENHANCEMENT

- This system is a small implication of our concept in automating and monitoring a system.
- The future implications of the project are very great considering the amount of time and resources it saves.
- The project we have undertaken can be used as a reference or as a base for realizing a scheme to be implemented in other projects.
- Our project is been made with an idea, which gives the first level of approach for the automation.

VIII. LIMITATIONS

The proposed idea has certain limitations and a list of such is mentioned below:

- The receiver must reside in a location where a signal with sufficient strength can be received from a cellular phone network.
- Operation of the controlling unit is only possible through a cell phone with SMS messaging capabilities.
- The Controlling unit must be able to receive and decode SMS messages.

IX. CONCLUSION

The hunch delineated in this paper is immense in the ever changing technological world. It allows a greater degree of freedom to an individual to sway 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. However, the GSM system pose some potential threats. But the suggested system can be used as a reference or as a base for realizing a scheme to be implemented in other projects of greater level. Further it is hoped that it will serve as a basis for further study of industrial power management strategies. The end product will have a simplistic design making it easier for the users to interact with.

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