DIESEL GENERATOR MONITORING PANEL

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I.   ABSTRACT

Electricity is an essential commodity in our day to day life; electricity forms the basics of any developing country or a developed country. Electricity is required in Domestic, industrial and commercial purposes. Thus, electricity is very important. Failure in electricity supply or interruption in the supply has much adverse effect on Electrical equipments and control system.

The purpose of our project is to design and build a system that is called "DIESEL GENERATOR MONITORING PANEL".

Generator control System which can automatically allow switching from Mains power supply to a generator as backup power supply.

Here we are using IOT based interface for control action. The design is realized using major components like a step down transformer (220V-12V dc), microcontroller, rectifiers, voltage regulators, timers, relays, circuit breaker and others like resistors, diodes, and capacitors. The device automatically switches from mains to an auxiliary whenever there is an outage in the supply. This device also detects the main power supply when available and switches from auxiliary power supply to the mains with switching off the generator. The device has been constructed successfully, and it demonstrated a tendency to automatically switch from mains to the auxiliary source and vice-versa.

II.   INTRODUCTION

Power outage in general does not promote development to public and private sector. The investors do not feel secure to come into a country with constant or frequent power outage. These limit the development of industries. In addition there are processes that cannot be interrupted because of their importance, for instance surgery operation in hospitals, bank transactions and lots more.

An automatic change over switch can be entertained to allow smooth and fairly uninterrupted supply of electricity for operation and services that require no discontinuity in electricity supply. This is achieved by the use of integrated circuits that have timing abilities and relays to effect switching. Power supply instability in developing countries creates a need for automation of electrical power generation or alternative sources to back up the utility supply. This automation becomes predominantly high. Most industries and commercial processes are partly dependent on generators and public power supply. Therefore, if the processes of power changeover between these two power supplying sources are manual, human error during change over connections may occur; leading to machine damage, electric shock electrocution as well as increased down time consequently introducing massive losses. Electricity plays a major role in economic development of a nation, and this forms the basis of this study, with interests in human, infrastructural and economic development.

In most developing and undeveloped parts of the world, the supply of electricity for industrial, commercial and domestic use is highly unstable. This gives rise to the frequent use of alternative of power supply to meet up with the energy demands. Of all the existing types of changeover switch, the

most populous changeover is the manual change over which consists of a manual change over switch box, switch gear and cut-out fuse or the connector fuse. This change over switch box separates the source between the generator and public supply, as the contact is manually switched from mains terminal to the generator terminal and vice versa. Many challenges are experienced in this manual changeover as it requires lots of human activities in its operation. Electric shock can occur during the switching due to electric wire contact with the device metal casing as a result of crack in the ceramic insulator in the switch. This has led to several deaths and damage to electrical appliances also stipulates one of the disadvantages as wear and tear of some mechanical parts due to frequent movement from one source to the other. Electrical changeover switch is another type of changeover switch, which involves the use of electrochemical type relays, contactors, voltage monitoring relays and delay timer relays as main components of the device.

The device is cheap and the construction is easy, but associated with noise in switching of relays, leading to wear and tear, loss of reliability, and thereby making the device to be prone to failures. The electronic change over switch has proven to be a better device compared to both the manual and electrical changeover switch as it gives no noise, eliminates wear and tear, reduces damages to lives, and maintains high quality of service as it provide quick response for the interchanging of power to the load automatically from the main supply to the generator and vice versa. The electronic changeover device employed in this research work changes over immediately when the public mains are out. However, the generator starter/off has a periodic delay to start/off the generator. This requires the generator to have a kick starter and off facility, and a battery in good condition. We

present the construction of a single phase power changeover switch that switches power supply from public mains supply to an auxiliary source (ac generator) and vice versa.
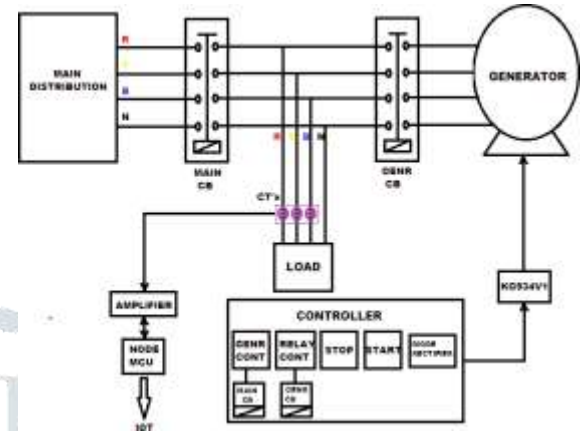
III. CIRCUIT DIAGRAM

Fig. 1.Circuit Diagram

The proposed system consists of a controller indicating the three phases of the supply mains, measures the D.G parameter and indicates the type of fault occurring in the supply mains. An IOT module is incorporated, which displays the generator parameters from a distance and it enable the controller with necessary commands. Wi-Fi module is the wireless connection of the local area network, which is less secure than the wired connections.

Node Microcontroller (ESP8266) is used in the proposed system which is programmed in embedded-C language. The LED indicator blinks when any of the phases of the supply goes off. The voltage and current of the mains is continuously measured. If it goes beyond the pre-defined cut-off values of the current and voltage, as programmed in the microcontroller, the microcontroller sends signal to the relay to shift the load to the diesel generator. The auxiliary battery provides power to the load up to when the D.G acquires rated speed. If the D.G runs abnormally, the load is removed from the D.G and thus the load is protected. The LCD

displays the current and voltage of the supply mains. The Wi-Fi module transfers the parameters regarding the D.G and controller to remote wireless devices like Mobile phones, laptops etc. Microcontroller ESP8266 is used to transfer the information about the parameters (voltage and current) of D.G set to the LCD. The module passes the information to the microcontroller and the LCD which displays parameters and the microcontroller transmits the information to the IOT module, which can be obtained from a distance through a laptop or a mobile phone. The voltage and current sensing network of the supply mains and the D.G is connected to the microcontroller ESP8266. If the supply mains is on, the supply voltage and current is measured by the voltage and current sensing network and through the microcontroller, the readings are displayed. On the other hand, if the mains supply is off, that is when the power goes off, the voltage and current of the mains will be zero. When such a situation arises, the microcontroller is programmed in such a way that the relay will disconnect the supply mains and the load, and the generator and the load will get connected. The relay driver is an amplifier which will drive all the relays used in the whole mechanism. There will always be a time lag between the time when the generator attains the rated speed and the time when the generator is made on. The power demand for the load can be supplied by the generator only when it attains rated speed and this interrupts the continuous power supply to the load. The provision of an auxiliary battery, which is attached next to the relay, solves this problem. Whenever the supply goes off, the relay switches and the auxiliary battery will get connected to the load. The battery will get disconnected only when the D.G attains rated speed. The time taken by the D.G to attain rated speed

is noted and the microcontroller is programmed.

Table 1: Represents The Summary Of The Operational Evaluation Of the Circuit

SL NO.	MAINS CONTACTOR	GENR. CONTACTOR	MAINS INDICATOR	GENR. INDICATOR	SW
1	ON	OFF	ON	OFF	ON
2	OFF	ON	OFF	ON	ON
3	ON	OFF	ON	OFF	OF
4	OFF	OFF	OFF	OFF	OF

IV.　OBSERVATION

1. Mains is available and it supplies power to the load
2. Mains is out, and the generator starts which supply power to the load
3. Mains is available and it supplies power to the load
4. Mains are out. The alternative source is out because the switch is reset to OFF mode. Hence, no power is supplied to the load

V.　CONCLUSION

It is capable of fault identification in the supply mains, conserving energy and can be controlled from a distance, since a Wi-Fi module is incorporated. The proposed idea can be modeled as hardware to carry out the demonstrations. Hardware modeling will be helpful in order to validate the results completely.
The proposed idea solves the disadvantages of the present system and moreover it is an innovative concept in the field of energy conservation. The proposed system is unavoidable in the present era having crucial energy crisis. The evaluation of the device indicates very good performance as it switches signal from mains power supply to generator automatically and vice-versa when necessary within fraction of seconds without human intervention. It saves energy consumption, reduces power interruption to the minimum and saves time.

VI.　REFERENCES

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