Fault Acknowledgement System for UPS using GSM

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Abstract- An uninterruptible power supply, commonly called a UPS is a device that has the ability to convert and control direct current (DC) energy to alternating current (AC) energy. It uses a conventional battery of 12V rating as the input source and by the action of the inverter circuitry, it produces an alternating voltage which is sent to the load. This particular UPS is designed for a small scale load like a personal computer and hence only a basic power rate is generated by the UPS. Standard Untint eruptible Power Supply (UPS) systems are connected in series between the ac mains and the critical load. A phase controlled rectifier feeds a battery-supported dc bus and an inverter supplies the load. These systems require two conversion stages. Input power factor is poor and large harmonic currents are injected into the ac mains. The proposed model will acknowledges the person from upcoming faults and suggest its remedy via SMS. If possible apply the remedy steps and avoid the fault.

Index Terms- UPS, GSM, Controller atmega8, Fault Circuit.

I. INTRODUCTION

The industrial processes expansion become very complex the electronic systems. The costs of not planned stops are so high that a project for fault detection and fault isolation has been very important. The advances in the Information Technologies allow that one people through a mobile phone has instantaneous access to an information in practically any place of the world. This work proposes the development of a system that reduces the time where an UPS system it is remained in the period after-faults until the maintenance. In this period, depending on the fault, part of the components still is in full operation, however, if to keep them thus for a long time will be compromise all system. The developed device analyzes the behavior of the equipment and detects some types of faults. After that it transmits through one GSM link the detected fault.

II. REVIEW STAGE

In an electronics area. Firstly K. Debebe, V. Rajagopalan, T.S. Sankar proposes the use of rules based on intelligent systems to fault diagnosis in voltage-fed inverters. Through a database a mechanism makes the supposition of the system conditions, beyond the status of the protection circuit.In D. Kastha, B. K. Bose the authors had made a methodical investigation of faults modes of voltage-fed Inverter system for induction motor drives. Through this study it is possible to determine components

Problems in the steady state and to contribute for the improvement of protection systems projects.

Another work using a data-base model was considered by R. Peuget, S. Courtine, J. Rognon. This study was based on the current vectors trajectories analysis and instantaneous frequencies during the PWM (Pulse Width Modulation) inverters faults. The fault definition was established in, like "a defect in a point or region in a circuit or component". Considering this, is possible to propose for the work definition two fault categories.

The first one where the fault leaves the equipment or device is not operate, and another one where the equipment continues operating, in inadequate form, supplying the loads. No plant stops in production systems can results of unnecessary costs, besides involving lives or important information. In hospitals or datacenters the use of UPS is essential. In this paper observe different types of fault without disturbing the UPS. An uninterruptible power supply, also uninterruptible power source, UPS or battery/flywheel backup, is an electrical apparatus that provides emergency power to a load when the input power source, typically the utility mains, fails. A UPS differs from an auxiliary or emergency power system or standby generator in that it will provide instantaneous or near instantaneous protection from input power interruptions by means of one or more attached batteries and associated electronic circuitry for low power users, and or by means of diesel generators and flywheels for high power users. The on battery runtime of most uninterruptible power sources is relatively short 5–15 minutes being typical for smaller units but sufficient to allow time to bring an auxiliary power source on line, or to properly shut down the protected equipment.

The offline / standby UPS (SPS) offers only the most basic features, providing surge protection and battery backup. The protected equipment is normally connected directly to incoming utility power. When the incoming voltage falls below a predetermined level the SPS turns on its internal DC-AC inverter circuitry, which is powered from an internal storage battery. The SPS then mechanically switches the connected equipment on to its DC-AC inverter output Frequency instability: defined as temporary changes in the mains frequency. Harmonic distortion: defined as a departure from the ideal sinusoidal waveform expected on the line. Fig-1 Offline / standby UPS

Uninterruptible power supplies (UPSS) are used to supply clean and uninterrupted power to critical loads, such as computers, communication systems, and medical support systems, etc. As such sensitive equipment is used worldwide, their interruption due to a power failure may lead to critical ac-accidents. The UPS system is indispensable for this reason as in.

According to maintainability is the quantity mean time to repair (MTTR) that is required in viability analysis. Viability is a concept used in the architecture and engineering of digital UPS measure of a system's capability performance and reliability.

In practice and in theory, a system that cannot fail is unachievable. So therefore, it is obvious that every UPS can and will eventual fail. Hence, it remains to consider the manner and effect of those failures and the cost of minimizing them. In this paper, we identified the various manner failure occurred in UPS over five year period and the effects of those failures on MTTR.

Units
Voltage =Volts
   Current = I
Temperature= Degree C/ F

UPS works on voltage/current every electronic equipment bias with certain voltage with rated current. Every component dissipate some amount of heat in after biasing. This heat is sometime normal or sometime make an abnormal change in semiconductor properties, this results in system failure.

III. SYSTEM DEVELOPMENT

Working of UPS fault detection:
This is the circuit diagram of a simple UPS that can deliver 12V unregulated and 5V regulated DC. The transformer T1 steps down the mains voltage to 12V AC and then the bridge B1 rectifies it. The rectified signal is smoothed by the capacitor C1.When the mains supply is available the battery will be charged via diode D3 and the regulator IC gets supply via diode D5. 12V and 5V DC will be available at the output terminals. When mains supply is not available the battery supplies current to the regulator IC and to the 12V DC terminal through diode D4.Also, the diode D3 blocks reverse flow of current during battery mode. Capacitors C2 and C3 acts as filte++++rs.

UPS
It works on the principle of switching ie when there is an A.C power then directly feed to load. Otherwise using inverter circuit feed form battery ie 12V DC power. Initially inverters are fabricated and sold out in market but it has certain drawback. Such as
1) *Startup time is more*
Switching time is more
Not reliable
Battery drain is more

In UPS this drawbacks are avoided i) Switching time is fastest Ie 3Usec ii) No startup time requires MOSFET and fast switching devices are used as a switch in system.
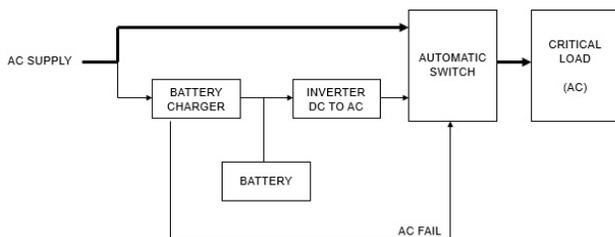

Fig 1: Block diagram of line UPS

Line interactive advantages:
Ac to dc converter / battery charger does not have to provide full load power (potentially cheaper)
Less stress on dc to ac inverter since it runs at no load until ups switches to battery power (potentially cheaper)
On-line advantages:
Zero switchover time from main line to battery power
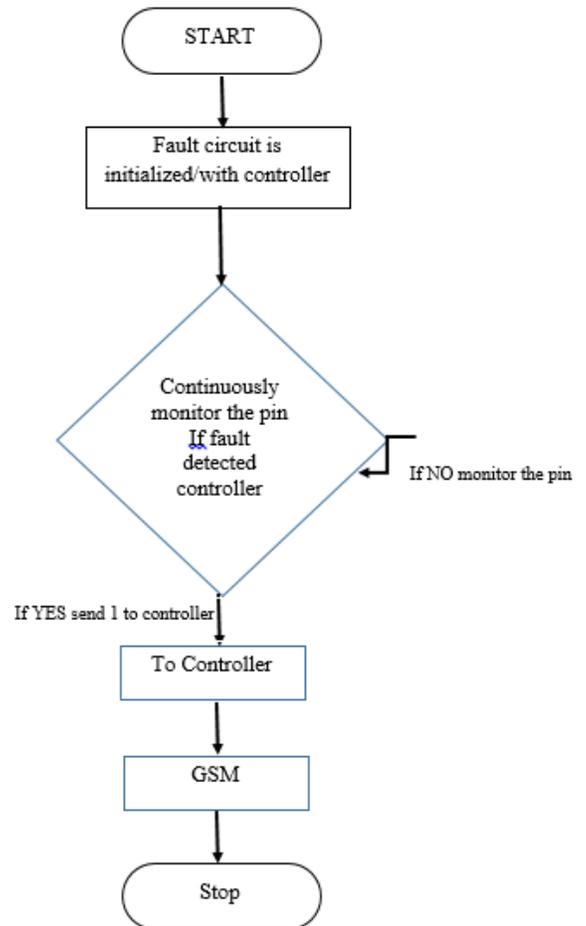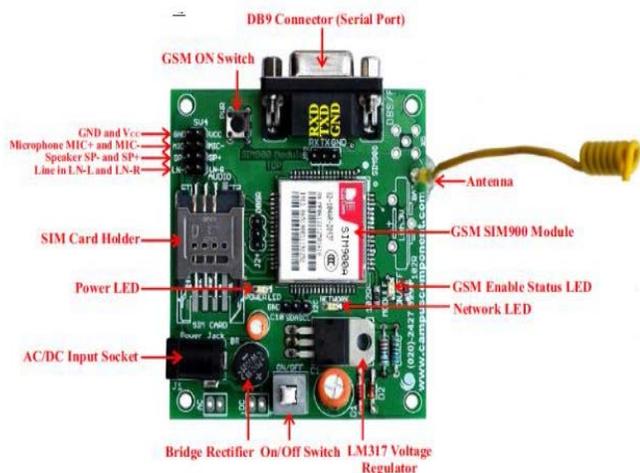Always isolated from power disturbances on the main line

Fig: Flowchart of our proposed system

WORKING OF GSM MODULE IN UPS CIRCUIT:

Fig 1: SIM Module

SIMCom SIM900A GSM Module:

This is actual SIM900 GSM module which is manufactured by SIMCom. Designed for global market, SIM900 is a quad-band GSM/GPRS engine that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. SIM900 features GPRS multislot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS- 4. With a tiny configuration of 24mm x 24mm x 3mm, SIM900 can meet almost all the space requirements in User's applications, such as M2M, smart phone, PDA and other mobile devices. We use GSM module over here for the purpose of receiving and transmitting the SMS.

Abbreviations and Acronyms
The abbreviation is as follows:
1>UPS- uninterruptible power supply
2>GSM-global system of mobile for all
3>SMS-short message service.
4>SIM-subscriber identity module
 This are some of abbreviations involved in paper

Equations
As comparator is being used in circuit. Initially comparator compares the quantity with reference quantity and gives out result. For instant if voltage is being compared with reference voltage, then output is taken and change in voltage is take as a fault

$$V_o = \begin{cases} 1, & \text{if } V_+ > V_- \\ 0, & \text{if } V_+ < V_- \end{cases}$$

a comparator is a device that compares two voltages or currents and outputs a digital signal indicating which is larger. It has two analog input terminals and one binary digital output. The output is ideally a comparator consists of a specialized high-gain differential amplifier. They are commonly used in devices that measure and digitize analog signals, such as analog-to-digital converters (ADCs), as well as relaxation oscillators.

Other Recommendations
Fault monitoring system of UPS acknowledges the person and distributes against the upcoming faults. The monitoring circuit sends SMS to user as well as dealer of UPS system.

If possible take some preventive measures to avoid that fault. For instant if temperature of system is increases the monitoring system sends SMS if preventive measures is not taken then it will switch on the integrated fan installed in the system.

 If voltage is varying then system is adjust itself up to certain level then it will massage to switch off the UPS system.

IV. SOME COMMON MISTAKES

The acknowledge systems are made earlier has not efficient mechanism. It will acknowledge the person after total system failure, this cause delay in online backup and installation of other system. Our proposed system will prevent the system as well it not only acknowledges the occurring faults but also takes some preventive measures to avoid it.

UPS is temperature and current sensitive device as temperature increases the semiconductor devices behavior changes result in system failure.
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3.1) Advantages
1) remote monitoring of UPS system is possible.
2) Easy to detect the faults
3) Reliable system
4) Easy to maintain the battery and other system
5) Due to battery monitoring system it is easy to maintain battery periodically without any assistance of service engineering.
6) More frequent faults are avoided.
7) It reduce the labor charge and transportation as well

3.2) Disadvantage

1) GSM based system requires connectivity.
2) Any unit can send fault acknowledgement only
3) Remedies can be send but consumer have particular know how to attend the massage
4) It is difficult to store any signal ie fault signal

3.3) Application
1) Desktop computers
2) Health monitoring units
3) Data centers
4) File servers of bank
5) Multi-computing system

 3.3) Conclusion
The proposed circuit provides the low cost solution for fault finding and its temporary solution to customers via GSM. But as all know electronics is not easy some fault are not in our hand and not easy to handle. Our proposed circuit can bale to detect the fault but not able for recovery

We are trying to update our system as per requirement after certain successful projects. Will able us to build real time and smart electronic device. The system is universal and can be applicable to any device where current and voltages are used / applied. This system can be applicable for verity of other uses and having more advantageous to, because "prevention is better than cure".

REFERENCES

[1] "Review Paper on Fault Detection for
UPS System Using GSM"by Anuradha.G.Deshmukh, Anuja B.Diggikar IJCSMC, Vol. 2, Issue. 12, December 2013, pg.344 – 349

[2] D. Kastha, B. K. Bose, "Investigation of Fault Modes of Voltage-Fed Inverter System for Induction Motor Drive", IEEE Transactions on Industry Applications, vol. 30, n. 4, p. 1028-1038, July/August 1994.

[3] K. Debebe, V. Rajagopalan, T.S. Sankar, "Expert Systems for Fault Diagnosis of VSI AC Drives", IEEE Industry Applications Society Annual Meeting, vol. 1, p. 368-373, 1991.

J. Breckling, Ed., The Analysis of Directional Time Series: Applications to Wind Speed and Direction, ser. Lecture Notes in

Statistics. Berlin, Germany: Springer, 1989, vol. 61.

[4] IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 56, NO. 6, JUNE 2009 1875

[5] S. Gibilisco, The Illustrated Dictionary of Electronics, 8.ed. [s.l.] : McGraw-Hill, 2001.

[6] Design of automatic weather station based on GSM module Author(s) Xingang Guo Dept. of Electron. & Inf. Eng., ChangChun Univ. of Technol., Changchun, China Yu Song IV. Published in: Computer, Mechatronics, Control and Electronic Engineering (CMCE), 2010 International Conference on (Volume:5) Date of Conference: 24-26 Aug. 2010

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Successfully completed the project on fault acknowledgement system for UPS via GSM. In our research we have developed the system which will able to detect the temperature faults, overcurrent and over voltage faults at input side as well as at output side.