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 until the maintenance. In this period, depending on the time where an UPS system it is remained in the period after-faults 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.

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.

Another work using a data-base model was considered by R. Peugeot, 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 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 smoothen 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 filters.

UPS

It works on the principle of switching i.e. when there is an A.C power then directly feed to load. Otherwise using inverter circuit feed form battery i.e 12V DC power. Initially inverters are fabricated and sold out in market but it has certain drawback. Such as

1) Startup time is more
2) Switching time is more
3) Not reliable
4) Battery drain is more

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

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

Fig 1: Block diagram of line UPS
WORKING OF GSM MODULE IN UPS CIRCUIT:

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

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

...
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 variety of other uses and having more advantageous to, because “prevention is better than cure”.

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Aniruddha A Dekate student studying in B.E final year at Amaravti University, Akola, India. 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.