

Cell Phone Tower Management and Base Station Safety using GSM Technology

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ABSTRACT

In mobile communication base transceiver station plays important role. Each mobile communication base station consist of different units like power generation and distribution unit, air conditioning unit, diesel generator unit, power back up unit. In present day scenario some problem are being faced in maintenance of this unit. The major problem is fluctuation of site temperature, theft of equipment, theft of fuel, fuel amount present in fuel tank being unnoticed. The project mainly focuses to solve these problems.

The recent analysis conducted by the manufacturer and network operator state that the energy required by the base stations should be 24*7 and this amount of energy requirement is very high. Each tower incorporates power generation and distribution unit which consist of battery unit, diesel generator unit. The growing awareness about energy saving, forces the engineer to develop green and eco friendly base station. The goal of developing power efficient base station is to develop energy from renewable resources such as wind, sun, etc and manage them. The same is discussed further in detail.

Key Words: Base Transceiver station, Green Base Station, Power Saving in Base Station

INTRODUCTION

In today's world, mobile or cell phone plays very important role in communication. A transceiver station called as cell site is present in every cell for transmission and reception of signal. Cell phone tower is installed to increase the network coverage of the GSM mobile network provider. Height of this tower is mainly in between 50 feet to 200 feet. At the base of this cell phone tower there is a processing unit which processes the signal. This unit is also called as "CELL SITE" or "BASE TRANSMITTER STATION".

A typical cell site consist of various units including power generation and distribution unit, air conditioning unit, diesel generator unit, and power back up unit. This different unit of cell site requires frequently maintenance. For some of the base stations, maintenance is required on a daily basis or weekly basis. This maintenance is quite expensive. The aim of our project is to design such a system which monitors and controls

various alarms at mobile cell site, reduce the maintenance cost and ensures the safety of the unit which is at the base of cell site. The main motive is to monitor various threats associate with base station like fire detection, unauthorized persons entry detection, fuel available in backup tank.

Along with the maintenance cost, Power management of base station is also costly. According to survey conducted, there are about five million cell phone towers worldwide, 640,000 of which are not connected to an electrical grid so this power requirement is fulfilled using generator. One study estimated that 75,000 new off-grid towers would be established in 2012 alone. The Indian telecom industry consumed an estimated 3.2 billion liters of diesel in 2011,[6] which means that huge amount of CO2 emission and hence collapsing of ecological balance. The CO2 emission per subscriber per year for base station and mobile handset is about 10.7 kg and 13.3 kg per year respectively [3]. Hence our project is to manage the

maximum power to base station is from eco friendly energy.

SCENARIOS:

The cell phone towers which are installed at remote location for providing the network coverage to cellular telephone user, in such kind of situation there are chances of getting thief of the costly and important material which plays important role in telecommunication is more. And the cell phone tower base station which is not connected to electrical grid, at such base station the hybrid power system [4] installed in which power is generated and managed, so third eye must be there on this system to get all information related to the power and timing of the power generated by the generator and hence fuel required by generator for generating power.

PROPOSED IMPLEMENTATION:

By making use of the sensor such as passive infrared sensor, radio frequency identification card system, etc, buzzer or alarm system we can provide a security and as well as by making use of real time clock for counting the operating time of generator the thieving of diesel can be prevented.

1. CELL PHONE TOWER POWER MANAGEMENT:

Cell phone tower base station is the most energy intensive part of a mobile tower network. Saving power in base station is therefore the primary focus. The main goal of designing the eco friendly base station is by means of using renewable energy sources for base station.

Current Scenario-

- 1) There are five million mobile towers worldwide.
- 2) More than six lakh towers are not connected to electrical grid.
- 3) Every generator consumes twenty eight liters of fuel for generating energy.

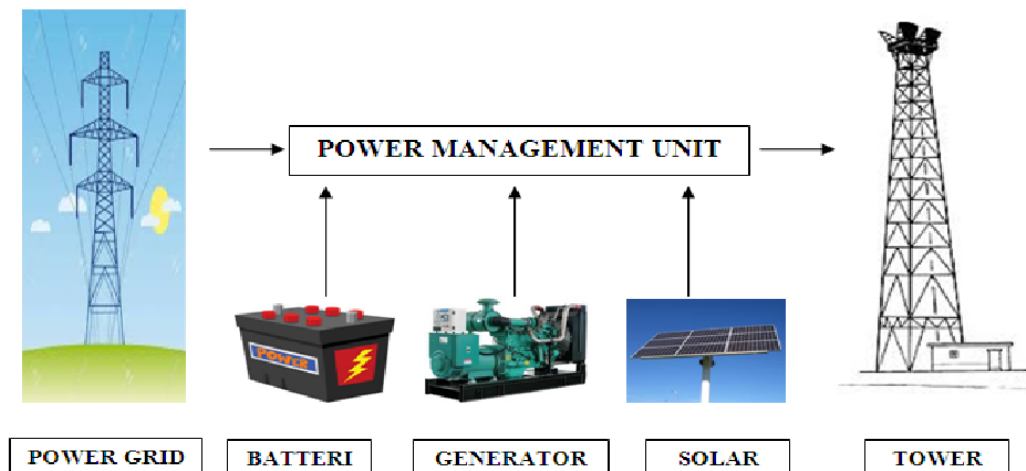


Figure1. Hybrid System for management of power

According to survey, The Indian telecom industry consumed an estimated 3.2 billion liters of diesel in 2011, and the amount may rise to six billion liters by 2020. By use of eco friendly energy, we would save more than 540 million liters of diesel annually and cut about nine million tons of carbon emissions by 2015[6].

In this project a hybrid energy system which works intelligently for supplying the maximum eco friendly power [4]. In this project we also use sun tracing system for obtaining maximum energy from sun. By making use of sun tracing system 30% more power is going to generate [5]. Depending up on the atmospheric conditions of particular cell site we can install proper eco

friendly energy system and we can store and use that energy.

Condition 1: Energy from renewable source is enough to drive the BTS.

In condition 1 the energy from renewable source is available so that the base station can run satisfactorily. In this case base station runs on eco friendly energy, which is ideal condition. Here the task of power management unit is to keep the mains power and battery power standby and generator is switched off.

Condition 2: Energy from renewable source is not enough to drive the BTS.

In condition 2 the energy from renewable source is not enough to run the base station. In this condition energy from renewable source and mains power both work parallel if possible but if energy from renewable source is not available at all then whole power is fed directly via static switch from mains.

Condition 3: Mains power is off; Energy from renewable source is available but not enough.

In condition 3 the mains power is off, energy from renewable source is not enough to run the base station. In this case energy from renewable source and battery power both work parallel and as soon as the mains power is available or energy from renewable source become maximum the system switch accordingly to condition 1 or condition 2.

Condition 4: Mains power is off; Energy from renewable source is not enough; battery drain completely (Critical condition).

In condition 4, mains power is off, energy from renewable source is not enough to run the base station and battery backup drains completely. In this case generator turn on and fed power to run the base station.

The system counts the timing for only critical condition that for how much time the generator is remain on means working due to this administrator will get to know how much liters of fuel is used and hence internal thieving of fuel can be get stop.

2. CELL PHONE TOWER BASE STATION MANAGEMENT AND SAFETY:

For proper working of base station, various units are present in base station. The units are air conditioning unit, ventilation unit, batteries, diesel generator, and power management unit. These units are serving the other unit to work without getting disturbed. This project aims to control and monitor the units present in base station. By making use of GSM technology administrator get all the information about the base station at any instant, this enables to cure the problem associated with base station earlier before degradation of the system. Due to this breakdown of the base station can be prevented successfully.

Problem statement-

- 1) C. If proper ventilation and air conditioning is not provided then system may get permanently damage or did not work satisfactorily.
- 2) The amount of fuel present in the backup tank of generator being unnoticed. So if in case of no power and no fuel in generator tank then system will stop working.

3) The problem because of theft of cable and equipment present in base station and fuel. As the cost of copper cables and fiber optic cables as well as machinery associated with base station are very expensive the chances of getting stolen them are very high.

4) The problem associated with entry of unauthorized person in premises of base station. Only the network and maintenance engineer have permission to enter but lack of security any one can enter inside.

5) Many times it is notices that there is thieving of fuel because of a perfect measurement system are not present which measure the fuel used by generator.

Problem solution-

1) The system consists of temperature sensor which continually monitors the temperature. Here if sensor sense the temperature rise, and the temperature rise is very drastic then it will alert on the administrators system that the cooling and ventilation system fails. But this will happen within the temperature range of 18C to 20C that is the prescribed limit, so that maintenance engineer will get time to replace it or repair it and the equipment present in the base station does not get damaged.

2) The system consists of the fuel gauge which monitors the fuel level. Here we design the system such that message is send to the administrator when the fuel tank is full with fuel, an early alert message when tank is half filled with fuel and a alert message when low fuel.

3) The system consist of two CCTV camera for surveillance one for base station premises and an inside the base station or inside the infrastructure.

The system consist of the push button so when the gate opens the push button present at hinge of the gate get pressed and the CCTV camera present in premises turns on and administrator get an message of same.

As the door opens the CCTV camera switch on and after closing the door CCTV camera switch off. The CCTV camera can be use for remote guidance or for providing the help to maintenance engineer if problem is associated with the network.

4) The system consists of RFID identification system, by making use of it only authorized person can enter inside.

5) The system consists of RTC which counts the working timing of generator. By knowing the correct time of working of generator administrator can estimate how much liters of the fuel consumed by generator. Due to this, internal thieving of fuel get stop

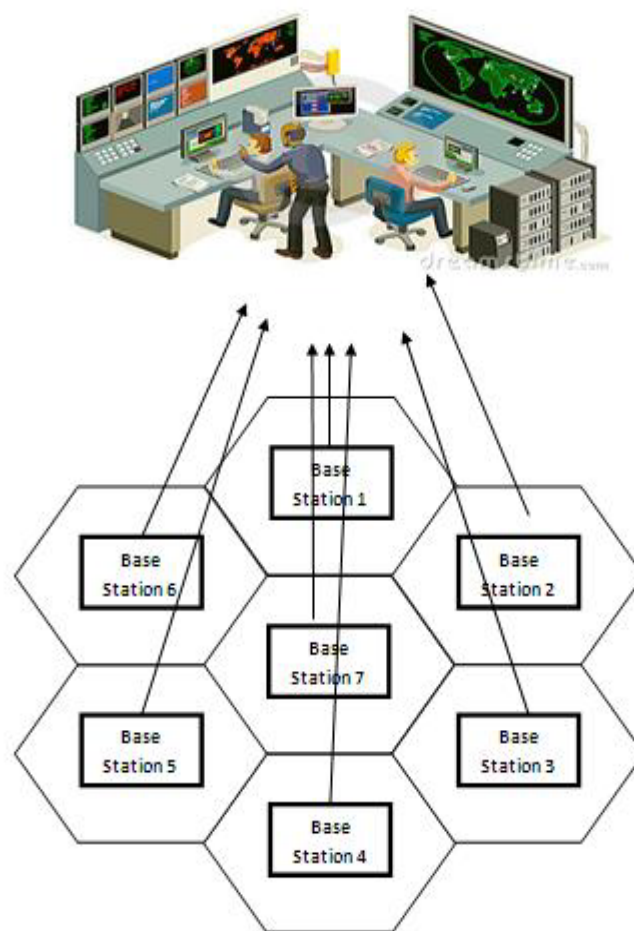


Figure 2: Overview of system (system provides all information about base station to control center)

3. ANALYSIS AND DISCUSSION:

Threat in base station can be known to technician present at long distance due to use of GSM technology. Quick action can be possible if any threat is detect. Failure of base station means of increase in Call dropping but by use of these system chances of getting failure of base station reduces. Due to providing Security by means of CCTV camera and RFID access cards, thieving of electronic devices as well as copper wire, fiber optic cables at remote location can be avoided. Due to displaying timing of power generated by generator the thieving of fuel (diesel) can also be avoided. If any problem created regarding about networking issues the maintenance engineer can directly interact with network engineer by using CCTV and can provide primary information. Continues supply of power is delivered to load, so that there are no issues regarding about failure of power. By using the solar energy which is also a clean source of energy for charging the battery thousands of liters of fuel is saved due to which maintenance cost and emission of carbon reduces.

4. CONCLUSION AND DISCUSSION:

In this project we are introducing some beneficial technique to protect the BTS site and its proper uninterrupted operation of different units associated with it. This system does not require any change in existing system it is just add on system.

In wireless network base station, Power consumption is the biggest issue. The Global warming and energy crisis is becoming a challenge. Day-by-day mobile users are increasing which leads to increase in base station which in turn increases the power consumption and emission of CO₂ gas which is one of the greenhouse gas. This can be reduced by considering various parameters in account. By use of renewable power resources emission of green house gases decreases as well as the cost for generating power. By using sun tracking system 30% of the energy generation increases and hence the system store that power and can use at night time when solar power is not available.

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