3rd National Conference on Innovative Research Trends in Computer Science and Technology (NCIRCST 2018) ISSN: 2454-4248
Volume: 4 Issue: 3 68 – 72

Reducing Radiation in Towers to Improve Green Environment

Subbulakshmi. M, Royal Kalyani. K, Sarmika.M., Vithyaa M.
Kalasalingam institute of technology/Anna university,

Abstract:-Green radio technology prefers environment friendly approach towards the mobile communication. This project aimed at energy conservation and CO2 reduction in mobile communication networks. The mobile towers are increasing in a rapid manner. Power required in developing countries is always greater than the power generated. To avoid using diesel, the Solar and wind mill are used as hybrid circuit to generate electricity. The bulbs in the towers are switched ON/OFF automatically based on the ambience light.Similarly, the air coolers used in the towers can also be switched ON/OFF according to climatic conditions.

Keywords:-*Eco friendly, Solar And Wind mills, Automatic ON/OFF switching-(Towers,Light , AC).*

*****

Introduction:

As part of the international efforts for energy conservation and CO_2 reduction, migration to an energy-efficient mobileinfrastructure is of high importance to the mobile communications industry. Move to higher-data-ratemobile broadband in the number of mobile subscribers and the increasing contribution of information technology to the overall energy consumptionof the world, there is a need on environmental grounds to reduce the energy requirements of radio access networks.For network operators, energy efficiency ismuch more than a corporate social responsibility topic — it will be one of the key factors for successful operation oflarge-scale mobile communication services. To overcome such a price-pressure trend, energy saving is one of the key subjects for mobile operators' total cost of ownership reduction. Because the base station accounts for most of the energy consumption by mobile operators, improving the energy efficiency of base station key components,such as power amplifiers and air conditioners, is of great importance. As a part of the developing world in order to reduce the energy consumption by the tower is reduced using green radio technology (GRT). GRT give rise to the use of alternative energy sources like renewable energy such as solar and wind. At present, on average, 70 percent of the approximately 400,000 communication towers in our nation. In future the telecom tower industry in India planned to install 511,000 towers approximately. These towers where operated at least for 8 hours using diesel generators it is estimated that it consume over 2.5 billion liters of diesel annually and making the nation a second largest consumer of diesel in the world. The 2.5 billion liters of diesel consumed, emit 6.6 million metric tons of CO_2 annually, making the current use of diesel generators both an environmentally and economically unattractive solution. Solar energy and wind energy are the real and unpolluted energy forever. Demand of electrical energy and less availability of present resources, if we develop a system which will be efficient to produce electrical energy by the use of natural resources like sunlight, wind, hydro etc. for example, solar-powered base stations in developing countries withoutreliable grid-based energy. Effective energy management is thus a key requirement for successful and profitableoperation of mobile communication networks.In order to reduce the use of diesel generators the solar panel are mounted on the towers which has the generating capacity of 2 kilo watt energy. In case of power outage from the grid to any of the towers we can transmit the generated energy to any towers using wired networks.

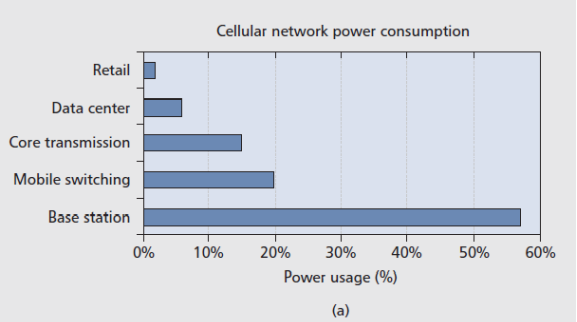


Fig 1:Power consumption of a typical wireless cellular network (source: Vodafone)

The typical power consumption of different elements of acurrent wireless network in Fig 1. These results clearly show that reducing the power consumption of the base station or access point has to be an important element ofthis research program.

Current scenario:

1) The operation of present scenario is notenergy-efficient. It does not account for user frequency(i.e.number of mobile users) in an area.
2) In India, more than 4lakhs towers are present.By 2014it is estimated to go beyond 5lakhs.
3) Every tower consumes 28 litres of diesel per day.
4) All the towers in an area are turned ON irrespective ofthe number of subscribers.One tower delivers 85 kg of carbonper day.
5) During night time only 10% of the total subscribers communicate but still all the towers remain in the workingstate.
6) A critical mobile network consumes 40-50MW approximately, even excluding the powerconsumed by subscriber's handsets.
7) A typical diesel generator, used for supplying power forcommunication purpose, which consumes seven million litresof diesel per day.

Basic Operation:

Our objective is to reduce the energy consumption in basestations and reduce the amount of CO2 emission..So, based on the user strength in a region, the number oftowers in that particular region is turned ON and remainingtowers are kept in IDLE state.Apart from implementing this configuration, we monitorcertain parameters, which can help in reducing energyconsumption. Those parameters are Responder Frequency,Cooling-Fan, Air Conditioner, and Light Indicator. Everytower has a lightning conductor, along with Light Indicator.This light glows throughout the day, which is not necessary.Similarly, we have Cooling-Fan and Air Conditionerrunning round the clock. Thus a tower consumes power torun all these accessories, apart from power used fortransmitting signal. The PIC microcontrolleris used to do the control job and send the signal toa computer. Here, PIC micro-controller is interfaced with allthe above mentioned Integrated chips (ICs). Each of thoseICs perform different task whose output is given to PCthrough PIC micro controller. We use LDR to monitor thelight intensity around the tower to determine day-break andnight.We use two thermistors to determine temperature and moisture content. There is standard value fixed for all these parameters. When it deviates from that switching action takes place through relay circuits.In our model, we use four relays to monitor each of
temperature, humidity, light intensity and frequency.

Literaturesurvey:

"Green Radio: Radio Techniques to Enable Energy-Efficient Wireless Networks" by Congzheng Hanetal.

Provides an overview of theongoing Mobile VCE Green Radio project, which aims to establish novel approaches to reducing the energy consumption of wireless links, especially improving the design and operation of wireless base stations. By the project, it has been shown that solar base stations can have much higher operational energy budgets than mobile networks; therefore, appropriate designing of the energy consumption of base stations is an important issue for decreasing the energy consumption of whole mobile communications systems.

T.Edler, "Green Base Stations — How to Minimize CO_2Emission in Operator Networks," Ericsson seminar, Bath BASE StationConf.,2008

In long-duration-evolution-advanced (LTE-advanced), heterogeneous deployments of relays, femtocells and current prominent cells are expected to provide coverage broadening and throughput enrichment, while significantly lowering the energy consumption and total-cost-of-ownership (TCO) in cellular networks. These studies presents a methodology for estimating the total energy consumption, taking into account the total operational potential and evince energy, and TCO of wireless cellular networks, and in particular provides a means to compare homogeneous and heterogeneity network (HetNets) deployments. The authors introduce realistic energy models and energy metrics based on information available from mobile -network operators (MNOs) and base stations manufacturers. Additionally, up-to-date operational and capital splurge (OPEX and CAPEX) models are used to calculate TCO of candidate networks. The authors evaluate two scenarios for HetNets, namely a joint macro-relay network and a joint macro-femtocell network, with desperate relay and femtocell deployments densities. The results obtained show that compared to macro-centric networks, joint massive-relay networks are both energy and cost efficient, whereas joint large-femtocell plexus reduce the networks TCO at the expense of increased energy-consumption. Finally, it is observed that energy and cost gains are highly sensitive to the OPEX model adopted.

"Energy Consumption in Wired and Wireless Access Networks" by JayantBaliga:

Provides detailed analyses on the corresponding energy consumptions of digital subscriber line, hybrid fiber coax networks, PONs, fiber to the node, point-to-point optical systems, UMTS (WCDMA), and WiMAX. The authors conclude that PONs and point-to-point optical networks are the most energy-efficient access solutions at high access rates.

"Energy Consumption in Wired and Wireless Access Networks" by JayantBaliga

Provides detailed analyses on the corresponding energy consumptions of digital subscriber line, hybrid fibre coax networks, PONs, fibre to the node, point-to-point optical systems, UMTS (WCDMA), and WiMAX. The authors conclude that PONs and point-to-point optical networks are the most energy-efficient access solutions at high access rates.

Existing system:

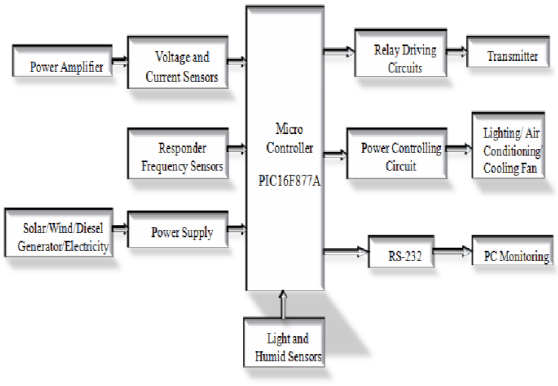
In the existing system all mobile towers are kept on in a particular locality irrespective of the number of users. As a result high power consumption occurs. A typical mobile phone network may consume approx 40-50MW, evenexcluding the power consumed by user's handsets. When direct electricity connections are not readily available, theseservice providers use diesel to power their network. As a result, a polluted environment is established and awhole ofabout 1% of the total power generation is being consumed by the mobile networks itself. In addition to this the lightingand cooling units are always in on state thereby considerably increasing the power consumption rate day by day. In INDIAmore than 5 lacks towers are present. Till 2014,1lacks towers will be increased.Also Tamil Nadu Govt., going to Stop the launching of new Mobile Towers in Tamil Nadu Towers will be always ON. Thepower consumption increased so that carbon emission also increased.One tower delivers 85kg of carbon/ day Duringnight time for the10% of users 100% towers are kept on. This leads to inefficient mobile towers.

Proposed system:

Energy saving is one of the key issues in our day today life.In the proposed system, the power consumption rate is lowered by keeping only one mobile tower in working state to takeup all communications while the remaining towers stay in idle mode. When the number of subscribers of the current tower reaches a predetermined value say 70% the responder frequency is sent to the nearby efficient tower to take up the remainingload by means of wireless sensors networks. Thus by keeping all the towers in idle state and by keeping only one inworking state the power consumption rate is considerably decreased. Moreover with the help of ambient analyzer, maximum power saving is achieved by means of localized power controller where the lighting and cooling units areturned on as per the requirement. Fuel level monitoring unit is made available devoid of manpower. Thereby, 1KW power saved = 2KW power generated.Directly and indirectly mobile operators are creatinghuge lose to the society by wasting power. We have to switch ON/OFF towers based on the peak and off peak hours. To avoid using diesel, we are using solar and wind mill as hybrid power source and saves electricity used in base stations.Moreover with the help of ambient analyzer maximum power saving is achieved by means of localized power controller where the lighting and cooling units are turned ON/OFF.

Block diagram:

In the overall block diagram the voltage and current sensing circuit senses the power from the power amplifier and feeds it to the monitoring system . When the responder frequency is received it is also displayed in the monitoring unit. The temperature and light sensor senses the temperature and illumination level of environment and then through localized power control, corresponding relays for cooling and lighting units are operated.



We use two thermistors to determine temperature and moisture content. There is standard value fixed for all theseparameters.In our model, we use four relays to monitor each of temperature, humidity, light intensity and frequency. For example light intensity above 1000 lumens is considered to be day-break, if not, its night. Hence light indicator will be turned ON automatically during night time. Similarly, basedon Temperature and Humidity of the generator room, Air-Conditioner and Cooling-Fan will operate respectively. This is the basic operation of our model.

Hardware snap shots:

The hardware consists of a transmitter and a receiver. Transmitter is considered as a tower and receiver isconsidered as another tower. When the number of users exceeds a particular limit, the receiver tower is switched on and the signals are transmitted from the transmitter tower to the receiver tower. The hardware with various components is shown in Fig.2.

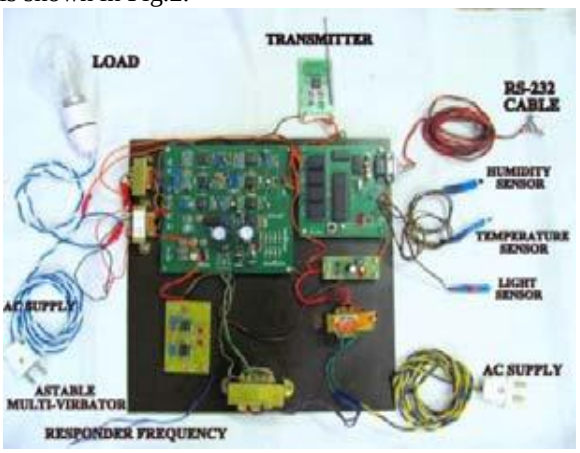


Fig.2 Transmitter Board

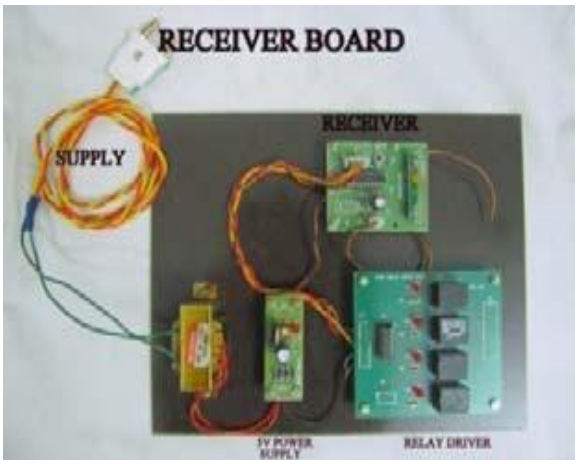


Fig.3 Reciever Board

Software snap shots:

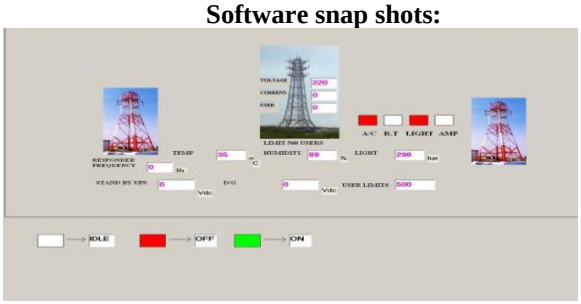


Fig.4Output without responder frequency

This Fig.4 shows that state of present hardwareconfiguration when the circuit is turned ON. It is designed in such a way that, out of the three towers, middle tower is our base station and other two are neighboring station towers. We can notice that, our tower is in IDLE

state. At present tower-1 is operating, whose user frequency is within thepredefined limit.

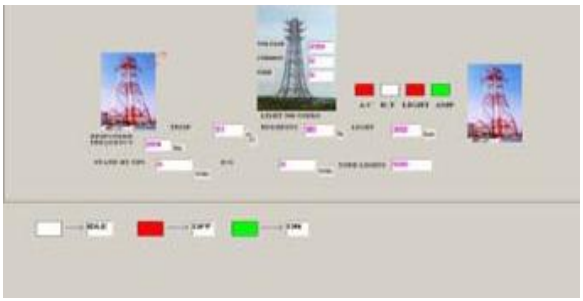


Fig.5 *Output with responder frequency*

Now, when the user frequency of remote tower-1 crosses the predefined limit, responder frequency is sent from its station to next base station tower is shown in Fig.5. Thus, our BS tower starts operating. We can see thatamplifier of our tower is turned ON, which is indicated by change in color from red to green.

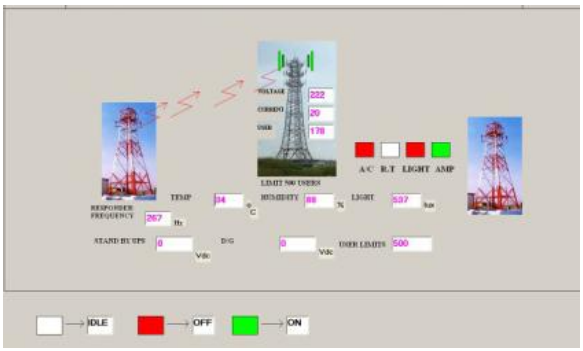


Fig.6 *Tower Is On And In Operation*

When our tower's amplifier is turned ON, our tower responds to the tower-1 frequency and starts operating. We can see the user limit displayed in the screen for current tower in Fig.6. Since it is within the user limit range, the next remote tower R.T is not turned ON. This turn- ON process is carried out using wireless network, which sends signal from our station to next station. Every station has transmitter and receiver units, which enables to carry out this automatic turn- ON & OFF operation.

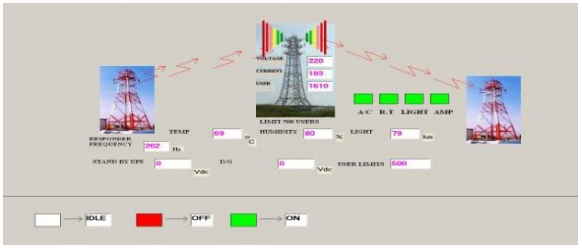


Fig.7 ***All Parameters Are Turned On***

In Fig.7 shows the entire working aspect of this project. All the parameters like Air-conditioner, Lighting, Humidity,Temperature and Responder Frequency-corresponding relayis turned ON & OFF to save power consumption and reduceCO_2 emission.

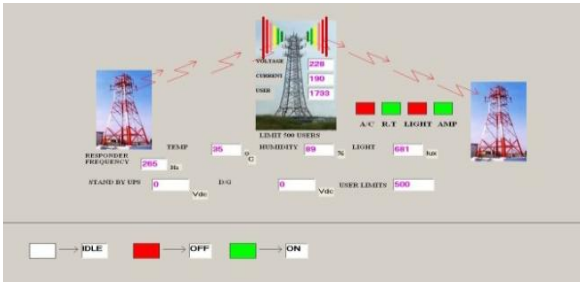


Fig.8 *Remote tower in operation*

In Fig.8 shows the change of state of light block. The LDR usedto monitor the luminous intensity around the tower to determine night-fall or day-break. Thus, light is turned ON during night time alone instead of entire day.

Merits of this technology:

1)The main advantage of this technology is the reduction of total power consumed by the base transceiver station of Wireless mobile networks.
2)This technology helps in maintaining and improving the ecological balance of the nature by reducing the CO_2 emission.
3) This technology helps in reduction of the size of generator set, which leads to low capital investment.
4) This technology helps in preventing depletion of fossil fuels.

Future scope:

This technology has huge scope of improvement in future,which will lead to fully implemented GREEN technology.Various other techniques of green radio technology likenetwork topology restructuring, antenna design, switchingtechnique used, transmitter and receivers used,communication techniques can all be combined together toachieve complete energy-efficient communication system. To start with, the leading way is with solar energy. It ispowering mobile towers with solar photo voltaic cells inremote rural India. The Solar Photo Voltaic uses sunlight togenerate electricity thus eliminating dependency on gridpower and diesel. This is a standalone system which can beinstalled on site. The installation process is easy and onceinstalled the equipment needs almost zero maintenance,keeping operating costs at a minimum. Its lifespan of 25years provides the site with a stable and permanent source ofpower, minus noise pollution or toxic emissions. On anaverage, installation of solar photo voltaic cells can lead to reduction of 2.5 tons of CO_2 emission per tower every year.

Conclusion:

It can be seen that increase in mobile users leads to increase in power consumption, which in turn leads to emission of more and more CO_2. This leads to global warming as CO_2 is considered to be one of the green house gases. In order to control this effect, the major area to be controlled is to reduce power consumption. This can be reduced by taking various parameters into account such as the operation of Air Conditioner, cooling fan, light indicatorand power amplifier. This project has aimed at

reducing the power consumption by taking these parameters into account and the outcome has been positive. As per the objective, energy consumption will be reduced as much as possible and hence the emission of harmful green house gases will bereduced. This leads to an environmental friendly approach towards wireless communication.

References:

[1] C. H. Harrold, "Green radio Radio Techniques to Enable Energy-Efficient Wireless Networks," *Communications Magazine*, IEEE June2011, vol. 49, pp. 46 – 54.

[2] T. Edler, "Green Base Stations — How to Minimize CO2 Emission inOperator Networks," *Ericsson seminar*, *Bath Base Station Conf*.,2008.

[3] K. Bumman, M. Junghwan, and K. Ildu, "EfficientlyAmplified,"*IEEE Microwave Mag*., vol. 11, no. 5, Aug.2010.