



GSM based Electrical Load Management

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Abstract: Power shortage is a major issue in India. As the electric power generation does not satisfy the increasing demand, power shortage occurs, which results in power outage. Presently, the power shortage is managed by supplying power in one area by cutting off power in another area. This will cause a lot of inconvenience for the consumers who are located in the power shutdown area. During summer, the problem would be still worse. We are proposing a solution for this problem using GSM technology. In this project we are reducing the power supply to each consumer thus increasing the number of consumers who are supplied with electricity. For that particular amount of time the consumer can use only the allotted amount of power. The power supply to each consumer can be supervised from the nearby distribution substation. In case, if a consumer is consuming more electricity than that is allotted to him/her, that consumer's load will be cut off from the supply. The consumer has to reduce the load in order to get electricity again. Also, Electricity provider has given a certain power limit for free consumers. But in some places the consumption of free electricity is more than that power limit. In such places this device can be used to continuously monitor the power supply and switch the load off once the load power goes above the allotted value. Also, on implementing this, people will try to replace their old energy hungry devices with new energy efficient devices which will automatically lead to energy sufficiency.

Keywords: Global System for Mobile Communication (GSM), Short Message Service (SMS), Arduino, Current Sensor.

I. INTRODUCTION

After globalization India has become a huge market for the world countries. Due to industrialization, power demand has raised by a great value. Now, India is facing a serious power crisis. Although power system development was significant during the last four decades of planning the generation of power proves insufficient in comparison to its requirement. Thus the country is facing a persistent power crisis, since last few years.

With temperature soaring high in the capital and other regions of India, power cuts are deteriorating the condition further and making the summers really unbearable. Power shortage is deeply impacting the industries as well as economy of our country. Power shortage and power outage does not bring any comfort to the consumers as they cannot even use the electrical devices which are important for their day to day life. Gadgets such as mobile phones, fans, lights etc are some of the essential electrical loads for the people.

II. FACTORS RESPONSIBLE FOR POWER CRISIS

1. Increase in Demand: Being a fast developing country the number of industries and other sector power demand is increased very rapidly. The number of companies are multiplying each year and the power demand is increasing very fast. This is the most serious matter to match production of electricity with the demand.

2. Poor Utilization of Electrical Equipments: Apart from insufficient power supply the power which is being supplies is not utilized properly. Around 30-40% power is wasted due to low power factor and this is very important point to be considered because if we can save that 30 % we have to produce less electricity as that wastage can serve the purpose.

3. High Transmission Losses: In India the efficiency of electrical equipments used in Power transmission and distribution like transformers and other equipments is very poor as compare to developed countries. So here is a chance to save power.

4. Power Theft: The biggest threat to the economy of nation is the theft of its resources.

Due to importance of power, it is considered as one among the crucial resource but this is stolen by some people and this has to be stopped.

5. Delay in Commissioning of Power Project: Due to non-availability of funds power project are delayed in India and sometimes some political problems are also faced. This delays the project and hence increases the supply versus demand ratio.

6. Shortage of Coal: Sometimes coal is not available at power generating locations like thermal power plants on time and this delays the power generation.

7. Faulty Planning and Plant Outages: The planning in Indian power industry is of 20 years behind the time.



People in industry are planning what developed countries planned 20 years ago.

III. OVER COMING ENERGY CRISIS

We can overcome this energy crisis by doing the following things.

- Building new power generation plants.
- Making the people to use energy efficient devices.
- Fastening the existing power plant project works.
- Making the transmission system more efficient.
- Reduce unauthorized usage of electricity from the grid - power theft.
- Better design of power system which can tackle the sudden transients due to several factors.

IV. CONCEPT OF PROPOSED SOLUTION

The device which we have created should be fixed in all the electricity consumer points and the power absorbed by the loads in any particular consumer point during any particular instant is measured through the device. During the power shortage period, every consumer is allotted with a limited power, more than which the consumer cannot use. By limiting so, we can supply all the consumers. The power limit is based on the power shortage. The value of the limit can be communicated to the device through SMS using GSM technology. Once the current limit value is received, the controller will change the limit from initial limiting value to the present limiting value. Also we are providing the consumer with an additional option of switching OFF and switching ON their electrical loads remotely by using an SMS.

The security of the system is ensured by providing the consumer and the electricity provider with different passwords, so that the consumer cannot be able to set the power limit value. The electricity provider or the Distribution center can have access to both the options of setting current limit value and switching ON and switching OFF the loads in any consumer point.

V. BLOCK DIAGRAM

The block diagram above shows the GSM based electrical load management system. The device is connected after the energy meter. The current flowing through the total load is measured using a current sensor and the corresponding voltage signal is sent to the microcontroller. The microcontroller will convert the analog value into a digital value and determines the current. Then it compares the measured current with the preset value of current. When the measured current value is less than the preset value of current, nothing will be done. Once the measured current value goes above the preset value of current, the load will be disconnected from the supply. The consumer has to switch on the relay again after reducing the load below the preset value.

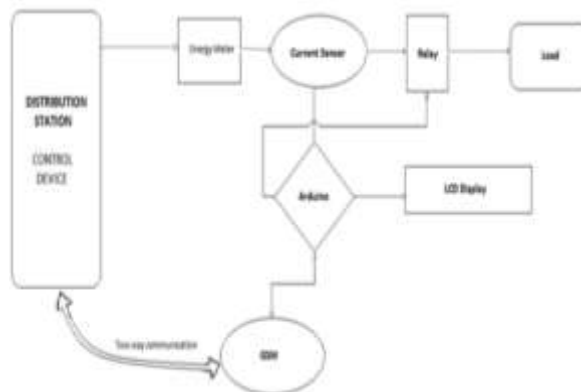


Fig 1. Block diagram

VI. COMMUNICATION

The communication between the device and the user (or) electricity provider and the device is done through SMS by using GSM. The user and the electricity provider are provided with different passwords, so that the user with his password can have access to remote switching ON and OFF of the load only, whereas the electricity provider with his password can have access to setting current limit alone. As we have used password, the password can be shared among the consumer's family members which is an added advantage to the consumer. However the password of the electricity provider will not be disclosed to anyone. Hence only the electricity provider can be able to set the current limit value in the device.

The device can be reset in case of any problem by the electricity provider. The whole setup will be placed in a sealed box which cannot be opened by the user. If consumer needs to reset the device, he has to call for a support from the electricity provider.

SMS codes:

1)For user:

Switching ON: #\$.<password><ON>*

Eg: #\$.1234ON*

Switching OFF: #\$.<password><OFF>*

Eg: #\$.1234OFF*

2)For electricity provider:

Current limit: #\$.<password><currentlimit>*

Eg: #\$.X1YZ08*

VII. OPERATION

A. Normal (or) Under limit condition: In this condition, the measured load current value is less than the preset value and so the relay will continue to be in ON state. Hence the load will not be disconnected from the supply. During normal conditions, i.e., when there is no power shortage, the current limit value will be set to the fuse value, hence the device will not interrupt the load until the load current value goes above the fuse rating.

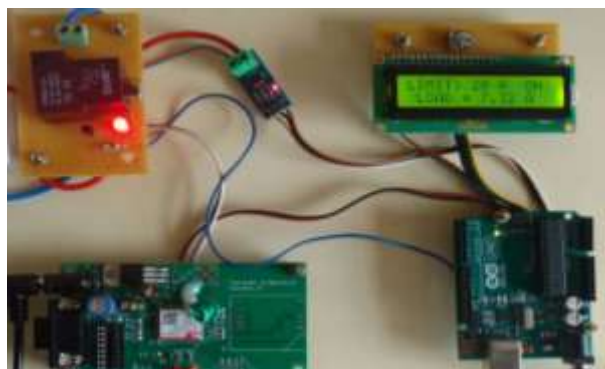


Fig 2. Device operation during normal condition

B. Over limit condition: In this condition, the load current value goes beyond the preset value. As a result, the device will trigger the relay to disconnect the load from the supply.

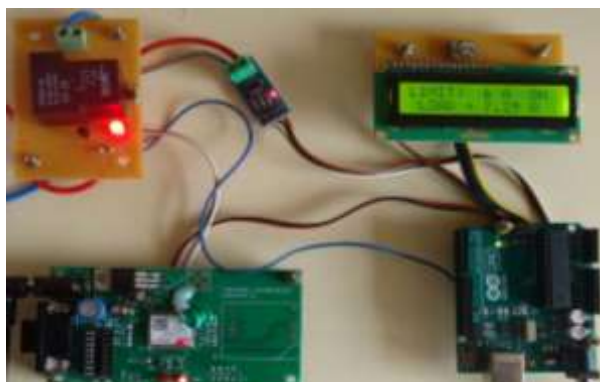


Fig 3(a): Over limit condition(measurement display)

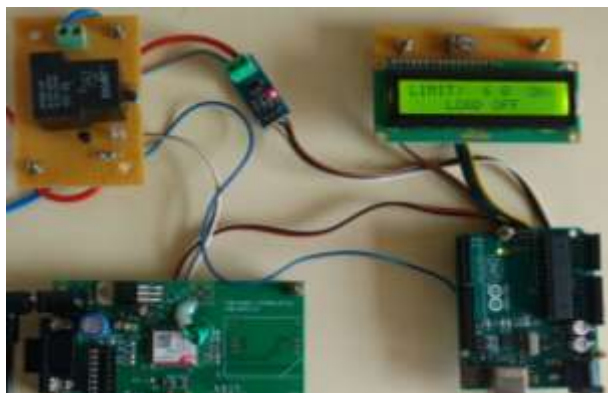


Fig 3(b): over limit condition (load off)

VIII. CONCLUSION

Thus by implementing this project in all the domestic, industrial and other consumer points, we can effectively control the usage of power in real time. This projects aims at not only preventing power cuts due to power shortage , but also to make people to use energy efficient devices in future and not to waste the precious energy. This project will also prevent the free electricity users from using more

electricity than what is allotted to them. Hence by implementing this project, power shortage will reduce to considerable amount as usage of high electricity consuming products will not be used by the consumers.

IX. FUTURE SCOPE

This project can further be developed by using Internet of Things which is going to be the next major breakthrough in technology. In few years every home will have a smart meter installed in them. These smart meters will be connected to the internet and hence load management can be done over the internet. Along with the other features of the smart meters, this feature can be added to benefit both the consumer as well as the energy supplier.

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BIOGRAPHIES



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