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Advanced Domestic Energy Consumption Monitoring and Alert System

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Abstract - In recent years, the demand for electricity has increased in households with the use of different appliances. This raises a concern to many developed and developing nations with the demand in immediate increase of electricity. There is a need for consumers or people to track their daily power usage in houses. In Sweden, scarcity of energy resources is also important. This research work focuses on a advanced alert energy monitoring system data for distributing the electricity smartly and efficiently to the consumers. The main drawback of previously used traditional meters is that they do not provide information to the consumers, which is accomplished with the help of advanced alert energy monitoring system.

Key Words: GSM, ACD, DAC, ARM Controller

1.INTRODUCTION

Electricity is the crucial requirement for leading a comfortable life. To use the electricity efficiently, there is a need to monitor the power consumed by each appliance. In the early phase of household technology, delivery of electricity is completely depended on traditional energy meters. These meters play a key role in measuring the consumption of electrical energy in individual households. The usage of these meters has been slowly declining with the advancement in technology as rapid changes has been made to encounter the problems occurred by the traditional meters. The idea of advanced alert energy monitoring system is being proposed to collect the data regarding energy consumed by each appliance.

Advanced alert energy monitoring system is an effective way of collecting the data of each appliance used each day and the energy being consumed is calculated for a particular period and sent to the customer's mobile. Hence it gives information about energy consumption of each appliance daily. By knowing that information customer can have a control over the usage of each appliance.

2. METHODOLOGY

The advanced alert energy monitoring system is designed and developed by using ARM7 controller and smart sensors. In this system continuously monitoring and recording the data regarding electrical energy consumed by each appliance is done. This can be achieved by means of an ARM controller. Microcontroller unit continuously collect the data regarding energy consumption and the same data is processed. So that the details regarding usage time, power being used in that time by an appliance, the corresponding tariff to be paid by the user is calculated. This data will be displayed on LCD. The same data will be sent to user mobile using GSM technology.

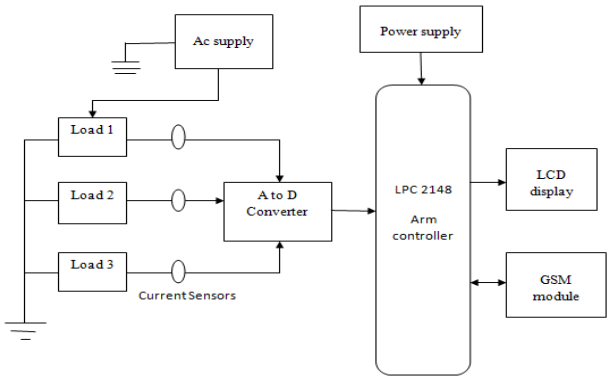

Fig 2.1: Block diagram of the advanced alert energy monitoring system

To measure the energy consumed by any appliance smart sensor is used. A current sensor is a device that detects electric current (AC or DC) in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output. It can be then utilized to display the measured current in an ammeter or can

be stored for further analysis in a data acquisition system or can be utilized for control purpose. When the ac supply is switched on, the appliances in the electrical system will be turned on. Then some amount of power will be utilized by each appliance. This power is measured by using smart sensors. The smart sensor will sense the current in the particular wire. This sensed data is in the analog form. For processing the reading for calculating the bill is needed digital data. So that Analog to digital converter with the resolution of 10 bit is used to convert analog data to digital form. Also, it should be able to register data related to consumption per period, allowing the subscribers to manage their consumption. The output data from the ADC will be sent to the Microcontroller.

ARM7 controller is used since it gives better performance. The Microcontroller collects the reading continuously and samples are obtained. This reading will be stored in the memory. The controller will calculate the energy consumed by an appliance and the cost to be paid. The calculated data will be displayed on the LCD display. The same data will be sent to the user mobile through GSM technology.

3. COMPONENTS REQUIRED

The main hardware components used in this project are:

- ARM7 LPC2148 microcontroller
- Liquid crystal display
- GSM module
- Power supply
- Current sensor
- Analog to digital converter (ADC)
- Digital to analog converter (DAC)

3.1 SOFTWARE TOOL USED

The software tool used in this project is Keil µ-vision

The µVision combines project management, run-time environment, build facilities, source code editing, and program debugging in a single powerful environment. µVision is easy to use and accelerates your embedded software development. µVision supports multiple screens and allows you to create individual window layouts anywhere on the visual surface.

The µVision Debugger provides a single environment in which you may test, verify, and optimize your application code. The debuggers includes traditional features like simple and complex breakpoints, watch windows, and execution control and provides full visibility to device peripherals.

4. RESULT AND DISCUSSION

Once the advanced alert energy monitoring system is turned on, the LCD displays the initialization message. The advanced alert energy monitoring system calculates the energy consumed by each individual appliance using the current sensors. Here we have taken three different loads, these loads draws different current. In the beginning no load is switched on, so that there is no power consumed by any load. The power consumed by each load is zero. So that the output is displayed on the LCD. When load1 is switched on keeping load2 and load3 in the off state the advanced alert energy monitoring system calculates the reading with respect to the energy consumed by load1. The measured readings are displayed on the LCD. Now the load1 is turned off and load2, load3 are switched on, the meter calculates the energy consumed by load2 & load3. The advanced alert energy monitoring system is interfaced with the GSM model to send the calculated power and the bill to be paid for the calculated bill. The meter sends the message to the customer mobile after calculating the energy consumed by all the loads.

5. ADVANTAGES

- It reduces the loss of electricity.
- Amount of power consumed by each and individual appliances can be done.
- It will facilitate the use of home energy management system.
- Advanced alert energy monitoring system make it easier for us to identify the situations where using a

lot of energy and might want to make changes to reduce it.

- The user will know about the bill to be paid for each appliance per day or per week.
- Providing real time data useful for balancing electric loads and reducing power outages.

6. CONCLUSION

Now a day the electricity is the crucial requirement for leading a comfortable life. So the advanced alert energy monitoring system with power calculation has been developed by using GSM technology in which is more useful to the consumer for maintenance of electricity and it decreases the power overloaded by the components. In future it can be implemented in industrial and offices. The versatile use of advanced alert energy monitoring system in smart grid scenario is great and to be employed in order to meet the consumers objectives in terms of monitoring and control of power consumption and it detailed feedback for billing , saving energy, monitor the load demand by demand side management programs, home energy management system which are been explored. The smart meters are interfacing with the house hold appliance, to know the each appliance power consumption and to save the power by inter coordination between the home appliance, which system is also to be simulated and evaluated based on which simulator can predict the power conservation by controlling the loads on the each home appliance, while doing this harmonic analysis to improve the power quality in the system and it detection, mitigation techniques are have been addressed.

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