

INSPIREEE

Inspirational Scripts,
Personalities and Innovative
Research of EEE

NEWS LETTER EEE/
VOLUME 11: ISSUE 1

-

September -2022-2023

K.L.N.COLLEGE OF ENGINEERING

(An Autonomous Institution,

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)

(Accredited by NAAC for 5 Years W.e.f November 2018) (Accredited by NBA for EEE)

(An ISO 9001:2015 Certified Institution)

Pottapalayam -630612, Sivagangai District, Tamilnadu

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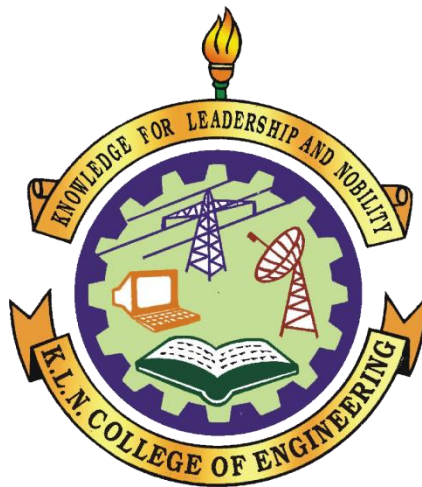
INspirational Scripts, **P**ersonalities and **I**nnovative **R**esearch of **EEE**

VISION

To become a high standard of excellence in Education, Training and Research in the field of Electrical and Electronics Engineering and allied applications

MISSION

To Produce excellent, innovative and Nationalistic Engineers with Ethical values and to advance in the field of Electrical and Electronics Engineering and Allied Areas



K.L.N. College of Engineering

Pottapalayam – 630 612, Sivagangai District, Tamil Nadu, India

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MESSAGE FROM HEAD OF THE DEPARTMENT

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MESSAGE

Greetings,

I am very happy to inform that the EEE Department got Accredited, 5th time by NBA, New Delhi. It is a very prestigious moment for us. I wish to thank, in this occasion, all the well-wishers of KLNCE-EEE for their kind support and valuable assistance.

Issues 1 have been nicely prepared starting with beautiful cover page. Topics focusing latest trends in EEE filed covering FACTS, Smart Grid etc., are well informed. The articles by Final year students show their dedicated work, presenting the material in a nice manner, and their depth of knowledge. The fourth issue is focusing on social impact of Electrical field. Their presentation is also very good. Engineers should develop such writing skills, once they reached the quality, they are the expert. Engineers can acquire the best of their writing skills by reading Novels, Newspapers and watching best Hollywood movies. Once they develop such skills, their writing will like a thriller, everyone love to read, and thereby the reader get benefitted. Students can claim later, anywhere about their contribution on the work they submitted for the Newsletter. I thank the contributors of this issue for publishing as per the schedule. Best wishes to all.

Dr. S.M. KANNAN
Head of the Department - EEE

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Basic Economics of Transmission and Distribution

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In most industrialized countries, electric power is provided by generating facilities, known as central station generators, are often located in remote areas, far from the point of consumption. The economics of central station generation is largely a matter of costing. As with any other production technology, central station generation entails fixed and variable costs. The fixed costs are relatively straightforward, but the variable cost of power generation is remarkably costs of power generation.

The fixed costs of power generation are essentially capital costs and land. The capital cost of building central station generators vary from region to region, largely as a function of labor costs and "regulatory costs," which include things like obtaining siting permits, environmental approvals, and so on. It is important to realize that building central station generation takes an enormous amount of time.

In a state, such as Texas, the time-to-build can be as short as two years. In California, where bringing new energy

infrastructure to fruition is much more difficult (due to higher regulatory costs), the time-to-build can exceed ten years. Table 5.1 shows capital cost ranges for several central-station technologies. Although the ranges in Table 5.1 are quite wide, they still mask quite a bit of uncertainty in the final cost of erecting power plants.

Operating costs for power plants include fuel, labor and maintenance costs. Unlike capital costs which are "fixed" (don't vary with the level of output), a plant's total operating cost depends on how much electricity the plant produces. The operating cost required to produce each MWh of electric energy is referred to as the "marginal cost." Fuel costs dominate the total cost of operation for fossil-fired power plants. For renewables, fuel is generally free (perhaps with the exception of biomass power plants in some scenarios); and the fuel costs for nuclear power plants are actually very low. For these types of power plants, labor and maintenance costs dominate total operating costs. Further, generators which run on fossil fuels tend to have operating costs that are extremely sensitive to changes in the underlying fuel price.

DISASTER MANAGEMENT

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Disaster management is the creation of plans through which communities reduce vulnerability to hazards and cope with disasters. Disaster management does not avert or eliminate the threats; instead, it focuses on creating plans to decrease the effect of disasters. Failure to create a plan could lead to human mortality, lost revenue, and damage to assets. Currently in the United States 60 percent of businesses do not have emergency management plans. Events covered by disaster management include acts of terrorism, industrial sabotage, fire, natural disasters (such as earthquakes, hurricanes, etc.), public disorder, industrial accidents, and communication failures.

RESEARCH

The Centre for Disaster Management and Public Safety aims to facilitate and enable research collaborations, projects and engagement leading to an increased understanding of disaster, risk and resilience trends, challenges and solutions. One of the key objectives of the research program is to use a multi-disciplinary approach to create a knowledge base that can be used to support further research activity, training and education programs.

RESEARCH PRIORITY AREAS

The Centre has identified through consultation with key stakeholders and an analysis and review of studies conducted on major disaster events, six key priority areas. These key areas reflect the research that is considered to be critical in enhancing disaster management practice and policy over the next three years.

RECENT

The recent oil spill off the Chennai coast makes this painfully obvious. The Chennai oil spill which occurred after a collision between two tankers at the Kamraj Port in Ennore brings back into sharp focus India's preparation to handle disasters from its port developments. Coast Guard has repeatedly brought up the need of Local Contingency Plans (LCPs) for the proper functioning of the national plan National Oil Spill Disaster Contingency Plan.

The National Oil Spill Disaster Contingency Plan (NOS DCP) was adopted way back in 1996. The plan has been reviewed and revised periodically to reflect international safety standards and provisions according to the Union Ministry of Shipping and Indian Coast Guard, in charge of oversight and implementation.

Disaster Risk Reduction can take place in the following ways:

1. Preparedness

This protective process embraces measures which enable governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Preparedness includes the formulation of viable emergency plans, the development of warning systems, the maintenance of inventories and the training of personnel. It may also embrace search and rescue measures as well as evacuation plans for areas that may be at risk from a recurring disaster. Preparedness therefore encompasses those measures taken before a disaster event which are aimed at minimizing loss of life, disruption of critical services, and damage when the disaster occurs.

2. Mitigation

Mitigation embraces measures taken to reduce both the effect of the hazard and the vulnerable conditions to it in order to reduce the scale of a future disaster. Therefore, mitigation activities can be focused on the hazard itself or the elements exposed to the threat. Examples of mitigation measures which are hazard specific include water management in drought prone areas,

relocating people away from the hazard prone areas and by strengthening structures to reduce damage when a hazard occurs. In addition to these physical measures, mitigation should also aim at reducing the economic and social vulnerabilities of potential disasters.

DISASTER MANAGEMENT IN ELECTRICAL ENGINEERING

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Disaster management (or emergency management) is the creation of plans through which communities reduce vulnerability to hazards and cope with disasters. Disaster management does not avert or eliminate the threats; instead, it focuses on creating plans to decrease the effect of disasters. Failure to create a plan could lead to human mortality, lost revenue, and damage to assets. Currently in the United States 60 percent of businesses do not have emergency management plans. Events covered by disaster management include acts of terrorism, industrial sabotage, fire, natural disasters (such as earthquakes, hurricanes, etc.), public disorder, industrial accidents, and communication failures.

Emergency planning ideals:

If possible, emergency planning should aim to prevent emergencies from occurring, and failing that, should develop a good action plan to mitigate the results and effects of any emergencies. As time goes on, and more data becomes available, usually through the study of emergencies as they occur, a plan should evolve. The development of emergency plans is a cyclical process, common to many risk management disciplines, such as Business Continuity and Security Risk Management, as set out below:

- Recognition or identification of risks
- Ranking or evaluation of risks
- Resourcing controls
- Reaction Planning
- Reporting & monitoring risk performance

- Reviewing the Risk Management framework

There are a number of guidelines and publications regarding Emergency Planning, published by various professional organizations such as ASIS, National Fire Protection Association (NFPA), and the International Association of Emergency Managers (IAEM). There are very few Emergency Management specific standards, and emergency management as a discipline tends to fall under business resilience standards.

In order to avoid, or reduce significant losses to a business, emergency managers should work to identify and anticipate potential risks, hopefully reducing their probability of occurring. In the event that an emergency does occur, managers should have a plan prepared to mitigate the effects of that emergency, as well as to ensure Business Continuity of critical operations post-incident. It is essential for an organization to include procedures for determining whether an emergency situation has occurred and at what point an emergency management plan should be activated.

An emergency plan must be regularly maintained, in a structured and methodical manner, to ensure it is up-to-date in the event of an emergency. Emergency managers generally follow a common process to anticipate, assess, prevent, prepare, respond and recover from an incident.

Pre-incident training and testing:



Emergency management plans and procedures should include the identification of appropriately trained staff members responsible for decision-making when an emergency occurs. Training plans should include internal people, contractors and civil protection partners, and should state the nature and frequency of training and testing.

Testing of a plan's effectiveness should occur regularly. In instances where several business or organizations occupy the same space, joint emergency plans, formally agreed to by all parties, should be put into place.

Communicating and incident assessment:

Communication is one of the key issues during any emergency, pre-planning of communications is critical. Miscommunication can easily result in emergency events escalating unnecessarily.

Once an emergency has been identified a comprehensive assessment evaluating the level of impact and its financial implications should be undertaken. Following assessment, the appropriate plan or response to be activated will depend on specific pre-set

criteria within the emergency plan. The steps necessary should be prioritized to ensure critical functions are operational as soon as possible.

Local Emergency Planning Committees:

Local Emergency Planning Committees (LEPCs) are required by the United States Environmental Protection Agency under the Emergency Planning and Community Right-to-Know Act to develop an emergency response plan, review the plan at least annually, and provide information about chemicals in the community to local citizens. This emergency preparedness effort focuses on hazards presented by use and storage of extremely hazardous, hazardous and toxic chemicals. Particular requirements of LEPCs include

- Identification of facilities and transportation routes of extremely hazardous substances
- Description of emergency response procedures, on and off site
- Designation of a community coordinator and facility emergency coordinator(s) to implement the plan
- Outline of emergency notification procedures
- Description of how to determine the probable affected area and population by releases
- Description of local emergency equipment and facilities and the persons responsible for them
- Outline of evacuation plans.

BEST TRANSFORMER PROTECTION

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INTRODUCTION

This technical relies on the previously published article (6 alarms coming from a substation transformer you MUST take very seriously), but is much more dedicated to the implementation of relay protection principles. You know that transformer is one of the most important links in a transmission system.

Unfortunately, its great range of characteristics and special features makes complete protection difficult.

Practical implementation of the six most common transformer protection principles

The choice of suitable protection for transformers also is governed by cost, as the ratings required in transmission, and distribution systems, range from a few kVA to several hundred MVA.

Fuses are used for the lower rated transformers. Higher ratings, however, require the best protection that can be designed.

The most common principles adopted in transformer protection include the following:

1. Overheating protection
2. Overcurrent protection
3. Earth fault protection (restricted and standby)
4. Biased differential protection
5. Gas detection protection, and
6. Overfluxing protection (large transformers or where a risk of over flux exists).

1. Overheating Protection

The rating of a transformer is based on the **temperature rise above an assumed maximum air temperature**. An oil temperature of about **95°C** is considered to be the maximum working value beyond which a further rise of 8-10°C will have a detrimental effect on the transformers insulation. It will lower the life of a transformer, if sustained.

Large transformers have oil and/or winding temperature detection devices. Both **direct (oil) and indirect (winding) methods** of temperature measurement may be employed, or a combination of both

2. Earth Fault (Restricted)

Generally, the simple overcurrent and earth fault scheme used in a typical line protection application does not give adequate protection to a star connected winding.

The degree of protection is greatly improved by the application of a **unit differential earth fault scheme (or restricted earth fault protection)**. This is shown in Figure 2. This diagram shows a high impedance relay.

The protection system is operative for faults within the zone of the current transformers. Virtually complete cover for earth faults is obtained, particularly when the star point is solidly earthed.

3. Overcurrent Protection

Protection against excess current was the earliest evolved protection system. From this basic principle, the **graded overcurrent system** was introduced for fault protection. Most system disturbances utilizing this method are detected with IDMT relays, that is, relays having:

1. **Inverse characteristic** (the larger the fault current, the quicker is the operation), and
2. **Definite minimum time of operation.**

The degree of overcurrent protection provided to a transformer by an **IDMT relay** is limited. Usually, settings of these relays must be high, that is, **150% to 200%**. This is because the relays must not operate for emergency overload conditions.

4. Gas Detection

Faults inside oil immersed electrical plant (for example, transformers) cause gas to be generated. If the fault is severe, oil movement occurs.

The generation of gas is used as a means of **fault detection in the gas/oil operated relay**. This comprises one or two hinged vanes, buckets, or similar buoyant masses inserted into the pipework between the oil conservator and the transformer tank

5. Overfluxing

Transformer overfluxing is caused by **overvoltage and/or a reduction in system frequency**. Overvoltage causes an increase in the flux generated and stress on insulation. The increased flux density causes an increase in iron loss and an increase in magnetising current.

Flux is diverted from the laminated core of the transformer into the steel structure. This gives rise, particularly, to the core bolts carrying more flux than their designed limits. Under these conditions, the core bolts may be rapidly heated to a temperature which destroys the insulation surrounding them.

6. Differential Protection

Differential protection is designed to cover the complete transformer. This is possible because of the high efficiency of transformer operation and the nearly equal ampere turns developed in the primary and secondary windings. (MVA 'in' approximately equals MVA 'out').

This type of protection scheme **compares current quantities flowing into the network with quantities flowing out of the network**.

The difference between these values is referred to as the 'spill' current available for operation of the protection relay.

7. Magnetising Current Inrush

When a transformer is energized initially, magnetising current is required. The current appears **only on the primary side of the transformer**, therefore, the whole of the magnetizing current appears as an imbalance to the differential protection.

Since this phenomenon is only transient, **stability of protection may be maintained by the use of a second harmonic restraint**, being the most widely used to prevent the operation of magnetizing inrush current. This is because the waveform produced by inrush currents has a significant amount of second harmonics.

“Analysis of a gas sample collected in a Buchholz chamber frequently may assist diagnosis of the type of fault. The rate of gas generation indicates the severity of the fault.”

GSM-BASED SMART ENERGY METER WITH ARDUINO UNO

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INTRODUCTION

Smart electrical energy meter technologies have been investigated and developed for approximately 10 years. Various technologies have been developed and used to measure the electrical consumptions. For the billing, the users will get the bill from the energy board after they generated and provided using the several methods. At the moment, most of the residences in Malaysia for example use the traditional electro - mechanical watt meters and the readings are not automated. The users will have to wait the bill of energy consumptions for every month to pay their energy bill. Normally, at the end of the month, a staff from the meter board billing will visit every house to read the meter reading and at the same time, give the bill to the users. An electricity meter or energy meter is a device that measures the amount of electric energy consumed to residence or business. There are two types of Domestic Ordinary Power Consumers meters single phase and three phases. The energy consumption is measured by all electrical services using kilowatt- hours meter with refer to kilowatt-hours (kWh) .

Then electronic meters was introduced with similar function with the electro-mechanical, but it replaces from analog to digital system. With this system users can note down the voltage, power reading unit, current and the time, date of the energy consumption. This system just gives some advantages over the previous meter reading. After the electronic ones, the meter reading developed with the Bluetooth based technology which is the wireless communication and also known as Automatic Meter Reading (AMR). This system is wireless and the personal computer could be used to record the power consumption of energy meter. The reading meter will be saved to the database and bill will be generated. The latest technology is using a Global System for Mobile Communication (GSM) based system. This system replaces the Bluetooth technology and the data sent using Short Message Service (SMS) to the customer and the energy board.

OVERVIEW OF THE SYSTEM

The System consists of hardware and software part. Figure 1, the hardware parts, shows the block diagram of energy meter project that the users can monitor their home current power consumptions anytime and anywhere. As for the software part, all the program located in Ardduino UNO, using C language. Arduino UNO, as the main controller, connect energy meter, GSM module, and other sensors/peripherals so they can communicate each other. And Arduino UNO can only work after we uploaded the designed program into it.



Figure 1: Block Diagram of the System

Hardware System

Automatic Meter Reading system (AMR) continuously monitors the energy meter and sends data on request of the service provider through SMS. It saves huge human labor. The data received from an energy meter has been stored in database server, which was located at the electricity Board station through an SMS gateway for further processing by the energy provider. Automatic meter reading system helps the customer and energy service provider to access the accurate and updated data from the energy meter. AMR System can send energy consumption in hourly, monthly or on request. This data is sent to a central system for billing and troubleshooting. These data are stored into the database server for processing and recording. This technology mitigates labor cost, collection time, energy theft, avoids late payment. Adding to this it increases data security, improved customer service, reduced revenue losses. This system provides freedom for electricity companies to take action against lenient customers who have outstanding dues; otherwise companies can disconnect the power of customer. This meter use 240V AC current and count 1Wh per pulse



Figure 2: Energy meter with loads of 2 lamps

In figure 2 shows the box covered the circuit, only Energy meter and LCD can be seen from the outside. The material for the box is plastic PVC with A4 size and cover with stickers wallpaper. The socket was implementing as a switch between load and the energy meter. So that, 2 lamp can be used as the load. Each lamp can give load for 100W for 1 hours. The LCD display had been place at the top side of the meter while beside the LCD, the LED indicator will blink when counting 1 pulse. The sensor was placed close to the LED at the Energy Meter to catch the blinking when 1 pulse. This prototype might be different to the real product in the future. It must be well arranged without the socket close to the Energy meter and the box should be built with the proper material such as wood or Perspex transparent.

As for GSM, It is the second generation digital cellular system. Digital transmission was used rather than analog transmission in order to improve transmission quality, system capacity, and coverage area. GSM works on three frequencies 900 MHz, 1800 MHz and 1900 MHz To make efficient use of frequency bands GSM networks uses combination of FDMA (frequency division multiple access) and TDMA (time division multiple access) . GSM operators have set up roaming agreement with foreign operator which help users to travel abroad and use their cell phones. GSM module was used for receiving SMS from users mobile phone that automatically enable the controller to take further action like switching ON and OFF electrical applications such as fan, air conditioner, light and other . The system was integrated with microcontroller and GSM network interface using arduino or other microcontroller and software was utilized to accomplish the integration.

In this project, GSM module SIM900 is chosen to use. The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. Define that, GSM module which contain of SIM card and subscription with mobile operator will operate like a mobile phone. The GSM module must be connected to Arduino with TX and RX to pin 2 and 3 respectively. When switch 'ON' the module, the blue LED will be 'ON' and after push the Button Key the red LED will be blinking. That shows the GSM in good condition, but we cannot define the line connected or not until we program the Arduino to test the GSM module.

There are other technologies beside GSM that can act as interface between the energy meters to the users, so that the users can monitor the current usage of their power consumptions. Technologies like Bluetooth and ZigBee are the some of the them. ZigBee is a radio frequency (RF) communications standard based on IEEE 802.15.4. ZigBee is a new wireless communication technology, representing a wireless sensor network which is highly reliable, secure, low data rate, low power consumption, low cost and fast reaction. The Zigbee coordinator is responsible for creating and maintaining the network. All communication between devices propagates through the coordinator to the destination device. The wireless nature of ZigBee helps overcome the intrusive installation problem with the existing systems identified earlier. The ZigBee standard theoretically provides 250kbps data rate, and as 40kbps can meet the requirements of most control systems, it is sufficient for controlling the system. The low installation and running cost offered by ZigBee helps tackle the expensive and complex architecture problems with existing systems. Zigbee enables broad-based deployment of wireless networks with low-cost, low-power solutions. It provides the ability to run for years on inexpensive batteries for a host of monitoring and control applications. Smart energy/smart grid, AMR (Automatic Meter Reading), lighting controls, building automation systems, tank monitoring, HVAC control, medical devices and fleet applications are just some of the many spaces where zigbee technology is making significant advancements. But the limitation of ZigBee against GSM is the coverage or distance area. Unlike ZigBee that has distance limitation up to hundred metres, we can find or get GSM signal in almost everywhere. This is the main consideration why we use GSM instead of ZigBee technology. So that the users can monitor their home power consumption from anywhere as long as they have cellular (GSM) signal in their mobile phones. Different frequencies have different characteristics, low frequency tend to have better penetration of particular materials compare to high ones, with the assumption of using same power. Experiment conducted in showed the microwave capability of penetrating material of water to measure moisture content.

A microcontroller is an integrated circuit that contains processor core, memory and programmable input and output peripherals. It also known as small computer that designed for embedded applications. On the other hand, the microcontroller incorporates all the features that founds in microprocessor. However, it has also added features to make a complete microcomputer system on its own. The microcontroller has built-in ROM, RAM parallel I/O, serial I/O, counters and clock circuit . The project use Arduino UNO for the microcontroller, The host processor for the arduino UNO is the Atmel Atmega328. The '328' is the 28 bit microcontroller. The architecture is based on Reduced Instruction Set Computer concept which allows the processor to complete 20 million instructions per seconds operating at 20MHz. The ATmega328 is equipped with three main memory section which is flash programmable read only memory (EEPROM), Static random access memory (SRAM) and byte-addressable EEPROM for data storage . The Arduino Uno is the 'standard' Arduino board and the most readily available. It is have 32KB of flash memory, 2KB of SRAM and 1KB of EEPROM memory. With a total of 14 digital I/O pins and 6 analog I/O pins, this is a very capable device, able to run most programs.

The DS1307 serial real-time-clock (RTC) is low power, full binary-coded decimal (BCD) clock / calendar plus 56 bytes. It communicates to Arduino over I²C connection. A real time clock just act like watch, it use 3V battery and keep time even when no current . Real time clock was used in this project to get the real time counting and storing the bill in the EEPROM. With the real time clock, the bill can be reset at 1st date for every month. It used battery 3V to maintain their life even no current flow.

For light to voltage converter, the TSL257 is combination of photodiode a transimpedance amplifier on a single monolithic CMOS intergrated circuit, it is high-sensitivity low-noise light to voltage optical converter. Output voltage is directly proportional to light intensity (irradiance) on the photodiode The TSL 257 light to Voltage converter also known as sensor because it detect the light and convert it to the voltage. It is used as interface energy meter to the arduino. It connected to the digital pin at the arduino and declares as digital write output 'HIGH'. When the LED at energy meter blinking, this sensor will sent the voltage to the arduino as a pulse 1. The system also added liquid crystal display (LCD), the display unit that used in this project is a 16 X 2 alphanumeric LCD which consist of 16 characters and 2 lines. It can act as the output display to show the bill, unit and GSM status on the meter.

Software System

Figure 3 shows the flowchart of the program used in the project, developed in C language with the Arduino syntax in the Arduino IDE. The software is also used for loading the program code into Arduino board. In this project, the arduino IDE was used to program, create, debug and upload the coding into the microcontroller. There are parts that need to be program which are digital write input/output, GSM network, Real time clock and EEPROM. Each program need to include the libraries of the coding such as for GSM use GSM.h or SIM900.h and other type of libraries but it depend on the coding requirement. For this project, it used libraries GSM.h, DS1307RTC.h, Wire.h, LiquidCrystal.h, and EEPROM.h

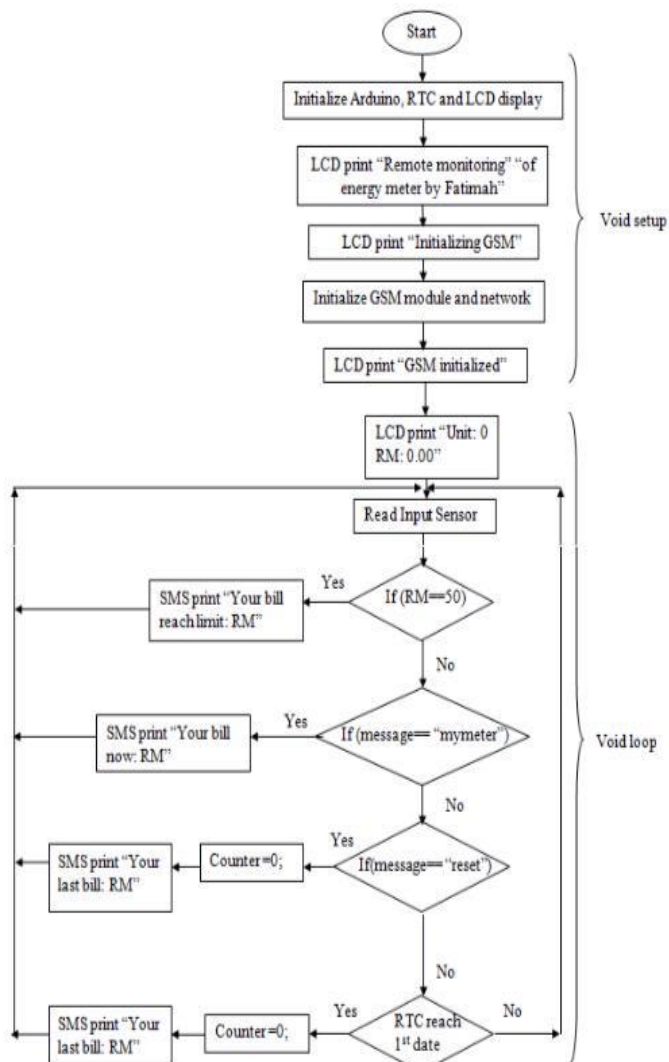


Figure 3: Flowchart of the Program

In the RTC coding, the real time get the time from the laptop for the first time when the program uploaded, and then it will continue as normal watch until we upload the new time. For the EEPROM coding, it writes 2 byte and read back 2 byte the data we write. To save the space, the EEPROM just store the bill for every 30 minutes pulse count and it can store up to 1 Kb. The data will not deleted even the power breakout because EEPROM is non-volatile memory. 'Count' is the unit of pulse for every 1Wh. Figure 4 shows the calculation of bill in 3 conditions. In this project, if the Count is less than and equal to 10, the unit will be multiple with RM 0.22 but in the real tariff for the first 200KWh must be multiple by RM0.218. For the next 100KWh the tariff is 0.334 while the net 300KWh is RM0.516. For this project, the tariff block and the bill range in small scale for simplification.

```

if (Count <=10)
{
  RM = Count*0.22;
}

if ((Count >= 11)&&(Count <=20))
{
  RM = ((10*0.22)+((Count-10)*0.26));
}

if (Count >= 21)
{
  //GST 6%
  RM = ((10*0.22)+(10*0.26)+(((Count-20)*0.35)+0.06));
}

```

Figure 4: Bill Calculation Formula

The Real time clock is used as indicator to reset the bill for every month. If the time reaches to the setted time, the Count will reset to zero and start count back the pulse. The SMS will be sent to inform the bill for that month. Another function of GSM in this project is to send SMS to users when the bill reached the limit as figure 5, or user ask a bill anytime or when the users wishes to reset the Count or Unit using SMS.

```

if((RM >=50)&&(sms_sent==false))
{
  sms.beginSMS(phoneNUM);
  sms.print("SMS from meterEnergy: ");
  sms.print(" \n You reach your limit RM :");
  sms.println(RM);
  sms.endSMS();
  Serial.println("\nCOMPLETE!\n");
  sms_sent = true;
}

```

The scope or working principle of the project would be,

- The remote monitoring of energy meter was installed at residential house.
- The sensor was place close on the LED flash indicator of KWh energy meter and Arduino counted the pulse as 1 pulse = 1 Wh when LED blinking.
- The user set the limit of energy consumption using SMS for example the limit is RM50
- The Arduino count the pulse continuously
- User received SMS from the Energy Meter after the energy consumption reach the limit.
- User sent "mymeter" as command to ask the current unit of energy consumption and the price.
- The Energy Meter replied the SMS to the user with contain of Unit and RM.
- The counter was reset to zero at the 1St date for every month and user received the last bill.
- User also can reset by their own with sending message "reset" to the system when needed.

RESULT AND DISCUSSION

There are two parts that was combined to make the system. The two parts that was combined were circuit for interfacing energy meter to arduino and interface from GSM module to Arduino. Circuit operation was in good condition with the right sequence of program that uploaded into microcontroller. For the light to voltage sensor part, Arduino with microcontroller ATmega238 was used to count the input, calculate the bill and store it into EEPROM. Real Time Clock was used to set the reset counter every month. LED indicator was blinking when input from sensor detected. The value of unit and bill price was display at the LCD display as set in the microcontroller. At the program, the number of mobile phone user was set to receive a message when limit reach. In GSM network, the network plan SIM card was used to transmit message to mobile phone. To combine this two part system, the GSM module Tx and Rx was connected to pin 2 and 3 respectively to Arduino while RTC used analog pin A4 and A5 at Arduino for CLOCK and RS. The other components such as LCD, LED and light to voltage sensor were connected to digital port 4 to 13.

ENERGY EFFICIENT LAMP AND ITS APPLICATIONS

GURUZ STEPHEN ALEX A - 212001 II YEAR / III Sem / A Sec

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Electric lighting is a major energy consumer. Enormous energy savings are possible using energy efficient equipment, effective controls, and careful design. Using less electric lighting reduces heat gain, thus saving air-conditioning energy and improving thermal comfort. Electric lighting design also strongly affects visual performance and visual comfort by aiming to maintain adequate and appropriate illumination while controlling reflection and

glare. Lighting is not just a high priority when considering hotel design; it is also a high return, low-risk investment. By installing new lighting technologies, hotels can reduce the amount of electricity consumed and energy costs associated with lighting. There are several types of energy efficient lighting and affordable lighting technology. The following are a few examples of energy- saving opportunities with efficient lighting.

Installation of Compact Fluorescent Lamps (CFLs) In Place of Incandescent Lamps.

Compact Fluorescent Lamps use a different, more advanced technology than incandescent light bulbs and come in a range of styles and sizes based on brand and purpose. They can replace regular, incandescent bulbs in almost any light fixture including globe lamps for the bathroom vanity, lamps for recessed lighting, dimming, and 3-way functionality lights. CFLs use about 2/3 less energy than standard incandescent bulbs, give the same amount of light, and can last 6 to 10 times longer. CFL prices range from \$4 to \$15 depending on the bulb, but you save about

\$25 to \$30 per bulb on energy during the lifetime of the bulb. Energy Efficient Lighting
Electric lighting is a major energy consumer. Enormous energy savings are possible using energy efficient equipment, effective controls, and careful design. Using less electric lighting reduces heat gain, thus saving air-conditioning energy and improving thermal comfort. Electric lighting design also strongly affects visual performance and visual comfort by aiming to maintain adequate and appropriate illumination while controlling reflection and glare. Lighting is not just a high priority when considering hotel design; it is also a high return, low-risk investment. By installing new lighting technologies, hotels can reduce the amount of electricity consumed and energy costs associated with lighting. There are several types of energy efficient lighting and affordable lighting technology. The following are a few examples of energy- saving opportunities with efficient lighting. When looking to purchase CFLs in place of incandescent bulbs, compare the light output, or Lumens, and not the watts. Watts refers to the amount of energy used, not the amount of light. In other words, if the incandescent bulb you wish to replace is 60 Watts, this is equal to 800 Lumens. To get the same amount of light in a CFL, you should look to find a CFL that provides 800 Lumens or more (equal to about a 13-watt fluorescent bulb). Use the table below to easily figure the conversions.

Installation of Energy-Efficient Fluorescent Lamps in Place Of “Conventional” Fluorescent Lamps.

Many lodging facilities may already use fluorescent lighting in their high traffic areas such as the lobby or office area. However, not

all fluorescent lamps are energy efficient and cost effective.

There are several types of fluorescent lamps that vary depending on the duration of their lamp life, energy efficiency, regulated power, and the quality of color it transmits. There are a few styles worth noting; these models are simply labeled as "T-12", "T-8", or "T-5". The names come from the size of their diameter per eighth inch. For example, a T-12 lamp is 12/8 inch in diameter (or 1 1/2 inch); a T-8 lamp is 8/8 inch in diameter (or 1 inch); a T-5 lamp is 5/8 inch in diameter. This is a simple way to identify the type of fluorescent lamps your facility is using. The recommended style of fluorescent lighting is a T-8. T-8 lights are the most cost effective. They usually cost about

\$0.99 a bulb and are 30% to 40% more efficient than standard T-12 fluorescent lamps, which have poor color rendition and cause eye strain. T-8 lamps provide more illumination, better color, and don't flicker (often exhibited by standard fluorescent fixtures). T-5 lamps are the most energy efficient and also tend to transmit the best color; however, they usually cost about \$5.00 per bulb. Each style of fluorescent lamp cannot function without a ballast. A ballast is an electrical device used in fluorescent lamps to regulate starting and operating characteristics of the lamp. Some ballasts are magnetic where as others are electronic. Electronic high frequency ballasts are now standard for most fluorescent lights. Due to

the differences in wattage between the types of lights, if converting from a T-12 to a T-8 light, one must also change the type of ballast being used.

Installation of Occupancy/Motion Sensors to Turn Lights on And Off Where Appropriate

Lighting can be controlled by occupancy sensors to allow operation whenever someone is within the area being scanned. When motion can no longer be detected, the lights shut off. Passive infrared sensors react

to changes in heat, such as the pattern created by a moving person. The control must have an unobstructed view of the building area being scanned. Doors, partitions, stairways, etc. will block motion detection and reduce its effectiveness. The best applications for passive infrared occupancy sensors are open spaces with a clear view of the area being scanned. Ultrasonic sensors transmit sound above the range of human hearing and monitor the time it takes for the sound waves to return. A break in the pattern caused by any motion in the area triggers the control. Ultrasonic sensors can see around obstructions and are best for areas with cabinets and shelving, restrooms, and open areas requiring 360-degree coverage. Some occupancy sensors utilize both passive infrared and ultrasonic technology, but are usually more expensive. They can be used to control one lamp, one fixture or many fixtures. The table below provides typical savings achievable for specific building areas, as determined by EPA studies, with the average savings being 60%.

Use an Automated Device, Such as A Key Tag System, To Regulate the Electric Power in A Room.

The key tag system uses a master switch at the entrance of each guest room, requiring the use of a room key-card to activate them. Using this technique, only occupied rooms consume energy because most electrical appliances are switched off when the keycard is removed (when the guest leaves the room). Along with lighting, the heating, air conditioning, radio and television may also be connected to the master switch. This innovation has a potential savings of about \$105.00 per room per year.

Offer Nightlights to Prevent the Bathroom Lights from Being Left on All Night.

Many guests opt to have a light on while they sleep. By turning the bathroom light on and leaving the bathroom door cracked open, guests are able to find their way through an unknown room in the middle of the night. Those who are accompanied by children may often do the same to comfort their child. By

offering a nightlight, the energy used to power a bathroom light during the nighttime

can be avoided and guests will still be able to feel comfortable in unfamiliar territory. One particular model uses six Light Emitting Diodes (LEDs) in the panel of a light switch to provide light for guests. LEDs are just tiny light bulbs that fit easily into an electrical circuit. They are different from ordinary incandescent bulbs because they don't burn out or get really hot. They are often used in digital clocks or remote controls.

MV/LV TRANSFORMERS, WHERE EVERYTHING STARTS...

SIVALINGAM R- 212026 II YEAR / III Sem / A Sec

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ABSTRACT

The general term power supply in LV networks refers to the supply of electrical energy. The power supply, and more generally the different supplies, are provided by sources (mains supply, batteries, generator sets, etc.) which can be MV/LV transformers, diesel generator sets, and UPSs.

This technical article will explain the most common power supply for LV networks provided by a MV/LV transformer. Don't be confused, the same transformer with or without some modifications can be used also as backup power supply, special power supply for safety services or auxiliary power supply.

Let's see now the the most common power supply source – transformers that are used in MV/LV networks.

MV/LV transformers are generally divided into three types depending on their construction: Oil, Air insulated and Resin insulated dry-type transformers.

Contents:

- Oil transformers
- Air insulated transformers
- Resin insulated dry-type transformers
- Applications
- Medium-voltage winding
- Characteristics of MV/LV transformers
- Primary and Secondary Connection Configurations
- Time index

- MV/LV transformer common couplings
- Coupling group

1. Oil transformers

The magnetic circuit and the windings are immersed in a liquid dielectric that provides insulation and evacuates the heat losses of the transformer.

This liquid expands according to the load and the ambient temperature. PCBs and TCBs are now prohibited and mineral oil is generally used. It is flammable and requires protective measures against the risks of fire, explosion and pollution.

The four types of immersed transformer:

- Free breathing transformers,
- Gas cushion transformers,
- Transformers with expansion tank and
- Transformers with integral filling, only the latter are currently installed.

Structural standards for immersed transformers

Power from 50 to 2500 kVA (25 kVA possible):

Primary voltage up to 36 kV

Secondary voltage up to 1.1 kV

Power > 2500 kVA:

HV voltage greater than 36 kV

IEC 60076-1, IEC 60076-2, IEC 60076-3,

IEC 60076-4, IEC 60076-5

1.1 Free breathing transformers

A quantity of air enters the surface of the oil and the cover allows the liquid to expand with no risk of overflowing. The transformer “breathes”, but the humidity of the air mixes with the oil and the dielectric strength deteriorates.

1.2 Gas cushion transformers

The tank is sealed and a cushion of neutral gas compensates for the variation in volume of the dielectric (risk of leak).

1.3 Transformers with expansion tank

To limit the previous disadvantages, an expansion tank limits the air/oil contact and absorbs the overpressure.

However the dielectric continues to oxidise and take in water. The addition of a desiccant breather limits this phenomenon but requires regular maintenance.

1.4 Transformers with integral filling

The tank is completely filled with liquid dielectric and hermetically sealed. There is no risk of oxidation of the oil.

The word "VISION" is displayed in large, bold, black capital letters. Each letter is contained within a separate, brightly colored rectangular block. The colors from left to right are: red for 'V', blue for 'I', purple for 'S', pink for 'I', cyan for 'O', and orange for 'N'. Each block is suspended from a thin gold chain, giving the impression of hanging signs.

VISION

**To become a high standard of excellence in Education,
Training and Research in the field of
Electrical and Electronics Engineering
and allied applications**

The word "MISSION" is displayed in large, bold, black capital letters. Each letter is contained within a separate, brightly colored rectangular block. The colors from left to right are: yellow for 'M', red for 'I', purple for 'S', blue for 'S', cyan for 'I', red for 'O', and cyan for 'N'. Each block is suspended from a thin gold chain, giving the impression of hanging signs.

MISSION

***To Produce excellent, innovative and Nationalistic Engineers
with Ethical values and to advance in
the field of Electrical and Electronics Engineering
and Allied Areas***