Energy Efficient Technology In Industrial System

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ABSTRACT-For any industry there is a certain limit for the electricity demand, if industrial systems demands electricity more than limit then company have to pay penalties. Usually it happens for 8-30 minute and company have to pay penalties in lakhs. Our projectEnergy Efficient Technology in Industrial System is useful in industrial systems. The main objective is to manage and control the maximum requirement of electricity used by industrial systems within desired limit. A system will continuously monitor and control the power require by the device. If demand of electricity goes above desired maximum limit then the system will turn off unnecessary equipments sequentially such as tube light, fan, motor, air conditioner, bulb etc. Sequence is user defined and as per user requirement. So company can avoid the penalties and can save money. We can also save electricity by reducing its use and can be use it for another application.

I.INTRODUTION

Maximum Demand is the power require over a predetermined span duration, which is between 8– 30 minutes. The most occurring length of time, in the most of countries is 15 minutes. This power is count and billed by a kW require quantity, which save the max kW value in one 15 minute time, over a month's time. The maximum demand charge often be an example of a large portion of the total bill. Monitoring power use and switch off or reducing non essential application during such time of high power use can realize considerable savings. The Maximum Demand Controller is a realistically priced stand-alone Controller suitable for small to medium user wishing to decrees their maximum demand in a low cost and simple manner. The unit can also be used for reducing cable and transformer loadings.

Apart from this, it gives you a runtime Power usage and without interruption observation of Voltage, Current, and Power in KVA. On a LCD screen panel it shows the uninterruption varying data. At the controlling end this network comes with the service to control certain action of the plant. This can be obtain by giving the threshold reading of MD to the orderliness via a keyboard. So in the process of monitoring if it detects current MD maximum than or near to user set MD then it can trip the controller as per need.MD controller works on principle of random values of voltage and current and calculating power in KVA. At the exactly alike time system's Real Time Clock will keep follow of time and highly adaptable and low cost solution to many embedded control system calculates present MD. Then willingly to the logic the current MD and the MD specification by user is compared and the predetermine load tripping action is taken. After a predetermine period it again take reading of MD. Now if the calculated MD is less than the current MD then it reconnects the load in proper manner and if it is more than the current MD then it trips the next application. This action continues forever and thus the total load gets controlled, monitor and the desired MD is restricted from reaching its maximum value.

II. SYSTEM MODEL

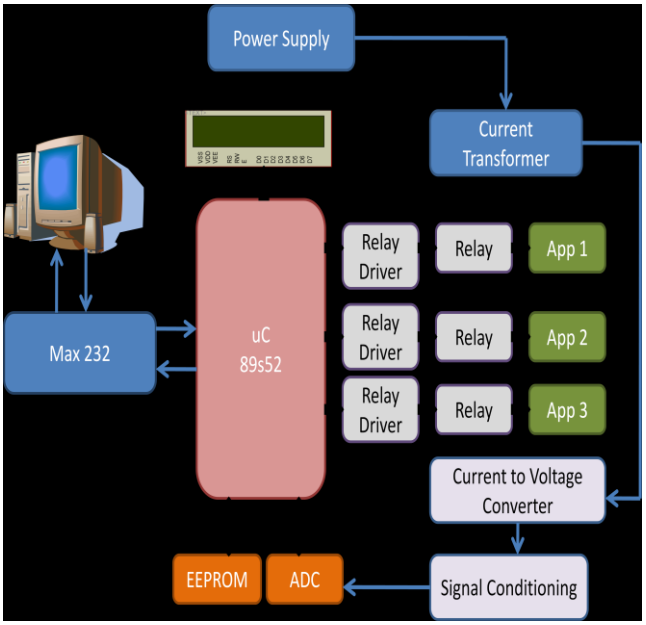

Figure.1. Block Diagram of System

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III.HARDWARE DESIGN & SPECIFICATIONS:

Controller: 89s52: Easily Available
EEPROM: 24c02: 2k bits memory sufficient for storing meter reading & the meter ID, I2C protocol used for communication between the controller & the EEPROM.
ADC: ADC 0808 : simple to interface & easily available.
LCD: 2x16: for displaying the current Meter reading.
On/off switch: Used to turn ON/OFF house power.
Buzzer: Used to indicate a warning that the Bill hasn't been paid.
MAX 232: Used to convert 0 & 5V serial data from the controller into MAX 232 protocol to be interfaced with the central PC.
The EEPROM is used to store the current METER READING, METER ID & if there is a power failure the previous meter reading is saved in the EEPROM. So upon power ON the meter is started from the previous reading only.
The meter is connected to the central computer using MAX 232 the meter sends its meter ID & current meter reading to the PC when the PC asks for it. The PC can also turn ON/OFF the POWER to the house by sending a command to the METER.
The relay driver circuit is used to drive the relay which in turn provides the power to the house. If the relay is deactivated the power to the house is discontinued & when it is activated the power is provided to the appliances.
The power line to the house goes through a Current Transformer. The current transformer has a ratio of 20:1 i.e. if the current through the primary is 20A then the current through the secondary will be 1A. This secondary current is then given to a current to voltage converter which converts the current into corresponding voltage level. This is then given to a signal conditioning circuit to remove any noise & spike. Now this voltage is then given to the ADC 0808 & the ADC converts the corresponding analog signal into digital & gives it to the controller. The controller then monitors this data continuously & increments the METER according to the current used in the house.Normally 20A is provided for each house but in case the current drawn is more than 20A then the meter runs at double the speed. The buzzer is used to notify the house owners if bill payment is due & the power will be disconnected if bill is not paid. For power of the house to be disconnected a signal is send by the PC to the controller the controller then deactivates the relay. Calculation for 1 unit = 1KWH i.e. if 1KW is consumed continuously for one hour then the UNIT will increment by 1.

KW: Voltage x Ampere
Since voltage= 230v
Then if current drawn is 1000/230 = 4.34A for 1 hour continuously then the unit is incremented by 1.
4.34AH: /60/60: /3600
1 SEC: 4.34/3600:1.2MA
The complete ckt operates on regulated 5V . This 5V is generated from the 230V using a step down transformer, then rectifying the sine wave & then using the voltage regulator 7805 to obtain a regulated 5V.

1] Microcontroller:
The 89S series is a low-power, high-performance CMOS 8-bit microcomputer with Flash programmable and erasable read only memory.Here we are using ATMELS AT89c/s52 microcontroller. The controller executes instructions as per the clock cycles; this clock is generated using a crystal which is connected to the XTAL1 & XTAL2 pin of the microcontroller, the two capacitors C1 & C2 are connected between the two XTAL pins & the ground. They are required for the crystal to oscillate. A Power ON reset circuit is connected to the RESET pin of the microcontroller, the controller must be reset properly whenever is power is turned on, which is done by applying a Vcc to the reset pin & for normal operation of the controller the pin should be pulled low. So an RC (R1, C3) circuit is connected to the RST (9) pin of the microcontroller. Whenever the power is turned ON the Capacitor is fully charged & the RST pin gets 5V. Then the capacitor slowly discharges through the resistor & is then pulled to ground. Microcontrollers Port 0 does not have an Internal Pull Up resistor so we need external Pull Up resistors on Port 0. For which we use 9-Pin SIP resistor which are basically eight resistors with one end common.

2]Relay and driver:
Relays are devices which use in low power circuits to change from relatively high Current or Voltage logic 1 or logic 0. For a relay to operate a suitable pull-in & holding current should be passed through its coil. Usually relay coils are use to operate from a particular voltage from 5V or 12V. Over here we have used a 12v relay with which we can switch 5A load current. This relay is also commonly known as CUBE Relay. The relay basically consists of five terminals, two of them are used for the coil & the remaining three consists of a common pole & one Normally Closed (NC) & Normally Open Pole. The function of relay driver circuit is to provide the necessary current (typically 50 to 100mA) to energize the relay coil. The relay driver section consists of NPN transistor BC547 which is labeled as Q1. The transistor is driven into saturation (turned ON) when a LOGIC 1 is written on the

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PORT PIN thus turning ON the relay. The relay is turn OFF by taking LOGIC 0 on the port pin. A diode (1N4148) is connected across the relay coil; this is done so as to protect the transistor from damage due to the BACK EMF generated in the relay's inductive coil when the transistor is turned OFF. When the transistor is logic 0 the energy stored in the inductor is dissipated through the diode & the internal resistance of the relay coil.

3]EEPROM

EEPROM stand electrically erasable programmable read only memory and it is type of non-volatile memory used in computer and other electronics devices to store small amount of data that must be save when power is removed or off.When large amount of static data are to be stored a specific type of EEPROM such as flash memory is more economical then other traditional EEPROM device.Each EEPROM device typically has its own set of op-code instruction to map to different function. Some of the common operations on SPI EEPROM devices are:-

1. write enable(WRENAL)
2. write disable(WRDI)
3. read status register(RDSR)
4. write status register(WRSR)
5. read data(READ)
6. write data(WRITE)

Newer non volatile memory such as FeRAM and MRAM are slower replacing EEPROMs in some application.

4] Buzzer Driver Circuit:

Lots of buzzers are available in the market depending upon the size and voltage range and as per the application. We mostly use piezo buzzer working on 5v or 12v having a resonant frequency around 2000Hz. These buzzers are easily available in the local market and low costing. These buzzers require about 25ma - 45ma current for proper sound generation if they do not get the desired current and voltage the output volume of the buzzer decreases or else we do not get any output at all. The controller cannot directly turn ON/OFF the buzzer as the output source as well as sink current of the current is below 20ma. So we have used an NPN transistor BC547 to ON/OFF the buzzer and provide the necessary current and voltage required for the buzzer. The main function of buzzer is to give alert to used that there is some error or any level is gone maximum or minimum level. Buzzers are the some alert function in the any of the electrical or electronics application, which alert the user about the application.

5] Switch:

In electrical engineering, a switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch may be operated directly by a human operator to control a circuit (for example, a light switch or a keyboard button), may be operated by a moving object such as a door-operated switch, or may be operated by some sensing element for pressure, temperature or flow. A relay is a switch that is operated by electricity. Switches are made to handle a wide range of voltages and currents; very large switches may be used to isolate high-voltage circuits in electrical substations.

6]MAX232:

MAX232 is a very common IC basically required for interfacing controller to PC.MAX 232 IC basically converts RS232 voltage level into TTL voltage level i.e. 10Vto 5V. MAX 232 is used not just used for PC interfacing it is also used to interfacefollowing modules

1. GSM Module.
2. GPS Module.
3. RFID Reader.
4. Zigbee Module.
5. Bluetooth Modules.
6. Wifi Modules.

As we can see most of the modules available in the market provides RS232 outputwe will be requiring MAX232 IC for interfacing the modules to controller.

7] Current transformer:

Current transformers (CTs) are an indispensable tool to aid in the measurement of AC current. They provide a means of scaling a large primary (input) current into a smaller, manageable output (secondary) current for measurement and instrumentation. A CT utilizes the strength of the magnetic field around the conductor to form an induced current on its secondary windings. This indirect method of interfacing allows for easy installation and provides a high level of isolation between the primary circuit and secondary measurement circuits.CTs are available in various sizes, designs and input ranges and output signal types.

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IV. FLOWCHART:

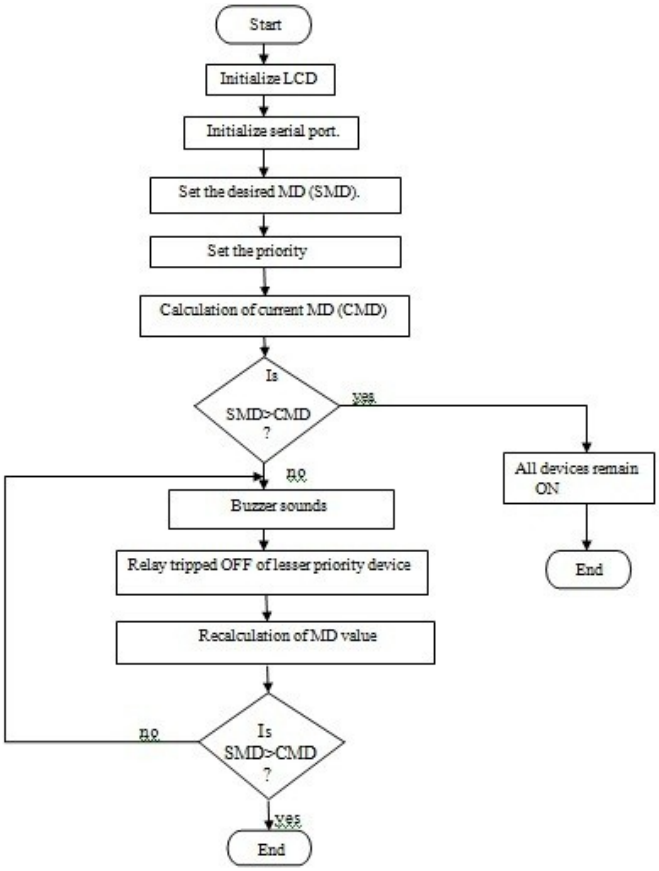

Figure.2. Flowchart

V. APPLICATIONS:

1. It can use in medical industries.
2. It can be use in automobile industries.
3. It can be use in manufacturing companies.
4. It can be use in big hotels.
5. Can be use in electronics companies.

VI. ADVANTAGES:

1. Power consumption gets reduced.
2. Reduce electricity bill and penalties.
3. Protect devices from electrical damage.
4. Maintainstability of power by continuous monitoring.

VII. CONCLUSION:

Thus we can conclude that, we can save power, money and can avoid damages of electrical appliances in industries by implementing energy efficient technologies. With the help of this project we can reduce human effort, increase accuracy in maximum demand detecting and increase stability of power.

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