ISSN XXXX XXXX © 2019 IJESC

Research Article Volume 9 Issue No.3

Load Shedding Time Management System using Microcontroller

Sumit Vyas[1], Mohd. Shakir [2], Vishal Rana[3], Shaz Raza Khan[4], Manu Agarwal[5]
Department of Electrical & Electronics Engineering
Galgotias College of Engineering & Technology, Greater Noida, Uttar Pradesh, India

Abstract:
As demand of power is increasing continuously, with already installed power generation system, we cannot replace the new generating system every time. Therefore Load Shedding is the most preferred solution to meet this problem. Since Load Shedding is monitored manually by allotment of some in charge person to turn On/Off the switch, so it is not very efficient as well as non reliable. Therefore " Load Shedding Time Management System using microcontroller " can be designed which can automatically turn On/Off the switch as per the command fixed into it with Real time clock system operated using 8051 microcontroller. This paper would be providing information of how a Real time clock system interfaced with microcontroller will help in shedding the load of various zones as per the command fed to it.

I. INTRODUCTION

For proper functioning of the complete distribution system, the power generation system must be operated in the stable condition. The stable condition is defined as the power generated by the system must be completely utilized in running and remaining in losses so that equation may become valid. Reserved power + power generated = System Running power + losses. But the problem may arise if there is an extra demand in the Load, which will make the system unstable during demand time. This will affect the system stability and the demand will also not get fulfilled because of a specific range of pre-installed generation system which cannot generate more than its capacity. Hence we say there serve power for critical/extra loading is not possible. Thus it becomes very important to shed the Load of some zones to meet the demand of other zones and providing next time to those which were shed before. Since, till now, Load Shedding was done manually but if done using "Programmed devices" to control, it may prove more efficient. The reason is that the entire substation can be controlled by a single controlled substation and command can be transferred from single centered substation to ease the work of different person. The control of various feeders , substation, Distribution Transformer and Various distribution Points are not easier to control at a time, therefore to meet this problem a single centered station designed with Programmable Load shedding system to operate them all from a single location.
The problem of theft can also be reduced by a very great margin because it completely closes the power to a specific zone. Thus after completely cutting the power from a particular zone, no one can access power from any other nearby locations under the restricted zone, but with manual handling at substation people try to steal the connection from other active connections of near-by zone but when this new technology is employed, it completely cuts off the total power available in that zone. Thus Load shedding is the technique which can be used where there is a heavy demand of power & is beyond the capacity of system to generate it. The biggest problem is to deal with the assembly of various components including feeders, distribution points, etc all at a time, therefore to meet the problem a single centered station designed with Programmable Load Shedding system to operate them all from a single location. Therefore a system has to be designed which can control the supply over specific period of time for every zones. Thus "Load shedding time management system using microcontroller" is a reliable system to monitor the on/off of electrical devices as per the time. Real time clock system interfaced with 8051 microcontroller. When the set time matches the real time, the microcontroller gives command to the respected relay to turn on/off the load.

II. METHODOLOGY

The electric power system main job is to connect the power structure to the consumers load. An electric power system has mainly three parts:

1. Power generation

2. Transmission system

3. Distribution system

In power generating station the electric power is generated at 11KV, 50Hz. Before transmitting the power over long distances, the power is stepped-up to 400KV, 220 KV to reduce the power losses while transmission. A high voltage line of transmission network is used to transmit the power. Normally, the voltage lines which are used for transmission are installed in hundreds of kilometer and it delivers the power into the grid. A sub transmission network of 33KV, 66KV lines is used for the connection of the load to the grid. Then the voltage is stepped down to 11KV at the substation for the purpose of power distribution to load points through the transmission lines of 11KV and lower. The further section briefs about the number of effective loads shedding techniques which are-

i. Manual load shedding technique

In this technique, an electrician is employed at the substation whose job is to cut the power supply of a certain region for certain time period. This is done to control the demand of electrical energy of that region. In this way the manual load shedding is done.

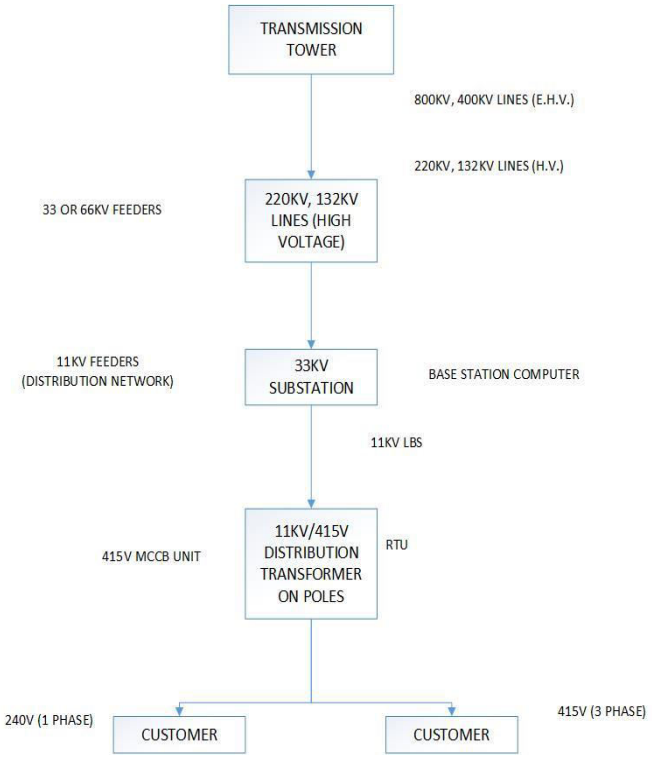

Figure.1. Transmission Layout

ii. Programmable load shedding technique

The demand of electricity regularly varies and sometimes generating station couldn't satisfy the required the demand. Hence it becomes difficult to match the generating capacity to high demand. So whenever the demand exceeds the supply an effective load shedding for power system is needed. The "Load shedding time management system using microcontroller" is a better alternative to the manual task of cutting the power supply with respect to the time. This system uses 8051 microcontroller which is interfaced to the real time clock (RTC). The microcontroller gives command to the relay which turns on the electrical load as the set time is equal to the real time. Then give the next command to turn off the load as per the program. The biggest advantage of this project is the multiple on/off time entries which makes the system more flexible. The system load is continuously observed by measuring the input rates and the load level on each server is also estimated accordingly. The requirements of this system are:

A. AT89S52 MICROCONTROLLER

It is an 8 bit low power microcontroller which has 8K bytes of programmable flash memory. It is compatible with the industry standards 80C511 instruction set and pin out. It is manufactured using thick non-volatile memory machinery of Atmel. The program memory can be re-programmed in the system using on-chip flash or by a non-volatile memory programmer. Atmel AT89S52 is best solution to many embedded control applications because of its high flexibility & good performance.

B. Relay Driver ULN2003

Relay Driver ULN2003 is a high voltage, high current Darlington transistor array comprising seven open collector Darlington pairs with common emitters. It comprises of seven NPN Darlington pairs that feature high voltage outputs with communal cathode Clamp diodes for switching inductive loads. The collector current rating of a single Darlington pair is 510 mA. For higher current competences, the pairs can be paralleled. ULN2003 is used to edge relays with the microcontroller since the maximum output of the microcontroller is 5V with too little current distribution and is not practicable to operate a relay with that voltage. [1]

C. Electromagnetic Relay

It is an electromagnetic device which is used to isolate two circuits electrically and link them magnetically. For example, a relay can make a 9V DC battery circuit to switch a 230V AC mains circuit. Therefore a small sensor circuit can drive a small fan or an electric bulb. A relay switch can be distributed into two parts: input and output. Operating voltages like 5V, 9V, 10V, 24V etc. Input part - 2 Coil Pins: These pin are the controller switch which is connected to electromagnet through which we can govern the operation of relay. Here low voltage is applied to generate magnetism. Output part - Normally Open Contact (NO) – NO contact is also called a make contact. It ends the circuit when the relay is started. It detaches the circuit when the relay is not active. (NC) Normally closed contact, it is also known as break contact & it is opposed to the NO contact. When the relay is deactivated, the circuit connects & when the relay is activated the circuit disengages.

D. LCD

A display where many small rod shaped molecules are sandwiched between a piece of flat glass & a dense substrate is known as L.C.D. Due to these rod-shaped molecules present in between the plates, two different physical positions into line based on the electric charge is applied to them. In case there is no charge they become crystal clear whereas in the case of electric charge they align to block the light coming through them which makes the desired images appear by making the light passing through it. It is the basic concept of LCD. Due to many advantages of L.C.D. they are most frequently used as they have benefit over other display technologies. LCD is very small in size and in comparison to L.E.D.'s & C.R.T.'s it consumes very less electricity. In a 16x2 LCD there are 2 lines and can display 16 characters per line. There are 2 registers command & data in a LCD. The command register is used to rations the command directives applied to the LCD. When a command instruction is given to LCD its job is to do tasks like clearing its screen, setting the cursor position, initializing it, regulatory display etc. The data which is to be displayed on the LCD is stored using the data registers. The data which is to be displayed on the LCD should be ASCII value of the character. LCD are driven by an onboard power supply similar to most of the presently available home appliances & electrical devices having transformer for AC source, a bridge rectifier to convert to DC source & to get a 5V DC source from a voltage controller. A power supply of 5V is supplied to the Atmel AT89S52 microcontroller, ULN2003, 16×2 LCD module & a level shifter IC MAX232.

E. REAL TIME CLOCK (RTC)

A real-time clock (RTC) is a processer clock (most often in the form of an integrated circuit) that keeps track of the current time. A real time clock (RTC) is a timepiece module having an independent battery for operation and has a backup RAM always provided with electric power from the battery. Many data processing circuits utilize real-time clocks to deliver a real-time

clock value representing, for example, the current day, date and time. Typically, when the data dealing out the circuit is first activated, the correct day, date and time may need to be set. When the data handling circuit is shut down, power is sustained to the real-time clock by a battery, so that the real-time clock may continue to operate. [2] A Real-Time-Clock (RTC) is, as the name suggests, a clock which keeps track of time in a "real mode." While there are a numeral of 8051-compatible microcontrollers that have built-in, precise real-time clocks (especially from Dallas Semiconductor), some humble applications may benefit from a software RTC solution that uses the built-in capabilities of an 8051 microcontroller. [3]

III. BLOCK DIAGRAM

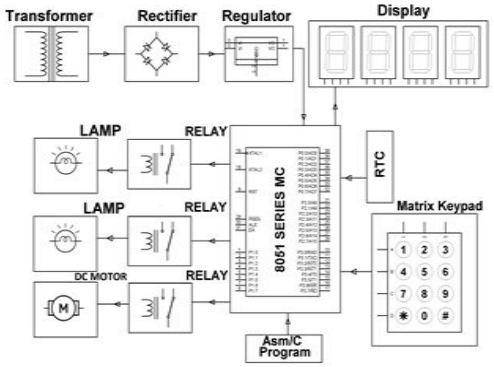

Figure. 3. Simplified block diagram of the system

OBSERVATIONS

As per our observations (RTC) is working more accurately in comparison to other time keeping devices, because of its function to perform important tasks, also it is power efficient . By using real-time clocks (RTC) functionality of electronic devices can also increase. While comparing the times of previous functions electronic devices can rely on real time clocks. Also device functions can be reduced if the functions have taken place within a selected period of time. The observation for different time is given below:

Table 1. Load observation Table

S.No	Time Slot	Function	Load connected with switches			
			L-1SW1	L-2 SW2	L-3 SW3	Total load (Bulbs) in Watts
1	1:30	To turn switches (1, 2, 3) On/Off as per command fed into µ controller	ON	ON	OFF	10 W
2	1:40		ON	OFF	ON	10 W
3	1:50		OFF	ON	ON	10 W

Where,
L1 = Load connected to switch 1,
L2 = Load connected to switch 2,
L3 = Load connected to switch 3.
Therefore real time clocks interfaced with AT89S52 microcontrollers can be used in load shedding time management system by utility departments.

IV. ADVANCEMNENT & FUTURE SCOPE

This project could be further extended in which the distribution point can be monitored by one central location. The supply of concerned geographical region is cut off using relays through circuit breaker. In this system to read the remote electrical parameters, user can send commands to concerned DP. This system can send the electrical parameter data like active power, reactive power, current, voltage, frequency etc., in the form of SMS to the user when relay trips. In this type of power system sensors are used to communicate with the microcontroller. Internal memory in the microcontroller helps to hold the assembly code. . Some set of assembly instructions are dumped into the controller using internal memory. Assembly instructions are very important as the operation of the micro-controller is completely dependent on these instructions. This proposed system might takeover manual efforts for controlling the load shedding time break by sending SMS. Power supply cut off of specific zone can be done by just sending an SMS to the concerned Distribution Point from a central point .When the electrical parameters overdo the predefined values these relay will be activated.

V. REFERENCES

[1]. Data Sheet - Texas Instruments of ULN2003 [online] www.ti.com/lit/ds/symlink/uln2003a.pdf

[2]. MVP Rao - A Research in Real Time SchedulingPolicy for Embedded system-2009 thepaper is available at www. clei.org/ cleiej/papers/v12i2p4.pdf

[3]. DS1307 - Part Number Search – Maxim data sheets. Maxim integrated.com/en/ds/DS1307.pdf

[4]. Demand for electricity changes through the days www. eia. gov

[5]. Electricity Demand http://www.mpoweruk.com/electricity_ demand.htm