



Grid frequency based load control using pic microcontroller

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Abstract - This paper contains the problems related with frequency. It is one of the effective tools to maintain the reliability by controlling the grid frequency of the power system. The Grid frequency controller is used with PIC Microcontroller for individual load shedding purpose. Because of this, the nearby areas can not be affected. As the demand of electricity increases; at the generating stations there will be increase in the load and hence the decrease in the generating frequency can occur. If this goes out of control then MTPS will switch off the supply to the Grid and thus the Load shedding will be avoided for the total area.

Keywords - Grid frequency; PIC Microcontroller; Load shedding.

1. INTRODUCTION

The Grid frequency controller is the tool or concept with which MTPS (METTUR THERMAL POWER STATION) can control the power supplied to the customers. As the demand of electricity increases; at the generating stations there will be increase in the load and hence the decrease in the generating frequency can occur .To maintain the frequency in the decided range i.e. 49 to 51 Hz lot of additional resources like coil, water etc are being used currently. If this gone out of control then MTSP will switch off the supply to the Grid and thus the Load Shading for common man occurs. That means that as the load increases MTPS will shut the supply in the grid off and thereby for that grid no one will able to have the electricity until the load demand reaches to its nominal value. By the time in generating stations the generation of electricity will not stop and it is only wastage.

To avoid this lot of work is going on our present concept is a part of that. Its approach is at individuals instead of some particular area. In this project, for demonstration purpose we will store system power on readings of voltage and current across the load along with the real time clock. We have

proposed to use the PIC microcontroller, ADC for the respective data acquisition of load voltage and load current.

Therefore current transformer provides current rating& potential transformer voltage rating in the analog form to the ADC (0808).After that, digital signal is applied to different ports of the microcontroller as per the limit of frequency; the microcontroller executed the control action to the relay. For switch OFF and switch ON the load. If the frequency is in limit, then only load switch ON continuously.

Otherwise it will cut off & which is known as load shedding from the supply side.

For frequency monitoring we use interrupt of PIC microcontroller and for real time clock we will use battery backup RTC chip interfaced with microcontroller on I2C protocol. The control of load will be achieved through the relay. Required software will be in assembly language.

2. RELATED WORKS

Grid Frequency Controller using Microcontroller 89V51.In present situation when there is increase or decrease in load which affect the behaviour of the generator. The Indian appliances designed to operate at 50 Hz. If this not maintained they will damage drawing high current. In case of faults or high loads, the following steps take place. Power delivered by the generator increases as the power input is constant (mechanically). The kinetic energy stored in rotor as speed decreases frequency tends to fall.

In substation under frequency or over frequency relay are installed. When there is any fault i.e. increase or decrease in frequency due to the load, the relay senses the fault and trips the circuit immediately and comes to ON position when the frequency comes to normal condition i.e. 50 Hz. During tripping the load shedding of that area is done till it comes to normal condition [1].

Frequency-Based Load Control in Power Systems Decentralised synchronous and asynchronous algorithm is used to solve the load control problem. Imbalance between

generation and load is corrected. Optimization technique is emerged. The power demand and supply is balanced [2].

Co-ordinate load control and load shedding balance by using Microcontroller. To control load shedding and to detect the fault using microcontroller. Control the power grid. Overload protection system can be controlled by,

- Load shedding
- Voltage regulator
- Coordinate current control [3].

Automatic Load Sharing and Control System Using a Microcontroller. Automatically controls the overload on the generator by sharing power and to provide non interrupted power supply. It is based on system realization.

It consists of five modules, Alarm unit and display unit is used.

- Power supply
- Power regulator
- Microcontroller unit(PIC16F877A)
- Load
- Load switching unit[4].

Priority Energy Load Management Using Microcontroller. Guarantee the energy supply for critical load using automation technique. Transmitter section includes, Atmega328, Relay, load Receiver section includes, Personal computer. If the threshold current is more, then it will off the selected load. Atmega328 controls the serial communication and relay [5].

To maintain the balance between the demand and supply for regulating the frequency using automatic generation control system (AGC) and turbine generator. It is used to stabilise the load frequency using load frequency control. Step response is obtained by the time delay given through programming to the microcontroller.

It consists of,

- Servomotor
- Cooling tower
- Turbine generator [6].

3. PROPOSED SYSTEM

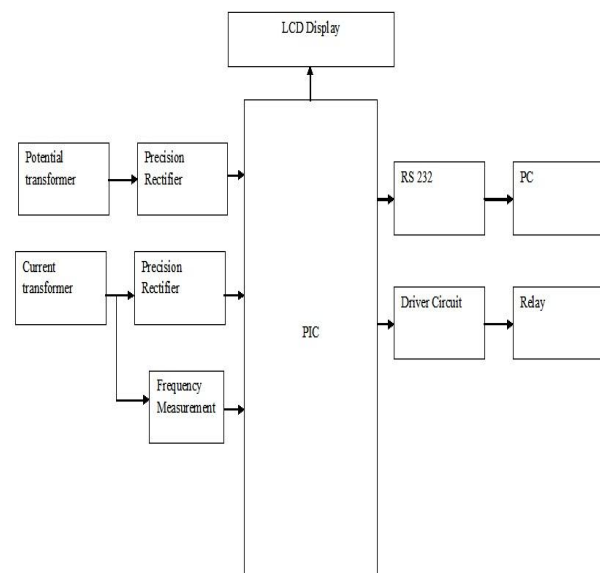
Now days because of load increasing for some particular area, the total load demand can be increasing on generating side. These difficulties can be overcome, by individual load shedding method. Because of that, the Frequency can be controlled by Grid Frequency controller by using PIC microcontroller. This is the effective frequency control method. In the grid frequency controller frequency can be controlled with the help of PIC Microcontroller.

PIC MICROCONTROLLER

PIC stands for Peripheral Interface Controller coined by Microchip Technology to identify its single chip microcontrollers. These devices have been phenomenally successful in 8-bit microcontroller market. The main reason is that Microchip Technology has constantly upgraded the device architecture and added needed peripherals to the microcontroller to suit customer's requirements, large user base Extensive application notes, and Low cost free / low cost development tools. Hardware / Software

- PIC microcontroller
- Relay
- Load
- Relay switching unit
- Load frequency control
- Current transformer
- Voltage transformer
- LCD display
- Multiplexer
- ADC converter
- Power supply
- I/O ports.

BLOCK DIAGRAM



Working of Block Diagram

As the load demand changes inversely supply frequency can be changes. In the block diagram there are different types of equipments are connected each other.

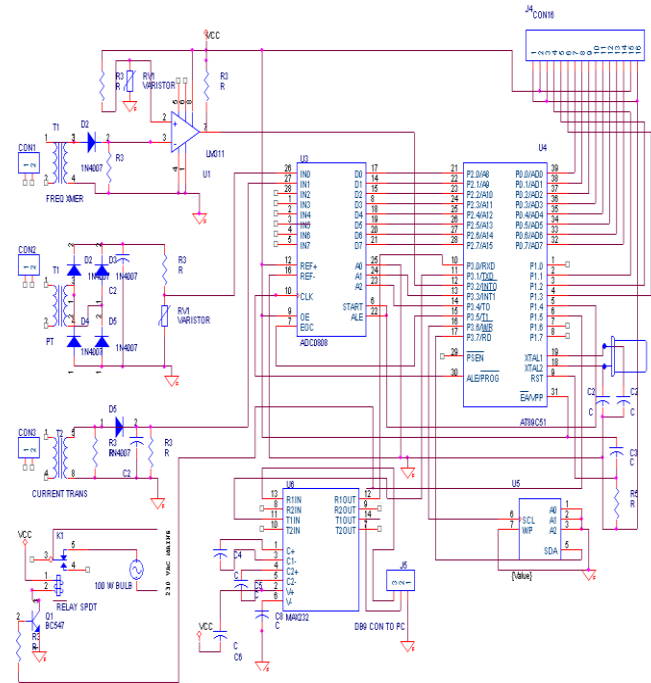
From the load, there are three parameters taken which are namely as voltage, current and frequency. Those parameters should be in limit. The voltage & current are applied to the ADC for analog to digital conversion purpose. And frequency applied to comparator through PIC microcontroller. Therefore current transformer provides current rating & potential transformer voltage rating in the analog form to the ADC (0808).

After that, digital signal is applied to different ports of the microcontroller as per the limit of frequency; the microcontroller executed the control action to the relay. For switch OFF and switch ON the load. If the frequency is in limit, then only load switch ON continuously.

In the Grid Frequency Controller, there are three reading taken out. Which are at the time of starting, during fault and during restoring. Those readings are stored in external memory. When the upload key is pressed at that time with help of MAX 232 with the TTL compatibility, reading can be display on PC. All the data can be serially transmitted over the PC by using the RS232 cable with help of DB9 connector.

For monitoring purpose, the LCD display is used. This shows the current, voltage, time, frequency at the different instants. The LCD can be programmed for that indication. For the reliable operation of the circuit there are no. of capacitor, diodes are used. There are also one reset key provided on the PCB for reset the microcontroller. If in case it produces a garbage value then by pressing that key we can reset the microcontroller.

MAIN CIRCUIT



Working of Circuit Diagram

Now days because of load increasing for some particular area, the total load demand can be increasing on generating side. This situation can be occurring due to the load increasing due to the individual consumer. That will affect the total load demand. Therefore load shedding can be occurring. These difficulties can be overcome, by individual load shedding method. The Frequency can be controlled by Grid Frequency controller by using PIC microcontroller. This is the effective frequency control method.

In the grid frequency controller frequency can be controlled with the help of PIC microcontroller. There are number of equipments use in this control method. This is one of the important control actions in the power system.

There are four main section of grid frequency controller using PIC microcontroller.

- Input section.
- Converter section.
- Control section.
- Output section.

The output monitoring is by using the LCD. When upload key is press, after that by using DB9 port we can see the all the

readings on the PC for monitoring purpose LCD (16*2) module used. From the port 2 of microcontroller input is given to the LCD. On the LCD screen, current, voltage, frequency, time can be display. This all function of LCD done with help of programming. The output can be seen on the PC with the help of upload key. The MAX 232 is used for TTL compatible purpose because microcontroller language not read by computer; for that MAX 323 is used with the help of RS 232 serially data can be transmitted over PC. For monitoring purpose Windows XP must be available, with the help of hyperlink port all reading can be display.

ADVANTAGES

Reliable and malfunctioning of PIC percentage is very less. Performance is fast because of using RISC architecture. Power consumption is less. Analog devices can be directly connected. Programming is easy.

4. RESULTS AND DISCUSSION

With the help of this installation in individual area of high load users (end user) we can avoid the conventional way of complete load shading to that area and the individual load shading can be done. This will not harm the rest users as only the user who is having maximum load will be cut for some time from the supply until he minimizes the load on his side and rest will be unaffected. This will avoid wastage at both the generation side and also to production side.

5. CONCLUSION

With the help of this installation in individual area of high load users (end user) we can avoid the conventional way of complete load shading to that area and the individual load shedding can be done. This will not harm the rest users as only the user who is having maximum load will be cut for some time from the supply until he minimizes the load on his side and rest will be unaffected. This will avoid wastage at both the generation side and also to production side.

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