"RELIABLE POWER QUALITY MONITORING AND PROTECTION SYSTEM"

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Abstract

In restructured power market, power quality has a direct economic impact on both utilities and industrial customers. Therefore both the utilities and end users of electric power are becoming increasingly concerned about the quality of power. There is no generic solution for all of these problems. Testing of different PQ events is a difficult but very important step. It is also essential to identify the disturbance and clear the problem before it has caused widespread equipment malfunctions and other expensive consequences. So there is an ever increasing need for power quality monitoring systems due to the growing number of sources of disturbances in AC power systems. Therefore automatic detection, identification and classification of disturbances become a very important task. This system has been developed to monitor and detect any disturbance signals in power lines. If disturbance occurs in one of the phase, monitoring system will detect the fault The parameters sent over GPRS network and collected by remote side pc on real time basis where an application is developed using Matlab in which we can get monitoring data in graphical way. The Matlab shows the received data in terms of waveform where we examine power parameters easily.

Keywords: *Power quality monitoring, TCP protocol and ARM7.*

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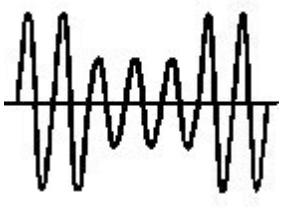
1. INTRODUCTION

Electrical systems are useful in Industry, hospitals, malls and other service providers which are tremendously dependent upon electrical and electronic systems. Monitoring of power quality is essential to maintain proper functioning of utilities, customer services and end equipment's [4]. These end equipment's are extremely sensitivity to any disturbance in mains power quality. It is thus the necessity of every individuals that to watch their own electrical systems under control of every hours a day. If the first signs of poor mains quality appear such as overvoltage, under voltage sags voltage swells, voltage surge, transients, flickering lights, harmonics, action should be taken to overcome these power problems. Sources can be identified through the use of suitable measuring equipment. Power quality determines the fitness of electric power to consumer devices

The superiority of electrical power may be described such as:

- Continuity of service
- Variation in voltage magnitude
- Transient's voltages and current

With the increasing usage of power electronic devices and sensitive loads in power systems, power quality has attracted the attention of power engineers over the past years [1].
To improve electric power quality, many power electronic based power quality conditioners are design and developed



Voltage sags

Voltage swells

Fig1 Voltage variation

2. BACKGROUND AND RELATED WORK

In conventional systems power quality monitoring system based on virtual instrument using Labview. They can only monitor the power disturbances and also complicated circuits may degrade system performance [14]

The system proposed in [13] is DSP based solution, which involves high cost and considerable high power consumption. Also it is a complex system to design and useful in high-end applications

In many cases, the monitoring system ends up in massive power quality data which makes analysis difficult. Therefore, the development of automatic tools for

classification of the measured data is required to help engineers to have clear understanding of what is happening in their power lines

3. PROPOSED SYSTEM

Due to power disturbances the entire system may burn out or destroyed which affects overall system of organization or industry and eventually lead to permanent damages which in terms of money and time give setback to the further activity in any industry or organization. So the system is needed to design in such a way that it will monitor power quality and compensate for better yield at industry in case of emergency. Such system can be developed using the arm based embedded system and which can efficiently indicate the power quality problems such as sag, swells and also protect the other equipment's from malfunctioning.

So devolved system is planned for specific purposes which are to detect, protect and display the fault waveform in remote side at real time or whenever desired.

In proposed system the power quality monitoring in the embedded system can acquire the voltage, current and the status of the line frequency. It can send them via gprs network and can display the fault signals of power fluctuation. In addition At the same time, GPRS network acts as the communication medium for Power Quality monitoring and protection station and remote pc. The supervisors can analysis the result at remote location

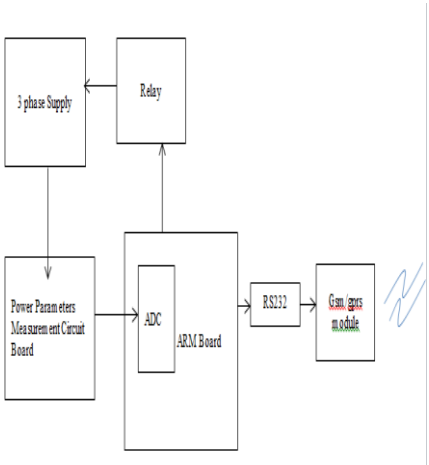


Fig 2 Acquisition of power parameter at workstation

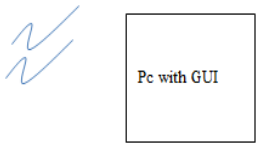


Fig 3 Remote station pc gathered the power parameters

4. HARDWARE IMPLEMENTATION

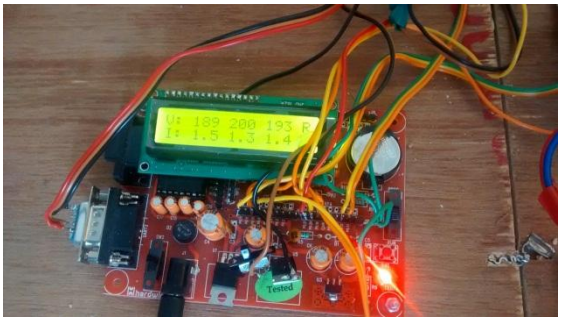


Fig 4.1(a) Snapshot of Hardware at monitoring station

As seen from figure 4.1(a), hardware at power quality monitoring and protection station has, ARM 7s display which shows status of phase R,Y,B voltages and current.

Fig 4.2(b) Snapshot of Hardware at monitoring station

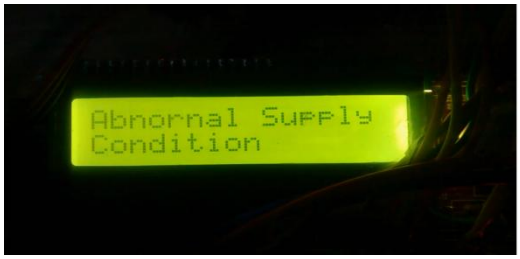


Fig 4.3(c) Snapshot of Hardware at monitoring station

Figure 4.2(b) shows that one of the phase voltage is below threshold voltage which is not normal voltage for proper functioning of end equipment hence at that time input supply must be disconnected. LCD display of ARM shows Abnormal supply condition when supply voltage is below or above threshold voltage (figure 4.3(c))

5. SOFTWARE IMPLEMENTATION

For any hardware to work correctly as desired it is necessary to embed required code written in particular language using associated software. As in this system ARM7 is incorporated, software's that can be used to write code are namely Keil µvision3.The voltage and current parameters are acquired using sensors and it sends to ADC after processing the data, ARM sends that data into GPRS module through UART than it transmitted to remote side. And at the same time LCD is used to show status of power parameters so all this initialization that is for ADC, LCD has completed in embedded c using Kiel.

After proper configuring and establishing GPRS module and remote pc GPRS start sending power quality parameters. In remote side developed graphical user interface shows waveforms in MATLAB

6. RESULTS

Figure 4.1(a) shows normal voltages. phase R has 189v phase Y has 200v and phase B has 193v which are required voltages for normal operation of load.

The Personal Computer takes information about status of voltage and current acquired from the power quality monitoring hardware via GPRS network. The Personal Computer must send a request command to that hardware by using TCP/IP protocol the monitoring hardware can receive the command from the PC and send the information such as 3-phase voltages and current and monitoring status. The figure 5 shows connection establishment procedure for connecting Personal computer to workstation through Matlab Software.

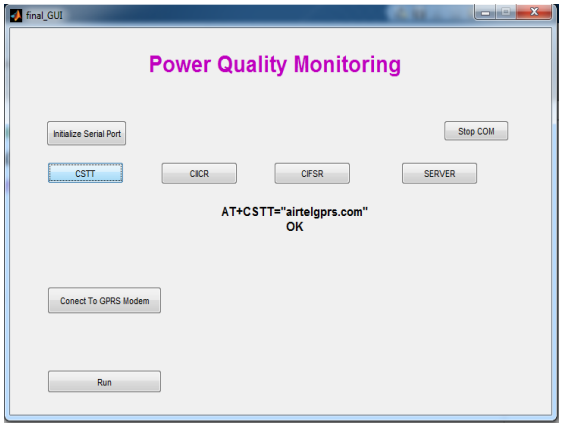


Fig 5 Snapshot of communication procedure of GSM module and remote PC

Figure6 shows graphical waveform of phase R, Phase Y, Phase B's Current status and voltage status at remote station using Matlab GUI. Once the signal is properly acquired at monitoring station it is then transmitted to remote station using GPRS and is observed in MATLAB GUI.

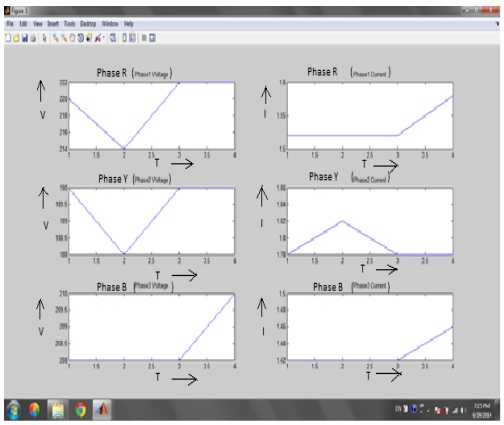


Fig 6 Snapshot of power parameter at remote location

7. CONCLUSIONS

When any catastrophic event occurs than, the ARM controller automatically cuts the power supply to protects the end equipment from damage.It is mainly useful in the areas where the power fluctuations are high.

TCP/IP protocol is the backbone of this system because it provides reliable service in terms of data integrity that is important in case of transmission of Power parameters signal since any loss in this signal cannot be tolerated and it also takes care of lost packets, out of order, duplicates, long delays Thus, efficient and secured data transmission can be achieved.

At remote workstation the Matlab GUI shows graphical waveform of Phase R, Phase Y, and Phase B's Current and voltage status.

Obtained results of this system can be used to avoid poor consequences of power quality, hence equipment damages and malfunctioning can be eliminated.

Better power quality will increase working quality of end product.

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