

ISSN 2278 – 0211 (Online)

An Extensive Design of a Low Cost Power Quality Monitoring and Improvement System

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Abstract:

Power quality monitoring and its improvement is an important part of quality control. But the cost of power quality monitoring and control system is very costly and complex system. The investigator has developed very low cost virtual instrument based power quality and its improvement system which is extremely powerful and effective. This virtual instrument based system will be very much useful for the whole power system.

Keywords: Power quality monitoring, power quality software, power quality improvement

1. Introduction

Power quality determines the fitness of electrical power to consumer devices. Synchronization of the voltage frequency and phase allows electrical systems to function in their intended manner without significant loss of performance or life. The term is used to describe electric power that drives an electrical load and the load's ability to function properly. Without the proper power, an electrical device (or load) may malfunction, fail prematurely or not operate at all. There are many ways in which electric power can be of poor quality and many more causes of such poor quality power. There are different software tools which can be used to develop power quality equipment[i],[ii].

The quality of electrical power may be described as a set of values of parameters, such as:

- Continuity of service
- Variation in voltage magnitude (see below)
- Transient voltages and currents
- Harmonic content in the waveforms for AC power

Main factors affecting power quality are:

- i. Noise
- ii. Harmonics
- iii. Voltage Spikes
- iv. Power factor, etc.

2. Power Quality Measurement

The requirement for follow up and checking of power quality is increasing and a number of different national norms and regulations have been introduced to give guidance for what is to be considered good power quality[iii],[iv].

- Voltage variations
- Power factor
- Unbalance
- Harmonics (THD)
- Frequency
- Efficiency etc.

3. Tools and Softwares Used

3.1. LabVIEW

LabVIEW (short for Laboratory Virtual Instrument Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments.

LabVIEW is a highly productive development environment for creating custom applications that interact with real-world data or signals in fields such as science and engineering. The net result of using a tool such as LabVIEW is that higher quality projects can be completed in less time with fewer people involved.

4. Inferences Drawn Out of the Literature Review

The investigator after going through a large number of literatures divulges the following inferences:[v],[vi],[vii],[viii]

- Power quality measurement is very important and also its very difficult to monitor it properly round the clock.
- The equipments used for power quality measurement are very costly.
- Lot of harmonics, noises and other disturbances are continuously generating due to different loads and power electronics devices.
- Low power quality reduces the life of equipment, malfunctioning of devices and more power consumption.
- Power quality improvement is very complex process.
- Different filters, STATCOM and other devices/techniques are used to improve the power quality
- Power quality measurement and control is very serious issue in residences as well as in industries.

5. Proposed work

The main objectives of this work are as follows:

- To develop low cost high performance power quality measuring equipment/technology.
- To develop software based (NI LabVIEW) power quality measurement technique so that the cost of devices may be reduced many times and more efficient method may be developed.
- To improve power quality by reducing noise by designing proper filter/combinations of filter in Labview.

6. Software Developed for Power Quality Monitoring

The investigator has developed highly powerful software which can measure different power quality data like voltage, current, power, energy, total harmonic distortion etc. The GUI of the software is given below.

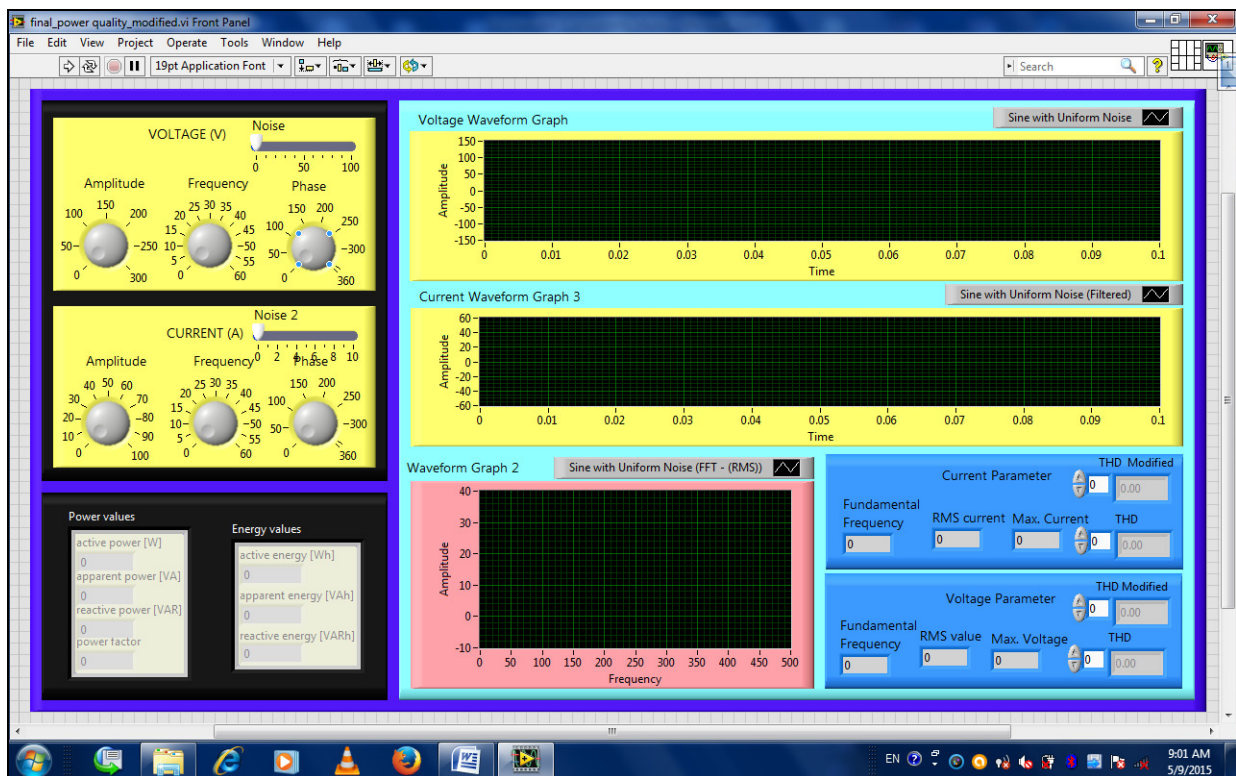


Figure 1

The working of the software is shown in the figure below

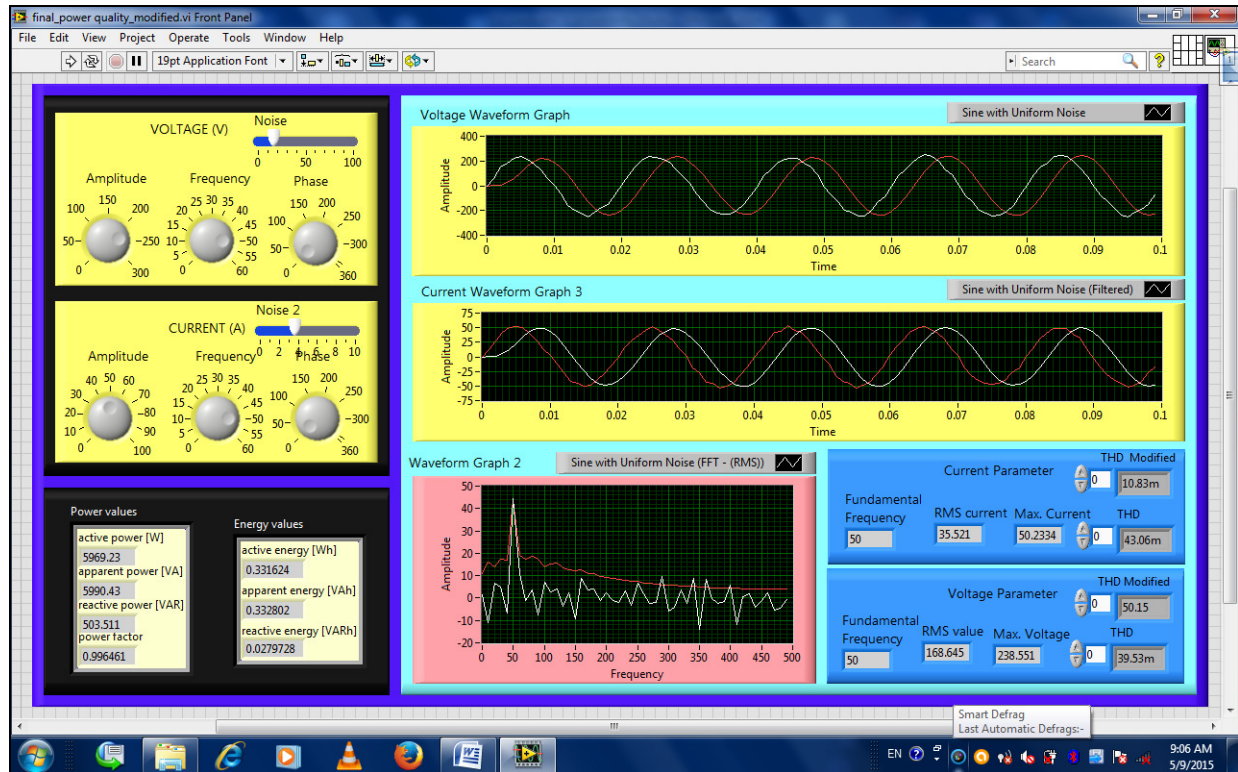


Figure 2

From the figure above, it is clear that all the parameters mentioned above are measured by the software and it is also improving the signal by filtering the harmonic and noise.

7. Conclusion

The software developed is very useful and by interfacing it using DAQ card, very low cost power quality monitoring system may be developed. Also filtering system developed is extremely useful in power quality improvement.

8. References

- i. Prudenzi, M. Di Lillo, A. Silvestri, M.C.Falvo "Software Tool for Energy Audit Activities in Building" IEEE International Symposium on Power Electronics, Electrical Drives, Automation and Motion, August 6, 2008.
- ii. Azimah Omar, Norman, Marium, Mohd Amran Mohd Radzi, "Software development for energy auditing practice" IEEE, SCORED 2003 Proceedings, Putrajaya, Malaysia, March 4, 2003.
- iii. Bucci, G, " Embedded power and energy measurement system baed on an analog multiplier", Instrumentation and Measurement, IEEE Transactions on (Volume:62 , Issue: 8), pp: 2248 - 2257, Aug. 2013.
- iv. De Yong, D, "Educational software for power quality analysis", Latin America Transactions, IEEE (Revista IEEE America Latina) (Volume:11 , Issue: 1), pp: 479 - 485, Feb. 2013.
- v. Ren-Feng Yuan, Qian Ai ; Xing He, "Research on dynamic load modeling based on power quality monitoring system", Generation, Transmission & Distribution, IET (Volume:7 , Issue: 1), pp: 46 - 51, Jan. 2013.
- vi. Jinfeng Ren, Stefan Giurgea, "A hybrid method for power system frequency estimation", Power Delivery, IEEE Transactions on (Volume:27 , Issue: 3), pp: 1252 - 1259, July 2012.
- vii. Yuan Yao, Yaping Dai, Dezhen Tian, Xin Zhang, "MATLAB and Internet Based Remote Control Laboratory" IEEE Journal, September, 2009.
- viii. A.P. Jagadeesh Chandra, C.R.Venugopal "Novel Design Solutions for Remote Access, Acquire and Control of Laboratory Experiments on DC Machines" IEEE Transactions on Instrumentation and Measurement', 0018-9456/2011.