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Removing of Harmonics using Labview

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Abstract- The main objective of this paper is to demonstrate the ability of estimation methods of real time power calculation and to improve upon such methods using technology to reduce the effect of harmonics. Each method will be examined under three main criteria developed in conjunction with input from energy supplies, namely Optimally accurate solution for the state of the power system with given measurement. The method is robust enough to struggle with the presence of bad data and abnormal operating statesSo that analysis can be done close to real time the operation is as fast as possibleIn addition to these the implementation cost to the system that is advised is tried to be minimized. Upon keen and careful investigation of methods under proposed criteria, will provide the opportunity for tests on actual power data. As a result the completion of work will contribute an implementation ready, test hardened method for real time monitoring a calculation of power. So it can be said that the aim of this theses is to calculate the real time power and minimizing the effect of harmonics on it

Keywords: AC, LabVIEW

I. INTRODUCTION

Modern power electronics is the state of the art and the tendency to use it more and more is increasing. Therefore, the generation of current at unwanted frequencies ought not to be allowed to grow without limit, because it may impact the public mains. As a consequence the harmonic content on the public networks has to be limited. Furthermore, the equipment connected to the mains has to show sufficient immunity in order to continue to operate as intended in the presence of a certain allowed harmonic distortion. Harmonic distortion is defined as change in the supply voltage waveform from an ideal sinusoidal one.

The release of international standards is a practicable compromise in order to establish reference levels for the coordination of emission and immunity in the interests of electromagnetic compatibility.

A harmonic is a signal/wave that has frequency which is an integral (a whole number) multiple of the frequency of some reference signal or wave. This given term can also be referred to the ratio of the frequency of such a wave or signal to the frequency of the reference wave or signal.

Let f represent the main, or fundamental, frequency of an alternating current (AC) signal, electromagnetic field, or sound wave. This frequency, usually expressed in hertz, is the frequency at which most of the energy is contained, or at which the signal is defined to occur. If the signal is displayed on an oscilloscope, the waveform will appear to repeat at a rate corresponding to f Hz. For a signal whose fundamental frequency is f, the second harmonic has a frequency 2 f, the third harmonic has a frequency of 3 f, and so on. Let w represent the wavelength of the signal or wave in a specified medium. The second harmonic has a wavelength of w /2, the third harmonic has a wavelength of w /3, and so on. Signals occurring at frequencies of 2 f , 4 f , 6 f , etc. are called even harmonics; the signals at frequencies of 3 f , 5 f , 7 f , etc. are called odd harmonics.

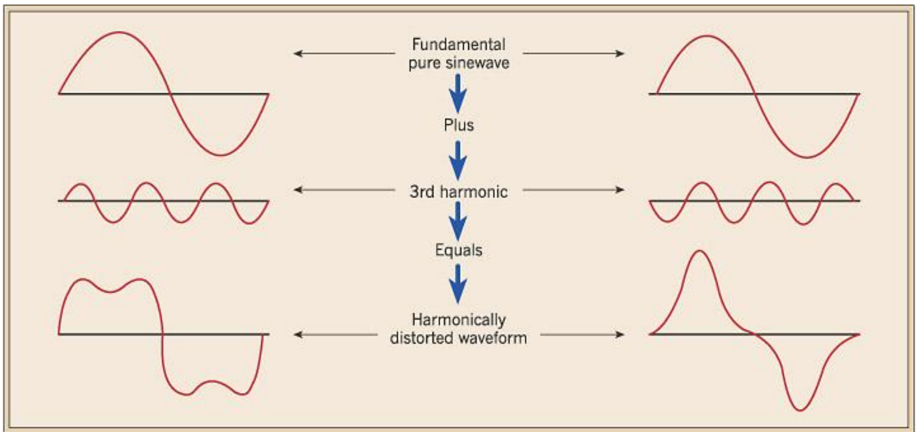

Fig 1: Fundamental waveform,3rd harmonic and Harmonically distorted waveform.

A signal can, in theory, have infinitely many harmonics. Nearly all signals contain energy at harmonic frequencies, in addition to the energy at the fundamental frequency. If all the energy in a signal is contained at the fundamental frequency, then that signal is a perfect sine wave. If the signal is not a perfect sine wave, then some energy is contained in the harmonics. Some waveforms contain large amounts of energy at harmonic frequencies. Examples are square waves, saw tooth waves, and triangular waves. In wireless communications and broadcasting, transmitters are designed so they emit a minimum of energy at harmonic frequencies. Normally, a wireless device is intended for use at only one frequency. Signal output at harmonic frequencies can cause interference to other communications or broadcasting. For example, a broadcast signal at 90.5 MHz (in the standard FM band) would have a second harmonic at 181 MHz, a third harmonic at 271.5 MHz, a fourth harmonic at 362 MHz, and so on. Some or all of these harmonic signals could, if strong, disrupt activities in other wireless services.

A 250 Hz sine-wave signal, superposed onto the fundamental 50 Hz mains frequency, will be designated as the 5^{th} harmonic or as the harmonic of 5th order (5 x 50 Hz). Any signal component having a frequency which is not an integer multiple of the fundamental frequency is designated as an inter-harmonic component or referred to more simply as an inter-harmonic. Harmonics and inter-harmonics are basically the result of modern developments in electricity utilize at ion and the use of electronic power conditioning modules. Using switching power supplies to control loads and to reduce power consumption results in unwanted frequencies superimposed on the supply voltage. The presence of voltage at other frequencies is, as far as possible, to be avoided.

In a linear system (e.g. a circuit, with ideal resistors, capacitors and/or inductors), the characteristics of the voltage and the current are sinusoidal in nature. The current contains only one frequency, the mains frequency or the so called fundamental. Beside this 50 Hz component there are no other frequencies and therefore there are no harmonic components.

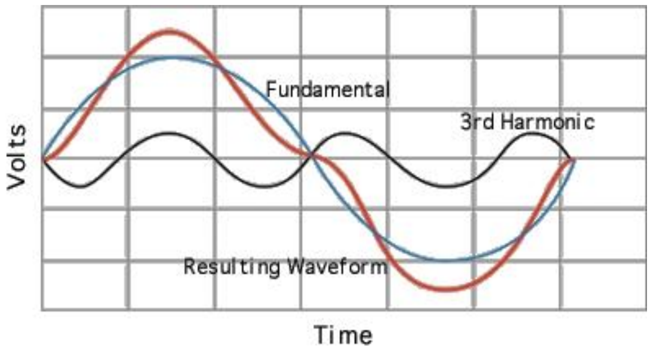

Fig 2 3^{rd} harmonics

II. METHODOLOGY

LabVIEW (Laboratory Virtual Instrument Engineering Workbench), created by National Instruments (www.ni.com) is a graphical programming language that uses icons instead of lines of text to create applications. In contrast to text-based programming languages, where instructions determine program execution, LabVIEW uses dataflow programming, where the flow of data determines execution.

LabVIEW programs/codes are called Virtual Instruments, or VIs for short. LabVIEW is used for Data acquisition, signal Processing (Analysis), and hardware control – a typical instrument configuration based on Labview.

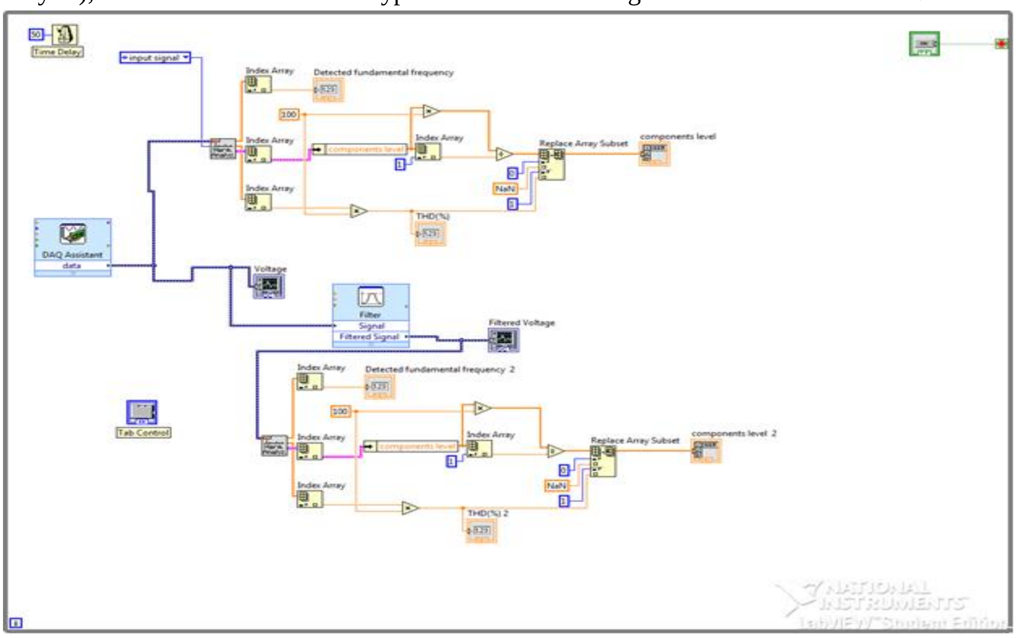

Fig.3 software design

III. RESULTS

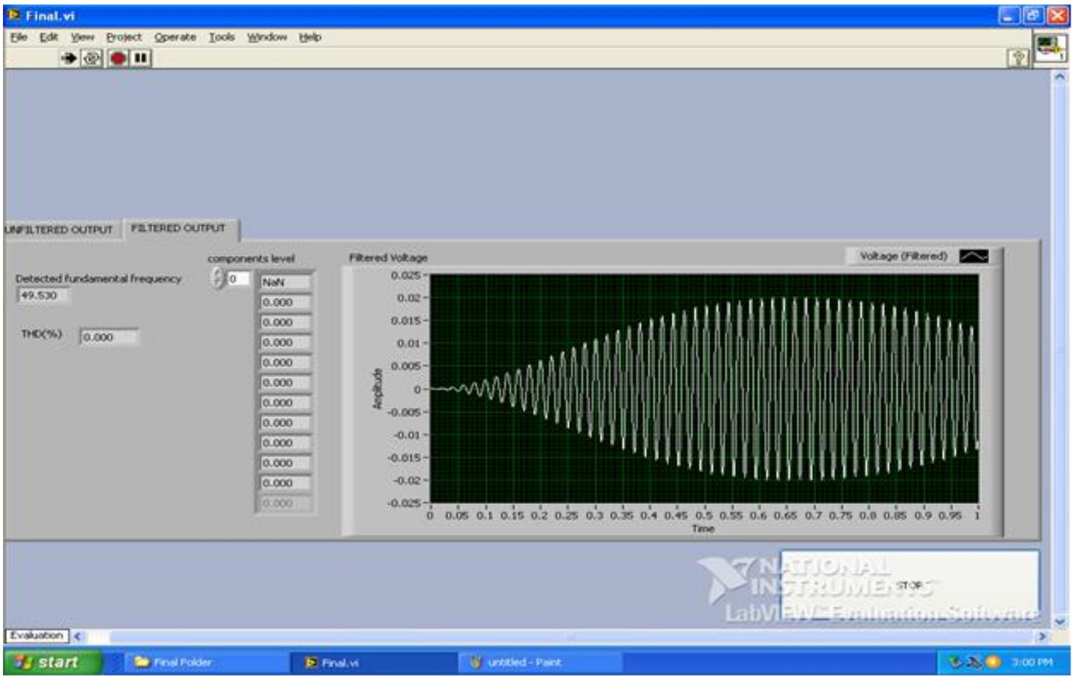

Fig 4 Harmonic analysis of sine wave oscillator circuit using digital filter.

IV. CONCLUSION

For better power quality solutions the harmonics level in the circuit must be analyzed so that according to that precautions can be taken for the required improvement of the power quality. Also the excessive harmonic distortion degrades some types of equipment's so it is important to calculate the harmonic levels and reduce them in such cases.
The technique can be used for analyzing the harmonic disorder and then improving them by using suitable digital filters.
This technique of analyzing and improving harmonic distortion is also useful for the applications where the requirement of the frequency is near around about the fundamental one.

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