

# HARMONICS REDUCTION BY USING DETUNED FILTER WITH CONTROLLER

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## ABSTRACT

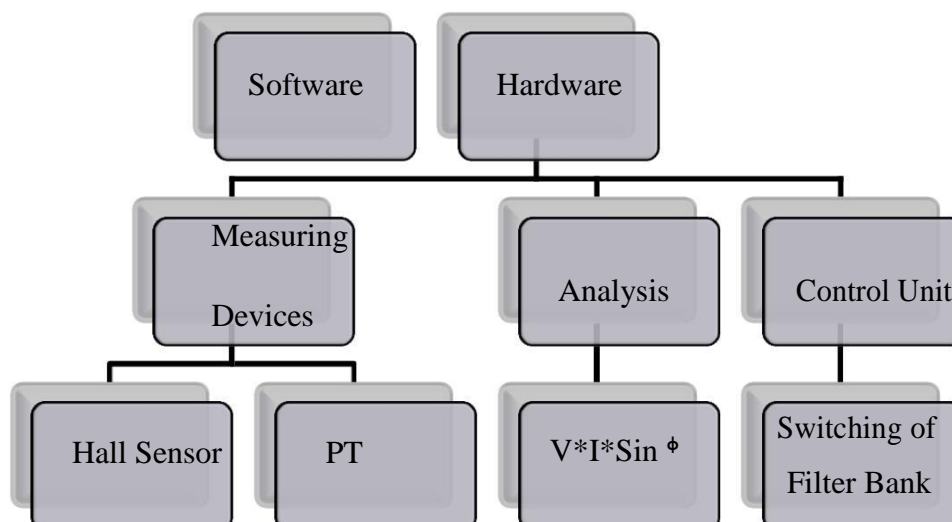
This study paper includes a design of Arduino based system for reduction of harmonics using detuned filter with the purpose of reducing losses in filters. Detuned filters are passive filters which are low in cost but they have losses. So, for the reduction of losses in filters, filters are distributed with automatic control by using Arduino.

**Keywords :** Harmonics, Detuned Filter, THD(Total Harmonic Distortion), CT(Current transformer), PT(Potential Transformer)ADC (analogue to digital converter), Reactor

## I. INTRODUCTION

Harmonics play significant role in deteriorating power quality, called harmonic distortion. Harmonic distortion in electric distribution system is increasingly growing due to the widespread use of nonlinear loads. With the rapid developments and use of nonlinear loads, the controlling technique is important over the harmonic. Also voltage and current waveform to maintain power quality is becoming more important so that both passive and active filters have been used near harmonic producing loads or at the point of common coupling to block current harmonics. Passive filters still dominate the harmonic compensation at medium/high voltage level, whereas active filters have been proclaimed for low/medium voltage ratings. So we are going to install passive filters i.e. detuned filters.

## II. SYSTEM REPRESENTATION



Overall system consist of mainly two parts i.e. hardware and software. Whereas hardware part consist of three sections i.e. measuring devices, analysis and control unit, in which measuring devices are CT & PT, Analysis of  $VISin^{\phi}$  & gives it to control unit. This controller will give the output to contactors & to display consists the line parameters, present KVAr & Compensated KVAr.

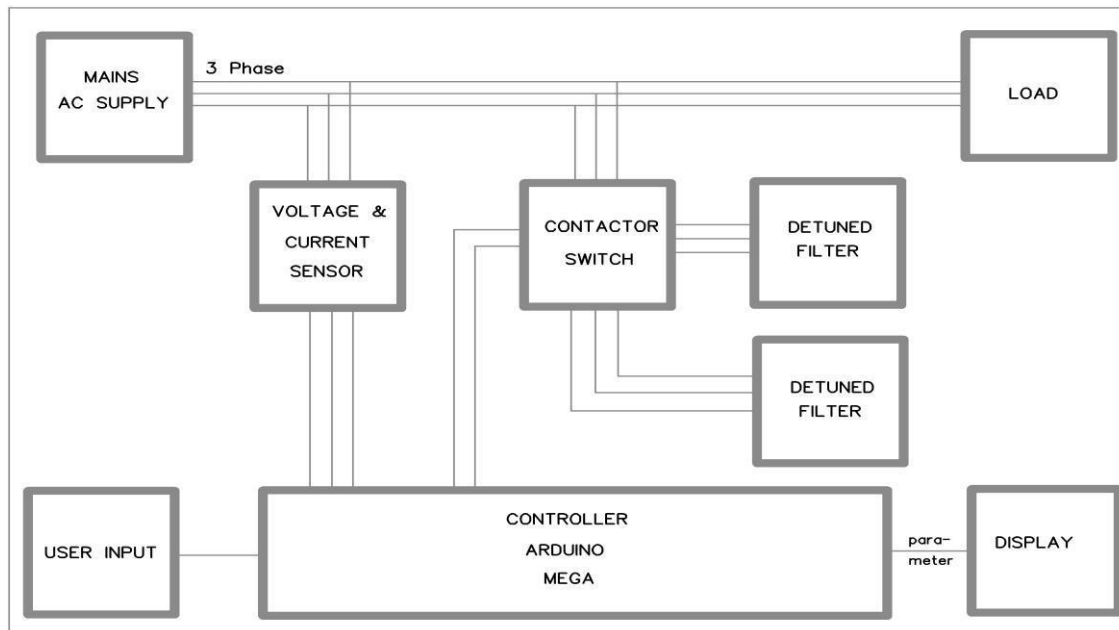


Fig- Main Block Diagram

As shown in above block diagram our system is placed before APFC device & through which supply flows through it. Where filters are near to APFC Which are operated by controller unit. And also we get actual quantities of supply & number of operating filters on LED display.

### III COMPONENT DESCRIPTION

#### 3.1 Detuned Filter (7% Detuned Series Reactor-Copper)(SYCON-REC62XX)

It has inductance of 9.39mH. Its rated voltage is 440V, current is 6.56A, frequency is 50hz and ita series no. is 'R-5A-17001' of make SYCON.

#### 3.2 Power Factor Correction Capacitor

Its rated voltage is 440V, current is 6.55A, frequency is 50hz and ita series no. is 'C-5K-17002' of make SYCON. Its ambient temperature is 50°C, 3kV insulation level. It consists of dielectric MPP (SH). It is connected in Delta

### 3.3 Hall Effect Base Linear Current Sensor (WCS1500)



Fig.WCS1500

The Winsen WCS1500 current sensor provides economical and precise solution for both DC and AC current sensing in industrial, commercial and communications systems. The unique package provides easy implementation without breaking original system and makes current sensing possible. Typical applications include motor control, load detection and management, over-current fault detection and any intelligent power management system etc...

The WCS1500 consists of a precise, low-temperature drift linear hall sensor IC with temperature compensation circuit and a diameter 9.0mm through hole. Users can use system's own electric wire by pass it through this hole to measure passing current. This design allows system designers to monitor any current path without breaking or changing original system layout at all. Any current flowing through this hole will generate a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage.

The terminals of the conductive path are electrically isolated from the sensor leads. This allows the WCS1500 current sensor to be used in applications requiring electrical isolation without the use of opto-isolators or the other costly isolation techniques and make system more competitive in cost.

### 3.4 PT (Potential Transformer 440:12V)

It drops down the voltage for measurement purpose.

### 3.5 Arduino Mega 2560

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila

### 3.6 Contactor

Contactors are used for switching purpose

## IV. RESULTS

System Without Reactor			
Line Voltage	I in R	I in Y	I in B
420V	0.86A	0.67A	0.88A
System With Reactor			
Line Voltage	I in R	I in Y	I in B
422V	0.62A	0.32A	0.62A
Testing of Filter			
Line Voltage	I in R	I in Y	I in B
420V	6.3A	6.6A	6.3A

## V. FUTURE SCOPE

1. Measuring and displaying THD, harmonic order and power loss occur by harmonics.
2. Replacing 5 kVAR filters by five 1kVAR filters for smooth correction and reducing the filter losses.
3. Individual operation of reactor and filter

## VI. CONCLUSION

This designed system gives accurate result of harmonic reduction; also system gives reduction of filter losses. Along with that it displays compensated kVAR, line parameters. System is more flexible with variation of load.

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