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Power Quality Improvement by Inductive Filtering Method

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***Abstract*— In recent years power quality is the main problem in the power system. Also various power electronic devices are used in power system, i.e. wind power and solar energy are integrated into the network by means of cur-rent source converters (CSCs) and/or voltage-source converters (VSCs). This paper proposes the inductive filtering method and converter transformer. The operating principle is compared with traditional filtering methods, such as APF, PPF etc. In this paper control strategy of FT branch and impedance co-ordination of inductive filter transformer depend on theoretical analysis. This method does not allow the harmonics to flow through the overall system. Since the harmonic components are suppressed near the harmonic source. This method is presented by using closed loop with PI controller and also for generating gate pulse, PWM controller is used. The PI controller is capable of compensating current harmonics in three phase four-wire systems. By using the proposed method source current harmonics is reduced and THD value is tabulated Besides, since the harmonic flow is limited to near the harmonic source, the PQ of the distribution network can be improved.**

***Index Terms*— fully tuned branch, inductive filtering method, harmonic, power quality.**

CSC- Current Source Converter.
VSC- Voltage Source Cnverter
APF- Active Power Filter
PPF- Passive Power Filter
HPF- Hybrid Power Filter
FT- Fully Tuned Branch.
PQ- Power Quality
PCC- Point Of Common Coupling.
IAF- Inductive Active Filtering.
AC- Alternating Current
DC- Direct Current
PI- Proportional Integral
THD- Total Harmonic Distortion
PWM- Pulse-Width Modulation
PF- passive filter
V_{Aah}, V_{Bbh}, V_{Cch} - Three-Phase Voltage Of The Secondary Extended Winding
V_{abh}, V_{bch}, V_{cah} - Three-Phase Voltage Of The Secondary Delta Winding .
V_{Agh}, V_{Bgh}, V_{Cgh} - Three-Phase Voltage Of The Primary Winding
Z_{1h}, Z_{2h}, Z_{3h}- Equivalent Impedance Of The Primary, The Secondary Extended, And The Secondary Delta Winding, Respectively
$Z_{Fah}, Z_{Fbh}, Z_{Fch}$ - Three-Phase Equivalent Impedance Of The FT Branch
Z_{h21}, Z_{h23} – Short-Circuit Impedance Between The Extended And The Grid Winding, Between The Extended And The Delta Winding, Respectively.

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I. INTRODUCTION

The term power quality became most prominent in the power sector and both the electric power supply company and the end users are concerned about it. With the increasing use of non-linear devices either for residential or industrial applications, the power distribution system is polluted with harmonics. Thus filters are very much essential for the harmonic compensation and improving the power quality and hence increases the reliability of the distribution system. The harmonic compensation can be obtained by Passive Filters (PF), Active Power Filters (APF) and hybrid filters (HPF) [1]. Active Power Filters (APF) are often used in applications where low current harmonics are desirable and improvement of quality of energy taken from the power grid are needed. With the use of APF, it is possible to draw near perfect sinusoidal currents and voltages from the grid or renewable distributed power sources. Since APF are effectively solve PQ problems of public network but cannot give solution to power supply system connected to the network. This leads to additional losses, temperature increase, poor power factor and vibration.

Hence to overcome these problems, Inductive Active Filtering method was proposed. This can prevent harmonics and reactive power components from flowing into primary winding of transformer. Thus improves PQ on power supply system. The Inductive filtering can only suppress the fixed order harmonics by the fixed impedance design for the Fully Tuned branch. The inductive filtering method is designed based on the harmonic characteristics of the nonlinear load. The FT branch can track the change of harmonic components at the load side. It consists of LC circuit, Voltage Source Inverter. An LC circuit, tuned to each harmonic order to be filtered, is installed in parallel with the non-linear load representing more than 500KVA and the power factor correction to be done. This bypass circuit absorbs the harmonics, thus avoiding their flow in the distribution network. The FT branch is connected to the winding tap of converter transformer. The IAF method can track online the change in harmonic generation of the nonlinear load and always maintain effective filtering performance. Simulate both schemes are analysed and compare in MATLAB/SIMULINK environment. In This thesis, a shunt hybrid power filter (SHPF) is modeled in the stationary "a-b-c" reference frame and then, the model is transformed into the rotating "d-q" reference frame to reduce the control complexity. Two different decoupled current control techniques using proportional– integral (PI)-type controller and hysteresis controller, are implemented to force the current of the filter to track their reference value. On the other hand the dc-voltage of the filter is regulated using P-I controller. The harmonic current of the non-linear load is controls by feeding it to the passive filter, hence no harmonic currents are drawn from the ac mains

This paper distributed in V sections. Introduction of complete system included in Section-I. Section-II presents the concept and system developement. Also discusses the operation, modeling and applications of APF and IAF. Section-III Describes the different control strategies used in the mitigation and control of harmonics and voltage related problems in power quality. Section-IV Comparison and performance analysis of both filtering methods. And in the last section conclusion of paper is addressed.

II. SYSTEM DEVELOPENT

Power filtering is an effective way to solve the PQ problems. Currently, it includes PPF, APF, and HAPF methods [2]. However, these methods are mainly used to implement the filtering and the reactive power compensation at the PCC; thus, they are effective in solving the PQ problems of the public network, but cannot provide an effective solution for the power-supply system connected with the network. To overcome these problems, an inductive power filtering method was proposed in recent years [3-4]. This method can prevent harmonic and reactive power components from flowing into the primary (grid) winding of the transformer, so it can effectively solve PQ problems of the power-supply system. In principle, this method uses the balance of a trans-former's harmonic magnetic potential to carry out the power filtering. , this paper pro-poses an IAF method. It combines the advantages of inductive power filtering and active power filtering methods and can im-prove the PQ of the distribution network and the power-supply system itself. More important, it can track online the change in harmonic generation of the nonlinear load and always maintain effective filtering performance.

The modeling and analysis have been carried out in the MATLAB/SIMULINK environment. Based on the analysis, possible solutions for this problem have been suggested, such as providing passive filters on the secondary wind-ings of the converter transformer, connecting a parallel capacitor on the dc side of the converter and R-C snubbers across the sec-ondary windings. The suggested solutions have been compared to bring out their relative merits and demerits.

A. P-Q Theory:-

"The Generalized Theory of the Instantaneous Reactive Power in Three-Phase Circuits", also known as instantaneous power theory , or p- q theory. It is based on instantaneous values in three-phase power systems with or without neutral wire, and is valid for steady-state or transitory operations, as well as for generic voltage and current waveforms. The p-q theory consists of an algebraic transformation (Clarke transformation) of the three-phase voltages and currents in the *a-b-c* coordinates to the *α-β-0* coordinates, followed by the calculation of the p-q theory instantaneous power components.[5]

$$\begin{bmatrix} V_o \\ V_\alpha \\ V_\beta \end{bmatrix} = \sqrt{\tfrac{2}{3}} \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} & 1/\sqrt{2} \\ 1 & -1/2 & 1/2 \\ 0 & \sqrt{3}/2 & -\sqrt{3}/2 \end{bmatrix} . \begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} .$$

$$\begin{bmatrix} i_o \\ i_\alpha \\ i_\beta \end{bmatrix} = \sqrt{\tfrac{2}{3}} \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} & 1/\sqrt{2} \\ 1 & -1/2 & 1/2 \\ 0 & \sqrt{3}/2 & -\sqrt{3}/2 \end{bmatrix} . \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} \quad (1)$$

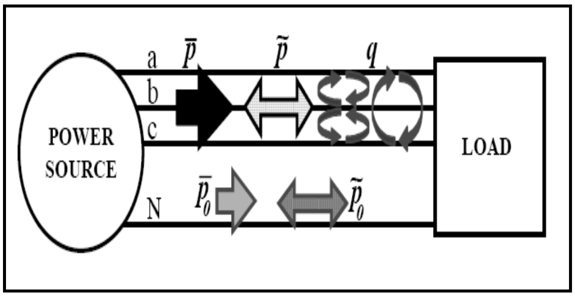

Fig. 1 – Power components of the p-q theory in *a-b-c* coordinates

$$p0 = Vo.\ Io \quad (2)$$
$$p = V_\alpha . i_\alpha + V_\beta . i_\beta \quad (3)$$
$$q = V_\alpha . i_\beta - V_\beta . i_\alpha \quad (4)$$

Where,
P0= Instantaneous zero-sequence power
P=Instantaneous real power
q= Instantaneous imaginary power (by definition)
The power components *p* and *q* are related to the same *α-β* voltages and currents, and can be written together:

$$\begin{bmatrix} p \\ q \end{bmatrix} = \begin{bmatrix} V_\alpha & V_\beta \\ -V_\beta & V_\alpha \end{bmatrix} . \begin{bmatrix} i_\alpha \\ i_\beta \end{bmatrix} \quad (5)$$

These quantities are illustrated in Fig. 14 for an electrical system represented in *a-b-c* coordinates and have the following physical meaning:

$\overline{p0}$ = mean value of the instantaneous zero-sequence power – corresponds to the energy per time unity which is transferred from the power supply to the load through the zero-sequence components of voltage and current.

$\widetilde{p0}$ = alternated value of the instantaneous zero-sequence power – it means the energy per time unity that is exchanged between the power supply and the load through the zero-sequence components.

$\bar{P}$ = mean value of the instantaneous real power – corresponds to the energy per time unity which is transferred from the power supply to the load, through the *a-b-c* coordinates, in a balanced way (it is the desired power component).

$\tilde{P}$ = alternated value of the instantaneous real power. It is the energy per time unity that is exchanged between the power supply and the load, through the *a-b-c* coordinates.

q = instantaneous imaginary power – corresponds to the power that is exchanged between the phases of the load. This component does not imply any transference or exchange of energy between the power supply and the load.

$\bar{q}$ (the mean value of the instantaneous imaginary power) is equal to the conventional reactive power ($\bar{q} = 3 \cdot V \cdot I_1 \cdot sin\varphi_1$).

B. Converter Transformer:

The converter transformer is an integral part of HVDC system. High AC and DC voltages put specific requirement on dielectric insulation. Non sinusoidal current gives rise to additional losses, which are to be considered.

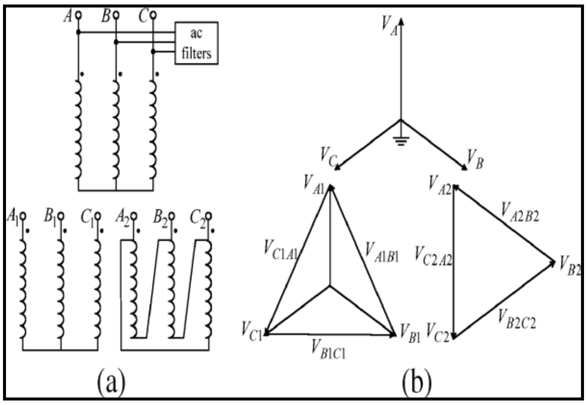

Fig. 2. Traditional converter transformer with ac filters. (a) Wiring mode. (b) Voltage phasor diagram

As Fig. 2 shows, the traditional converter transformer and ac passive filtering method are commonly used in 12-pulse HVDC system. It is clear that the transformer adopts wye/wye/delta wiring, and ac filters are placed at the transformer's primary side. Although this kind of converter transformer and passive filters are widely applied in HVDC systems. and the corresponding inductive filtering system, in which, (a) shows the wiring mode of the transformer, and its secondary winding adopts prolonged-delta wiring. To facilitate our discussion, the winding of A_i- c_i, Bi-b_i, Ci-c_i (i=1,2,3) is called prolonged winding, and the winding of, is a_1_b_1, b_1_c_1, c_1_a_1, a_2_c_2, b_2_a_2, c_2_a_2,called common winding. (b) shows the transformer's voltage phasor diagram, which is used to discuss the phase-shifting of the new transformer.

C. Filtering Mechanism

i) *Active Power Filtering:*

Fig. compares the topologies of the traditional APF and the proposed IAF. As shown in Fig. 3(a), the traditional APF is generally configured at the PCC, and it usually adopts a coupling transformer to interface with the power system. For nonlinear loads, such as a large power industrial dc load, it needs the converter transformer to isolate the dc supply system from the distribution network. A power transformer with MV/LV windings is generally used to connect the nonlinear load with the MV distribution network.

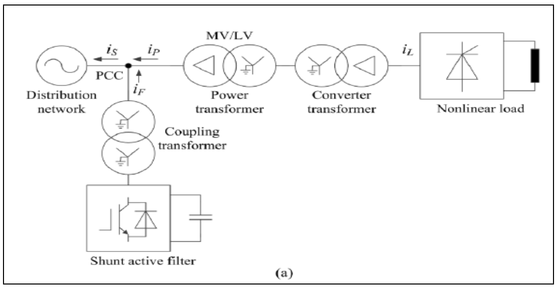

Fig. 3(a) . Traditional APF located at the PCC side

During the analysis of harmonic flow, the load current flows into point of common coupling through the converter transformer and power transformer and Hence these transformers is affected by harmonics and reactive components from load current resulting in temperature increase, noise, poor power factor. Since the PQ problems is solved only to public grid but not to power supply system, for non-linear load, the APF circuit is altered and configured with the proposed IAF method.

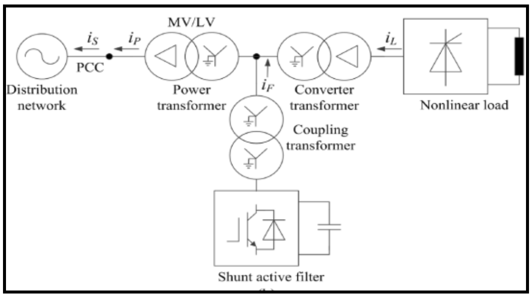

Fig 3(b) Traditional APF located at the primary side of the converter transformer.

Furthermore, Fig. 3 (b) shows that APF is located at the secondary side of the power transformer, that is, the primary side of the converter transformer. Although this configuration can effectively solve the PQ problems of the power transformer, the converter transformer still has to face all of the PQ problems caused by the nonlinear load. Here, it should be noted that the commutation process of CSC needs the sup-port of commutation reactance provided by the converter trans-former. When APF is directly parallel with the converter bridge, the commutation process may be affected by the impedance of the APF. Thus, in a traditional scheme, the PQ problems cannot be avoided for the converter transformer .

ii) Inductive Filtering Mechanism:-

Usually a converter transformer is generally used in the rectifier/inverter system. Since there is no effective scheme on PQ improvement active on power-electronics side of the transformer, all of the harmonic and the reactive power components flow freely in the windings of transformer, which inevitably leads to a series of problems for the transformer, such as additional losses, temperature increase, vibration, noise & sometimes may lead to system failure. To overcome these problems, an inductive power filtering (IAF) method was proposed [3] in recent years. This method can prevent harmonic and reactive power components from flowing into the primary (grid) winding of the transformer, so it can effectively solve PQ problems of the power-supply system.

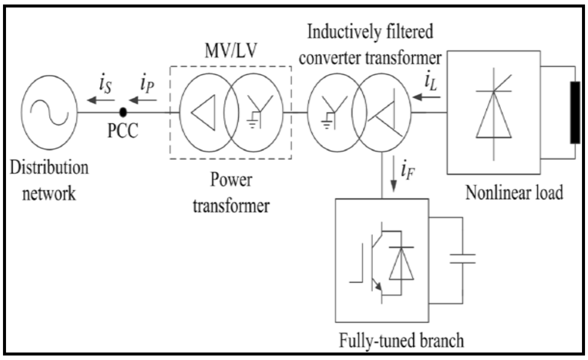

Fig. 3(c) General model of Inductively Active Filter with converter transformer**.**

Unlike the traditional APF con figurations, Fig. 3(c) shows the topology of the proposed IAF. In this figure, there is an inductively filtered converter transformer between the nonlinear load and the power transformer. This converter transformer has a special wiring scheme. Its secondary winding adopts extended delta wiring. Between the extended windings and the delta windings, there is a linking point connected to the FT branch.

The FT branch is controlled by an inverter, and it can attract almost all of the harmonic components flowing into this branch. Under these conditions, the harmonic magnetic potential is balanced between the extended windings and the delta windings; thus, there are very few harmonic components in the primary winding of the converter transformer. In this way, the harmonic components are suppressed near the nonlinear load (harmonic source).

D. Equivalent Circuit :

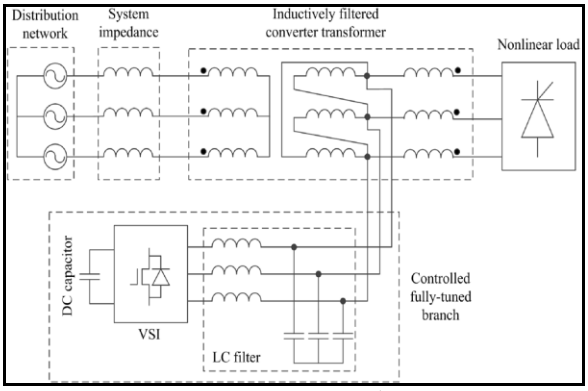

Fig. 4. Wiring scheme of IAF

According to Fig. 4, the three-phase equivalent circuit model for the inductively filtered converter transformer and the FT branch can be established, as shown in Fig. 4. In this model, each winding of the transformer is equivalent to an impedance and the FT branch can be seen as a controlled impedance[10]. For conveniently analyzing the filtering mechanism, the flow direction of the fundamental and harmonic currents from the load to the grid side are defined by solid arrows.

E. Mathematical Modeling

According to the theory of multi winding transformers and combining the equivalent circuit model shown in Fig. 5, the voltage equations at the fundamental and the harmonic frequencies can be obtained as follows:-

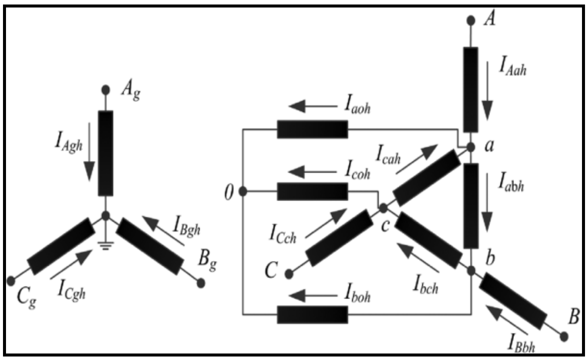

Fig. 5. Three-phase equivalent circuit

voltage equations at the fundamental and the harmonic frequencies can be obtained as follows

$$\begin{cases} V_{Aah} - k^{-1}{}_{12}V_{Agh} = -k_{12}I_{Agh}Z_{h21} - k_{32}I_{abh}Z_{2h} \\ V_{Aah} - k^{-1}{}_{32}V_{abh} = -k_{32}I_{abh}Z_{h23} - k_{12}I_{Agh}Z_{2h} \\ V_{Bbh} - k^{-1}{}_{12}V_{Bgh} = -k_{12}I_{Bgh}Z_{h21} - k_{32}I_{bch}Z_{2h} \\ V_{Bbh} - k^{-1}{}_{32}V_{bch} = -k_{32}I_{bch}Z_{h23} - k_{12}I_{Bgh}Z_{2h} \\ V_{Cch} - k^{-1}{}_{12}V_{Cgh} = -k_{12}I_{Cgh}Z_{h21} - k_{32}I_{cah}Z_{2h} \\ V_{Cch} - k^{-1}{}_{32}V_{cah} = -k_{32}I_{cah}Z_{h23} - k_{12}I_{Cgh}Z_{2h} \end{cases} \quad (1)$$

Where $\boldsymbol{Z_{h21}}$ and $\boldsymbol{Z_{h23}}$ can be obtained by the short-circuit test, and $\boldsymbol{Z_{2h}}$ is calculated based on $\boldsymbol{Z_{h21}}$, $\boldsymbol{Z_{h23}}$ and $\boldsymbol{Z'_{h13}}$ (here the superscript means the impedance value is reduced into the side of the secondary extended winding) that is to say

$$Z_{2h} = \frac{1}{2}(Z_{h21} + Z_{h23} - Z'_{h13}) \quad (2)$$

According to the principle of transformer magnetic poten-tial balance and ignoring very few exciting currents, the current equations at the fundamental and the harmonic frequencies can be obtained as follows:

$$\begin{cases} I_{Abh} + k_{12}I_{Agh} + k_{32}I_{abh} = 0 \\ I_{Bbh} + k_{12}I_{Bgh} + k_{32}I_{bch} = 0 \\ I_{Cch} + k_{12}I_{Cgh} + k_{32}I_{cah} = 0 \end{cases} \quad (3)$$

According to Kirchhoff's current law (KCL), the following equations can be obtained to illustrate the relationship between the load-side current and the winding current, between the winding current and the FT branch current, respectively, that is

$$\begin{cases} I_{Aah} = I_{ALh} \\ I_{Aah} = I_{abh} + I_{a0h} - I_{cah} \\ I_{Bbh} = I_{BLh} \\ I_{Bbh} = I_{bch} + I_{b0h} - I_{abh} \\ I_{Cch} = I_{CLh} \\ I_{Cch} = I_{cah} + I_{c0h} - I_{bch} \\ I_{abh} + I_{bch} + I_{cah} = 0 \\ I_{Aah} + I_{Bbh} + I_{Cch} = 0 \end{cases} \quad (4)$$

Where $\boldsymbol{I_{ALh}}$, $\boldsymbol{I_{BLh}}$, and $\boldsymbol{I_{CLh}}$ can be used to express the harmonic characteristics of the nonlinear load.

Furthermore, according to Kirchhoff's voltage law (KVL), the equations which express the relationship between transformer windings' and FT branch voltage, can be obtained as follows

$$\begin{cases} V_{abh} = -V_{b0h} + V_{a0h} \\ V_{bch} = -V_{c0h} + V_{b0h} \\ V_{cah} = -V_{a0h} + V_{c0h} \\ V_{a0h} = I_{a0h} Z_{Fah} \\ V_{b0h} = I_{b0h} Z_{Fbh} \\ V_{c0h} = I_{c0h} Z_{Fch} \end{cases} \quad (5)$$

where Z_{Fah}, Z_{Fbh} and Z_{Fch} are controlled by the VSI. Equations (1)–(5) construct the mathematical model for the inductively filtered transformer and the FT branch. Based on this model, it is easy to investigate the operating characteristics and the special filtering characteristics that the IAF method

III. CONTROL STRATEGIES

Unlike the existing APF method, in the IAF method, the control object of the FT branch includes the following parts:

1) Track the change of harmonic components at the load side;
2) Predict the amount of harmonic components that should flow into the FT branch; and
3) Generate the opposite harmonic components to eliminate them.
In the following subsections, the basic control flow will be presented and then the essential part, which is about how to calculate the amount of the harmonic current attracted to the FT branch, will be investigated in detail:

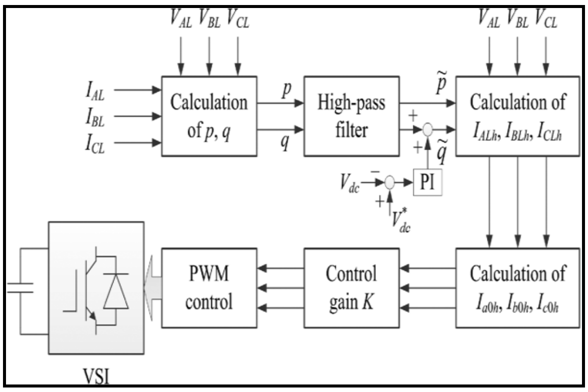

Fig. 6. control diagram for the fully tuned branch.

a) Calculation of p and q

Based on the detected three-phase voltage (V_{AL}, V_{BL} , and V_{CL}) and current (I_{AL} , I_{BL} , and I_{CL}) at the load side, the instantaneous real and reactive power based on α and β quantities are obtained by using the p–q theory. Generally, the phase voltage at the ac valve side of the converter bridge represents nonsinusoidal; thus, it is difficult to accurately transform the three-phase voltage into the α and β quantities. To overcome this problem, we can measure the voltage at the primary (grid) side of the converter transformer and indirectly obtain the voltage at the load side by using the potential transformer (PT) with the same wiring to the converter transformer, or consider the phase-shift factor of the converter transformer and indirectly calculate the valve-side voltage by using the grid-side voltage.

b) High-Pass Filter (HPF):

The HPF is used to filter the dc and the low-frequency components in and ; thus, the high-frequency components remain, that is, and . The performance of the HPF highly depends on the proper setting of the characteristic frequency . Here, in order to attract the full harmonic components from the load-side current to the FT branch and, at the same time, prevent the fundamental component,f_c is set as 100 Hz.[8-9]

c) PWM Controller

To control the shunt active filter a PWM logic controller is developed. The difference between the injected current and the reference current determine the modulation wave of the reference voltage. This voltage is compared with two carrying triangular identical waves shifted one from other by a half period of chopping and generate switching pulses [12]

d) Calculation of Harmonic Components of the Load-Side Current:

The harmonic components of the load-side current are extracted by p,q , and the load-side voltage (V_{AL} , V_{BL} ,and V_{CL}). Besides, the dc voltage of the VSI is controlled by a proportional integral (PI) controller. The output of the PI controller is an additional component to the filtered reactive power at the q-axis.

e) Calculation of Harmonic Components Attracted to the FT Branch:

Due to the constraints among the harmonic currents in the secondary extended and delta winding, the harmonic components attracted to the FT branch, that is, the I_{a0h}, I_{b0h} , and I_{c0h} are not shown in fig of control for FT branch from the load side directly.

f) Control Gain K:

The calculated currents Ia0h, Ib0h and Ic0h are multiplied by K to generate the current reference for the pulse-width modulation (PWM) of the VSI. The reference is compared with the output of the ac current of the VSI, which is used to produce the PWM waves for the independent current control of the VSI.

B)Phase Locked Loop (PLL)

The basic function of the PLL [6] is a feedback system with a PI-regulator tracking the phase angle. Input is the three phases of the grid voltage and output from the PLL is the phase angle of one of the three phases. In the power supply substation there will be one inverter leg for each of the three phases. There are two alternatives, [7] either assuming the grid voltages are in balance and track only one of the phases and then shift with 120 degrees for each of the other two phases or having three PLL system one for each phase. The main advantage of this method is best suitable for harmonic compensation with sinusoidal and non sinusoidal source voltage [14].The Fig.7. shows the Block diagram of synchronous frame phase locked loop.

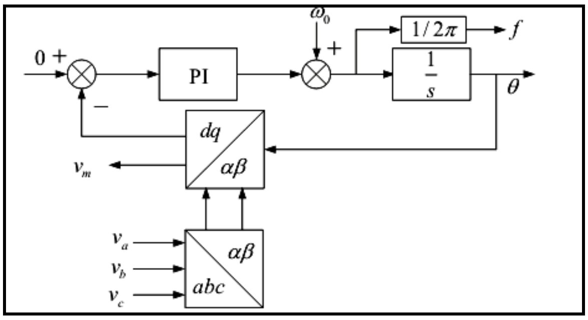

Figure 7: Block diagram of SF-PLL

IV. SIMULATION RESULTS AND DISCUSSION

In order to validate the theoretical analysis and indicate the filtering performance of the distribution network supply system using the inductive filtering method, both the simulation and the experimental studies on a practical. The simulation model is as shown in fig.8

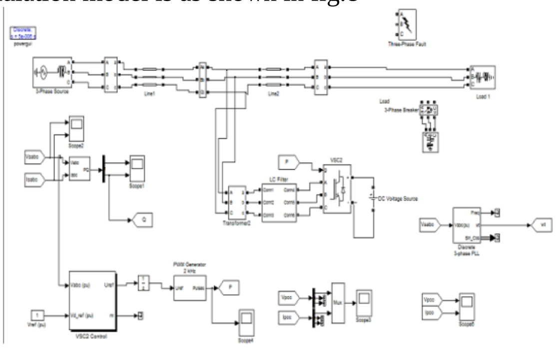

Fig.8. Circuit model for the IAF

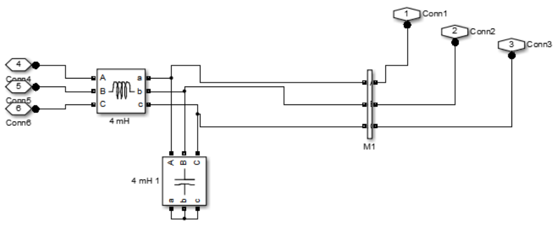

Fig.9. Filter Configuration

In the experimental study one part involves the test on the inductive filtering performance, which is used to verify the filtering effect on the public network, and the other part involves the test on the harmonic magnetic flux suppression, which is used to represent the effect of inductive filtering on the rectifier transformer the filtering performance tests as follows

a) Comparison between traditional method and IAF Method:- The simulation model is as shown in figure.8.It has the connected with VSC and control circuit has the pulse width modulation.

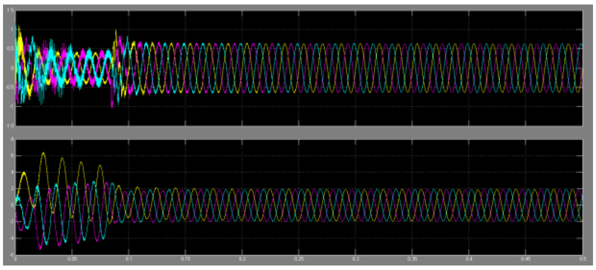

fig.10 . voltage and current at load side with the traditional filtering

Fig.10 shows the traditional filtering methods at the load side. When the inductive filtering method is used in the power system.the voltage and current waveforms are as shown in fig. 11.

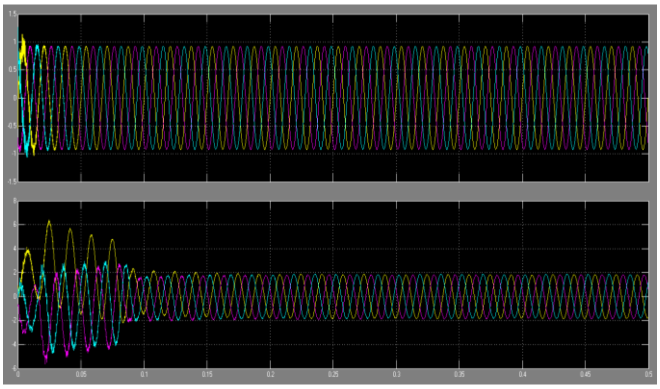

Fig.11. voltage and current at load side with IAF filtering.

we can obviously see that the inductive filtering method has the better filtering performance than the traditional passive power filtering method. The inductive filtering method can greatly reduce the harmonic content in the grid winding of the converter transformer; however, the traditional passive filtering method cannot get the good filtering performance.

Sampling time = 5e-06 s
Samples per cycle = 3333
DC component = 0.05473
Fundamental = 1.909 peak (1.35 rms)
THD = 1.72%

0 Hz	(DC):	2.87%	90.0°
3 Hz		4.29%	45.9°
6 Hz		2.74%	26.5°
9 Hz		1.88%	16.2°
12 Hz		1.54%	14.8°
15 Hz		1.25%	10.3°
18 Hz		1.10%	4.0°
21 Hz		0.72%	25.8°
24 Hz		0.70%	11.9°
27 Hz		0.61%	8.3°
30 Hz		0.49%	12.9°
33 Hz		0.44%	6.0°
36 Hz		0.32%	5.4°
39 Hz		0.18%	170.8°
42 Hz		0.66%	0.1°
45 Hz		0.39%	-4.0°
48 Hz		0.16%	-51.7°
51 Hz		1.23%	15.4°

Fig.12. THD load list.

From Fig.12 it is seen that the inductive converter transformer filters the harmonic current components caused by the nonlinear load. This is evident by the reduction of source current THD from 4% to nearly 1.72%.

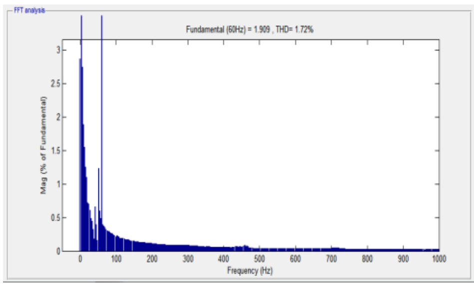

Fig.13 Harmonic spectrum of the system with inductive filtering method.

The THD is the most common indicator to determine the quality of AC waveforms. Using the Fast Fourier Transform (FFT), the harmonic spectrum of the source current under different compensation conditions is presented. Then, the THD comparison is carried out for the simulation results and from the spectra plot, it can be seen that the source current contains large amount of harmonic current components. (According to IEEE-519 standards the THD limits on the magnitude of harmonic current frequencies should be within 5%)

V. CONCLUSION.

This method is presented by using closed loop with PI controller and also for generating gate pulse, PWM controller is used. The PI controller is capable of compensating current harmonics in three phase four-wire systems. By using the proposed method source current harmonics is reduced and THD value is tabulated.

In this paper, using IAF method it is possible to improve the power quality of distribution network (public grid) and also the power-supply system (power consumer side) connected with the non-linear loads. The new power filtering method is introduced with the FT branch design, used to create the balance of harmonic magnetic potential in the windings of converter transformer. With the improved THD, it is possible to make the current in grid winding purely sinusoidal using IAF method.

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