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MODELLING AND SIMULATION OF DVR WTH ACTIVE FILTER

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ABSTRACT

Power quality is one of major concerns in the present era. It has become important, especially with the introduction of sophisticated devices whose performance is very sensitive to the quality of power supply Power quality problem is an occurrence manifested as a non standard voltage ,current or frequency that result in a failure of end use equipments one of the major problem dealt here is the power sag, swell, transient, so we use DVR .but in this DVR we use the active filter .which help to reduced the harmonics which is generated by the VSC.

KEYWORDS: DVR, H- Bridge, Thyristor Bridge, Hysteresis control scheme.

I. INTRODUCTION

DVR (DYNAMIC VOLTAGE RESTORE) which is the most efficient and effective modern custom power device used in power distribution networks DVR is a recently proposed series connected solid state devices that inject voltage in the system in order to regulate the load side voltage.

It is normally installed in distribution system between the supply and the critical load feeder at the point of common coupling (PEC).

Among the power quality problem (sags, swell, harmonic) Voltage sags are the most serves disturbances, To overcome the sag, swell, the concept of power devices is introduced recently.

Advantage Of Dvr
1. Compensate voltage sag and swell.
2. Line voltage harmonic compensation.
3. Reduction of transients in voltage and fault current limitation.

Basic Configuration Of Dvr
The general configuration of DVR:
- Linear transformer
- Active filter
- Storage device
- Voltage source converter
- D C charging circuit
- A control and protection system

Linear Transformer
A transformer is a four terminal device comparing of two or more magnetically coupled coil,
It is composed of two coil.
- A primary coil of Resistance R and self inductance L
- A secondary coil of Resistance R_2 and self inductance L_2

Active filter
Active filter is reduced the harmonic in the system . Active filter is consist of H Bridge, Thyristor Bridge, etc

Voltage source converter

A voltage source converter is power electronic system consists of storage device and switching device which is generated a sinusoidal voltage at any required frequency, magnitude and phase angle. In DVR application, the VSC is used to generate supply voltage.

There are four main type of switching device such as MOSFET, GTO, IGBT, and IGCT. Each type have its own benefits and drawbacks.

Dc charging circuit

DC charging circuit has two main duties:
1. The first duty is to charge the energy source after a sag compensating event.
2. The second task is to maintaining dc link voltage at the nominal D.C. link voltage.

Control and protection

The control mechanism of the general configuration typically consists of hardware with programmable logic .All the protective function of the DVR should be implemented in the software.

Equation related to dvr

The system impedance z_{TH} depend on the fault level of the load bus. When the system voltage (V_{th}) drops the DVR injects a series voltage DVR through the linear transformer so that the desired load voltage V_L can be maintained.

The series injected voltage of the DVR can be written as

$$V_{DVR} = V_L + Z_{TH}I_L - V_{TH}$$

Where V_L = the desired load voltage magnitude: ZTH = the load impedance, I_L= the load current, V_{TH} = the system voltage during fault condition
The load current I_L is given by:

$$I_L = \left[\frac{P_L + JQ_L}{V_L} \right]$$

Where V_L = reference equation.

The complex power injection of the DVR can be written as

$$S_{DVR} = V_{DVR}\ I^*$$

I t requires the injection of only reactive power and the DVR itself is capable of generating the reactive power

Operating mode of dvr:

The basic function of DVR is to inject the voltage into the system

The DVR has three mode of operation which are
1. PROTECTION MODE
2. STAND BY MODE
3. INJECTION MODE

Protection mode

If the over current on the load side exceeds as permissible limit due to short circuit the load or large inrush current .the DVR will be isolated from the system by using the bypass switch (s_2 and s_3) and supplying another path for current S_1 will be closed.

Stand by mode ($v_{dvr} = 0$)

In the standby mode the linear transformer low voltage winding is shorted through the converter, no switching of semiconductor occur in this mode of operation and the full load current will pass through the primary

voltage injection method of dvr pre sag /dip compensation method

The pre sag method the supply voltage continuously and if there is any defect in supply voltage, it will inject the different voltage between sag or voltage point common coupling and pre fault condition

Compensation of voltage sag in the both phase angle and amplitude sensitive load would be achieved by the sag compensation method

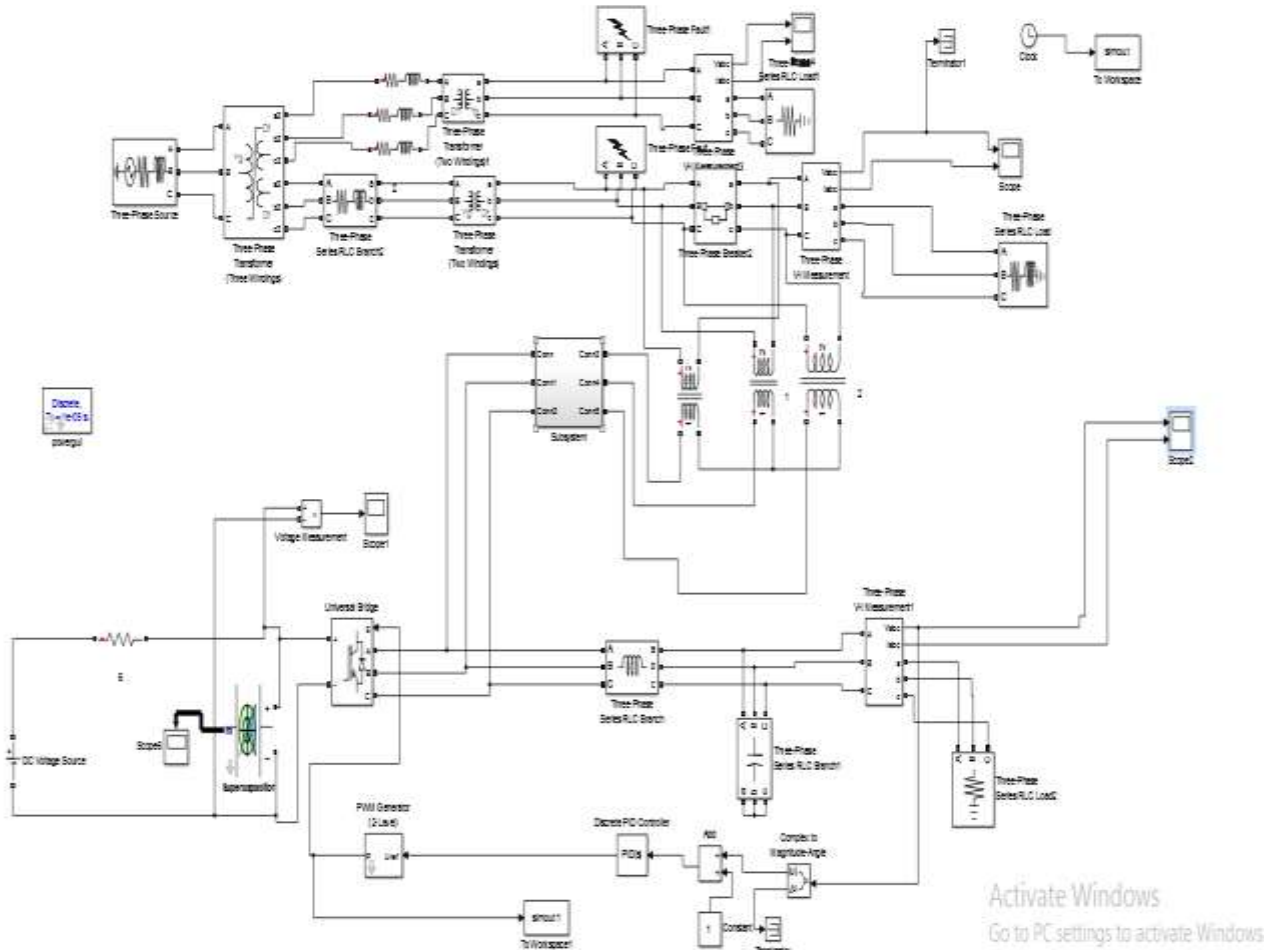$$V_{DVR} = V_{PRE\ FAULT} - V_{SAG}$$

II.   SIMULATION MODEL

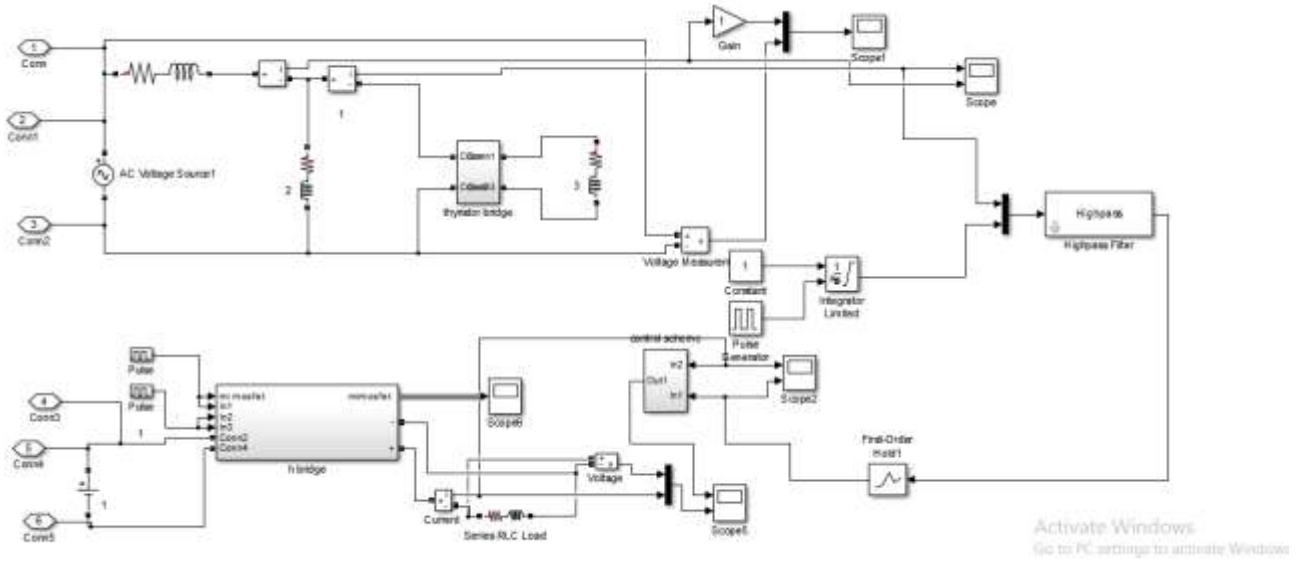

Fig.1. Simulation Model of DVR with Active Filter
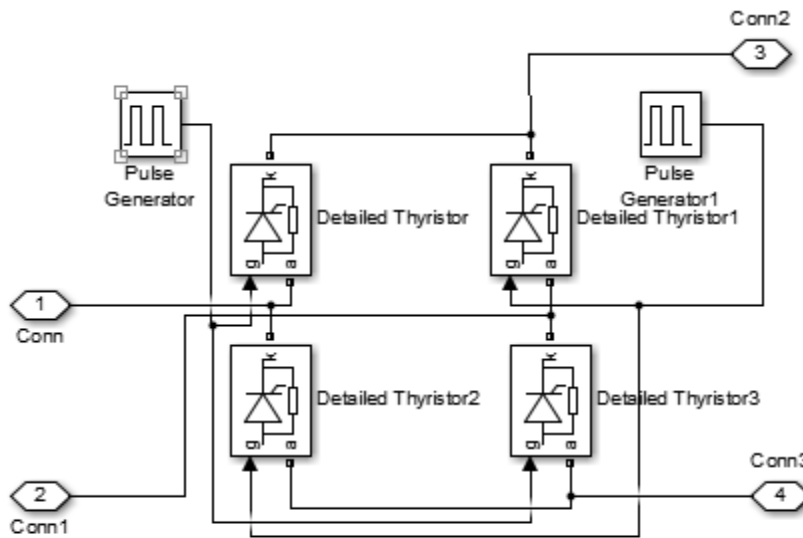
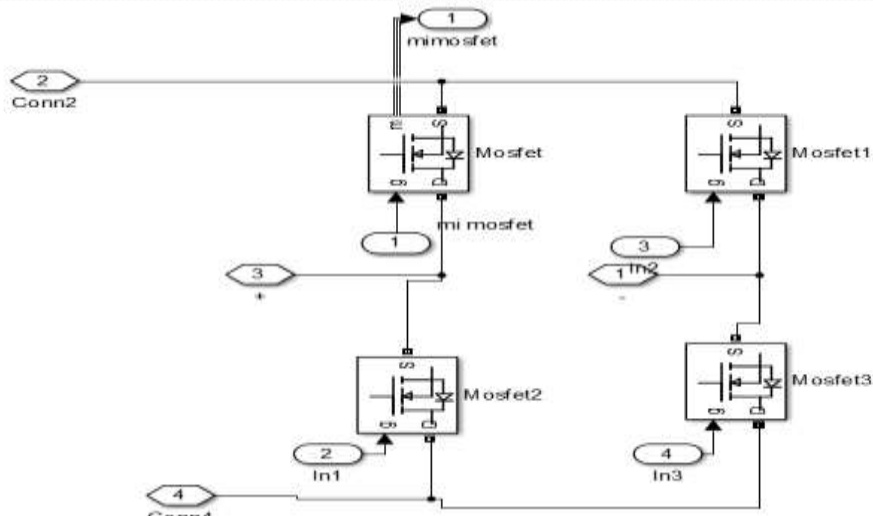*Fig.2. Active Filter*

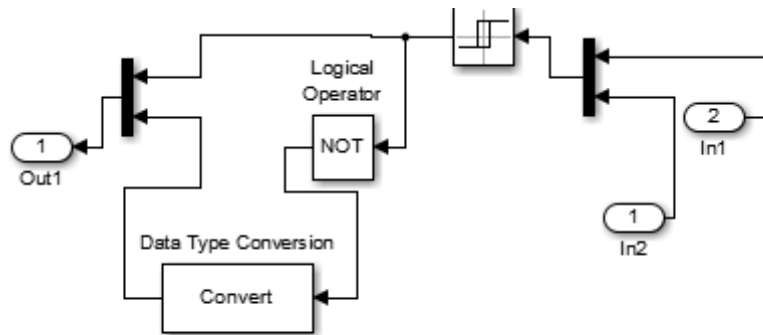*Fig.3. Thyristor Bridge*

Fig.4. H Bridge

Fig.5. Hysteresis Control Scheme
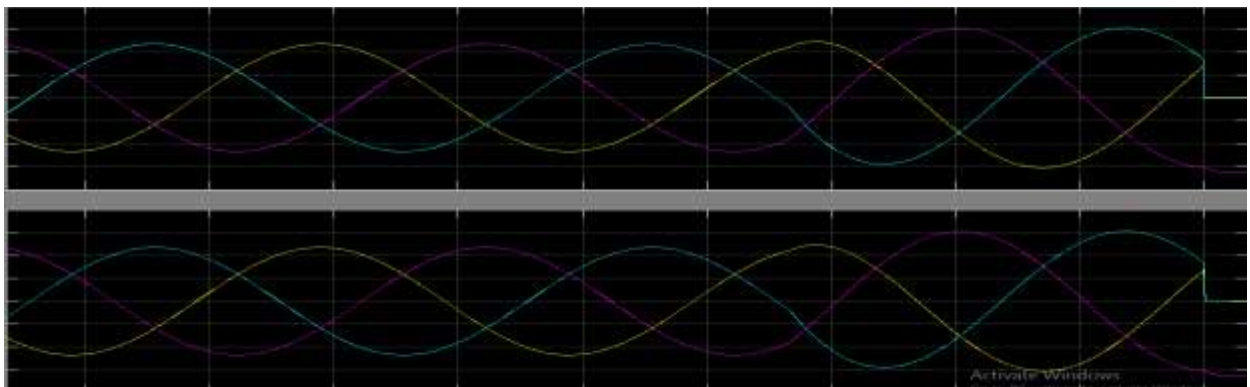
III.   SIMULATION RESULT

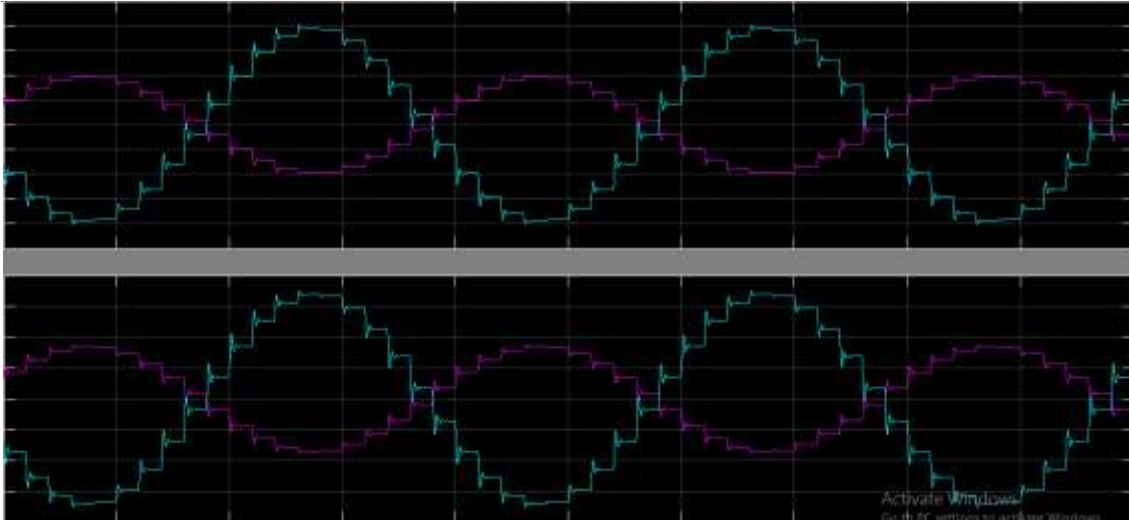*Fig.6. Simulation Result of DVR with Active Filter*

Fig. 7. Simulation Result Of DVR with Passive Filter

IV.   CONCLUSIONS

In this paper, we understand the function of DVR in all fault condition such as symmetrical fault as well as unsymmetrical faults. Function of DVR in this fault condition. In the fault condition, DVR boost up the fault voltage.DVR used as custom devices in distribution systems. In this DVR we use active filter to reduce more harmonics in distribution systems.

V.   ACKNOWLEDGEMENT

VI.   REFERENCES

[1] F.A.L Jowder," Design and analysis of dynamic voltage restorer for deep voltage sag and harmonic compensation" Published in IET Generation, Transmission and distribution Received on 17, October 2008, revised on 2nd march 2009
[2] Singh Manesh Tiwari Varibhav "Modeling Analysis and Solution of Power Quality Problem"
[3] BENACHAIBA Chellali FERDI Brahmin Voltage Quality improvement using DVR Electrical power quality and utilization Journal vol XIV NO 1, 2008
[4] M. Jazayeri H Abdollahzadin " A Novel DVR Control System Design for Compensating all type of voltage sag Based on Pre fault Method European Journal of scientific Research " ISSN 1450-216 X Vol 33 no. 1 (2009)
[5] Norbert EDOHAH "Effect of Voltage Sags, swell and other disturbances on electrical equipment and their economic implication, "Paper 0018, 20th International conference on Electricity Distribution Progue 8-11 June 2009
[6] Hauriuo Acigulo ,"IEEE Transaction on Industrial Electronic Vol 60 7 July 2013"
[7] Solem Rahmani, Abdelhamid Hamadi etal " A combination of shunt hydrid power filter and thyristorn controlled reactor for power IN IEEE Transaction on Industrial Electronic vol 61 vol 5 May 2014 on P(2152 -2164)
[8] Jungi Liu Peride Zanchetta etal " Control design and implementation for high performance shunt active filter in aircraft power grid In IEEE Transaction on Industrial Electronic vol 59 NO 9 September 2012 on P(3604-3613)
[9] AF Zobaa "Optimal multi objective design of hybrid active power filter considering a distorted environment "
[10] Parag Kanjiya, Vinod Khadkikar etal,"A non iterative Optimized algorithm for shunt active power filter under distracted and unbalanced supply voltage.
[11] Ram Mohan etal .In this paper they used the H.bridge Multi level Inverter which is based on DSTATCOM and Control for Harmonic Compensation is Modified synchronous frame method is present.

[12] Chapman David ,” The cost of poor power quality applications guide , copper development association , UK , , March , 2001”

[13] Santos, Surya , Dugon , RC, MC Granaghan , MF, Beauty , HW , “ Electrical Power System Quality “ , HC Graw Hill , Second Edition , 2003”.

[14] Francisco C. De La Rasa,” Harmonics and Power System “, Sun Francisco, June, 2005

[15] Mostafa S. hamad , Mohmound , L mosoud ,etral,” A Shunt Active Power Filter For A medium Voltage 12 Pulse Current Source Converter using Open Loop Current Compensation “, In IEEE Transaction on Industrial Electronics , Vol. 61 , No . 11, November 2014 on P (5840 – 5850)

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