Mitigation of Power Quality Issues in Connected Load to Distribution Network Using Power Electronic Transformer Based DVR

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Abstract **- In a recent day's electrical equipment are more sensitive to the power quality problem in the power system. The power system there may be oscillation in power quality at the sensitive load due to faults and switching operation of breakers. The fault occurs and power quality changes that time voltage balance and unbalance condition are crated. In a power system distribution line disturbance may result in malfunction or failure of the equipment which are connected to the load side. This project used the bidirectional power electronic transformer based three phase four wire Dynamic voltage restorer (DVR) Structure is inject required series voltage to the electric power system in condition sinusoidal voltage is seen at load side is constantly any fault occurrences at the load side. Power quality main problem is voltage sag and voltage swell are the deliberate. The power electronic transformer (PET) main advantages is the increasing frequency to reduce overall size of transformer. In this power system delivers the extreme cost-effective solution to mitigate the problem voltage sag and voltage swells. the main advantages is the PET based DVR Protected against voltage. In that case also used three-dimensional space vector modulation (3DSVM) method are used for the pulse generation.**

Index Terms **- PET, DVR, 3DSVM, Power quality.**

INTRODUCTION

In the recent Days attention on Power quality (PQ) problems in the sensitive end user including industrial and commercial consumer .in that case studies it is clear that transient, voltage sag and momentary interruptions constitute 92% of all the power quality problems occurring in the distribution electrical power system. In fact, voltage sags always have a huge threat to the industry and still 0.25s voltage sag is long enough to interrupt a manufacture process resulting in enormous financial losses. The Typical sag can be a drop to between 10% and 90% of rated RMS voltage and time duration of half cycle to 1 min .According to the data presented in majority of the sags recorded are of depth no less than 50% .But deeper sags with long duration time obviously cannot be ignored as they are more unbearable than shallow and short duration sags to the sensitive electrical consumer .Power distribution system ideally provide their customer with a continuous flow of energy at pure sinusoidal voltage at the tapered magnitude level and frequency Power system specially the distribution system .have numerous non linear loads which considerably affect the quality of power supplies. As a result of the non linear load at the utility. In this Paper describe the effectiveness of dynamic voltage restorer (DVR) in order to alleviate voltage sags and swells in low voltage distribution system required by customer. DVR is a resourceful solution to power quality problem. In the power quality problem in that case Dynamic voltage restorer (DVR) can provide the worthwhile solution to mitigate voltage sag establishing the appropriate quality level necessary.

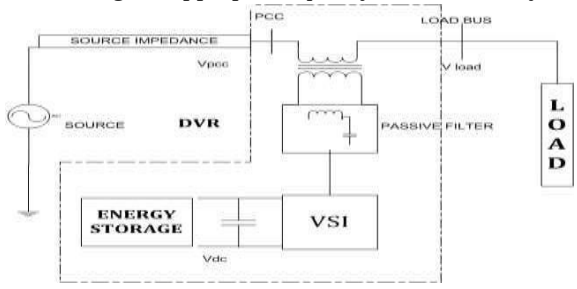

Fig.1 Basic Structure of DVR

II.METHODOLOGY

In this paper a three phases four wire dynamic voltage restorer (DVR) with bidirectional power In this paper a three phases four wire dynamic voltage restorer (DVR) with bidirectional power electronic transformer structure is proposed to inject the required compensating series voltage to the electronic power system in such a way that continuous sinusoidal voltage seen at load side ever at heavy fault occurrences at utility side. Three-dimensional space vector modulation (3DSVM) method is used for pulse generation. In the power system Fourth added wire enables the DVR to compensate unbalance voltage disturbance in that case custom power problems in electrical utility. The performance of the structure and applied switching scheme are verified under both balanced and applied switching scheme are verified under both balanced and unbalanced via simulation study in MATLAB software. The Dynamic voltage restorer (DVR) can be provide to the lucrative solution of the mitigate voltage sag by change the voltage quality level. In that case being used as the active solution for mitigation of power quality problem. In this paper is to propose is approach solution in power system provide voltage quality for sensitive loads under balanced and unbalanced disturbance. The three-phase four-leg converter based on 3DSVM.In this technique are main advantages such as higher amplitude modulation indexes if compared with convectional SPWM techniques. The main purpose of control scheme is to control the load voltage at a desired value.

III. SIMULATION & RESULT

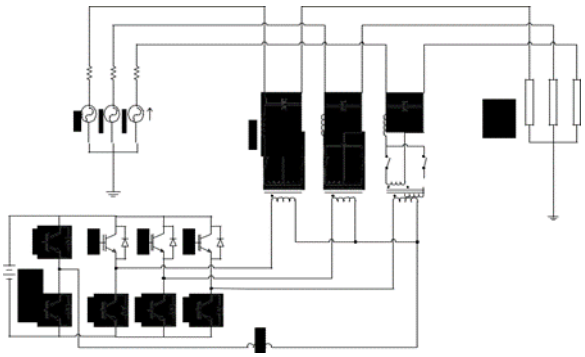

Fig 2. Three-Phase Four-Wire DVR

In this section, the proposed system in Fig.1 is simulated in MATLAB. System parameter are given table1.It should be noted that the series transformer is operating at switching frequency and in linear region. The simulation result under balance voltage sag condition, in this case,50% voltage sag has been considered for each phase. Utility voltage injected voltage and load voltage are shown, respectively. It is clear that the load voltage is restored to the normal condition (before sag occurrence) after a time lower than a half cycle. It shows the simulation result under unbalance voltage sag condition with values of 60%,5o% and 40% on phase a,b and c respectively. as can be seen, under such condition, this structure injected unbalance voltage in such a way that the load voltage remains balanced and sinusoidal and does not sense the voltage sag.

TABLE I. System parameters

Parameter	Value
Line Frequency	50 Hz
Switching Frequency	10000 Hz
Load Voltage	230 vrams
Dc Bus Voltage	80 v
Series Transformer Turns Ratio	1:4
Filter inductance %capacitance	1mh%25uf

It shows the simulation result of the proposed DVR under harmonic polluted utility voltage. In a power system the load voltage remains balanced and sinusoidal when such condition is occurred for utility voltage.

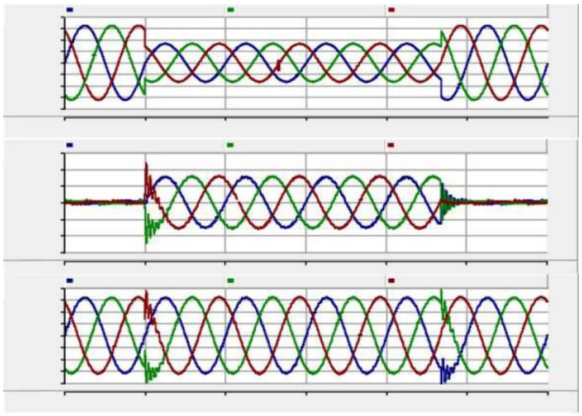

Fig.3. Simulation result under balance sag(a)Utility voltage (b)Injected voltage (c)Load voltage

In this Result Fig.3 shows the simulation result under balance voltage sag condition in that case 50% voltage sag is considered for each phases. The utility voltage, injected voltage &load voltage is restored to the nominal condition after a time lower than a half cycle.

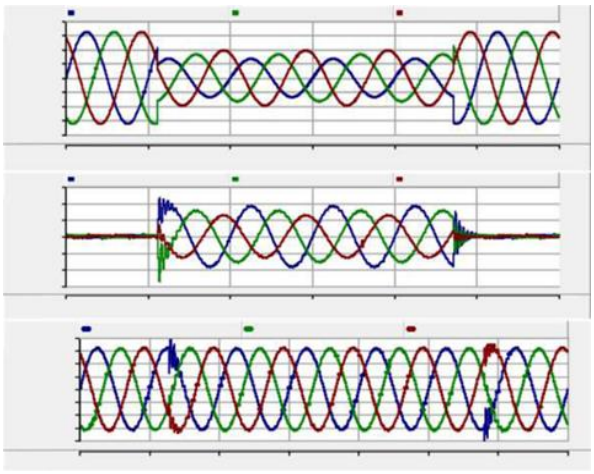

Fig.4 Simulation Result under unbalance sag(a)Utility Voltage(b)Injected Voltage (c)Load Voltage

In that case Fig.4 shows the simulation result under unbalance voltage sag condition with the values of 60%,50%&40% on phases a,b,&c respectively.

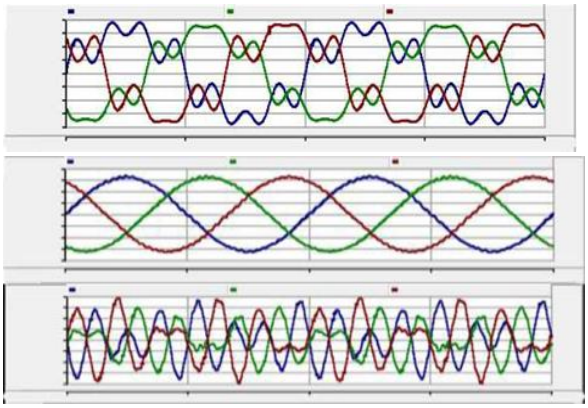

Fig. Simulation under harmonic Polluted utility voltage(a)Utility voltage (b)Injected voltage(c)Load Voltage

In that case fig.5 shows the simulation result of the proposed DVR under harmonic polluted utility voltage. It is clear that the load voltage remains balance &sinusoidal even when such condition is occurred of utility voltage.

The THD Values of utility voltage and load voltage compensated are given in Table. The THD of the load voltage is less than 3% that lays in the criteition reported in IEEE Standards 519-1992

TABLE II. THDs of utility and load voltages

Parameter	THDa	THDb	THDc
Utility voltage	%38.87	%32.02	%41.66
Load voltage	%2.28	%1.91	%2.37

IV.CONCLUSION

In this Paper, a three phase four wire DVR to compensate the balance and unbalance sag and swell voltage using three-dimensional space vector modulations. This result, DVR injects appropriated series voltage during utility voltage disturbance and maintains the load voltage at desired value. The performance of DVR is validated through simulations in MATLAB and the result verify the analysis

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