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Power Quality Improvement In Interline Dynamic Voltage Restorer Using Cascaded H Bridge Multi Level Inverter

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ABSTRACT: The interline dynamic voltage restorer which is used to mitigate the voltage sag occurs in transmission and distribution lines. An interline dynamic voltage restorer made of controlled rectifier and cascaded multilevel inverter. With the use of cascaded multilevel inverter eliminates total harmonic distortion compared with the conventional voltage source inverter. The voltage sag can be mitigated by injected power from one feeder to faulted feeder. IDVR compensation capacity, however, depends greatly on the load power factor and a higher load power factor reduce performance of IDVR. To overcome this disadvantage, a new idea is presented in this paper which allows to reduce the load power factor under sag condition, and therefore, the compensation capacity is increased. The validity of the proposed configuration is verified by simulations in the MATLAB/Simulink environment. Then, experimental results on a scaled-down IDVR are presented to confirm the theoretical and simulation results.

I.INTRODUCTION

Voltage Sag Analysis associated answer for an complex with Embedded Induction Motors is given by A. Felce .during this paper an influence quality (PQ) drawback in associate complex is analyzed and its doable solutions explored, specifically relating to voltage sags. it's analyzed a plant's electrical system sensitivity relating to voltage sags, however will the magnitude depression and its period have an effect on the performance of the electrical hundreds (mainly induction motors). many proposals ar mentioned and explored for voltage sag mitigation and their practicability for the plant's PQ drawback. Finally, settings of the voltage sag mitigation instrumentation (timer or "latching" relay) ar created analyzing voltage recovery times once voltage sag has occurred.Mitigation of Voltage Disturbances victimization Dynamic Voltage preserver supported Direct Converters is given by P.F. Comesana .In this paper, 2 new topologies are planned for three-phase dynamic voltage restorers (DVRs).hese topologies square measure supported direct converters. The projected topologies don't need dc-link energy storage components. As a result, they need less volume, weight, and cost. they will conjointly compensate long-time voltage sags and swells. The projected DVRs will compensate many varieties of disturbances, like voltage sags, swells, unbalances, harmonics, and sparkles. Moreover, attributable to the very fact that the compensation voltage for every part is taken from all 3 phases, the projected topologies will compensate one-phase outages. within the projected topologies, 3 freelance three-phase to single-phase direct converters square measure used. every device operatesIndependently and, as a result, the projected DVRs properly compensate unbalanced voltage sags and swells. The used converters will be made by four or six power switches. counting on the structure of the used converters, the compensation ranges are going to be completely different. a replacement management methodology is additionally projected for mistreatment direct ac/ac converters. The experimental and simulation results verify the capabilities of the projected topologies in compensation of voltage distortions.

II. INTERLINE DYNAMIC VOLTAGE RESTORER

BASIC STRUCTURE OF DVR

The basic principle of the dynamic voltage skilled worker is to inject a voltage of needed magnitude and frequency, so it will restore the load facet voltage to the required amplitude and wave even once the supply voltage is unbalanced or

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distorted. Generally, it employs a gate shut down thyristor (GTO) solid state power electronic switches in a very pulse dimension modulated (PWM) electrical converter structure. The DVR will generate or absorb severally manageable real and reactive power at the load facet. In alternative words, the DVR is formed of a solid state DC to AC switch power convertor that injects a collection of 3 section AC output voltages nonparallel and temporal relation with the distribution and cable voltages.

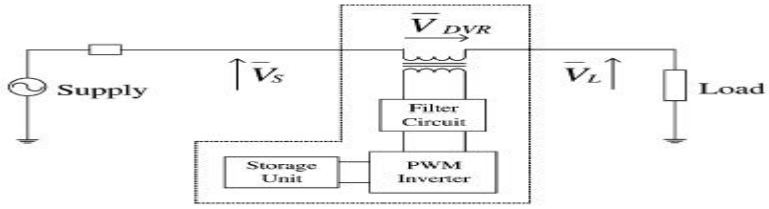

Fig 1 .basic structure of DVR

A. INTERLINE DVR

Among the various compensation methods given for management of a DVR, the in-phase compensation methodology and minimum energy strategy power unit extra attractive [10], [11]. inside the initial one, the injected voltage is in-phase with the availability voltage throughout the sag quantity. this system is straightforward and so the injected voltage has the tiniest magnitude. inside the second methodology, the injected voltage is perpendicular to the load current, and so, the compensation methodology can work with minimum active power [12]. the pliability of compensation with minimum energy is restricted once the voltage sag exceeds a definite price, that will be a perform of the load power issue [6]. this approach reduces the energy consumption, the long-term and deep voltage sags cannot be totally paid just by reactive power injection. Hence, to possess comprehensive voltage sag compensation, it's a necessity to use active and reactive power injection into the distribution system. in numerous words, if the DC link of the DVR ar usually energized properly, DVR ar ready to mitigate deeper sags even with long durations.

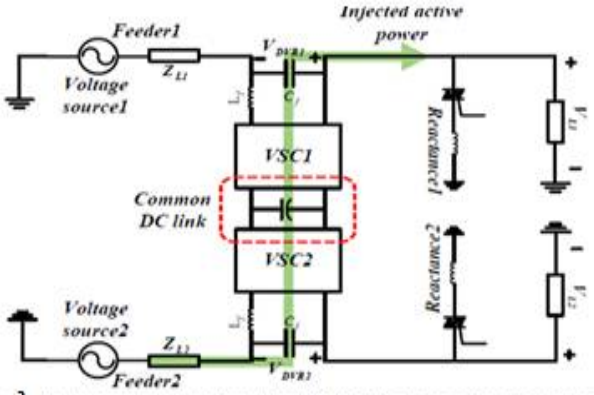

Fig. 2 Power circuit schematic of the IDVR with active power exchanging capability.

In [13], associate interline DVR (IDVR) has been planned. The structure of IDVR consists of many DVRs with a typical DC link that shield sensitive masses against voltage sags, whereas every DVR has been placed in associate freelance feeder. once one amongst the DVRs in IDVR structure starts to compensate the voltage sag by riveting active power from the common DC link, the opposite ones operate in rectification mode and provide the DC link to keep up its voltage at a precise level. In [14], a brand new management strategy for IDVR has been planned that minimizes the rating of the facility devices. supported this strategy, a discount within the price and size of the IDVR while not compromising its performance has been achieved. In [15], associate IDVR has been conferred and rather than bypassing the DVRs in traditional conditions, the DVRs ar utilized to boost the displacement issue (DF) of a part

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B. CASCADED H BRIDGE CONVERTER

Most of the revealed literature within the field of DVR and IDVR influence voltage supply converters complete victimization two-level converters. But, in high-voltage and high-octane applications, a CHB based mostly construction convertor may be aa lot of enticing answer associated its application in an IDVR is introduced during this paper. Among the construction topologies, cascaded H-bridge convertor is a lot of interested for IDVR topology due to its standard structure, reaching medium output voltage levels victimization solely commonplace low voltage mature technology elements, and therefore the higher reliableness. Moreover, low modulation techniques and fault-tolerant algorithms may be simply applied within the CHB.

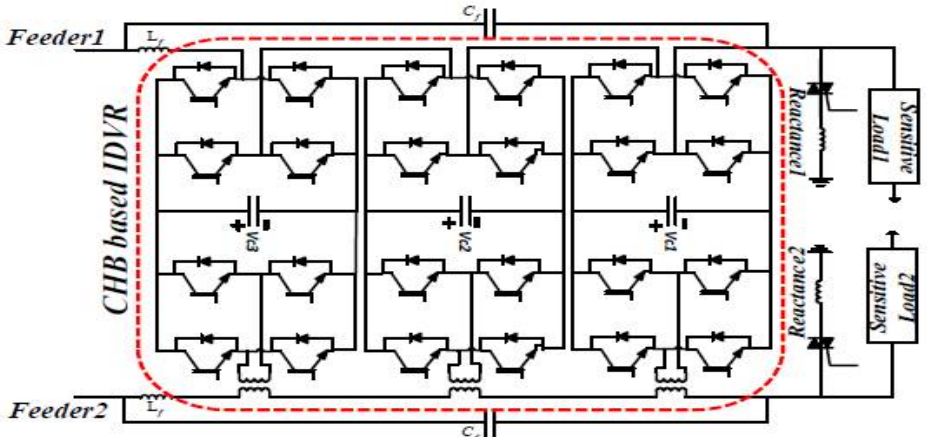

Fig 3 proposed IDVR structure

In a CHB device, counting on the quantity of voltage levels that needs to be synthesized, separate DC links square measure required. In IDVR structure, however, by succeeding association of 2 CHB converters and use of low frequency isolation transformers in one aspect, distinct DC links square measure simply provided. moreover, this structure eliminates the need to isolation transformers in one aspect that ends up in lower size, weight and value. the quantity of H-bridge cells in an exceedingly CHB device is chosen consistent with the desired AC voltage and therefore the voltage rating of power switches. Fig. five demonstrates one section 7-level CHB primarily based IDVR that is employed in simulation study and experimental investigation. though a 7-level succeeding device is chosen for the study during this paper, the planned management strategy are often applied to any range of voltage levels and there's no limitation from this time of read. In alternative words, the generated voltage references by the system are going to be synthesized by the CHB device through well-known construction modulation techniques. the sole issue is expounded to keeping voltage balance among DC link capacitors that has been addressed in [17] and [20] for any range of voltage levels.

III.SIMULATION RESULTS

To investigate the system performance in voltage sag compensation, many simulations are wiped out the MATLAB/simulink surroundings on a single-phase IDVR almost like that in Fig. 3. In these simulations, 2 shunt reactances area unit used for power issue reduction throughout the sag periods. By adding the shunt reactances, DC-current element could occur, however, if the shunt electrical phenomenon is switched on at close to the height of the voltage, this element are tiny.

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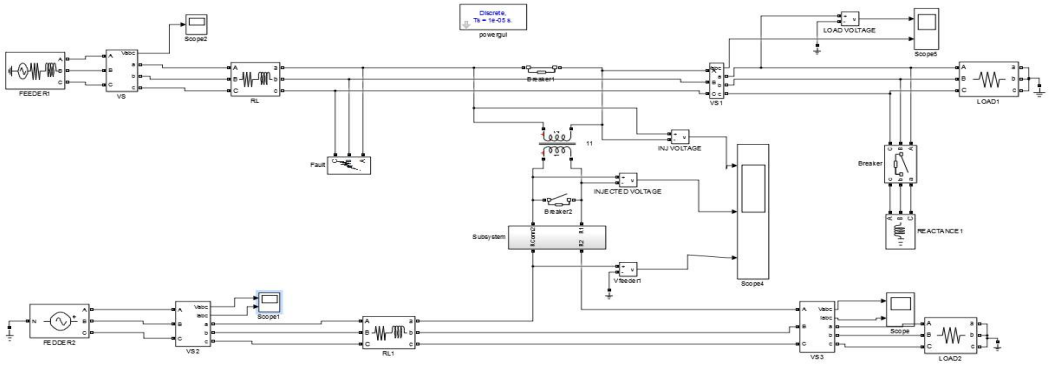

Fig 4 Simulink model diagram

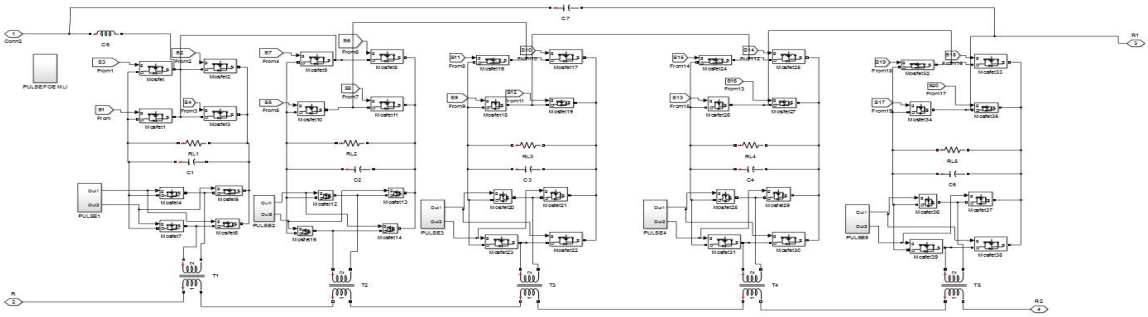

Fig 5. Simulink diagram of cascaded h bridge converter

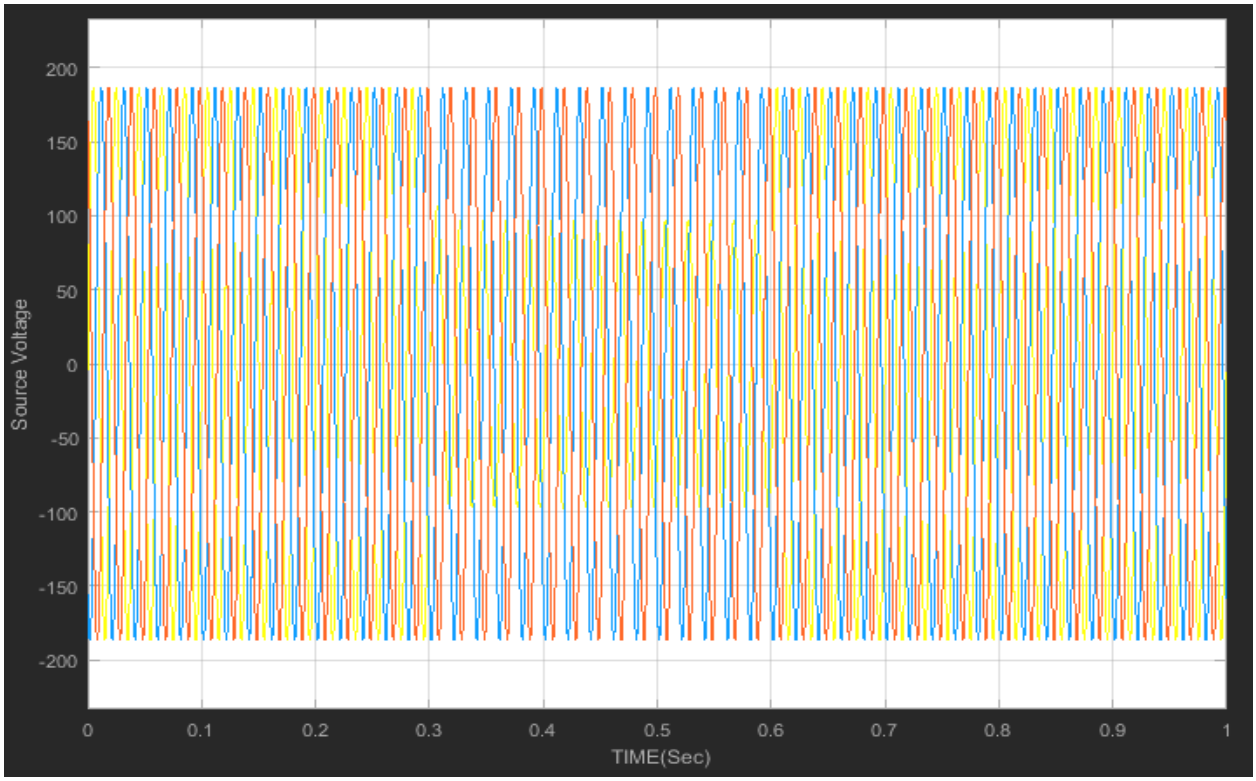

Fig 6. Source voltage

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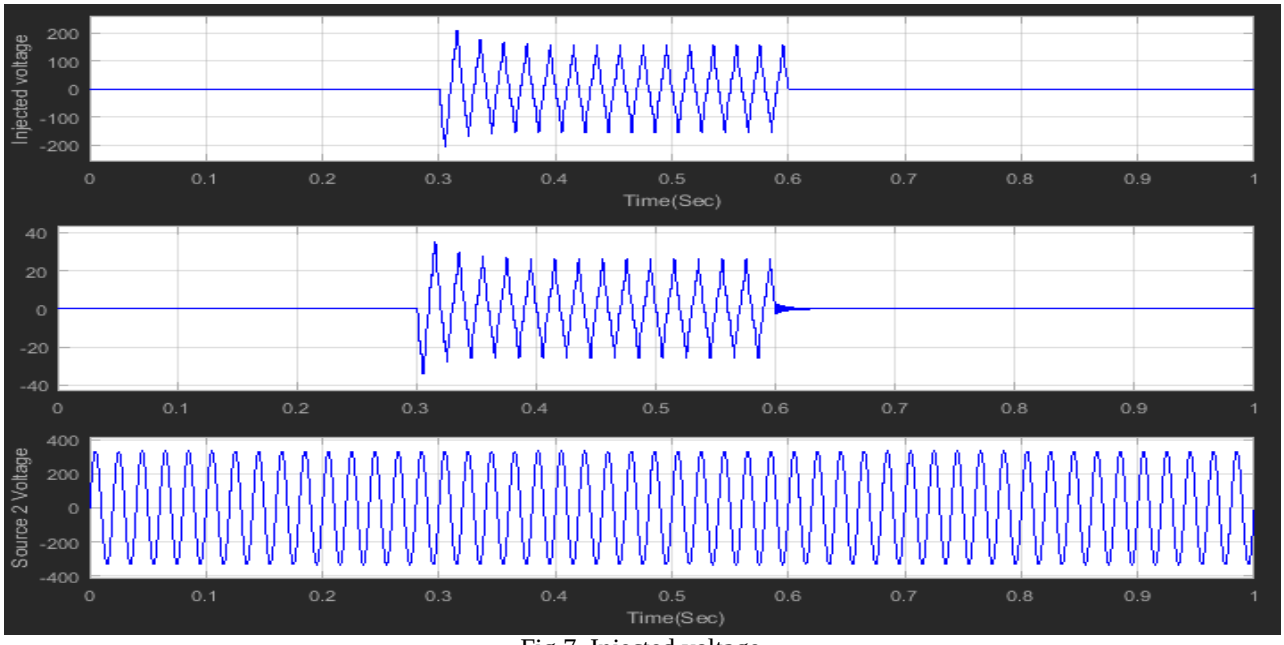

Fig 7. Injected voltage

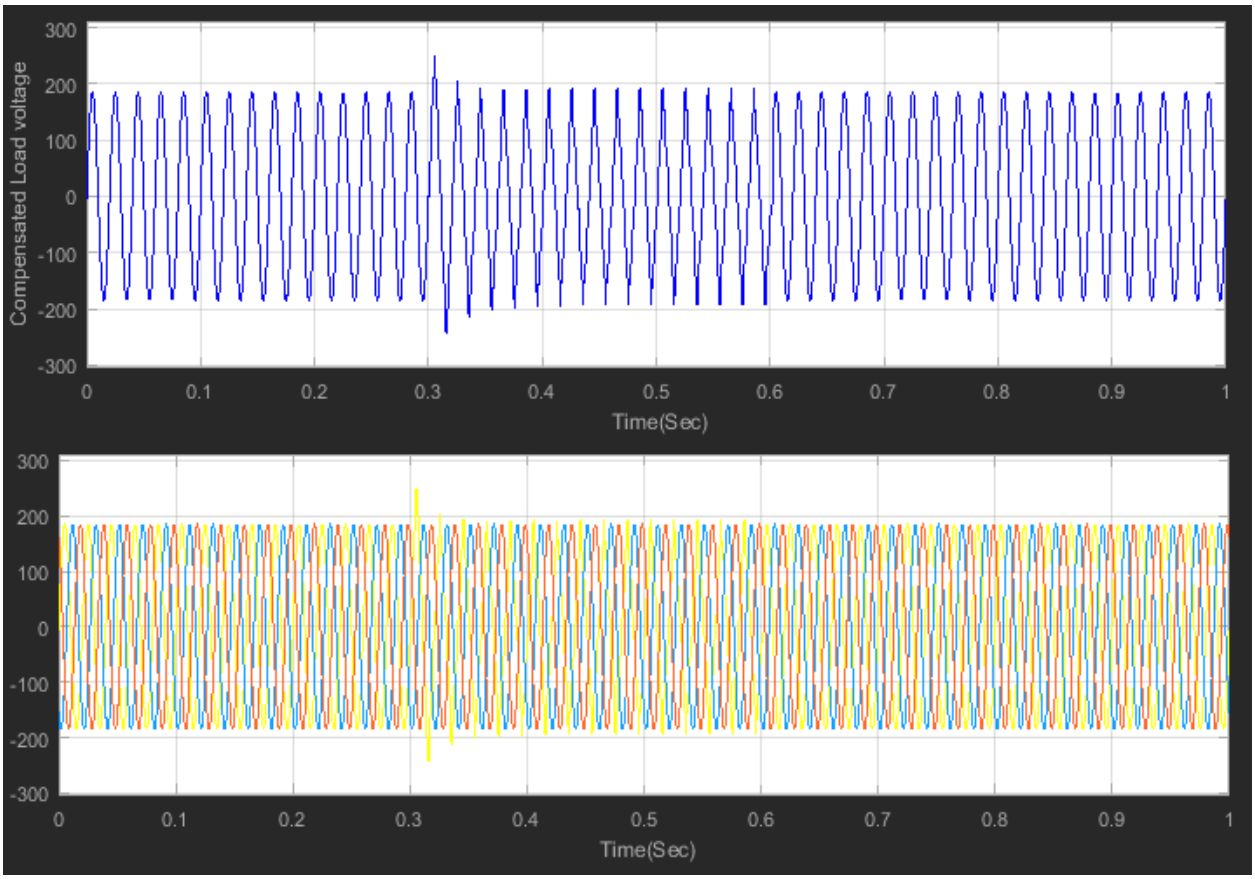

Fig 8. Compensated Load voltage

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IV. CONCLUSION

In this paper, a replacement configuration has been planned that not solely improves the compensation capability of the IDVR at high power factors, however additionally will increase the performance of the compensator to mitigate deep sags at fairly moderate power factors. These benefits were achieved by decreasing the load power issue throughout sag condition. during this technique, the supply voltages area unit perceived ceaselessly and once the voltage sag is detected, the shunt reactances area unit switched into the circuit and reduce the load power factors to boost IDVR performance. Finally, the simulation and sensible results on the CHB based mostly IDVR confirmed the effectiveness of the planned configuration and management theme.

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