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Dynamic Voltage Restorer (DVR)

Abhishek Dubey, Abhishek Kumar, Surender Kumar and Kanhaiya Lal

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Submitted by:-

Abhishek Dubey, Abhishek Kumar, Surender Kumar, Kanhaiya Lal

Department of Electrical Engineering

Poornima College of Engineering

2019pceeeabhishek30929@poornima.org

2019pceeeabhishek31039@poornima.org

2019pceeesurender30947@poornima.org

2019pceeekanhaiya30980@poornima.org

ABSTRACT:

The Dynamic Voltage Restorer (DVR) is fast, flexible and efficient solution to voltage sag problem. The DVR is a power electronic based device that provides three-phase controllable voltage source, whose voltage vector (magnitude and angle) adds to the source voltage during sag event, to restore the load voltage to pre-sag conditions. The DVR is designed for protecting the whole plant with loads in the range of some MVA. The DVR can restore the load voltage within few milliseconds. Several configurations and control methods are proposed for the DVR. In this paper, an overview of the DVR, its functions, configurations, components, compensating strategies and control methods are reviewed along with the device capabilities and limitations. Manufacturing cost and the reliability of those solid state devices have been improved as new technologies emerged. So, the protection devices which include such solid state devices can be purchased at a reasonable price with superior performance than the conventional electrical or pneumatic devices available in the market. Uninterruptible Power Supplies (UPS), Dynamic Voltage Restorers (DVR) and Active Power Filters (APF) are examples for commonly used custom power devices. Among those APF is used to mitigate harmonic problems occurring due to non-linear loading conditions, whereas UPS and DVR are used to compensate for voltage sag and surge conditions. Voltage sag may occur from single phase to three phases. But it has been found that single phase voltage sags are routine and most frequent in the power industry. Thus, the industries that use single and three phase supply will undergo several interruptions during their production process and they are forced to use some form of voltage compensation equipment.

As soon as the fault occurs the action of DVR starts. On event of fault which results in voltage sag, the magnitude reduction is accompanied by phase angle shift and the remaining voltage magnitude with respective phase angle shift is provided by the DVR. Employing minimum active voltage injection mode in the DVR with some phase angle shift in the post fault voltage can result in miraculous use of DVR. If active voltage is less prominent in DVR then it can be delivered to the load for maintaining stability. Considering this, a transition process is proposed such that voltage restoration is achieved by injecting the voltage difference between the pre sag and the in sag (source side) voltages during the initial first cycle or so the sag. When the sag voltage phasor is available, the injection voltage is controlled to move progressively from the in phase injection point to the corresponding minimum active voltage injection point. The initial voltage injection magnitude and phase angle of DVR can be categorized into different cases considering the injection limit that will be discussed further. The simulation of various 1 phase and 3 phase faults are done using MATLAB. The present project

deals with only voltage sag, voltage swell can be simulated in same way. The simulation results show the very good performance of the controller theoretically. The performance of DVR theoretically is tested. Therefore this project has contributed a strong knowledge to the research and development targeting industrial application to compensate the single-phase voltage sags and 3 phase balanced voltage sags.

INTRODUCTION:

Here we have use dynamic voltage restore (DVR) to remove voltage sag and swell problem and make constant supply. In this model we use three phase filter circuit, inverter battery also. When voltage sag or swell the voltmeter and ammeters reads the reading and send a signal to PWM controller. We have set a voltage and current reading into PWM controller. If voltage or current different to set off the PWM controller set reading the PWM controller gives a signal to three phase inverse to use storage battery and make supply voltage constant. DVR is a static var device that has seen applications in a variety of transmission and distribution systems. It is a series compensation device, which protects sensitive electric load from power quality problems such as voltage sags, swells, unbalance and distortion through power electronic controllers that use voltage source converters (VSC).

WORKING:

Whenever receiving end voltage is less than sending end voltage the three phase transformer detects the voltage from three phase transmission line. The voltmeter and ammeter is reads less reading in order to reduction in voltage. For the make supply voltage or transformer voltage constant the PWM gives control signal to inverter and inverter charge required amount of DC energy into AC energy to battery. In this energy ripples are present for the removing the ripple by using filter circuit give supply to three phase transformer .when sending end voltage is equal to receiving end voltage the PWM controller gives zero control signal so the inverter will stop. Some process repeat for voltage swell.

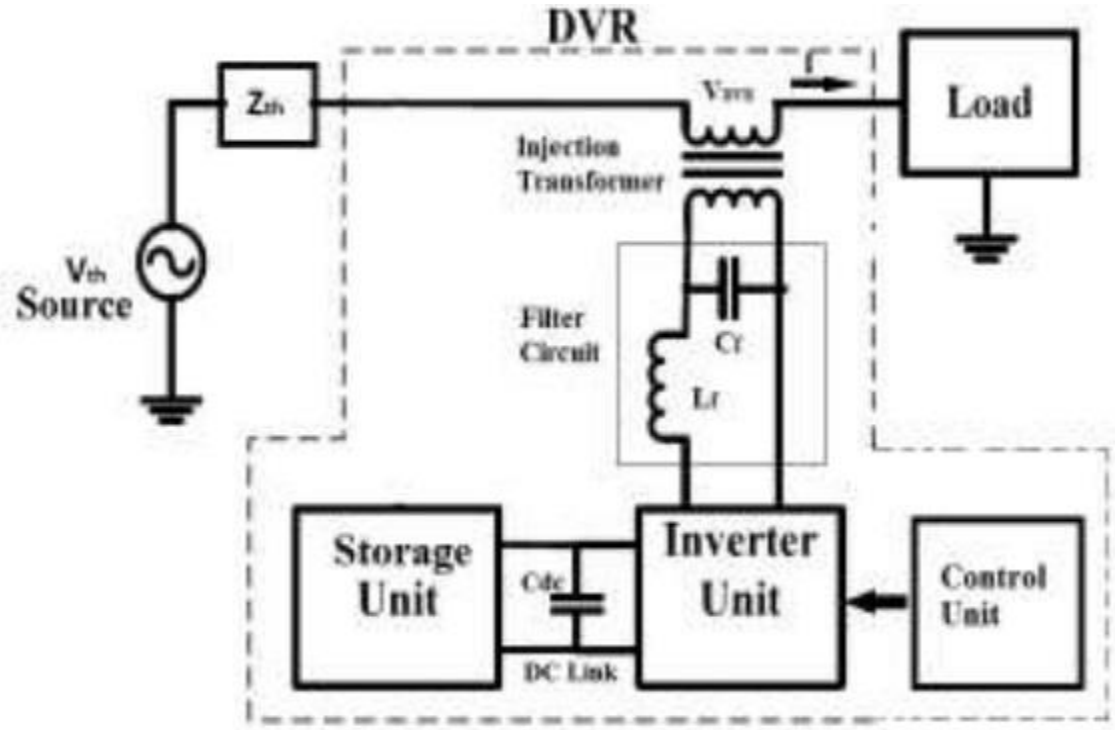


Figure:1. Dynamic Voltage Restorer (DVR).

In normal conditions, the dynamic voltage restorer operates in stand-by mode. However, during disturbances, nominal system voltage will be compared to the voltage variation. This is to get the differential voltage that should be injected by the DVR in order to maintain supply voltage to the load within limits.

The amplitude and phase angle of the injected voltages are variable, thereby allowing control of the real and reactive power exchange between the dynamic voltage restorer and the distribution system. The DC input terminal of a DVR is connected to an energy storage device of appropriate capacity. As mentioned, the reactive power exchange between the DVR and the distribution system is internally generated by the DVR without AC passive reactive components. The real power exchanged at the DVR output AC terminals is provided by the DVR input DC terminal by an external energy source or energy storage system.

Also, there is a resemblance in the technical approach to DVRs to that of providing low voltage ride-through (LVRT) capability in wind turbine generators. The dynamic response characteristics, particularly for line supplied DVRs are similar to

LVRT-mitigated turbines. Moreover, since the device is connected in series, there are conduction losses, which can be minimized by using Integrated Gate-Commutated Thyristor (IGCT) technology in the inverters.

OBJECTIVE:

To make constant supply by using DVR.

APPLICATIONS

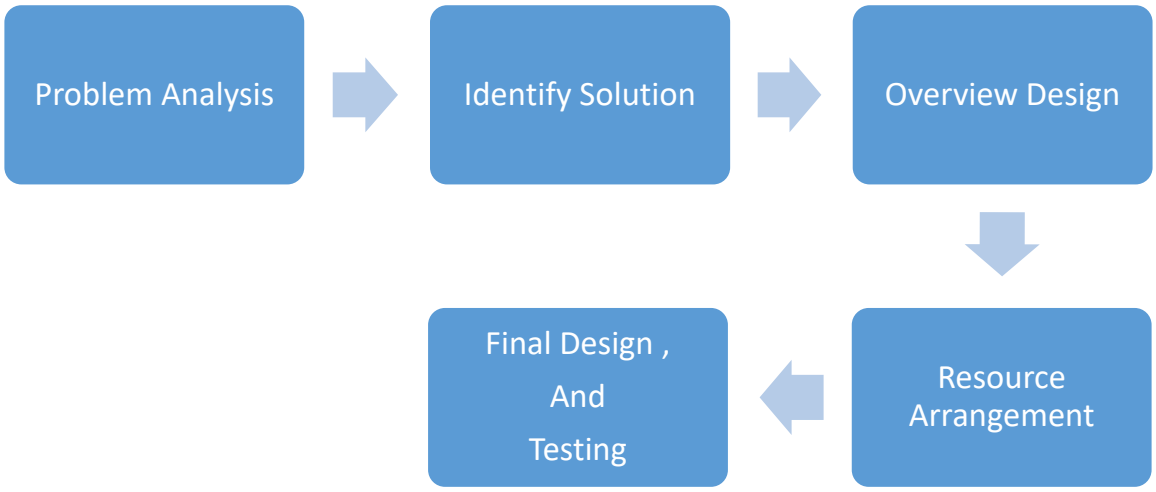
Practically, the capability of injection voltage by DVR system is 50% of nominal voltage. This allows DVRs to successfully provide protection against sags to 50% for durations of up to 0.1 seconds. Furthermore, most voltage sags rarely reach less than 50%.

The dynamic voltage restorer is also used to mitigate the damaging effects of voltage swells, voltage unbalance and other waveform distortions.

REFERENCE:

Pterra Consulting. (2007). *Application of DVRs in Networks Subject to Reactive Deficiencies*

WORK PLAN:



REQUIRMENT:

1. **HARDWARE REQUIRMENT** :-

- Three phase transformer
- Three phase inverter
- Three phase filter circuit
- Voltmeter , Ammeter ,PWM controller
- Battery storage