



## A Review Paper on Voltage SAG and Swell Compensation by Using Dynamic Voltage

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### ABSTRACT

Voltage sags area unit a well-known development with serious consequences for sensitive masses. The DVR could be a advanced and crucial custom power device for offsetting voltage sags in power distribution systems that solves this downside. The DVR (Dynamic Voltage Restorer) could be a fast, adaptable, and effective answer to voltage sag. The DVR could be a series compensator that reduces voltage sags and restores load voltage to its rated level. During this study, the capabilities and limitations of the DVR area unit mentioned, yet as its functions, configurations, components, operative modes, voltage injection strategies, and closed-loop management of the DVR output voltage.

**Keywords:** Dynamic Voltage Restorer (DVR), Power Quality, Sinusoidal Pulse Width Modulation (SPWM), Voltage Sags and Swells, Voltage Source Converter (VSC)

### INTRODUCTION

Because of its impact on energy suppliers, equipment manufacturers, and customers, power quality is a critical problem. "The variance of voltage, current, and frequency in a power system is referred to as power quality." Active power filters, battery energy storage systems, distribution static synchronous compensators, distribution series capacitors, surge arresters, super conducting magnetic energy systems, static eddy current energy systems, and static eddy current energy systems are some of the methods used to compensate for power quality issues, mostly voltage sags and swells (UPS) static VAR compensators, Thyristor switched capacitor, Uninterruptable power supply (UPS) and Dynamic Voltage Restorer DVR.

**Voltage Sag** A Voltage Sag is a momentary decrease in the root mean square (RMS) voltage between 0.1 to 0.9 per unit, with a duration ranging from half cycle up to 1 min. It is considered as the most serious problem of power quality. It is caused by faults in the power system or by the starting of large induction motor

**Voltage Swell** Voltage swell is defined as an increase in the root mean square (RMS) voltage from 1.1 to 1.8 per unit for duration from 0.5 cycles to 1 min. Voltage swells are not as important as voltage sags because they are less common in distribution systems. The main causes for voltage swell are switching of large

**Principle of DVR** The basic operating principle of a DVR is to insert a voltage of required magnitude and phase in series with a distribution feeder to maintain the desired Amplitude and waveform for the load voltage [4]. Moreover, the compensation capability is sensitive to the load level, and is independent of the system short circuit capacity and the installation position. To improve the compensation capability of DVR, such as the large amplitude or long duration voltage fluctuation, the energy storage unit is essential to supply the power transfer during the voltage compensation

### CONSTRUCTION OF DVR

The conventional DVR consist of Series injection transformer: 1. Basic function of injection transformer is to increases voltage supplied by filtered VSI output to desired level while isolating DVR circuit from distribution network. 2. Energy storage device: The energy storage such as capacitor, battery is responsible to supply energy source in DC form. Energy source may vary according to design and manufacturer of DVR. Energy storage consist of two type form. One using stored energy to supply the delivered power and other having no significant internal energy storage nut instead energy is taken from faulted grid supply during sag. 3. Filter: Filter is used to eliminate unwanted harmonics components generated in VSI section. 4. Inverter: The variable output voltage is achieved by voltage source inverter (VSI). Solid state semiconductor devices with turn on capability are used in inverter

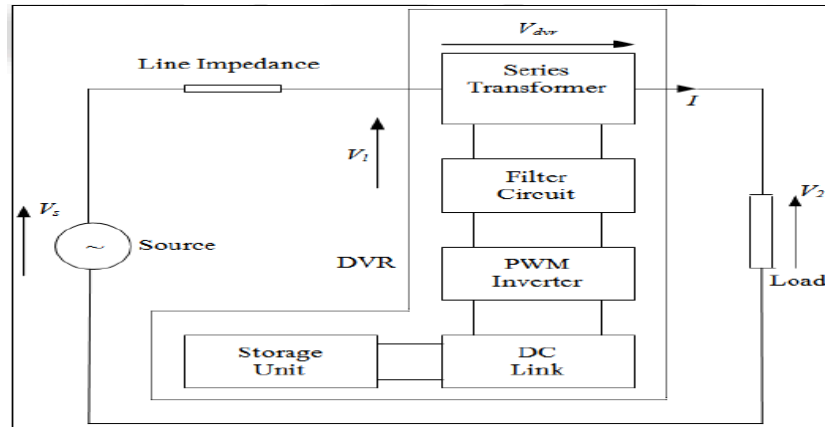


Fig. 1 Block Diagram

### COMPENSATION TECHNIQUES

There are 4 types of DVR voltage injection methods are as follow

1. Pre sag compensation method
2. In phase compensation method
3. Phase advanced compensation method
4. Energy optimisation method

### WORKING MODEL

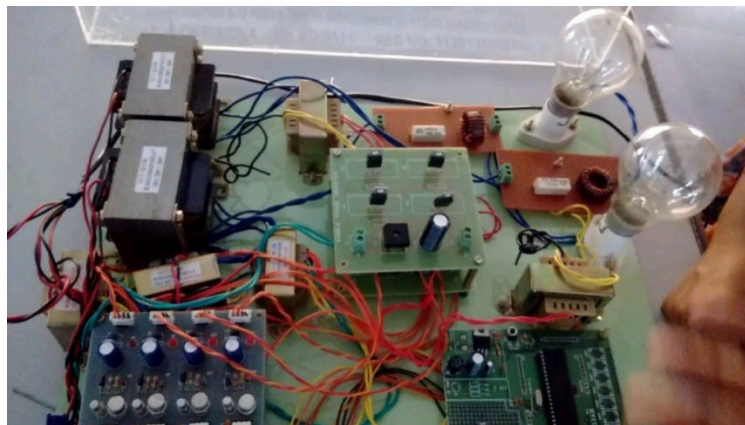


Fig. 2 Expected Waveform

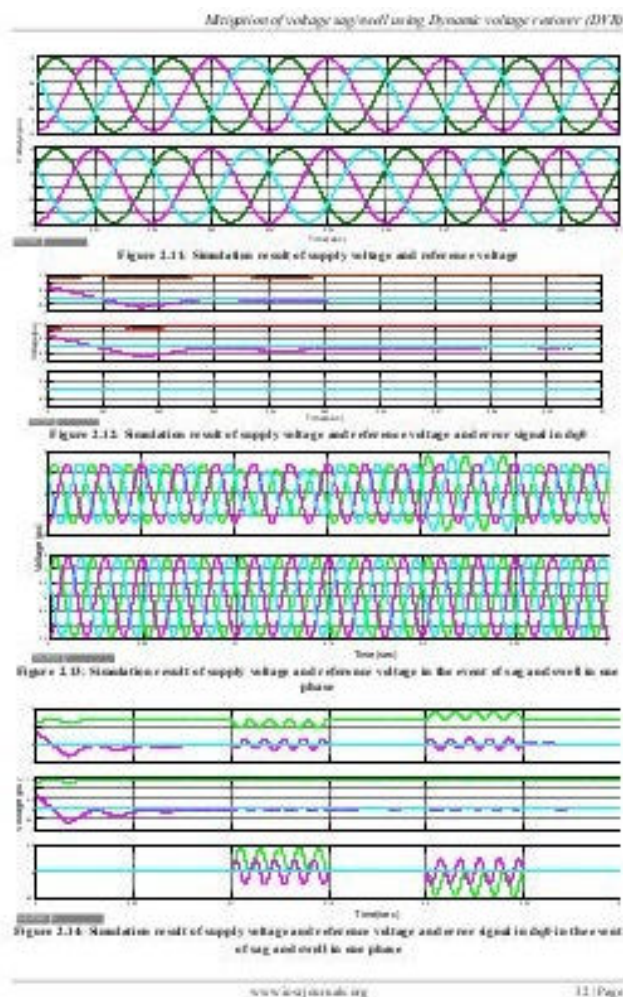


Fig. 3

### CONCLUSION

This paper has presented a comprehensive study on performance of DVR. The above study shows that the DVR is suitable for compensation of voltage sag and swell by the use of different controlling techniques. From these discussion paper presents DVR may be work in Inferior cost, smaller size, and its quick dynamic response to the disturbance due to power quality issues, Ability to control active power flow, Higher energy capacity and lower costs compared to the other active devices and also Less maintenance required. This study also gives useful knowledge for the researchers to develop a new design of DVR for voltage disturbances in electrical system. From this study of DVR applications, this work concluded that the trends of DVR through the years are still assumed as a powerful area of research.

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