

# Compensation Techniques of the Dynamic Voltage Restorer for Single Phase Voltage Sags

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## Abstract

Power quality associated problems such as voltage sag, surge (swell), flicker, imbalance, interruptions and harmonics become a major concern. These power quality problems affect the performance of the microprocessor based loads as well as the electric devices that are sensitive to load variations. Among those power quality problems the most frequent is the voltage sags and swells. Dynamic Voltage Restorer (DVR) is the best device to compensate for voltage sags/swells in the distribution line. It is a series connected custom power device, which has been proved as a cost effective device.

The function of the DVR is to inject the difference between the pre-sag and the sag voltage. The voltage sag can be identified as a change in voltage magnitude and the phase angle during a small period of time (0.5 – 30 operating cycles). Hence the DVR should compensate both for the voltage magnitude and the phase angle shift. Three DVR control techniques are available such as pre-sag compensation, in-phase compensation and energy optimization technique.

This paper presents a smooth control technique which combined pre-sag and in-phase compensation. Here the reference voltage is produced based on the phase angle of the measured voltage. This phase angle was tracked by feedback action. This control technique has simulated in using EMTDC/PSCAD. The result showed that an excellent performance with smooth compensation of the DVR without any phase jump.