

# Enhancement of Voltage Profile and Fault Current Interruption using DVR in Distribution System

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**Abstract**— Power quality is main issue that most affect all consumers also in industrial electricity consumer’s point of view in recent times. There are different problems associated with distribution related to voltage, power quality problems like voltage sag, swell, flicker, harmonic distortion, impulse transients and interruption are a prominent few. In this paper purposes and evaluates auxiliary control strategy for counteracts voltage sag and swell and enhance voltage profile started along with SVPWM technique for controlling dc capacitor voltage by means of DVR .It does not require phase locked loop and independently control system. The results are verified by mat lab/ Simulink.

**Key words:** Power Quality, DVR, Three Phase Three Level Inverter, Voltage Sag

## I. INTRODUCTION

In electrical power system consist of main 3 parts, generation, transmission, and distribution. The work of generation is to generation is to generate the adequate power which according to demand of consumers. Transmission system transports the bulk power along the long distance without overloading and without affecting stability. Distribution system must deliver electrical power to each consumer from bulk power .distribution system connected at end of a system and directly to the customer. So power quality mainly concern with this. Ago, this mainly used for transmission system but now a day’s more attention goes on the distribution system. Distribution system mainly focusing for improving power quality. For improving power quality improving now a days many customer power devices used. The customer power devices which are mainly used are DSTATCOM, DVR, UPQC, ACTIVE FILTER etc. In here we uses DVR in a radial distribution system, analyse their operation in diff. Load condition and also for mainly different fault conditions.

Dynamic voltage restorer is a series connected device to a distribution system which generate controlled three phase voltage for counteracts the voltage sag, swell and enhance voltage profile.

## II. DVR MODEL

### A. Equivalent Circuit of DVR

The system impedance  $Z_{th}$  depends on the fault level of the load bus. When the system voltage ( $V_{th}$ ) drops, the DVR injects a series voltage  $V_{DVR}$  through the injection transformer so that the desired load voltage magnitude  $V_L$  can be maintained. It requires the injection of only reactive power and the DVR itself is capable of generating the reactive power [10]. The magnitude of the sinusoidal reference signal determines the modulation index of the

PWM signal generator which is dependent upon the error signal.

The magnitude of the sinusoidal reference signal is controlled by the PI based feedback controller which adjusts the magnitude according to the error magnitude and hence control the modulation index. Generally, there are two control schemes, open loop and closed loop which are used in the DVR applications.

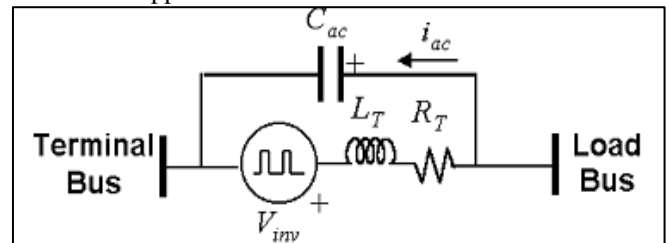


Fig. 1: Equivalent Circuit of DVR

### B. Equation Related to DVR:

Per sag compensation voltage given as,

$$V_i = V_{sag} + V_{DVR} \dots \dots \dots (1)$$

#### 1) Injection of Reactive Power

When injected reactive power only from DVR, the power equation given by:

$$jQ = V_{DVR} + I_l \dots \dots \dots (2)$$

$$S_l = V_l + I_l \dots \dots \dots (3)$$

Where  $Q$  is the injected reactive power by DVR,  $S_l$  is the load at bus and  $I_l$  is the load current.

#### 2) Injection of Active Power. When injected active power only from DVR, the power equation given by

$$P = V_{DVR} + I_l \dots \dots \dots (4)$$

## III. BASIC DIAGRAM OF DVR

As Shown In DVR Basic Diagram It Consists Voltage Source Converter and Series Connected To Distribution System through Coupling Transformer

It Counteracts The Voltage Sag Swell And Enhance Voltage Profile And Improve Power Quality. DVR Injects Three Phase Controlled Ac Voltage. For Reducing Voltage Sag within Few Seconds

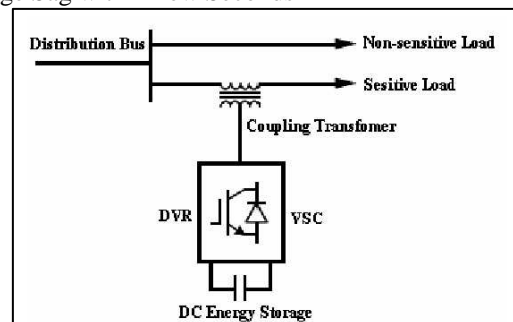


Fig. 2: Basic Diagram of DVR

IV. SIMULATION MODEL

The Model of Wind Turbine simulated using MATLAB/Simulink is shown in Fig. 1. Simulation model

parameter is given in Table 1. Subsystem of wind turbine model is shown in Fig. 2.

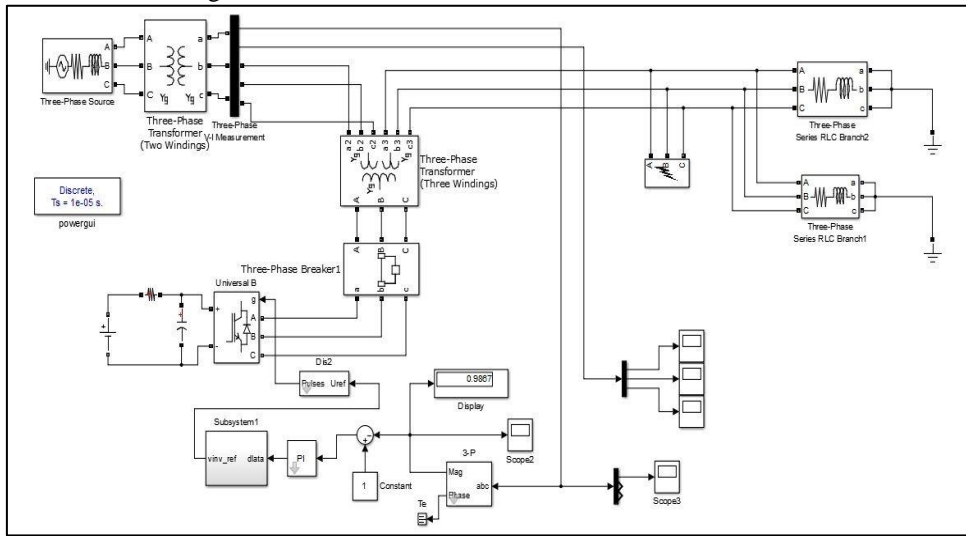


Fig. 3: DVR Test System Model in Distribution System

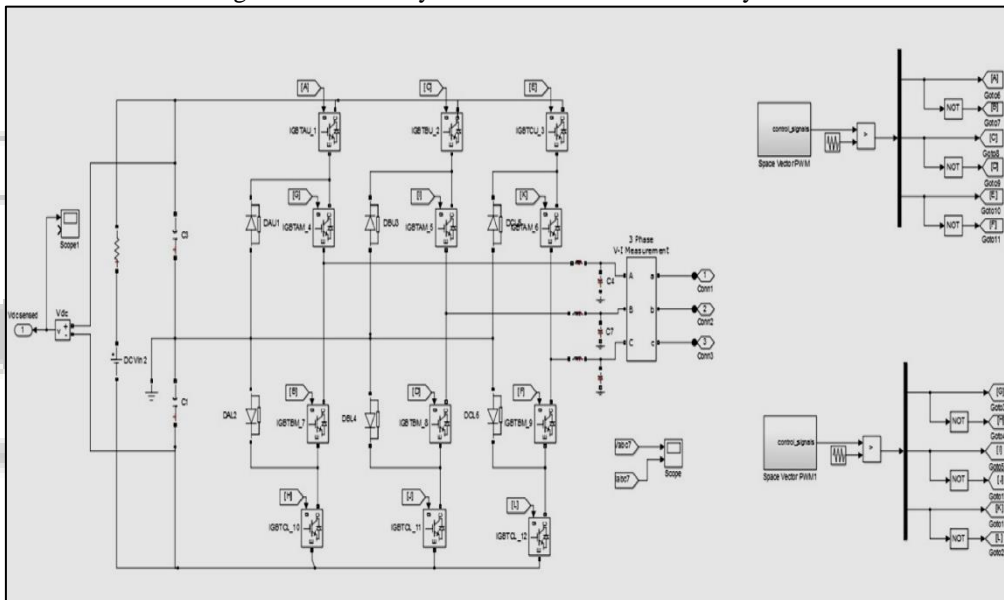


Fig. 4: Subsystem of DVR Test Model Control by SVPWM Strategy

V. SIMULATION RESULTS

Here shown in Fig. 3 the graph of voltage versus time in the voltage waveform there is some duration of time voltage RMS magnitude increases means voltage swell problem is arises.

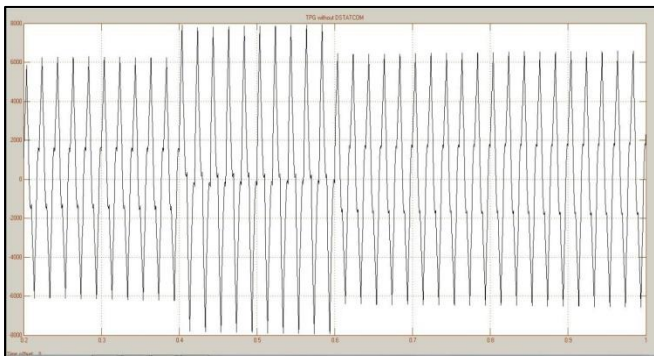


Fig. 5: Graph of Voltage Waveform without DVR (VOLTAGE SWELL)

In graph 4 there is a reduction in RMS magnitude of voltage distribution system when the DVR is not connected in test system.

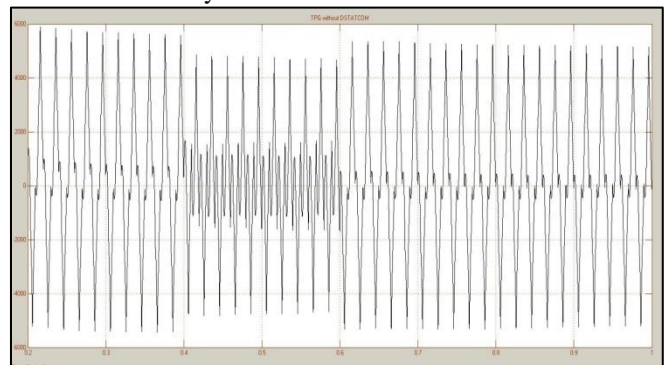


Fig. 6: Graph of Voltage Waveform without DVR (VOLTAGE SAG)

Fig 7 shows the waveform of voltage after connecting the DVR in Distribution system. The result shows that all the voltage sag, swell problem which associated with voltage is

eliminated by connecting DVR in series with distribution system within few seconds.

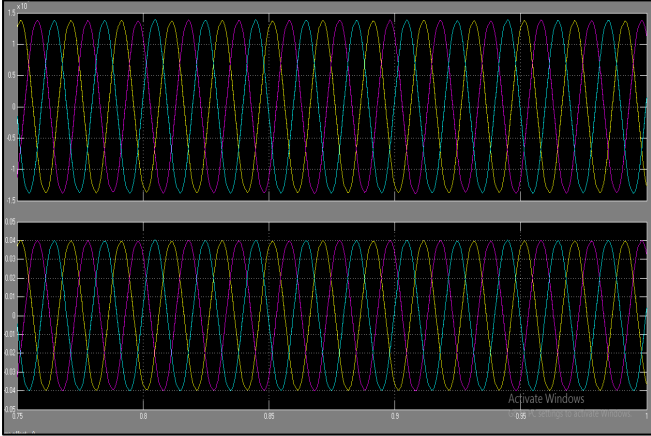


Fig. 7: Graph of Voltage Waveform with DVR in DIST. System

## VI. CONCLUSION

There is different configuration and different control strategy are presented in different paper but in this gives best technique which controlling the voltage sag, voltage swell in the distribution system for enhancement of voltage profile. SVPWM technique is good for the DVR operation which interrupting fault current and eliminating voltage sag and swell within few seconds. DC link voltage is high in SVPWM technique than SPWM.

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