**Simulation Analysis of DVR Performance for Voltage Sag Mitigation**

**ABSTRACT**

Voltage sag is literally one of power quality problem and it become severe to industrial customers. Voltage sag can cause miss operation to several sensitive electronic equipments. That problem can be mitigating with voltage injection method using custom power device, Dynamic Voltage Restorer (DVR).

This paper presents modeling and analysis of a DVR with pulse width modulation (PWM) based controller using Matlab/Simulink. The performance of the DVR depends on the efficiency of the control technique involved in switching the inverter. This paper proposed two control techniques which is PI Controller (PI) and Fuzzy Logic Controller (FL). Comprehensive results are presented to assess the performance of each controller as the best power quality solution. Other factors that also can affect the performance and capability of DVR are presented as well.

Recently, power quality problems become a major concern of industries due to massive loss in terms of time and money. Hence, there are always demands for good power quality, which positively resulting in reduction of power quality problems like voltage sag, harmonic and flicker Voltage sag is always considered as one of the major power quality problems because the frequency of occasion is so high. Moreover, according to the data recorded by Tenaga Nasional

Berhad (TNB), 80% of power quality complaints by consumers in Malaysia were outlined to be associated with voltage sag The common causes of voltage sag are faults or short circuit in the system, starting of large loads and faulty wiring This will lead to increase in both production and financial loss for industries. Therefore, it is vital to mitigate voltage sag.

There are various types of voltage sag mitigation equipment that available nowadays such as Uninterrupted Power Supply (UPS), flywheel, and the flexible ac technology (FACTS) devices which have been widely used in the power system due to the reliability to maintain power quality control. One of the most FACTS devices that have been created in improvement the performance of power quality is Dynamic Voltage Restorer (DVR) also known as custom power devices.

 In this paper, DVR which consists of the injection transformer, filter unit, PWM inverter, energy storage and control system is used to mitigate the voltage sag in the power distribution system. Control unit is the heart of the DVR where it main function is to detect the presence of voltage sags in the system, calculating the required compensating voltage for the DVR and generate the reference voltage for PWM generator to trigger on the PWM inverter. The components of control system unit are the dq0-transformation, Phase-lock-loop (PLL) and the PI or FL Controller. PI Controller is a feedback controller which drives the plant to be controlled with a weighted sum of the error (difference between output and desired set-point) and the integral of that value.

**Block diagram for proposed system**



**DESIGNG SOFTWARE AND TOOLS:**

MATLAB /SIMULATION Software and simpower systems tools are used. Mainly control system tools, power electronics and electrical elements tools are used.