

**MITIGATION OF VOLTAGE SAG USING PWM SWITCHED
AUTOTRANSFORMER**

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ABSTRACT

Power quality disturbances especially voltage sag become significant issues which make many researchers to be interested to find the effective solutions to solve it. According to this problem, there are few mitigation device that have been introduced such as dynamic voltage restorer (DVR) and distribution static compensator (DSTATCOM) in order to mitigate the voltage sag disturbances. However in this study, the objective of this project is to analyze the effectiveness of pulse width modulation (PWM) switched autotransformer as mitigation device for various percentages of voltage sag due to three phase fault with the total harmonic distortion (THD) of load voltage within the limits when the compensator is functioning. This research will be simulated by using PSCAD/EMTDC software. The simulation results of PWM switched autotransformer are presented. The results show that the effectiveness of the compensator as mitigation devices in order to maintain the THDs of load voltage within the limit during various percentages of voltage sag disturbances. It was also shown that because of detection delay, there exists an output voltage overshoot transient at the moment of the recovery voltage where will be increase as the magnitude of voltage sag decrease.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Voltage sags occur on utility systems both at distribution voltages and transmission voltages. Voltage sags which occur at higher voltages will normally spread through a utility system and will be transmitted to lower voltage systems via transformers. Starting of large motors or electrical faults inside the facility result to voltage sags within an industrial complex without any influence from the utility system. If electrical equipment fails due to overloading, cable faults etc., protective equipment will operate at the sub-station and voltage sags will be seen on other feeder line across the utility system. Among the other power quality disturbances, voltage sags are considered to be the most significant and critical. Voltage sag can cause serious problem to sensitive loads that use voltage-sensitive components such as adjustable speed drives, process control equipment, and computers [1].

Because of the impacts to important customers, utilities strive to improve the voltage sag performance of the power system by reducing the number of faults that occur in both transmission and distribution systems. However, faults that are the major cause of voltage sags cannot completely be eliminated. Therefore, customers often must employ power conditioning equipment to improve the ride-through capability for sensitive or critical loads [2].

Various voltage sag mitigation devices are based on inverter system consisting of capacitor as the energy device for supplying the dc power to the inverter. The D-STATCOM has emerged as a promising device to provide not only for voltage sag mitigation but a host of other power quality solutions such as voltage stabilization, flicker suppression, power factor correction and harmonic control. The D-STATCOM