VOLTAGE SAG MITIGATION BY DYNAMIC VOLTAGE RESTORER (DVR) USING MATLAB SIMULINK

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ABSTRACT

Voltage sags and momentary power interruptions are probably the most important power quality problem affecting industrial customers. Many industrial customers using sensitive equipments suffer a huge loss because of sag. If the magnitude and duration of voltage sag exceed the sensitivity threshold of the equipment, the equipment can be damaged. Sensitivity threshold can be defined as the minimum rms voltage for a certain duration a piece of equipment can withstand without disoperation or failure. Generally, voltage sags are caused by fault in transmission and distribution system. The purpose of this project is to model and perform the simulation of voltage sag mitigation using series converter, usually denoted as Dynamic Voltage Restorer (DVR). DVR has become popular due to cost effective solution for the protection of sensitive loads from voltage sags. The equipment studied in the thesis exploit the fast control actions that can be taken by power electronics devices, which are much faster than the speed of conventional equipment and protection systems. In this way, the power quality of distribution systems is improved, regarding duration and magnitude of voltage sags and momentary interruptions, which are the most relevant types of disturbances in distribution systems. The proposed model and simulation results are carried out using MATLAB Simulink software to observe performance and validate the effectiveness of the proposed control method of DVR.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

GENERAL BACKGROUND

In the past, equipment used to control industrial process was mechanical in nature, being rather tolerant of voltage disturbances, such as voltage sags, spikes, harmonics, etc. In order to improve the efficiency and to minimize costs, modern industrial equipment typically uses a large amount of electronic components, such as programmable logic controllers (PLC), adjustable speed drives (ASD), power supplies in computers, and optical devices. Nevertheless, such pieces of equipment are more susceptible to malfunction in the case of a power system disturbance than traditional techniques based on electromechanical parts [1]. Minor power disruptions, which once would have been noticed only as a momentary flickering of the lights, may now completely interrupt whole automated factories because of sensitive electronic controllers or make all the computer screens at an office go blank at once. In order to restart the whole production, computers, etc, a considerable time might be necessary (in the range of some hours), implying on significant financial losses to an industry.

It is thus natural that electric utilities and end-users of electrical power are becoming increasingly concerned about the quality of electric power in distribution