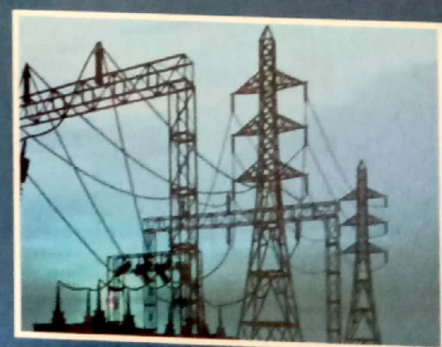
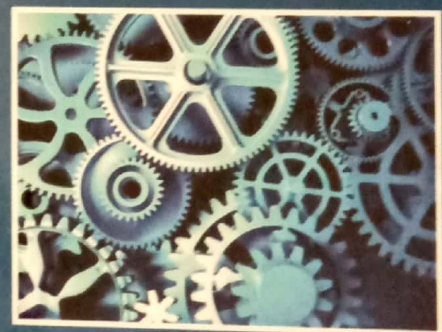
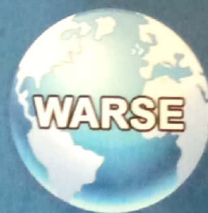


ISBN: 978-93-5258-110-8

Proceedings of The International Conference *on* Paradigms in Engineering & Technology

ICPET 2016

March 2-3, 2016, King Koti Road, Abids
Hyderabad- 500001, Telangana, India



METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY
(Affiliated to Osmania University)
HYDERABAD, TELANGANA
www.methodist.edu.in

Power Quality improvement in Distribution Systems using Super capacitor based Dynamic Voltage Restorer (DVR)

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Abstract – This paper presents the power quality improvement in distribution system using Dynamic Voltage Restorer (DVR) with super capacitor as energy storage for a three phase four wire system. The proposed system comprises of a super capacitor as energy storage, DC-DC converter and the power circuit of the DVR. The design of proposed DVR consists of filtering scheme, isolation transformer, injection transformer and voltage source inverter (VSI). The main aim of this project is the analysis and design of a Dynamic Voltage Restorer for a three phase four wire system. The energy storage is to supply real power to inverter during disturbances. In control circuit of DVR d-q-o transformation technique and proportional integral (PI) was applied. The design and implementation of a three phase four wire Dynamic Voltage Restorer (DVR) mainly deals with voltage sag and harmonics to mitigate voltage disturbances by injecting an appropriate voltage in series with the grid voltage in order to avoid the loss of power. All the simulations have been performed on the MATLAB/ SIMULINK software.

Keywords: Dynamic voltage restorer, Harmonic filter, Voltage Source Inverter (VSI), Injection transformer

I. INTRODUCTION

Power quality (PQ) is certainly a major concern in the present era; it becomes an important aspect at both transmission and distribution levels. Lack of power quality causes huge economical losses all over the world which makes it more important. Voltage quality [3] is the most important part of power quality from the viewpoint of sensitive load. Voltage disturbances mainly include voltage sags, voltage swells and voltage harmonics [1].

Power quality [4] can be defined as “the concept of powering and grounding sensitive equipment in a manner that is suitable to the operation of that equipment.” Making sure that power and equipment are suitable for each other also means that there must be compatibility between the electrical system and the equipment it powers. There should also be compatibility between devices that share the electrical distribution space. This concept is called Electromagnetic Compatibility (“EMC”) and is defined as: “the ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment” [2].

II. DYNAMIC VOLTAGE RESTORER

A Dynamic Voltage Restorer (DVR) is a power-electronic converter- based device that has been designed to protect critical loads from all supply-side disturbances other than outages. It is connected in series with a distribution feeder and is capable of generating or absorbing real and reactive power at its ac terminals [5].

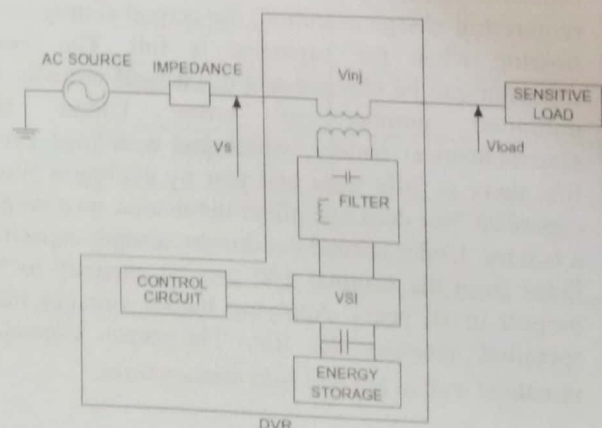


Fig.1. Schematic diagram of DVR