Abstract

Power quality has been an issue that is becoming increasingly pivotal in industrial electricity consumers point of view in recent times. Modern industries employ Sensitive power electronic equipments, control devices and non-linear loads as part of automated processes to increase energy efficiency and productivity. Voltage disturbances are the most common power quality
problem due to this increased use of a large numbers of sophisticated and sensitive electronic equipment in industrial systems. The Dynamic Voltage Restorer (DVR) has recently been introduced to protect the sensitive industrial loads from the detrimental effects of voltage sags/swells and other voltage disturbances. Configurations and control schemes for the DVR varies depending upon the nature and characteristics of the load to be protected. Industries with induction motors loads require a complete different approach for the design and control of a suitable DVR owing to the inherit inertia of the induction motors and their capability to withstand short-duration, shallow sags/swells, in addition to its tolerance to phase angle jumps. In this paper, a DVR with fast response, simple and efficient controller is proposed for fulfilling the voltage restoration requirements for industrial induction motor loads. The proposed DVR employs the classical Fourier Transform (FT) for sag/swell detection and quantification and a Fuzzy Logic based feedback controller which utilizes the error signal (difference between the reference voltage and actual measured load voltage) to control the triggering of the switches of an inverter using a Sinusoidal Pulse Width Modulation (SPWM) scheme. The proposed DVR utilizes the energy from available supply line feeders through a rectifier to feed the inverter. Modeling and simulation of the proposed DVR is implemented in MATLAB/SIMULINK platform. Simulation results have shown that the proposed DVR was efficient in mitigating balanced, unbalanced, multistage and consecutive sags, as well as swells.

Reference

- IEEE Std 1159-2001R, IEEE Recommended Practice for Power Quality Monitoring
- IEC 1000-4-30, Testing and Measurement Techniques - Power Quality Measurement Methods
A Fuzzy Logic based Dynamic Voltage Restorer for Voltage Sag and Swell Mitigation for Industrial Induction Motor Loads

Australia, pp: 1797-1802.


Index Terms

Computer Science
Power Systems
A Fuzzy Logic based Dynamic Voltage Restorer for Voltage Sag and Swell Mitigation for Industrial Induction Motor Loads

Key words

DVR  Power Quality  Voltage Sag
Voltage Swell

Fuzzy Logic Controller
MATLAB/SIMULINK