INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

POWER QUALITY USING CUSTOM POWER DEVICES (DSTATCOM)

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Accepted Date: 05/03/2015; Published Date: 01/05/2015

Abstract: Multilevel inverter topology has emerged recently as a very important in the area of high-power medium-voltage energy control. Comparison between the existing multilevel inverter topologies is performed. The topologies examined are the Neutral Point Clamped Multilevel Inverter or Diode-Clamped Multilevel Inverter, the Flying Capacitor Multilevel Inverter , the Cascaded Cell Multilevel Inverter The comparison of these inverters based on the criteria of output voltage quantity and on the theoretical results verified by detailed simulation results. A new Stacked Multicell (SM) converter based DSTATCOM for reactive power compensation and voltage sags and voltage swells reduction and elimination in distribution system is proposed. Indirect current control technique based on modified PSW modulation method has been applied to DSTATCOM.

Keywords: NPCMLI, DCMLI, FCMLI, CCMLI, Power Quality, DSTATCOM.

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How to Cite This Article:

Ritesh C. Ujawane, IJPRET, 2015; Volume 3 (9): 553-558

INTRODUCTION

Reactive Power Compensation in distribution power networks plays a vital role in improving power quality, correcting power factor and maintaining constant distribution voltages. Recently, in distribution systems, major power consumption has been in reactive loads. A Distribution Static Compensator (DSTATCOM) is one of the most effective equipments to compensate the reactive power dynamically, and can be used to improve power quality by voltage regulation and power factor correction. This Custom Power equipment includes a Voltage Source Converter (VSC) and a DC link capacitor connected in shunt. The main function of a DSTATCOM is to inject or absorb reactive power to the grid for improving power factor and voltage regulation. In this newly developed topology i.e. Stacked Multicell Converter is used.

II System Structure and Operation

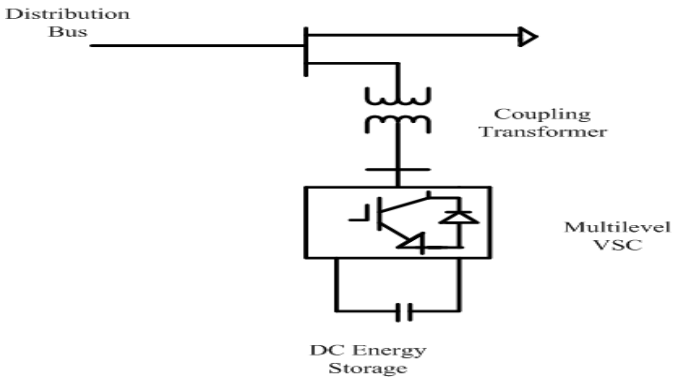

Figure (1) Operation of DSTATCOM

The Distribution Static Compensator (DSTATCOM) is three phase shunt connected power electronics based device. It is connected near the load at the distribution systems. In its more basic function , the DSTATOM configuration consist of a voltage source converter (VSC), a dc energy storage device, a coupling transformer connected in shunt with the ac system and associated control circuit.

III Simulation Models

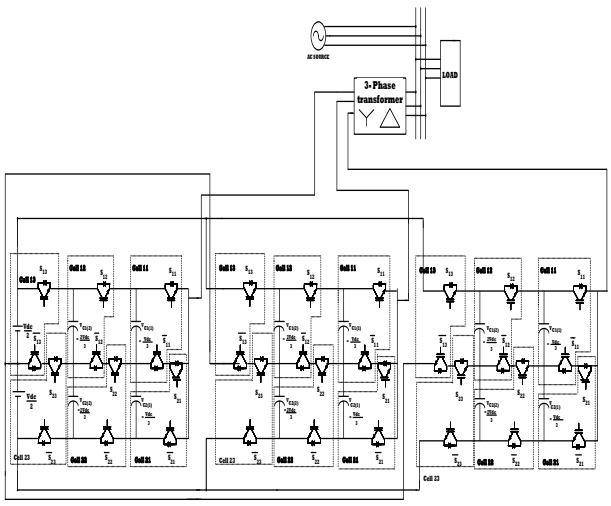

Figure (2) Three Phase Stag Multicell Converter

Three Phase Stag Multicell Converter

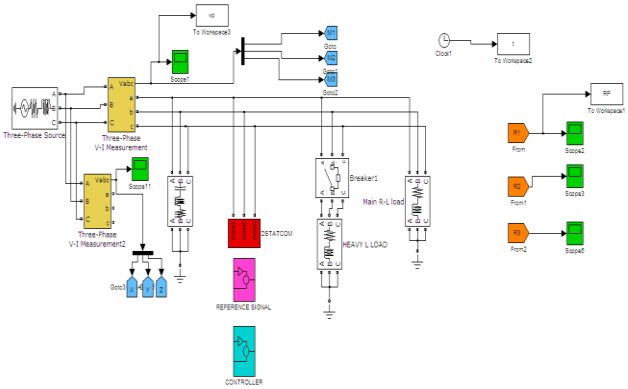

Figure (3) Simulation Model for Voltage Sag

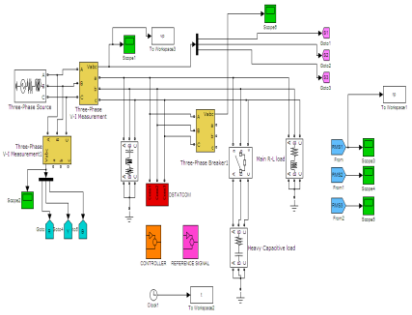

Figure (4) Simulation Model for Voltage Sag

III Simulation Results

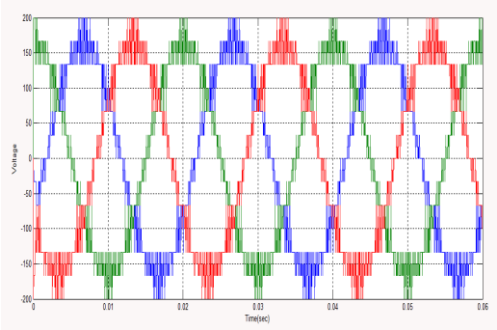

Figure (5) Three Phase Output Voltage Stack Multicell Inverter

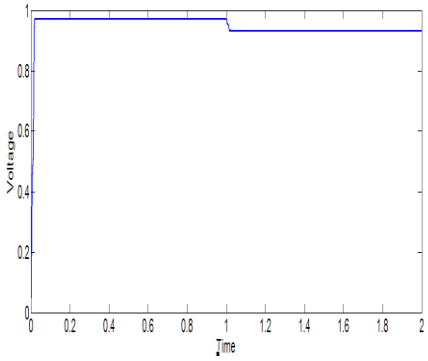

Figure (6) Voltage Sag Uncompensated

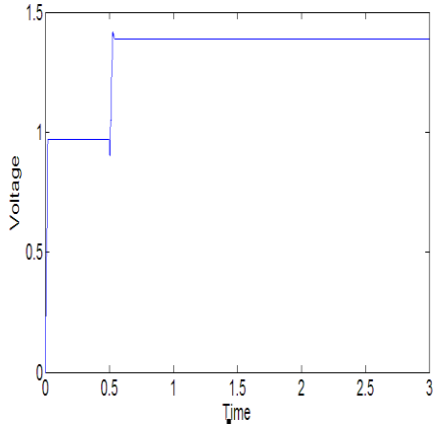

Figure (7) Voltage Swell Uncompensated

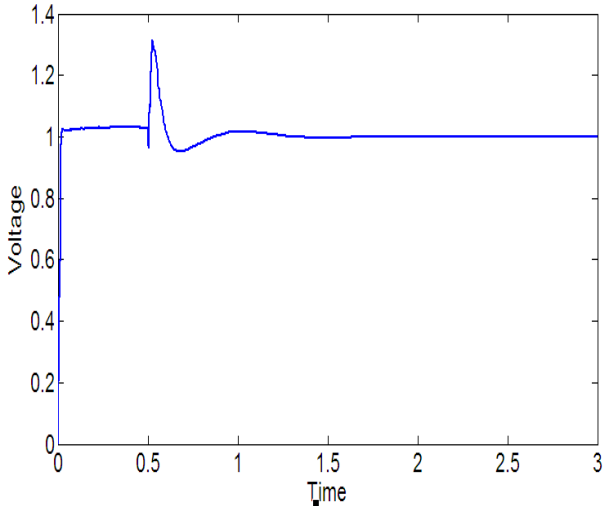

Figure (8) Voltage Swell Compensated

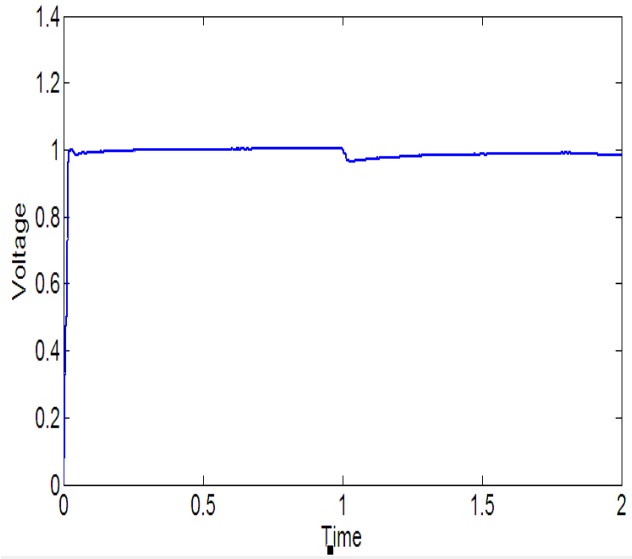

Figure (9) Voltage Sag compensated

Bandwidth of an array- 4.8 GHz to 6.2 GHz

Gain of an array – 2.29 dBi at operating frequency

Directivity of an array – 2.97 dBi at operating frequency.

Mutual coupling – less than -20 dB in an interested Bandwidth range

II RESULT & CONCLUSION

Since, the multicell converters are very interesting for high power/medium-voltage applications and considerably improve the output voltage frequency spectrum, hence a SM converter based DSTATCOM has been proposed to improve the quality of DSTATCOM output voltage. Also, the number of flying capacitors is decreased in comparison with the equivalent FCM converter for the same number of output voltage levels while the number of semiconductors is the same. Furthermore in the proposed configuration, only two dc link is used for three phase full bridge SM converters. Therefore, the required dc capacitors for dc link are decreased from 6 to 2 and the output voltage levels and its RMS are doubled.

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