INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) www.irjaet.com

ISSN (PRINT) : 2454-4744 | ISSN (ONLINE): 2454-4752

Vol. 1, Issue 4, pp.396 - 401, December, 2015

POSITIVE-SEQUENCE VOLTAGE INJECTION-BASED CONTROL STRATEGY

Mr. V.SUKUMAR [1] Mr. P.ELUMALAI. [2]

ARTICLE INFO

Article History:

Received 24th Dec, 2015

Received in revised form 26th Nov,15

Accepted 27th Dec, 2015

Published online 27th Dec, 2015

Keywords:

Positive-Sequence Voltage Injection (PSVI), High Voltage Direct Current (HVDC), voltage source.

ABSTRACT

This paper presents a Positive-Sequence Voltage Injection (PSVI) based model predictive control (MPC) strategy to control the dc current/power flow and simultaneously minimize the dc current ripple. For discrete-time dynamic model of the dc transmission-line current and, correspondingly, develops. Harmonics injection for proposed PSVI. Proposed strategy for a multilevel PHMMC-based HVDC station system is evaluated based on time-domain simulation studies. Regulating the dc current and power flow at their desired values. And also reducing/ eliminating dc current/voltage ripple of a PHMMC HVDC system, under various operating conditions.

INTRODUCTION

Electric power transmission has evolved from the system of local direct current (DC) transmission in the late nineteenth century to alternating current (AC) transmission in an interconnected regional power transmission network. One of the motivating factors for the interconnection of local power networks has been the sharing of resources. The system has developed over the century into national and regional electricity grid networks. All these grids have a common structure. The power sources in the systems must operate at the same frequency and in perfect synchronism. Conventionally, electric power is generated at medium voltages (1-35kV) which is then transformed through the use of power transformers to suitably high voltages in order to reduce the transmission losses. At the load centre, the transmitted power is transformed from high voltage to medium voltage for distribution to bulk power consumers and low voltage for distribution to domestic consumers. This conventional transmission system is unidirectional in nature as described and approximately 8% of the generated power is lost in transmission.

One way of improving the security of electricity supply and keeping the environmental impact low is to use power electronic technology. Power electronics, in the form of high voltage direct current (HVDC) transmission is useful for interconnecting neighbouring electricity networks. HVDC is also considered to be more efficient for transmitting bulk power over long distances as a result of the low transmission losses associated with DC transmission.

LITERATURE REVIEW

1. New transformer less scalable modular multilevel converters for HVDC-transmission

In this paper a novel concept of high voltage direct current converter (HVDC) is presented employing the modular multilevel converter (M2C). Converters using IGBT-power devices are getting increased importance in order to meet the global needs for reliable and environment friendly power supply and distribution.

The problem addressed as results, a comparison of the semiconductor losses and the efficiencies of the different topologies are given.

2. Dynamic performance of a modular multilevel back-to-back HVDC system

The modular multilevel converter (MMC) is a newly introduced switch-mode converter topology with the potential for high-voltage direct current (HVDC) transmission applications. This paper focuses on the dynamic performance of an MMC-based, back-to-back HVDC system.

Dynamic performance of the MMC-based back-to-back HVDC converter system, based on time-domain simulation studies in the PSCAD/EMTDC environment, is then evaluated.

3. Experimental validation of a parallel hybrid modular multilevel voltage source converter for HVDC transmission

This paper discusses a small scale laboratory model constructed to validate the operation of a recently proposed parallel hybrid modular multilevel voltage source converter which is intended for HVDC applications.

The problem addressed as presents a capacitor voltage balancing scheme for this converter and further demonstrates black start capability using a lower rated auxiliary DC source.

PROPOSAL OF SYSTEM:

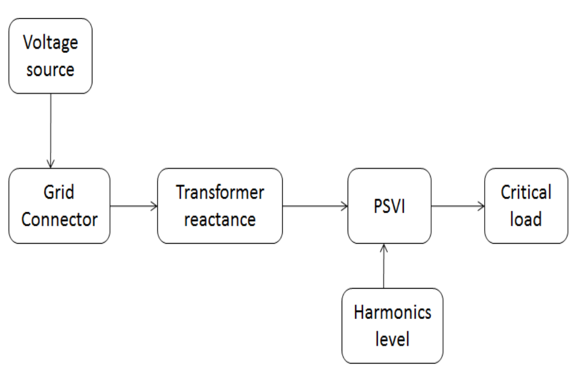

Fig.1 BLOCK DIAGRAM

A Grid Converter is a power inverter that converts directcurrent (DC) electricity into alternating current (AC) with an ability to synchronize to interface with a utility line. Its applications are converting DC sources such as solar panels or small wind turbines into AC for tying with the grid.[1]

Residences and businesses that have a grid-tied electrical system are permitted in many countries to sell their energy to the utility grid. Electricity delivered to the grid can be compensated in several ways. "Net metering" is where the entity that owns the renewable energy power source receives compensation from the utility for its net outflow of power. So for example, if during a given month a power system feeds 500 kilowatt-hours into the grid and uses 100 kilowatt-hours from the grid, it would receive compensation for 400 kilowatt-hours. In the US, net metering policies vary by jurisdiction.

Inverters take DC power and invert it to AC power so it can be fed into the electric utility company grid. The grid tie inverter (GTI) must synchronize its frequency with that of the grid (e.g. 50 or 60 Hz) using a local oscillator and limit the voltage to no higher than the grid voltage.

HIGH VOLTAGE DIRECT CURRENT (HVDC) TRANSMISSION

HVDC is a technology which involves the transmission of electric power using direct current at high voltages. In recent times, the technology is mainly implemented using high power semiconductor devices for the AC/DC power conversion and vice versa. It offers an effective medium for transmitting large amounts of electric power over long distances. The technology of HVDC transmission also find applications.

HARMONICS:

Harmonic voltages and currents in an electric power system are a result of non-linear electric loads. Harmonic frequencies in the power grid are a frequent cause of power quality problems. Harmonics in power systems result in increased heating in the equipment and conductors, misfiring in variable speed drives, and torque pulsations in motors. Reduction of harmonics is considered desirable.

CURRENT HARMONICS:

Current harmonics are caused by non-linear loads. When a non-linear load, such as a rectifier, is connected to the system, it draws a current that is not necessarily sinusoidal. The current waveform can become quite complex, depending on the type of load and its interaction with other components of the system. Regardless of how complex the current waveform becomes, as described through Fourier series analysis, it is possible to decompose it into a series of simple sinusoids, which start at the power system fundamental frequency and occur at integer multiples of the fundamental frequency.

VOLTAGE HARMONICS:

Voltage harmonics are mostly caused by current harmonics. The voltage provided by the voltage source will be distorted by current harmonics due to source impedance. If the source impedance of the voltage source is small, current harmonics will cause only small voltage harmonics.

MODELING AND SIMULATION

We plan to have the wind and geothermal generators transmit their AC power to a single HVDC converter station. The converter station would be sited to minimize the total distance of new AC lines needed to connect the generators to the switchyard where their incoming power would all be connected to the three-phase buses going into the converter station. The performance analysis is done using simulated results which are found using MATLAB.

SIMULATION DESCRIPTION

For HVDC applications a high number (greater than 100) of series connected IGBTs are required to be connected in series to achieve the necessary voltage rating. This requires that the series string of IGBTs are hard switched introducing additional switching loss as well as extra complexity required to dynamically share the device voltage during the switching event. Definitions of fault scenarios in DC grids are established in this section. Faults are divided into dual pole faults involving two conductors and single pole faults restricted to one conductor in the system.

Pole to Pole short – This is the direct zero impedance connection of both positive and negative conductors to each other. Where armored cable has been used it is also likely any short of the conductors would also likely mean both poles are grounded.

(MPC) is an advanced method of process control that has been in use in the process industries in chemical plants and oil refineries since the 1980s. In recent years it has also been used in power system balancing models.[1] Model predictive controllers rely on dynamic models of the process, most often linear empirical models obtained by system identification. Rectifier is an AC to DC power converter, that is implemented using forced commutated power electronic semiconductor switches. Conventional PWM converters are used for wind turbines that have a permanent-magnet alternator. Today, insulated gate bipolar transistors are typical switching devices.

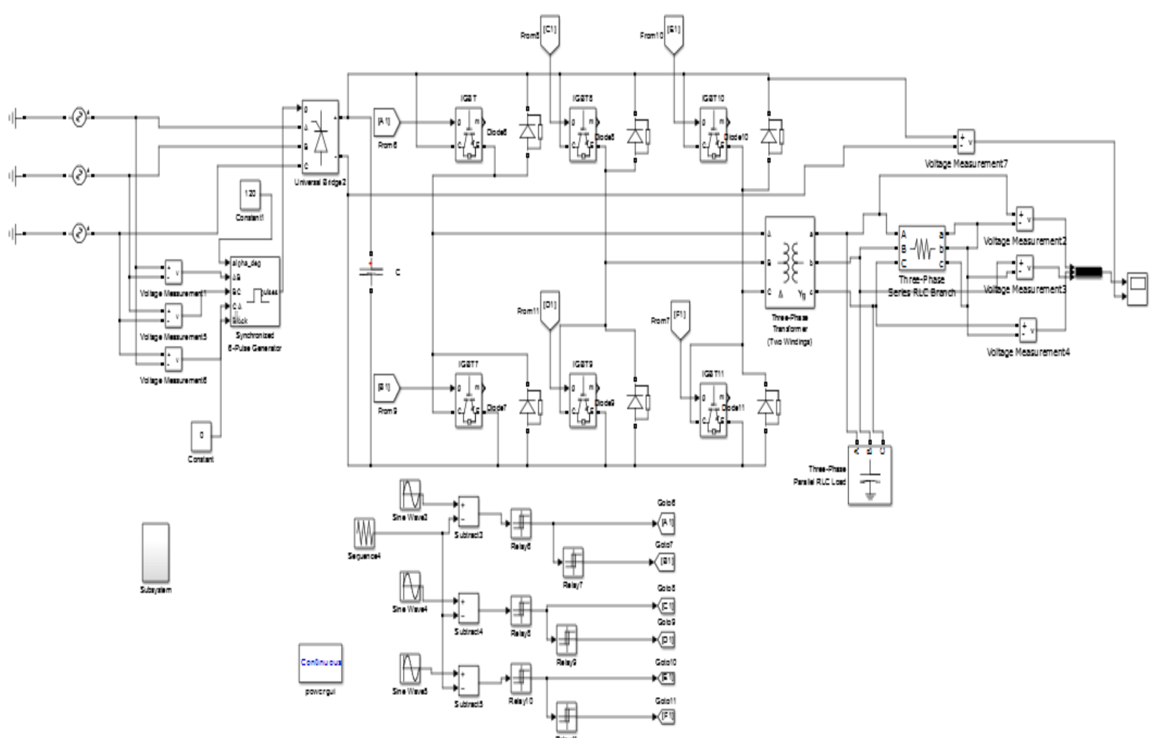

FIG .2 SIMULATION DIAGRAM

RESULT OF SIMULATION

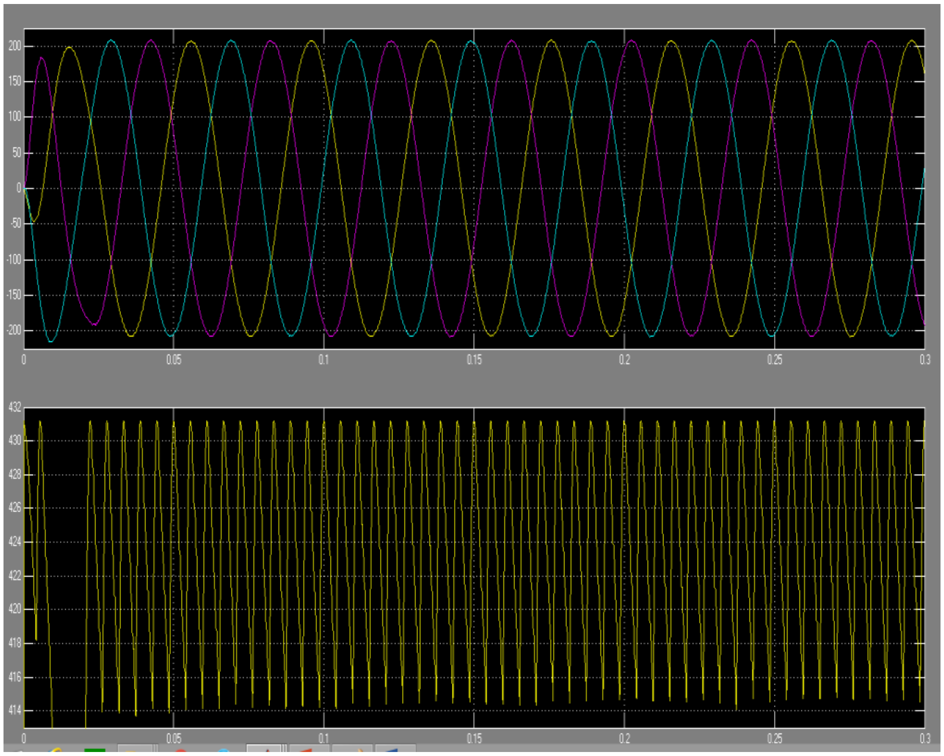

FIG .3 SIMULATION RESULT

CONCLUSION

The effect of unbalanced AC grid on the operation of the PH-M2L VSC has been investigated. An analysis has been developed which shows that during unbalanced AC grid operation the converter chain links will exchange unequal amounts of power with the grid. Without further intervention, such operating conditions result in the chain links sourcing or sinking power, which is incompatible with their implementations as passive'wave shaper'. A control algorithm over coming this issue and enabling operation of the converter during grid voltage unbalance has been devised and verified through simulation (upto 5% unbalanced grid voltage). Mathematical analysis and simulation results are used to support the operation of the proposed control method. Simulation results show that the contribution of the unbalance control to third harmonic current in the line current is less that 0.6% at the grid side of the converter transformer for unbalance upto5%.

FUTURE ENHANCEMENT

In this project, Positive-Sequence Voltage Injection (PSVI) based model predictive control (MPC) strategy to control the dc current/power flow and simultaneously minimize the dc current ripple.For discrete-time dynamic model of the dc transmission-line current and, correspondingly, regulating the dc current and power flow at their desired values.And also reducing/eliminating dc current/voltage ripple of a PHMMC HVDC system, under various operating conditions. In future I am going to enhance the efficiency by adding the new renewable energy resources by using the model predictive control to reduce the more number of losses. And converted it into the constant output by converter system, which is given into the grid.

REFERENCE:

[1] S. Allebrod, R. Hamerski, and R. Marquardt, "New transformerless, scalable modular multilevel converters for HVDC-transmission," in *Proc. IEEE Power Electronics Specialists Conf., Jun. 2008, pp.* 174–179.

[2] D. Trainer, C. Davidson, C. Oates, N. Macleod, D. Critchley, and R. Crookes, "A new hybrid voltage-sourced converter for HVDC power transmission," in *CIGRE Session, 2010.*

[3] M. Saeedifard and R. Iravani, "Dynamic performance of a modular multilevel back-to-back HVDC system," *IEEE Trans. Power Del., vol.* 25, no. 4, pp. 2903–2912, Oct. 2010.

[4] M. Merlin, T. Green, P. Mitcheson, D. Trainer, D. Critchley, and R. Crookes, "A new hybrid multi-level voltage-source converter with DC fault blocking capability," in *IET 9th International Conference on AC and DC Power Transmission, London, 2010.*

[5] C. Davidson and D. Trainer, "Innovative concepts for hybrid multilevel converters for HVDC power transmission," in *Proc. 9th IET Int. Conf. AC DC Power Transm. ACDC. , 2010, pp. 1–*

SUKUMAR.V Studying IIYear M.E In Power Systems Engineering. Of Priyadarshini Engineering College, Vellore Dist.

P.Elumalai is an Assistant professor of EEE in Priya darshini Engineering College, she received his M.E power electronics engineering in 2012. He is doing his Research work in power electronics.