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Effective Current Management Style and Analysis of Single Phase Electrical Converter for Power Quality Improvement

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ABSTRACT:

Using a good prophetical Current management strategy to one part voltage supply electrical converter and to analysisit's performance for varied parameters variations is that the main objective of this paper. associate degree improved performance of the proposed prophetical current management methodology hasbeen analyzed with varied conditions is dispensed like steady state, transient state, non curved references, input frequency variations, frequency variations, current referenceamplitude variations and filter inductance variations, that gives wonderful reference trailing with less current harmonicdistortion for all conditions. The management rule and electrical converter model was developed in Matlab /Simulink software package.

INTRODUCTION

Nowadays, the voltage source inverter is common topologies have been used in wide diversity of applications and give more attention of the researchers to control and conversion of power. For a grid connected inverter, the power quality mainly depends on performance of the current controller's in inverter. The development of PWM techniques is the most popular control technique for grid-connected inverters. As compared with the open loop voltage PWM converters, the current-controlled PWM has several advantages such as fast dynamic response and inherent over-current protection [1]. Several control technique that has been developed till now to control the current in inverter. In the Ref [1-16] a Varity of available current control techniques and its advantages and disadvantages are discussed. Nowadays, Predictive current control technique has been used for control the current of three phase inverter[27], three phase four-leg inverter[24], threephase two- level and three-level neutral-point-clamped inverter[29],[30], cascaded H-Bridge inverter[31], single phase boost rectifier[32],multilevel converter[33],matrix converter[34] and corresponding their application such as Active-Front-End Rectifier[18],[19], Distributed Generation Systems[20], Active Filters and Power Conditioning[23, 24], Non-Conventional Renewable Energy[20], uninterruptible power supplies (UPS) [25], drives [22], and power factor correction [26]. This current control method used in various wide power converters and the control scheme is to predict the future load current in terms of the measured actual load current and predicted load voltages. Compared with the Classic Linear PI-PWM the MPC offers many advantages such as good reference tracking and minimum output distortion [24, 22].In the all above mentioned

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strategies are only considering three phase inverter, multilevel inverter , matrix converter for various conditions is described. But the detailed investigation of single phase two level two-leg inverter for various conditions is not being described. In this paper, we use improved current controller used to control the current of single phase inverter for various condition are evaluated through simulation results.

CONVERTER BASED CLASSIFICATION

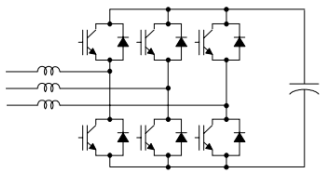

Fig.1. Basic diagram for VSI

(i)VOLTAGE SOURCE INVERTER

The voltage source inverter topology uses a diode rectifier thatconverts utility/line AC voltage (60 Hz) to DC. The converteris not controlled through electronic firing like the CSI drive. TheDC link is parallel capacitors, which regulate the DC bus voltage ripple and store energy for the system.The inverter is composed of insulated gate bipolar transistor (IGBT)semiconductor switches. There are other alternatives to the IGBT:insulated gate commutated thyristors (IGCTs) and injection enhancedgate transistors (IEGTs). This paper will focus on the IGBT as itis used extensively in the MV VSI drives market. The IGBT switchescreate a PWM voltage output that regulates the voltage andfrequency to the motor.The design in a neutral point clamped (NPC)Three-level inverter topology. The IGBT switching devices arecascaded to achieve a 4160V system rating.

• Self-supporting dc voltage
• Lighter, cheaper
• Expandable to multilevel

(ii) CURRENT SOURCE INVERTER

The way each of the drive building blocksoperates defines the type of drive topology.The first topology that will be investigated isthe current source inverter (CSI). The convertersection uses silicon-controlled rectifiers (SCRs), gate commutated thyristors (GCTs),or symmetrical gate commutated thyristors(SGCTs). This converter is known as an activerectifier or active front end (AFE).The DC link uses inductors to regulate currentripple and to store energy for the motor. Theinverter section comprises gate turn-off thyristor(GTO) or symmetrical gate commutated thyristor(SGCT) semiconductor switches. These switchesare turned on and off to create a pulse widthmodulated (PWM) output regulating theoutput frequency.

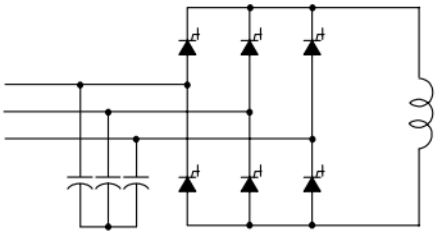

Fig 2..Basic diagram for CSI

• Switching frequency is restricted
• Higher losses
• Cannot be used in multilevel

MODEL PREDICTIVE CURRENT CONTROL

a) Predictive current control technique The proposed current control scheme is shown in Figure-3. It uses the discrete-time model of inverter and load for predicting the load current at a future sample instant for each of the available output voltage vector that can be generated by the inverter. The quality function

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or cost function or error between the reference and predicted values is calculated. The switching state that minimizes g is selected and applied during the next sampling period. The model need input voltage and actual load currents at instant of k. By using the system` input voltage to generate voltage vectors, which is given to the predictive model to predict the inverter future current. The current references are generated according to the application we are using. In this system a simple designing and analysis of the inverter. So that the references are user defined. By changing the reference it can be used for any applications.

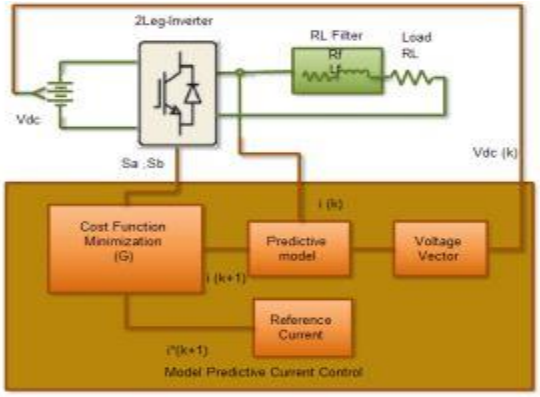

Figure-4. Configuration of MPC current control.

CONCLUSIONS

In this paper the current control of single phase two-level two-leg voltage source inverter has been presented. The control algorithm has been evaluated with seven different cases through simulation results. The result shows that good performances of the current tracking ability in all conditions with less harmonic distortion and the advantage of proposed technique are related to simplicity, design and modeling. With this the current control technique is a very good alternative solution to classical current control techniques. In further research on control technique with cost function values variations in control algorithm and to compare with conventional current controllers.

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