Various levels of Multilevel Inverters and comparative Analysis

Amarjeet Kumar*[1], Dr. Sanjay Jain[2]

*[1] *M.Tech Student, Electrical Engineering Department, RKDF University, Bhopal, M.P.*
amarkrjeet95@gmail.com[1]
[2]*HOD, Electrical Engineering Department, RKDF University, Bhopal, M.P.*
jain.san12@gmail.com[2]

ABSTRACT

Due to the scarcity of traditional resources, humankind is trying to invent and implement the renewable resources for electricity. Although these nonconventional sources provides a lucrative alternative for conventional supply, it dwells with many unavoidable issues such as, variation, intermittency of supply, inclusion of harmonics, power quality issues etc. Seeing to the vulnerability of these issues, researchers are trying hard to invent standard, cost efficient solutions to improvise the performance of these systems.

Key words- Multilevel inverter, cascaded inverter, Hybrid energy system

1. INTRODUCTION

In nowadays, non-renewable sources of energy are plays nice role in production of electricity. Renewable energy sources area unit simply accessible over wide geographical areas, nature friendly and various supply of energy. Power generation exploitation renewable sources are terribly helpful in remote areas. Accessibility of renewable energy source is discontinuous because it isn't accessible all the moment of your time as a result of amendment in nature. solar power is accessible throughout every day however not in night and star irradiation level additionally accomplished as a result of variation in sun intensity, that is tormented by shadow casting of clouds, tree, etc. Wind energy is additionally reckoning on wind handiness. the facility generation will be enhanced by combination of 2 or additional energy sources named as hybrid power generation. Hybrid energy system is just too centered on maintain energy property. Once one energy supply is unavailable or lean to meet load demand, then hybrid energy system stipendiary the distinction by correct using another source of energy.

Inverters area unit power device that converts power from DC to AC at needed voltage and frequency. Inverters not manufacture any power; solely amendment power from DC to AC. Lower order harmonics, lower switch losses, high power quality and higher frequency are needed parameter to style any electrical converter. Numerous unfavorable things are present in inverters. Construction inverters are created up for cut back these downside. Construction inverters area unit used over typical inverters with AN aim to reduce switch losses and distortion. switch losses and distortions area unit reduced by getting output voltage in sleek wave. Approximated wave is obtained as output waveform with sizable amount of steps. once variety of levels increase up to N level in construction inverters, output wave approach towards terribly closed to desired wave and distortion of output voltage reduces to minimum [2].

1.2 Conventional Inverter

Inverters are power electronic device that converts power from DC to AC at required voltage and frequency. Conventional inverters are inverter of two levels. Circuit of two level inverters consists of sources with amount of voltage and switches for controlling current or voltage. Inverter produces an AC output voltage at switched mode and magnitude & frequency controlled in switched mode.
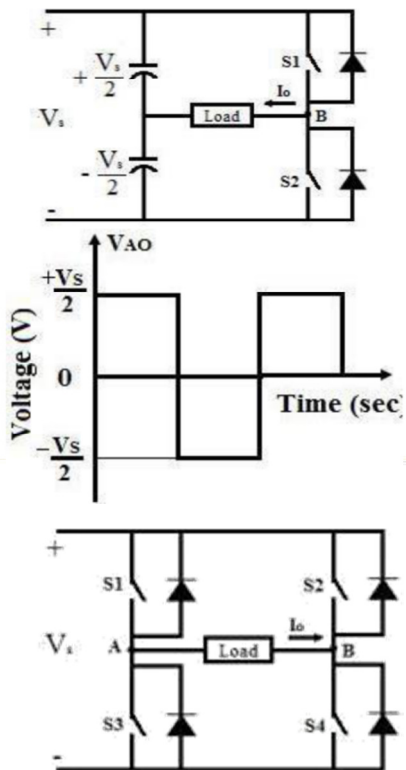

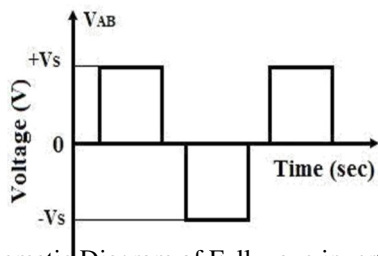Fig. 1 Schematic Diagram of Half wave inverter & output

Fig. 2 Schematic Diagram of Full wave inverter & output

2. Cascaded H-Bridge Multilevel Inverter for Different Levels

Cascaded H-bridge multilevel inverter begins with least three levels. Multilevel inverter broadly utilized as a part of high voltage side. They are not temperate for utilized as a part of lower voltage side. Fell H-bridge multilevel is works independently into three and one phases.

2.1 Three Level Single Phase Cascaded H-Bridge Multilevel Inverter

Construction of three level single phase cascaded H-bridge multilevel inverter .Two H-bridges are connected in series. VDC1 and VDC2 are DC input sources and single Phase full scaffold inverter is associated with every DC isolated source. Phases Output of inverter 1 are associated with input DC point with relating switches of inverter 2 Phase. Summation of all individual Output of inverter gives Output voltage waveform on the grounds that each extraordinary level full scaffold inverter AC Output is associated in series.

2.2 Five Level Single Phase Cascaded H-Bridge Multilevel Inverter

Four DC sources are utilized as a part of five level single Phase multilevel inverters. Voltage got in fell H-bridge multilevel inverter for single Phase with five levels is 0, VDC, 2VDC, 3VDC and 4VDC. Four H-spans are available in this multilevel inverter and they are A, B, C and D. Five level single Phase course H-bridge multilevel development. Example of exchanging in every H-bridge is same as single Phase three level fell H-bridge multilevel inverter yet switches are climbs to four extensions from A to D.

2.3 Seven Level Single Phase Cascaded H-Bridge Multilevel Inverter

Six DC sources utilized as a part of seven level single Phase multilevel inverters. A, B, C, D, E and F are named of H-spans. Seven level single Phase fell H-bridge multilevel inverter development. Seven level structures are shaped by associated six full scaffold inverters in arrangement. Yield levels of multilevel inverter are 0, VDC/6, VDC/3, VDC/2, 2 VDC/6 and VDC [19].

2.4 Five Level Three Phase Cascaded H-Bridge Multilevel Inverter

Development of five level three Phase H-bridge fell multilevel inverter is finished by joining four H-ladies per Phase. Fell H-spans multilevel for three Phase with five level. Power conveyed in every individual H-bridge by independent DC sources. A solitary Phase full scaffold inverter is related with each different DC source. Terminal AC voltages are associated in arrangement of various level inverters.

3. Compensation Phenomena of CHB-MLI

When levels increases in multilevel inverter then number of steps also increases. Multilevel inverter gives wave form as output of lesser harmonics. Sum of powers of all harmonic components is divided by power of fundamental frequency are gives THD. Non-linearity of system is measured by total harmonic distortion.

4. Photovoltaic (PV) Array Model

PV array is an interconnected system of PV modules. PV module has lower conversion efficiency. Photovoltaic system needs arrangement of panels for electricity production. Operating voltage of array is totally depends on amount of power generated by PV. Insulation and temperature of PV varies with maximum power point (MPP). Unique operating point where maximum possible power is delivered is given in its curve of V-I and V-P characteristics [25]. At maximum power point PV operates its highest efficiency. Various systems consist of photovoltaic- wind hybrid source. Photovoltaic and wind mill are modeled as a non-linear voltage source. Direct current to Direct current converter is connected to source of energy and then multilevel inverter is link with supply of Direct current. Modeling for a PV system is based in measurement of PV current to track maximum power. Power generated by PV array and wind generate is stored in batter bank for continuous flow input to inverter. So, 12 V DC supply by battery used as DC bank in proposed model. Schematic model plan.
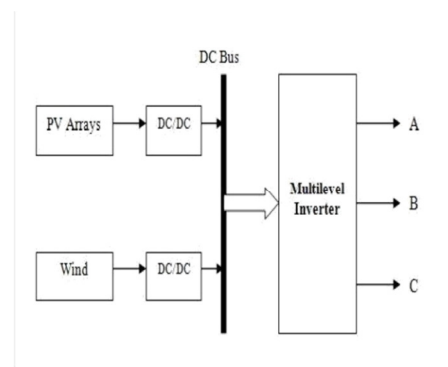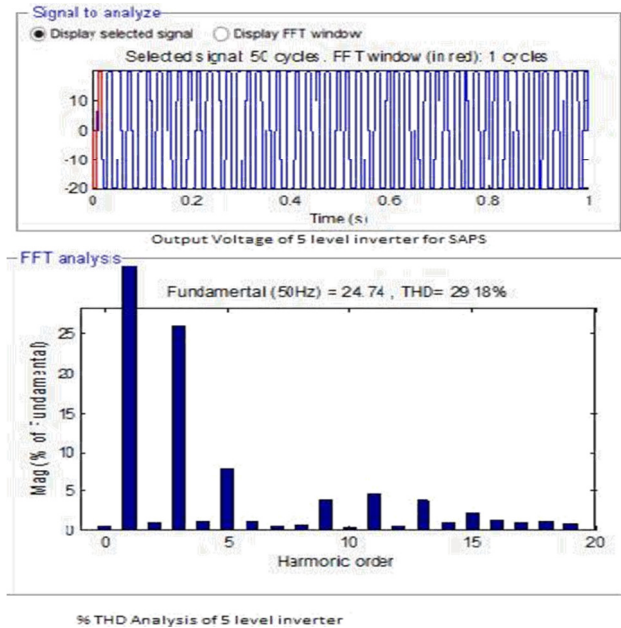

Fig. 3 Schematic model plan

5. SIMULATION RESULTS

Fig. 4 Analysis of THD in three phase with five level

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