Dual Bridge Multilevel Dc Link Inverter Fed Induction Motor

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Abstract: **The Multi-Level Inverter (MLI) highlights out nearly a higher quality sinusoidal output voltage from a stair case waveform and the distortion level in the output voltage depends on the number of steps. A DUAL BRIDGE MLI based on Multi level DC link (MLDCL) Inverter topology pioneer the component reduction and add benefits to apt for economic and power quality and thereby claim its superiority over the existing multilevel inverter (MLI) configurations. When these inverters are used for industrial drive directly, the THD contents in output voltage of inverters is very significant index as the performance of drive depends very much on the quality of voltage applied to drive. Finally, the paper includes simulation results of DBMLDCLI fed Single phase Induction Motor using In-phase Disposition (IPD) PWM technique.**

Keywords: **Multi Level Inverters, DBMLDCLI, THD, IPD PWM.**

I.INTRODUCTION

Recently multilevel power conversion technology has been a very rapidly growing area of power electronics with good potential for further developments. The most attractive applications of this technology are in the medium to high-voltage range and it makes the semiconductor devices in a multilevel converter have a much lower dv/dt, the outputs of the converter are very much distortion less, allows having almost perfect currents with very good voltage waveforms most of the undesirable harmonics will be eliminated generating low switching losses The dc voltage sources are available from batteries, capacitors, or fuel cells [1-5]. Multilevel converters are mainly controlled with sinusoidal PWM extended to multiple carrier arrangements of two types: Level Shifted (LS-PWM), which includes Phase Disposition (PD-PWM), Phase Opposition Disposition (POD-PWM) and Alternative Phase Opposition Disposition (APOD-PWM) or they can be Phase Shifted (PS-PWM) [6].

A multilevel inverter not only achieves high power ratings, but also enables the use of renewable energy sources. In practical implementation, reducing the number of switches and gate driver circuits is very important. Dual bridge multilevel dc link inverter (DBMLDCLI) will obtain a nearly sinusoidal voltage with a lower switch count [7]. Single phase AC supply obtained from DBMLDCLI topology is given to single phase Induction Motor and are the most common domestic appliance due to their rugged construction and lower cost.

II.CIRCUIT TOPOLOGY

The power circuit of the inverter consists of two H-bridges and a number of distinctive modules depending on the voltage levels requirement. First H-bridge in series with number of different modules gives number of voltage levels of dc-link voltage, which is supplied to a single phase full bridge inverter [13] as shown in fig.1. Each distinctive module contains a switch in series with a dc source and an anti-parallel diode is connected across this combination.

Hence when a dc link voltage is fed to the second H-bridge, it provides desired sinusoidal voltage. Thereby with less switch count compared to existing topologies, gives low switching losses and thereby increase in efficiency. So size and cost of the inverter is reduced. Comparison of device count between different Multi level structures is shown in fig.15.

The operating modes of the fifteen level DBMLDCLI topology are explained with individual figures for each level shown below figures (2-8).

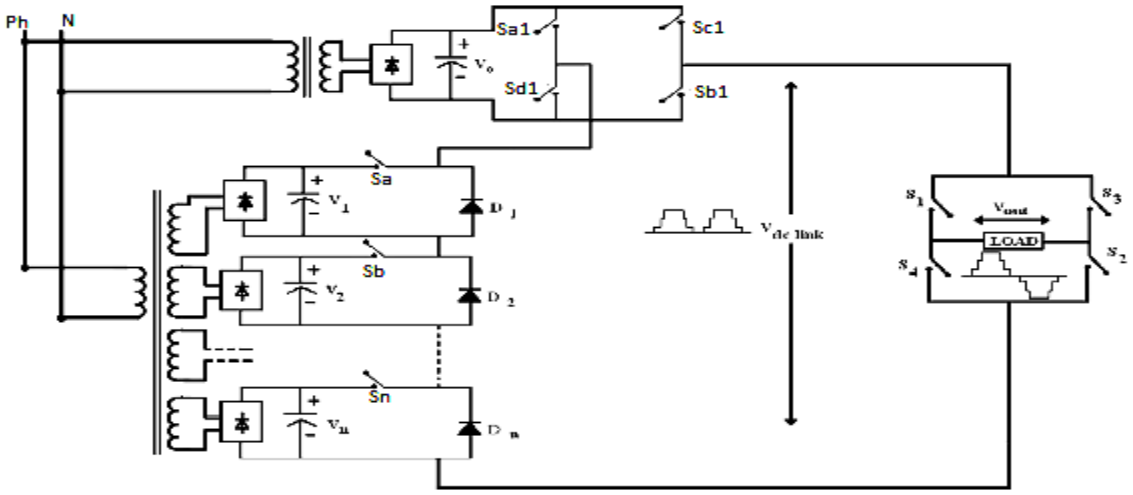

Fig.1.Generalized structure of DBMLDCLI

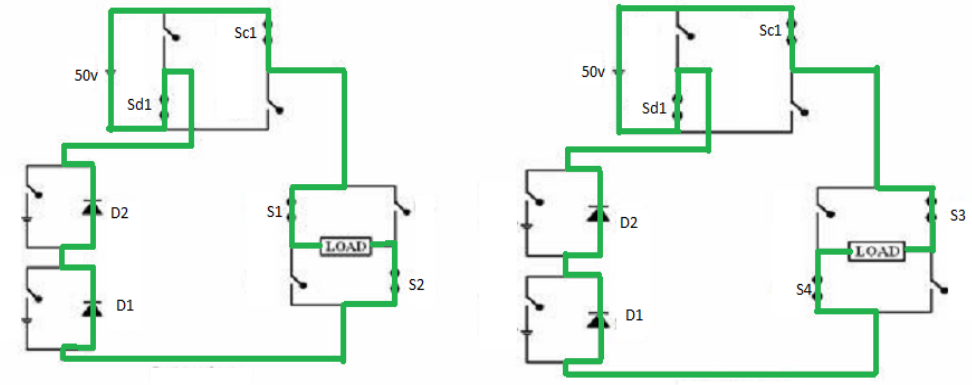

Fig.2. DBMLDCLI operating mode-level 1(±50 V).

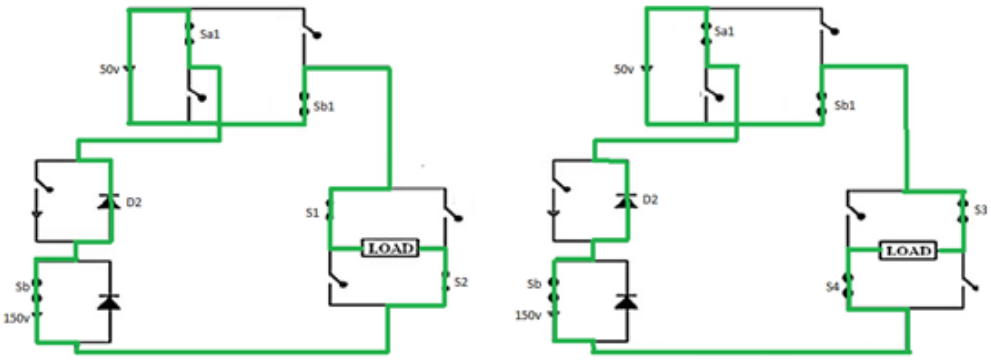

Fig.3. DBMLDCLI operating mode-level 2(±100 V).

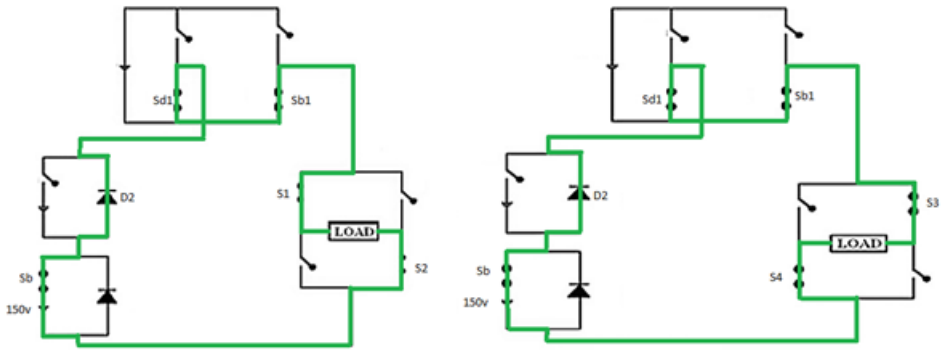

Fig.4. DBMLDCLI operating mode-level 3(±150 V).

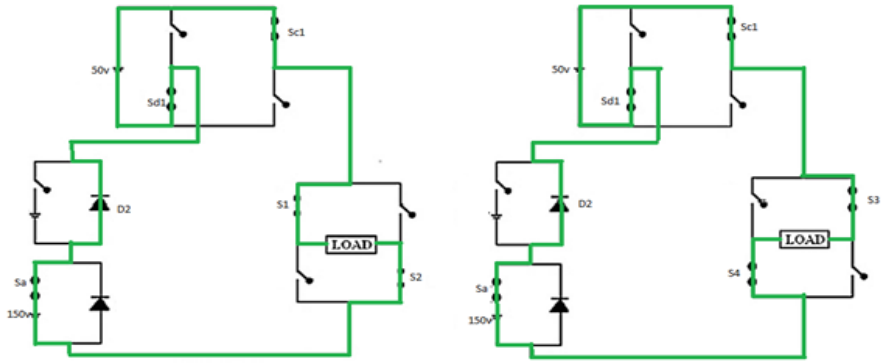

Fig.5. DBMLDCLI operating mode-level 4(±200 V).

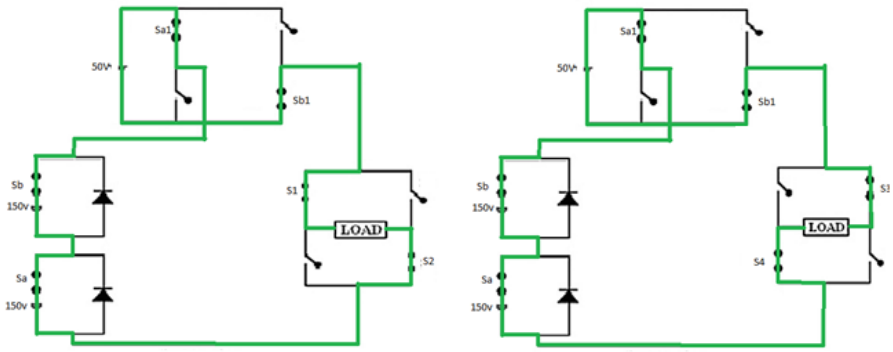

Fig.6. DBMLDCLI operating mode-level 5(±250 V)

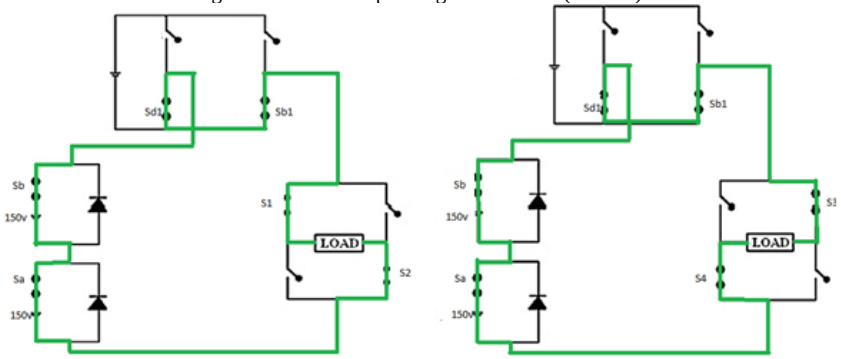

Fig.7. DBMLDCLI operating mode-level 6(±300 V).

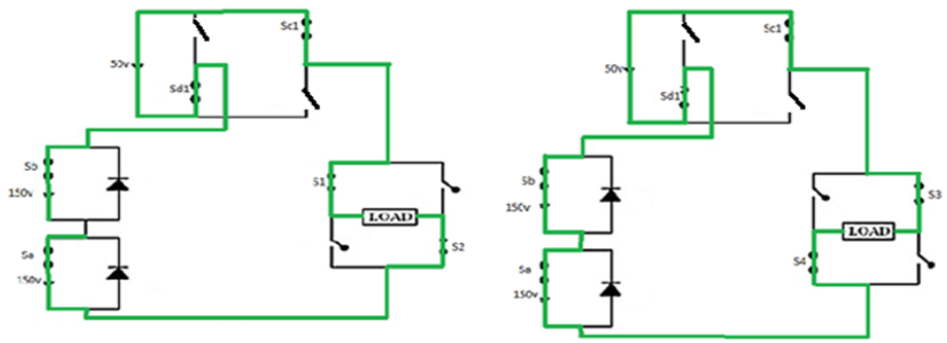

Fig.8. DBMLDCLI operating mode-level 7(±350 V).

III SIMULATION RESULTS

The Dual Bridge MLDCLI has been implemented and simulated using MATLAB for R, RL & Induction motor as loads. The THD of 7.72% for fifteen level has been obtained and shown in fig.12 and the results of DBMLDCLI topology with RL and Induction Motor loads are shown in figures (9,10,11,13 & 14).

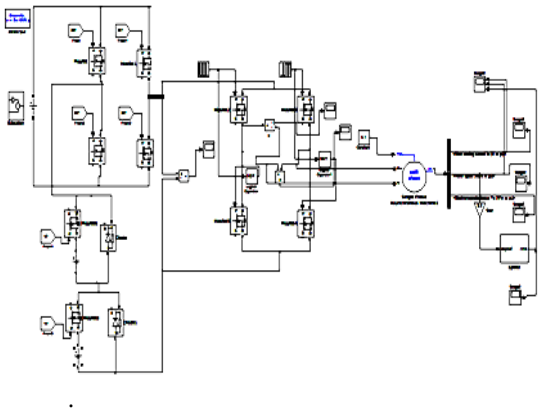

Fig.9 Simulation Circuit for DBMLDCLI fed single-phase Induction Motor.

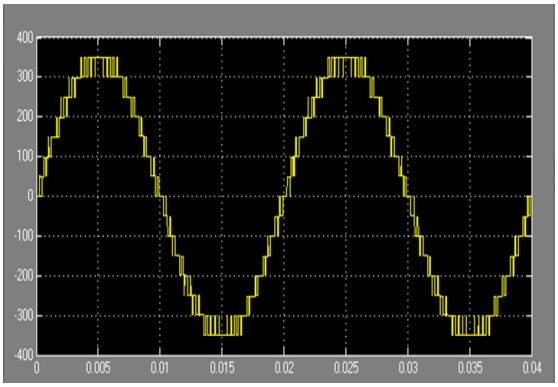

Fig. 10.output voltage waveform of DBMDCLI with RL-load

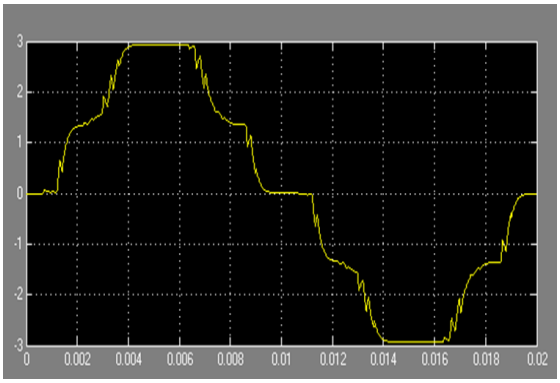

Fig.11.output current waveform of DBMLDCLI with RL-load

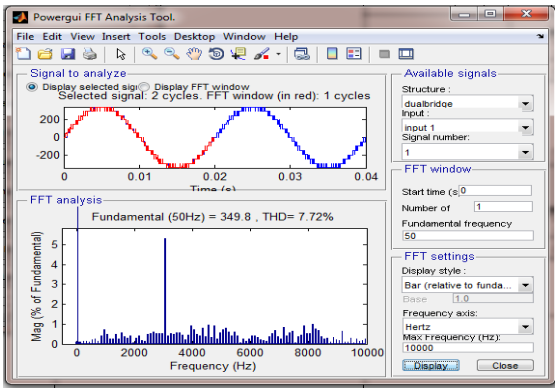

Fig. 12.FFT Analysis

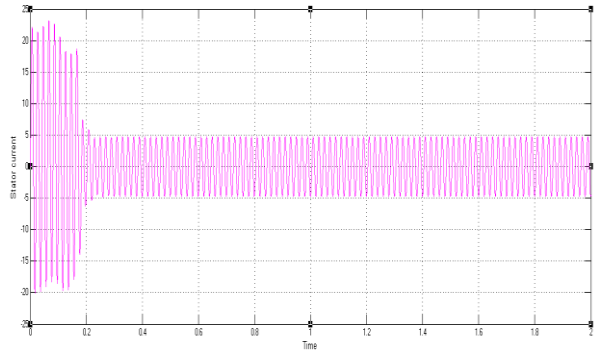

Fig.13.Stator current waveform of DBMLDCLI fed single phase induction motor.

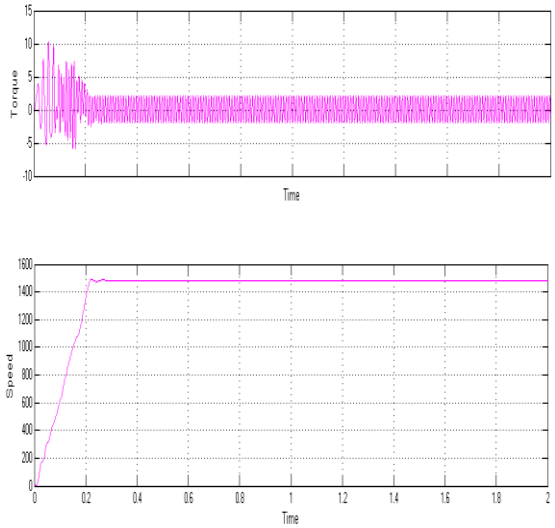

Fig.14.Torque and speed waveform of SPSMLDCLI fed single phase induction motor.

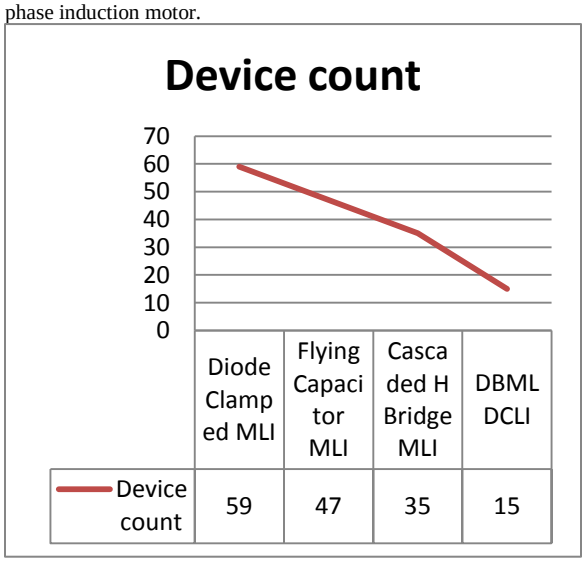

Fig.15. Comparison of device count between different Multi level structures.

IV CONCLUSION

The multi-level DC-link inverter structure is very promising in AC drives, when both reduced harmonic contents and high power are required. A DBMLDCLI topology provides the better sinusoidal output voltage with low THD and also requirement of gate drivers, protection circuits, installation area and converter cost is reduced compared with existing MLI topologies. In this paper, with the Dual Bridge (DBMLDCLI) topology, single phase Induction Motor is driven and simulation results are obtained.

V.REFERENCES

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