

THD Analysis and Comparison of Five Level and Seven Level Diode Clamped Multilevel Inverter using Matlab/Simulink

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Abstract: Motor drives are large applications in domestic and industries, common problem in the motors are getting heated [3] up while running the motor for long time. This is because the harmonics at the output of the inverter as well as linear and non linear loads, to suppress [6] and remove the harmonics many techniques are employed, in this paper the harmonic analysis and Total Harmonic Distortion is studied for future work.

Key words: THD, DCMI, harmonics, linear loads.

Introduction: Harmonics are major problems due to linear and non linear loads also it is very complex task to minimize a multi level inverter technique is one of the right technique to suppress the harmonics [1,2] and THD. Three phase seven level Diode Clamped Multilevel Inverter (DCMI) drive working with thirty-six switches. Initially Simulink/MATLAB is used to construct the three phase seven level DCMI drive, the harmonic analysis has been done [5,7]. The analysis is carried out for the frequency 10Hz. The results are used to compare with 5-Level DCMI drive [4].

1.1 Circuit Diagram:

The Fig.1 shows the three phase Five Level Diode Clamped Multilevel inverter, it is constructed with 24 switches, the switches are turned on to obtain the output voltage is equivalent to sinusoidal voltage in the form of steps. The seven level Diode clamped multilevel inverter drive is constructed with 36 switches is as shown in Fig.2, all the switches are turned on to obtain the stair case output voltage waveform similar to sinusoidal output voltage to suppress the harmonic content at the output of the inverter.

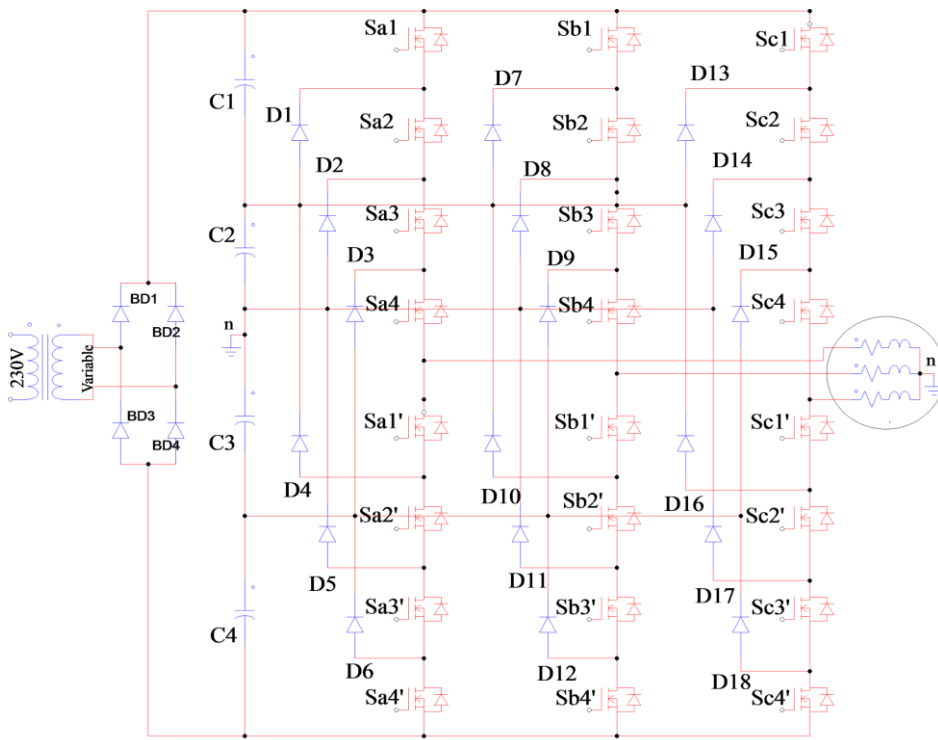


Figure 1: Five level Diode clamped multilevel inverter drive

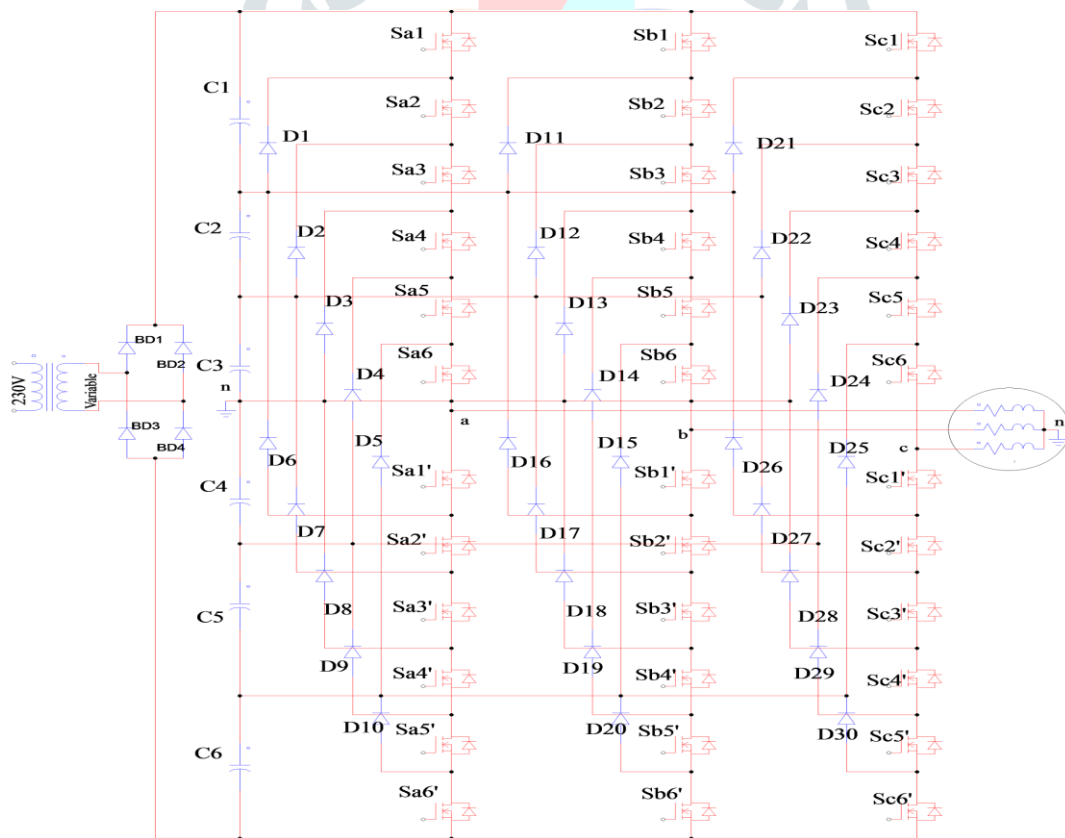


Figure.2: Seven level Diode clamped multilevel inverter drive

1.2 Simulation:

The software Simulink/MATLAB is used to construct the seven level diode clamped multilevel inverter drive.. This work is used to simulate and obtained the expected approximate sinusoidal output voltage, harmonic and THD of Seven Level Diode Clamped Multi Level Inverter Drive. The results are compared with the simulation work done for THD of Five Level Diode Clamped Multilevel Inverter drive.

The Fig.3 presents the synthesized sinusoidal output voltage at the output of inverter for the first phase A, the harmonic profile for the output voltage waveform is shown in Fig.4 for the fundamental frequency of 10Hz with output voltage 70.84V, the THD of the inverter is found to be 18.73%.

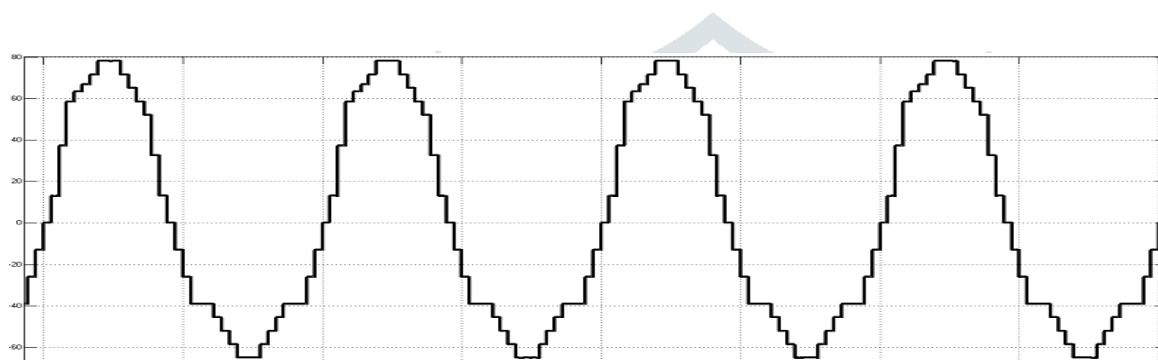


Figure.3:Time/ voltage plot of a First Phase to Neutral output voltage waveform at load Ra

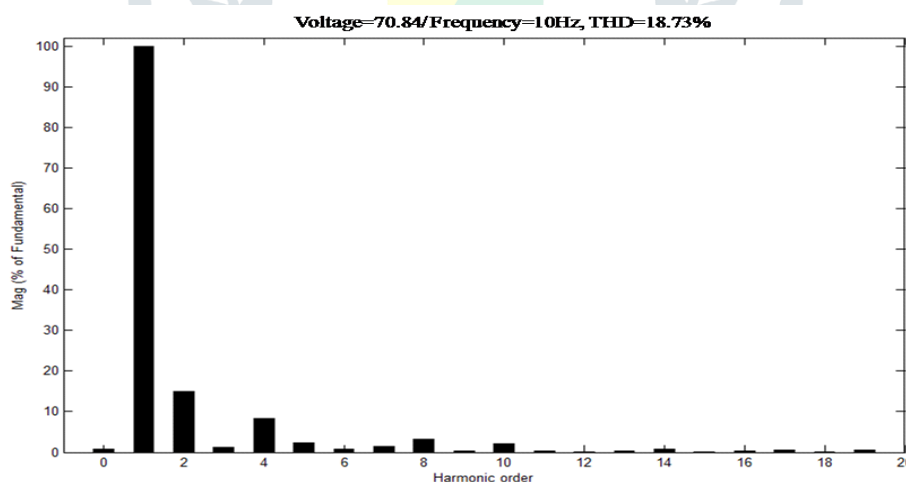


Figure.4 Harmonic Profile of 7 level DCMI drive

The Harmonic profile obtained from Three phase Five Level Diode Clamped Multilevel Inverter Drive is as shown in the Fig.5. The THD profile of both Three Phase Five Level diode clamped multi level inverter drive and Three Phase Seven Level Diode clamped Multilevel inverter drive has been compared and the results are presented in the conclusion.

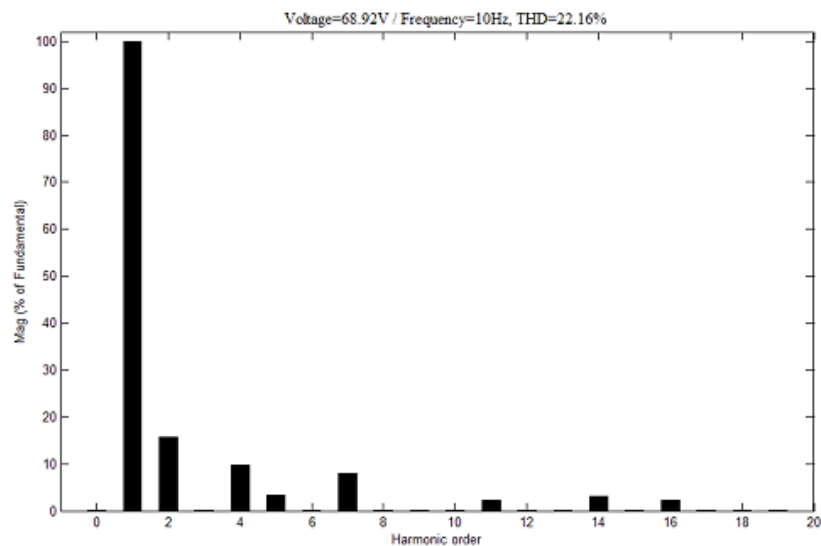


Figure.5 Harmonic Profile of 5 level DCMI drive

9.7 Conclusion

The 7-level Diode clamped multilevel inverter (DCMI) drive is constructed initially using simulink/MATLAB to observe the behaviour of a three phase inverter. the minimization of harmonics at the output of the 7- level DCMI drive is observed, the results obtained by the 7-level DCMI drive is compared with the 5-level DCMI drive. It is found that the THD obtained by 7-Level DCMI drive is found to be less, this work is extended to study the temperature analysis of the Five Phase Induction Motor for future.

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