ANALYSIS OF MULTILEVEL INVERTER BASED STATCOM

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Abstract:

In this paper mainly explained about performance of STATCOM connected to multilevel inverters. simple inverters like 3 phase inverters can't be used for the high-power applications and also these inverters mainly consist of high harmonic THD. Multilevel inverters which are mainly useful to handling the high-power capabilities with low THD so that's way these multilevel converters using HVDC, drive etc.
Key words: STATCOM, THD, HVDC

1. Introduction

Generally, Multilevel inverters using more now a days because these converters handle high power and high voltages with low harmonic loss so that's way Multilevel inverters doesn't require any filter [1]–[3]. Multilevel inverters produce stair case output voltage which is near to fundamental sinusoidal output voltage and these inverters doesn't produces any kind of induction effect[4]–[6]. In power system network these converters are using for the automatic control of power, reactive power compensation, voltage stability control etc. all these problems are now a days controlled by using power electronic converters[7]–[9]. Controlling of power system networks using power electronic converters is called flexible AC transmission[10]. So in this paper mainly discussed about the static compensator parallelly connected to the multilevel inverters.

1.1 Classification of multilevel inverters

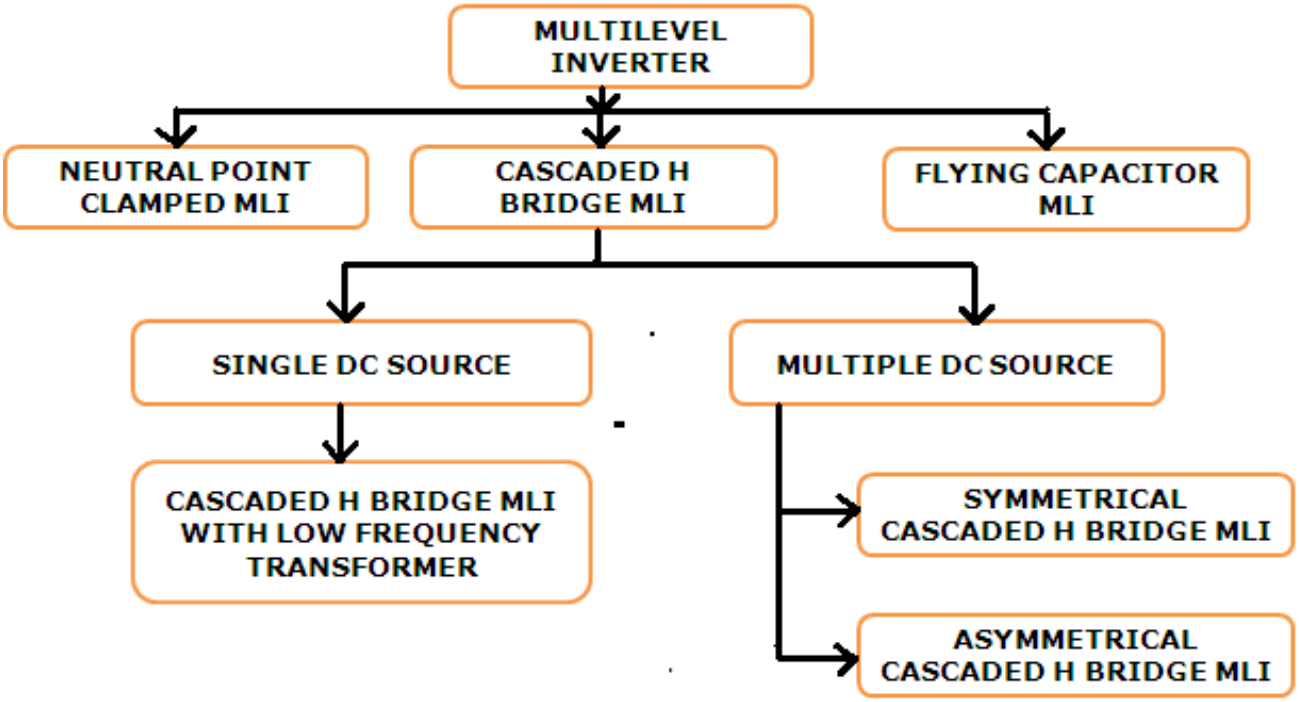

Fig1. Classification of multilevel inverters

a) Diode clamped MLI

Diode clamped multilevel inverters consist of only one source but output voltage is mainly depending on the number output voltage levels. In this inverters source voltage supplied to capacitors which are mainly balance

the output voltage levels through diodes. But this inverter mainly operates upto 5-levls because after 5 levels the clamping diodes not able to balance the voltage across the capacitor[7], [9], [10].

b) Capacitor clamped MLI

In this inverter also consist of only one source but output voltage mainly depends upon the number of output voltage levels. From the circuit diagram each level of the voltage level is consist of capacitors which are clamped to each leg. As the levels increases number of capacitors increases then circuit so complex[6], [7], [9], [10].

c) Cascaded H-bridge MLI

In this inverter consist of more number of sources but as the output voltage levels increases number of cascaded bridges increases. But main advantage of this circuit is no clamping of diodes and capacitors, but more number of sources are required. This converter can be used as many number of levels compared to others[1]–[5].

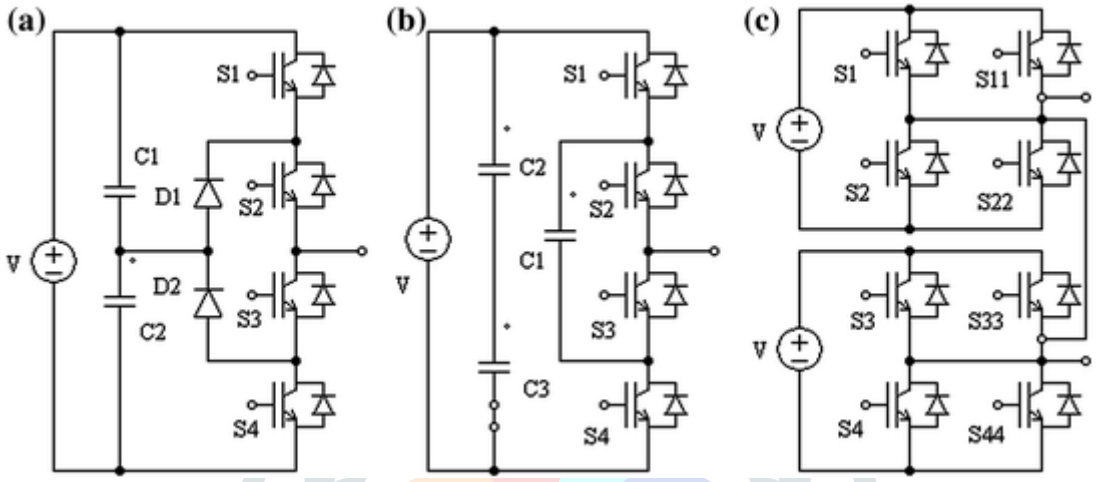

Fig2. a) diode clamped MLI b) capacitor clampedMLI c) cascaded H-bridge MLI

2. Proposed methodology of STATCOM

The static synchronous compensator is connected parallel to the power system network to improve the reactive power compensation with in the limits because generally reactive power is directly proportional the voltage supplied to the load[11]. STATCOM voltage more than the terminal voltage in that condition STATCOM supplies reactive power to the line to maintain the voltage levels within the limits. If STATCOM voltage less than the terminal voltage in that condition STATCOM absorb reactive power from the lineto maintain the voltage stability conditions[12]. STATCOM operates as both capacitor and inductor because under supplied condition behaves as capacitor[13]. Under absorbing condition behaves as inductor with this main conditions power factor of the power system network also improved so that stability can also improved with high efficiency lesser voltage regulation, less losses in the network etc.

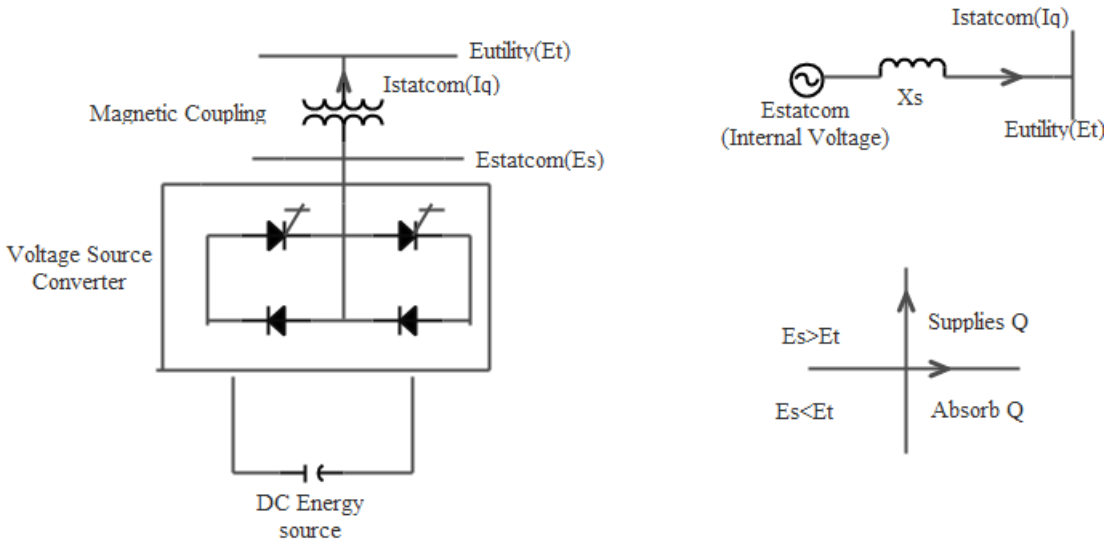

Fig3. Proposed STATCOM model

3. Results:

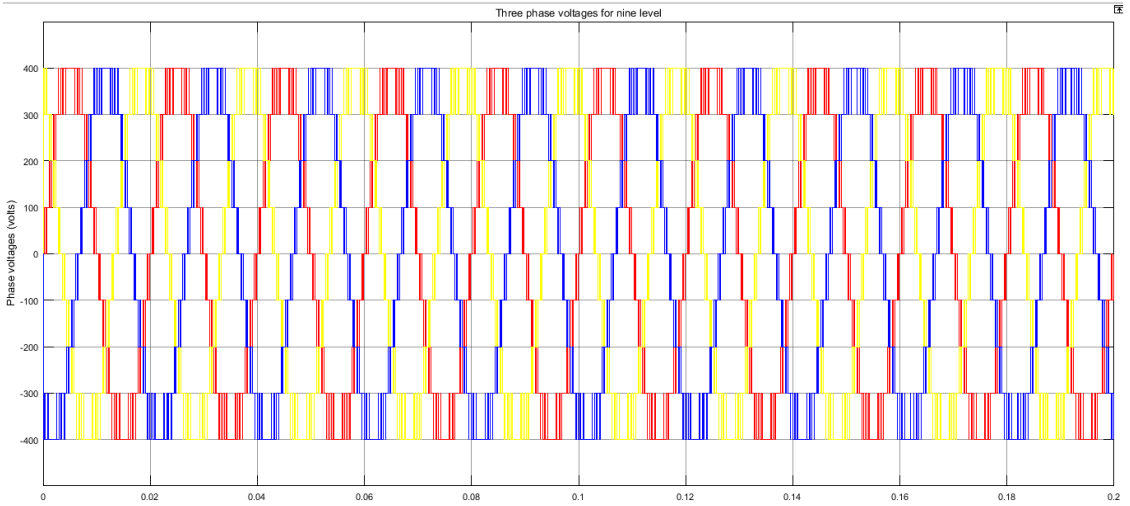

Fig 4. Three phase output voltage waveforms of 9-level asymmetrical cascaded inverter

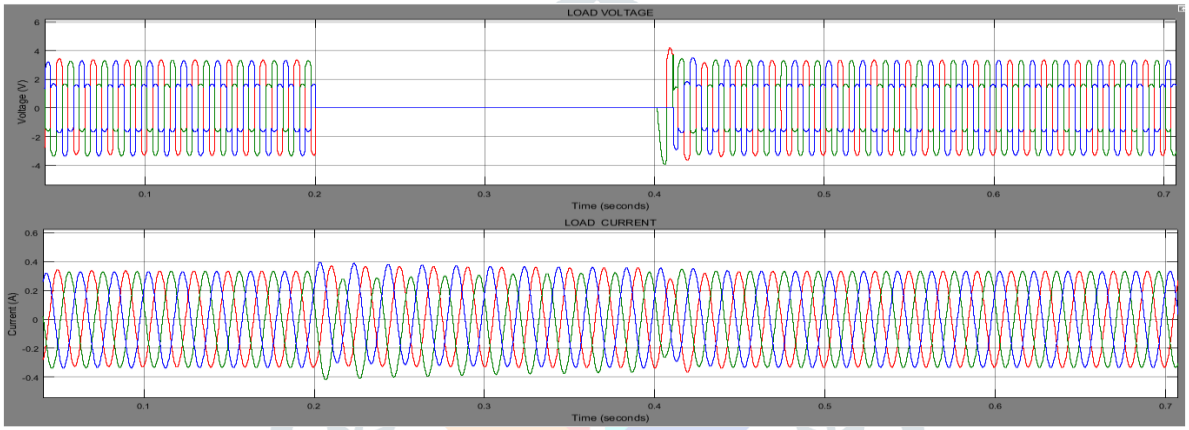

Fig5. Waveforms of load voltage and load current

4. Conclusion:

In this paper mainly explained about the different types multilevel inverters and STATCOM behaviour with power system network. With this STATCOM control able reduce electro-mechanical damping oscillations. In this STATCOM control not only controlling the reactive it also controlling the sustainable dc source.

5. References

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