EE3014 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

UNIT IV-POWERCONVERTERS FOR WIND SYSTEMS

4.3-PWM INVERTERS

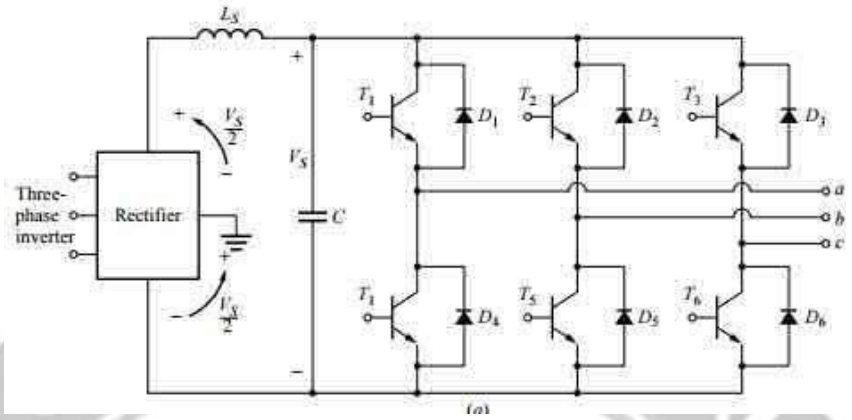
THREE PHASE PULSE WIDTH MODULATED (PWM) INVERTER

Pulse width modulated (PWM) inverters are among the most used power-electroniccircuits in practical applications. These inverters are capable of producing ac voltages ofvariable magnitude as well as variable frequency. The PWM inverters are very commonly usedin adjustable speed ac motor drive loads where one needs to feed the motor with variablevoltage, variable frequency supply. For wide variation in drive speed, the frequency of theapplied ac voltage needs to be varied over a wide range. The applied voltage also needs to varyalmost linearly with the frequency. PWM inverters can be of single phase as well as three phasetypes.

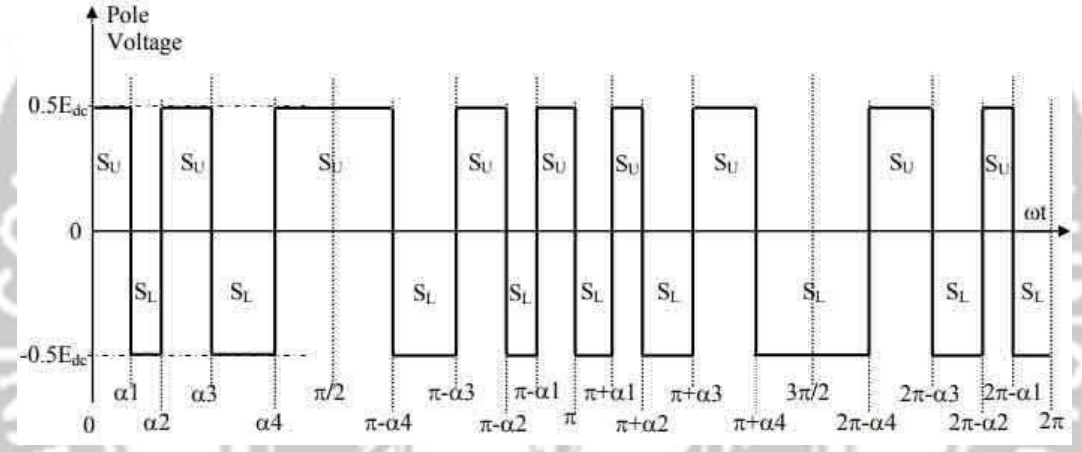
There are several different PWM techniques, differing in their methods ofimplementation. However in all these techniques the aim is to generate an output voltage, whichafter some filtering, would result in a good quality sinusoidal voltage waveform of desired fundamental frequency and magnitude. Nature of Pole Voltage Waveforms Output by PWM

Inverters Unlike in square wave inverters the switches of PWM inverters are turned on and off atsignificantly higher frequencies than the fundamental frequency of the output voltage waveform.

The time instances at which the voltage polarities reverse have been referred here as notch angles. It may be noted that the instantaneous magnitude of pole voltage waveform remains fixed at half the input dc voltage (E_{dc}). When upper switch (SU), connected to the positive dc bus is on, the pole voltage is + 0.5 E_{dc} and when the lower switch, connected to the negative dc bus, is on the instantaneous pole voltage is - 0.5 E^{dc}.



3 phase VSI using power transistors



A typical pole-voltage waveform of a PWM inverter

The switching transition time has been neglected in accordance with the assumption of ideal switches. It is to be remembered that in voltage source inverters, meant to feed an inductive type load, the upper and lower switches of the inverter pole conduct in a complementary manner. That is, when upper switch is on the lower is off and vice-versa. Both upper and lower switches should not remain on simultaneously as this will cause short circuit across the dc bus. On the other hand one of these two switches in each pole (leg) must always conduct to provide continuity of current through inductive loads. A sudden disruption in inductive load current will cause a large voltage spike that may damage the inverter circuit and the load.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