

Abstract

The motor is the very useful equipment in the world. It should be better if we can control the speed of the motor. We can separate to two kinds of motor that are the ac motors and the dc motors. For our project, we make the AC drives which is used to control the speed of the ac motors. The ac motors have a number of advantages. They are lightweight (20 to 40 percent lighter than equivalent dc motors), inexpensive, and low of maintenance compared to dc motors. They require control of frequency, voltage, and current for variable-speed applications. The power converters, inverters and ac voltage controllers, can control the frequency, voltage, and/or current to meet the drives requirements. These power controllers, which are relatively complex and more expensive. However, the advantage of ac drives outweigh the disadvantages. There are two types of ac drives:

1. Induction motor drives
2. Synchronous motor drives

For AC drives, we have to make the inverters which is used to convert the dc voltage to ac voltage. We can control the frequency of the ac output voltage of the inverters. When we can control the frequency, we can control the speed of the ac motors. Most of the voltage source is the ac voltage, but we can not control its frequency. Therefore, we have to change the ac voltage from the source to be dc voltage. After we get the dc voltage, we can use it as the input of the inverters to be converted to the ac voltage again which we can variable the frequency. For the inverters, we can make it by using the power transistors. Power transistors have controlled turn-on and turn-off characteristics. The power transistors can be classified broadly into four categories:

1. Bipolar junction transistors (BJTs)
2. Metal-oxide-semiconductor field-effect transistors (MOSFETs)
3. Static induction transistors (SITs)
4. Insulated-gate bipolar transistors (IGBTs)

BJTs or MOSFETs, SITs or IGBTs, can be assumed as ideal switches to explain the power conversion techniques. For 1-phase ac drives, we have to use two power transistors and for 3-phase, we have to use six power transistors. Another important part of the ac drives is the pulse width modulation (PWM). The dc input voltage is fixed and it is not controllable, a variable output voltage can be obtained by varying the gain of the inverters, which is normally accomplished by pulse width modulation (PWM) control within the inverters. The output of the inverters is not the actual sine wave but it is sinusoidal pulse width modulation that which is the width of each pulse is varied in proportion to the amplitude of sine wave.

