**Multilevel Inverter**

### **Inverter:**

The Inverter is an electrical device that converts direct current (DC) to alternate current (AC). The inverter is used in some aircraft systems to convert a portion of the aircraft DC power to AC. The AC power is used mainly for electrical devices like lights, radar, radio, motor, and other devices.

### **Multilevel Inverter:**

Now a day’s many industrial applications have begun to require high power. Some appliances in the industries, however, require medium or low power for their operation. Using a high power source for all industrial loads may prove beneficial to some motors requiring high power, while it may damage the other loads. Some medium voltage motor drives and utility applications require medium voltage. The multi-level inverter has been introduced since 1975 as an alternative in high power and medium voltage situations. The Multilevel inverter is like an inverter and it is used for industrial applications as an alternative in high power and medium voltage situations.

### **General DC-AC Inverter Circuit:**

The need for the multilevel converter is to give high output power from the medium voltage source. Sources like batteries, supercapacitors, the solar panel are medium voltage sources. The multi-level inverter consists of several switches. In the multi-level inverter, the arrangement of switches’ and Phase angles are very important.

**Cascaded H-Bridge Multilevel Inverter:**

The cascaded H-bride multilevel inverter uses switches and requires less number of components in each level. This topology consists of a series of power conversion cells and power can be easily scaled. The combination of switches pair is called an H-bridge and gives the separate input DC voltage for each H-bridge. It consists of H-bridge cells and each cell can provide the three different voltages like **zero, positive DC, and negative DC voltages**. One of the advantages of this type of multi-level inverter is that it needs less number of components compared with diode clamped and flying capacitor inverters. The price and weight of the inverter are less than those of the two inverters.

**Applications of Cascaded H-Bridge Multilevel Inverter:**

* Motor drives
* Active filters
* Electric vehicle drives
* DC power source utilization
* Power factor compensators
* Back to back frequency link systems
* Interfacing with renewable energy resources.

**Calculations required for H-Bridge Multilevel Inverter:**

Here in this cascaded H-bridge multilevel inverter, we will have number of H-bridge circuits. For one H-bridge we will have four MOSFET switches and one H-bridge is called as cell and one cell consists of four switches.

**One H-bridge = 4-Switches = 1-Cell**

With one H-bridge we can produce three level output.

**One H-bridge = Three-Level-Output**

Here is the formula to calculate number of H-bridges for respective Level-Output.

**Number of H-Bridges = M-1/2**

***M = Number of Levels***

For suppose we want 5-level output, replace “M” value with 5.

**5-Level-Output = M-1/2 = 5-1/2 = 4/2 = 2 H-bridges = Total 8-Switches**

**Calculations to find phase angle**

Below is the formula to calculate phase angle.

**Phase-Angle = 180/M**

***M = Number of Levels***

For suppose we want phase angles for 5-level output, then replace “M” value with 5.

**Phase-Angle = 180/M = 180/5 = 36°**

The switching phase angle starts from 36° to 360°. Below are the switching phase angles for 5-level inverter.

**α 1 = 36°**

**α 2 = 72°**

**α 3 = 108°**

**α 4 = 144°**

**α 5 = 180°**

**α 6 = 216°**

**α 7 = 252°**

**α 8 = 288°**

**α 9 = 324°**

**α 10 = 360°**