RECTIFIER

Concept of Phase Angle Control

As we know that SCR is 3 terminal devices i.e. Anode, Cathode & Gate. To turn it 'ON' by the gate at some angle with respect to the applied voltage, this firing angle is measured with respect to the given reference at which the firing pulses are applied to the thyristor gates. The reference point is the point at which the application of the gate pulses results in the maximum mean positive DC-terminal voltage of which the converter is capable i.e. a firing angle of 0˚ corresponds to the conditions when each thyristor

in the circuit is fired at the instant its anode voltage becomes at positive in each cycle, under this condition, therefore, the converter operates in exactly the same manner as it was an uncontrolled rectifier circuit. The symbol 'α' is known as firing angle. Hence the most common method to turn ON the thyristor is achieved by varying the firing angle of the thyristor. This method of thyristor control is known as phase angle control. This method is very efficient for the controlling the average power to the load such as lamps, heaters, motors, dc transmission

Semiconverter

In this configuration two thyristors are replaced by power diodes and can be connected in either arm of the bridge. Depending on the connections, these are further classified as

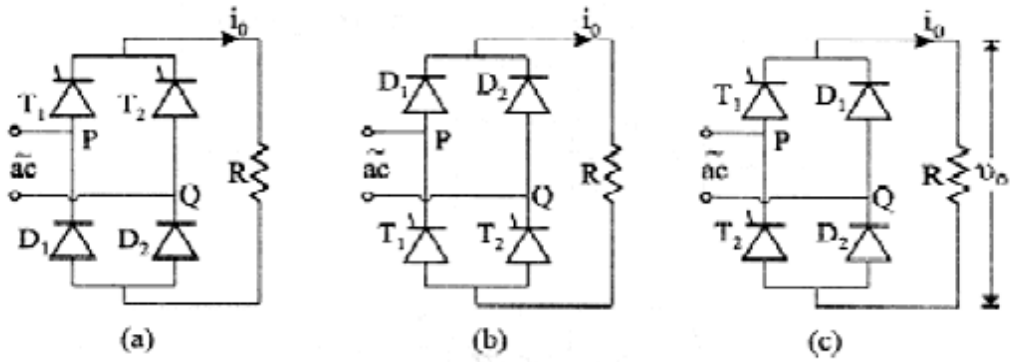
1. Symmetrical
2. Asymmetrical

Symmetrical configuration is in two types

1. Common cathode
2. Common anode

Out of these configurations, the common cathode symmetrical configuration is the most commonly used configuration, because a single trigger can be used to fire both thyristors without any electrically isolation.

During the positive half cycle, when 'P' is more positive w.r.t. 'Q' and when thyristor T1 is triggered, the load currents flows through T1 and the diode D2 in the circuit shown in figure. During the negative half –cycle, when 'Q' is more positive w.r.t. 'P', the thyristor T2 and the diode D1 constitute the load current. The waveforms of the voltage and current in relation to the input voltage are shown in figure.



Where, figure (a) is Common Cathode, (b) is Common Anode and (c) is Asymmetrical configuration

Average dc voltage across load is

$$V_{dc} = E_m (1+ \cos \alpha) / \pi \text{ .....} \textbf{(8)}$$

And average current is

$$I_{dc} = E_m (1+ \cos \alpha) / \pi R \text{ .....} \textbf{(9)}$$

Average power is

$$P_{dc} = Vdc \text{ X } Idc$$