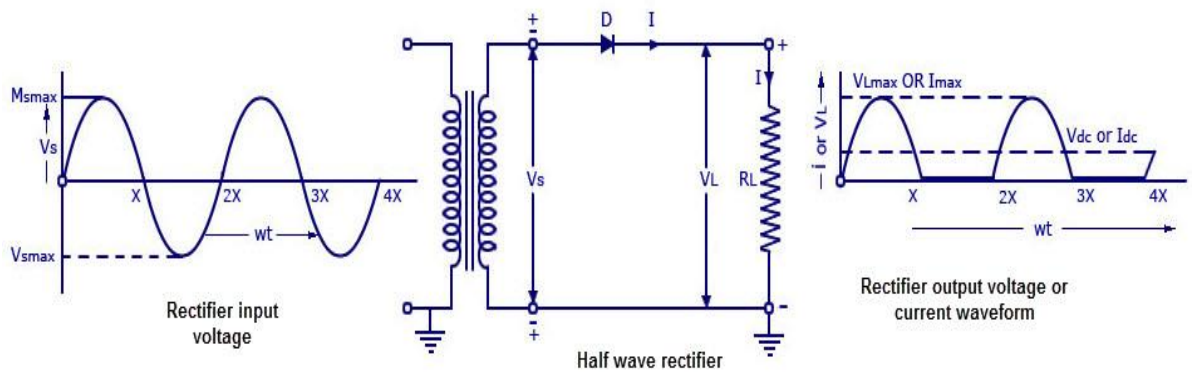


Half-Wave Rectification

A single-phase half-wave rectifier, either the negative or positive half of the AC voltage flows, while the other half of the AC voltage is blocked. Hence the output receives only one half of the AC wave. A single diode is required for a single-phase half-wave rectification and three diodes for a three-phase supply. Half wave rectifier produces more amount of ripple content than full-wave rectifiers and to eliminate the harmonics it requires much more filtering.



For a sinusoidal input voltage, the no-load output DC voltage for an ideal half-wave rectifier is

$$V_{rms} = V_{peak} / 2$$

$$V_{dc} = V_{peak} / \pi$$

Where

- V_{dc} , V_{av} – DC output voltage or average output voltage
- V_{peak} – peak value of input phase voltage
- V_{rms} – the output voltage of root mean square value

Working of a Half-Wave Rectifier

During the positive half cycle, when the secondary winding of the upper end is positive with respect to the lower end, the diode is under forwarding bias condition and it conducts current. During the positive half-cycles, the input voltage is applied directly to the load resistance when the forward resistance of the diode is assumed to be zero. The waveforms of output voltage and output current are the same as that of the AC input voltage.

During the negative half-cycle, when the secondary winding of the lower end is positive with respect to the upper end, the diode is under reverse bias condition and it does not conduct current. During the negative half-cycle, the voltage and current across the load remain zero. The magnitude of the reverse current is very small and it is neglected. So, no power is delivered during the negative half cycle.

A series of positive half cycles is the output voltage that is developed across the load resistance. The output is a pulsating DC wave and to make the smooth output wave filters, which should be across the load, are used. If the input wave is of half-cycle, then it is known as a half-wave rectifier.

Advantages of half wave rectifier are:

- Cheap – Because a minimal number of components are used
- Simple – Due to the reason that the circuit's design is completely straightforward
- Easy to use – As the construction is easy, the device utilization will also be so streamlined
- A low number of components

Disadvantages of half wave rectifier are:

- At the load section, the output power is included with both the DC and AC components where the basic frequency level is similar to the frequency level of the input voltage. Also, there will be an increased ripple factor which means that the noise will be high, and extended filtering is needed to provide constant DC output.
- Half wave rectifier has minimal transformer utilization factor

Application of half-wave rectifier is to gain AC power from DC power. Rectifiers are mainly employed internal circuits of the power supplies in almost every electronic device.

- Used on AM radio device for the detection purposes
- Used as pulse generation circuits
- Implemented in voltage amplifier and modulation devices.