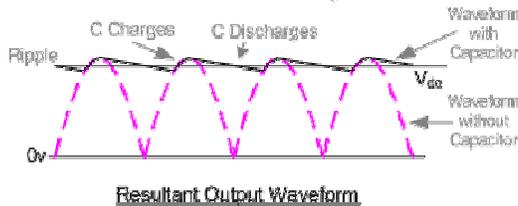
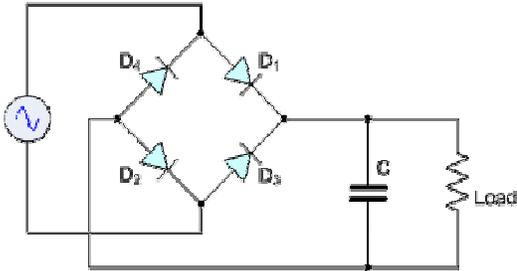




**Q.** What is meant by ripple voltage?



First of all, ripple is not something you want or is it ever purposely designed into a circuit. It is always an unwanted characteristic. We always want it to be as small as possible and it is usually defined as a percentage (%). The smaller the % the better off we are. Ripple is the AC component that rides on the DC output of a rectifier or of a generator.

The amount of ripple present on the output of a rectifier will vary depending on the type of rectifier circuit.

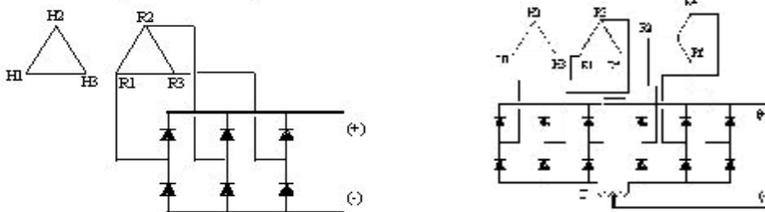
The only device that puts out pure DC is a battery.

**The drawing to the left illustrates the ripple voltage when DC is produced using a single phase full wave rectifier with an output capacitor filter across the load.**

**Below** are shown 2 rectifier configurations, a **6 pulse rectifier (left)** as used in 3 phase AC drives and a **12 pulse rectifier (right)** as used in a much more expensive drive that sets out to eliminate the lower order harmonic currents.

A six-pulse rectifier is composed of six or a multiple of six diodes configured to form a three-phase double-wye bridge for AC to DC conversion. The output of this configuration has six pulses per ac cycle and a ripple content of 4.17%.

A twelve-pulse rectifier is comprised of essentially two six-pulse bridges connected in parallel through an interphase transformer to ensure proper current balance between the two bridges. The input to the two bridges is provided by two separate windings of the rectifier transformer. One of the windings is connected delta while the other is connected wye. This provides the necessary phase shift to produce the six phases. When these six phases are full wave rectified this produces the twelve pulse output. This connection provides a ripple content of 1.02%.



**In a dc tachometer generator** the ripple voltage is defined as the variation in output voltage caused by the number of armature coils for a given design. The basic ripple frequency depends on the number of coils and is a measure of the number of cycles in one revolution. This fundamental ripple can be distorted by internal random and cyclic electrical noise such as commutation due to varying contact resistance between the brush and commutator surface as in brush bounce. Also misalignment between the driver motor and generator shaft could cause serious modulation in the output signal.

In general then, the % ripple needs to be as small as possible, as the tach (tachometer) voltage is often used as an analog feedback signal to an electronic variable speed drive. Too much ripple and the drive could start trying to respond to the ripple and not the dc voltage it is supposed to respond to. In a high performance tach the % is less than 1% and in a general purpose tach anywhere from 3 to 8% depending on the dollars spent.

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