

Alternators

An alternator is a device that changes mechanical energy into electric energy. This is done in the form of an electrical current. In essence, an AC electrical generator could likewise be called an alternator. The word usually refers to a small, rotating device driven by automotive and different internal combustion engines. Alternators which are situated in power stations and are powered by steam turbines are actually called turbo-alternators. Most of these devices use a rotating magnetic field but every so often linear alternators are also utilized.

A current is produced within the conductor when the magnetic field around the conductor changes. Usually the rotor, a rotating magnet, spins within a set of stationary conductors wound in coils. The coils are located on an iron core referred to as the stator. When the field cuts across the conductors, an induced electromagnetic field or EMF is produced as the mechanical input causes the rotor to revolve. This rotating magnetic field produces an AC voltage in the stator windings. Typically, there are 3 sets of stator windings. These are physically offset so that the rotating magnetic field generates 3 phase currents, displaced by one-third of a period with respect to each other.

"Brushless" alternators - these make use of brushes and slip rings along with a rotor winding or a permanent magnet in order to induce a magnetic field of current. Brushless AC generators are usually located in larger machines like industrial sized lifting equipment. A rotor magnetic field could be produced by a stationary field winding with moving poles in the rotor. Automotive alternators usually utilize a rotor winding that allows control of the voltage generated by the alternator. This is done by changing the current in the rotor field winding. Permanent magnet machines avoid the loss due to the magnetizing current within the rotor. These devices are restricted in size because of the cost of the magnet material. As the permanent magnet field is constant, the terminal voltage varies directly with the generator speed.