

Alternators

An alternator is actually a machine which converts mechanical energy into electric energy. This is done in the form of an electrical current. In essence, an AC electrical generator could be referred to as an alternator. The word normally refers to a small, rotating device driven by automotive and different internal combustion engines. Alternators which are situated in power stations and are driven by steam turbines are called turbo-alternators. Nearly all of these machines use a rotating magnetic field but every so often linear alternators are used.

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

"Brushless" alternators - these use brushes and slip rings together with a rotor winding or a permanent magnet to be able to generate a magnetic field of current. Brushless AC generators are usually located in larger machines like for example 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 which allows control of the voltage produced by the alternator. This is done by changing the current in the rotor field winding. Permanent magnet machines avoid the loss because of the magnetizing current within the rotor. These machines are restricted in size because of the price of the magnet material. As the permanent magnet field is constant, the terminal voltage varies directly with the generator speed.