Alternators

A device utilized in order to transform mechanical energy into electrical energy is known as an alternator. It could carry out this function in the form of an electric current. An AC electrical generator can in essence also be termed an alternator. Nevertheless, the word is usually used to refer to a rotating, small device driven by internal combustion engines. Alternators which are located in power stations and are driven by steam turbines are known as turbo-alternators. Most of these machines use a rotating magnetic field but sometimes linear alternators are also used.

Whenever the magnetic field all-around a conductor changes, a current is generated inside the conductor and this is actually how alternators produce their electrical energy. Often the rotor, which is a rotating magnet, turns within a stationary set of conductors wound in coils situated on an iron core which is actually referred to as the stator. If the field cuts across the conductors, an induced electromagnetic field likewise called EMF is generated as the mechanical input causes the rotor to turn. This rotating magnetic field produces an AC voltage in the stator windings. Normally, 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 along with a rotor winding or a permanent magnet to generate a magnetic field of current. Brushlees AC generators are most often 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 often use a rotor winding that allows control of the voltage generated by the alternator. This is done by varying the current in the rotor field winding. Permanent magnet machines avoid the loss because of the magnetizing current within the rotor. These devices are restricted in size due to the cost of the magnet material. As the permanent magnet field is constant, the terminal voltage varies directly with the generator speed.