

Alternators

A device utilized in order to change mechanical energy into electric energy is known as an alternator. It can carry out this function in the form of an electrical current. An AC electric generator can in essence also be referred to as an alternator. However, the word is usually utilized to refer to a rotating, small machine powered by internal combustion engines. Alternators that are placed in power stations and are powered by steam turbines are actually referred to as turbo-alternators. Most of these devices use a rotating magnetic field but occasionally linear alternators are also used.

A current is generated in the conductor if the magnetic field around the conductor changes. Normally 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 otherwise called EMF is produced as the mechanical input makes the rotor to revolve. 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.

In a "brushless" alternator, the rotor magnetic field could be caused by induction of a permanent magnet or by a rotor winding energized with direct current through slip rings and brushes. Brushless AC generators are normally found in bigger devices than those utilized in automotive applications. A rotor magnetic field may be generated by a stationary field winding with moving poles in the rotor. Automotive alternators usually make use of a rotor winding which allows control of the voltage produced by the alternator. It does this by changing the current in the rotor field winding. Permanent magnet devices avoid the loss due to the magnetizing current inside the rotor. These devices are restricted in size because of the price of the magnet material. The terminal voltage varies with the speed of the generator as the permanent magnet field is constant.