

## **Power Plant Generators: What is Excitation?**

Electric generators work on the principle of Faraday's electromagnetic induction. The essential part of this principle is the magnetic field. The magnetic field is produced from a DC power source from an Exciter that is part of the generator system. Read on for more.

The main requirement for electricity generation as per the basic principle is a magnetic field. The generator while producing electricity also has to produce this at a constant voltage for the electrical system to work properly. Controlling the magnetic field controls the voltage output of the generator.

### **How does one produce and control this magnetic field in a large generator?**

The rotor or the field coils in a generator produce the magnetic flux that is essential to the production of the electric power. The rotor is a rotating electromagnet that requires a DC (Direct Current) electric power source to excite the magnetic field. This power comes from an exciter.

#### **DC Exciter**

In the past, the exciter was a small DC generator coupled to the same shaft as the rotor. Therefore, when the rotor rotates this exciter produces the power for the electromagnet. Control of the exciter output is done by varying the field current of the exciter. This output from the exciter then controls the magnetic field of the rotor to produce a constant voltage output by the generator. This DC current feeds to the rotor through slip rings.

#### **Static Exciter**

In modern generators the exciters are static. The DC power for the electromagnet is from the main generator output itself. A number of high power thyristors rectify the AC current to produce a DC current which feeds to the rotor through slip rings. This eliminates the operation and maintenance problems associated with having another rotating machine. Static exciters offer a better control of the output than an electromechanical control.

During start up, when there is no output from the generator, a large battery bank provides the necessary power for excitation.

#### **Brushless Exciter**

Another method is the brushless system. In this system the armature of the exciter is on the rotor shaft itself. The DC output of this armature, after rectification by solid-state devices, goes to the rotor coils. Since the armature and rotor are on the same rotating shaft, this eliminates the need for slip rings. Hence it reduces maintenance and operational requirements and thus improving reliability.