



Advanced applications of synchronous motors

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Received: 01-Feb-2022, Manuscript No. GJEE-22-60298; **Editor assigned:** 03-Feb-2022, PreQC No. GJEEE-22-60298(PQ);
Reviewed: 17-Feb-2022, QC No GJEEE-22-60298; **Revised:** 21-Feb-2022, Manuscript No. GJEEE-22-60298(R); **Published:**
28-Feb-2022, DOI: 10.15651/GJEEE.22.1.001.

DESCRIPTION

In electrical systems, industry, power plant stations, or domestic needs, engines and generators are common. The present invention is to view a new model of these electrical devices as there is a demand for energy consumption systems with high energy efficiency. The basic calculation factor of high reliability operation engine and generator is power factor. It is the ratio of application performance to the required performance. In principle, a total company consumed at industries and factories is calculated based on power factors. Therefore, the power factor should always be maintained on the unit. However, the power factor is reduced because reactive power in these devices increases. Many methods have been introduced to maintain the power factor in the unit. The concept of synchronous motors is one of them.

The definition of the synchronous motor indicates that "AC motor is synchronized with the frequency of the applied current" that the rotation of the shaft is synchronized with the stop current. The synchronous motor operates as an AC motor, where the total rotation number generated by the shaft is equal to the integer function of the frequency of the applied current.

Synchronous Motor

The synchronous motor does not depend on the induced current. In these engines, in contrast to the induction motor, there is a multiphase alternating current electromagnet on the stator that generates a rotating magnetic field. Here, it is a rotor from a permanent magnet synchronized with the rotating magnetic field, and rotates in synchronization with the frequency applied.

Stator and Rotor are the main components of the synchronous motor. Here, the key rod and the stator frame wrapper plate with the peripheral rib are installed. Fill, frame holder is used to support machines. Slipplings and brushes are used to enhance field windings with DC power supplies. Cylinder and round rotators are used for 6-pin applications. The configuration of the synchronous motor and the synchronous generator is similar.

Motion Principle of Synchronous Motor

The work of the synchronous motor depends on the interaction of the rotor of the magnetic field of the stator. The stator contains a three-phase winding and 3 phase power is supplied. Therefore, the stator winding generates a three-phase rotational magnetic field. Direct current is supplied to the rotor. The rotor enters the rotating magnetic field generated by the stator windings and rotates synchronously. Here, the speed of the motor depends on the frequency of the supply current. The speed of the synchronous motor is controlled by the frequency of the applied current. The speed of the synchronous motor can be calculated as follows.

$$N_s = 60f/P = 120f / p$$

Where f=frequency of AC current (Hz)

p=total number of poles per phase

P=Total number of pairs of poles per phase.

If the load is greater than the destructive load, the motor will be asynchronous. Three-phase stator windings have the advantage of determining the direction of

rotation. With single-phase windings, the direction of rotation cannot be derived and the motor can start in either direction. A starter is required to control the direction of rotation of these synchronous motors.

The moment of inertia of the rotor prevents large synchronous motors from starting automatically. Due to this inertia of the rotor, the rotor cannot be synchronized with the magnetic field of the stator when an electric current is applied. Therefore, an additional mechanism is needed to synchronize the rotors. Large motors include inductive windings to generate sufficient torque for acceleration. For very large engines, use a pony engine to accelerate unloaded machines. When the frequency of the stator current changes, the electronically driven motor accelerates from standstill. For very small motors, if it is desirable to have a small moment of inertia and mechanical load on the rotor, it can be started without a starting method.

Types of Synchronous Motors

There are two types of synchronous motors, depending on how the rotor is magnetized:

- DC excited motor;
- Excited direct current.

Non-excited engine: In these motors, the rotor is mag-

netized by an external stator field. The rotor contains a constant magnetic field. High-strength steel such as cobalt steel is used to manufacture the rotor. These are classified as permanent magnets, reluctance, and hysteresis motors.

- Reluctance motors have cast steel rotors with protruding toothed poles. To minimize torque ripple, the rotor poles are smaller than the stator poles. Includes risk cage winding to provide starting torque to the rotor.
- Hysteresis motor is an automatic starter motor. Here, the rotor is a smooth cylinder made of hard magnetic cobalt steel with high coercive force. These motors are expensive and are used when accurate constant speeds are required. Generally used as a servo motor.

DC excited motor: Here, the rotor is excited by the direct current supplied through the slip ring. AC inductive and rectifiers are also used. These are usually large, for example. B. 1 horsepower or more.

Applications for Synchronous Motors

Synchronous motors are typically used in applications that require accurate and constant speed. Low power applications for these motors include positioning machines. One is an efficient means of converting AC energy into mechanical energy, and the other is power factor correction.