

## The Basics of Synchronous Motor Repair

Synchronous motors are great. But you need to know what to expect when it comes to repairs.

# Synchronous Motor Repair

You've invested money in synchronous motors for your machines, no doubt in part because synchronous motors offer higher efficiency than equivalent induction motors. When paired with electronic speed control, these motors offer tremendous and reliable torque. However, with time your synchronous motors are going to be in need of repair. So what kinds of repairs can you expect?

## Synchronous Motors

Synchronous motors are AC motors with shaft rotation speed that is proportional to the current frequency -- exactly proportional, in fact. In engineering terms, that means that the rotation period of the motor is going to be equal to an integer number of AC cycles. Its rate of rotation is actually locked to the line frequency.

Along with the induction motor, the synchronous motor is one of the most widely used types of AC motors. It does work differently from the induction motor, though. Unlike an induction motor, a synchronous motor does not require current induction to produce a magnetic field around the rotor. One of the benefits of using a synchronous motor is how efficiently it can convert AC energy to useful work when compared to other types of electric motors.

## Common Types of Synchronous Motor Repair

There are several different repairs, with the three most commonly performed repairs performed on synchronous motors being rewinding the coils, re-insulating coils, and dealing with rotor balancing and misalignment issues.

### Rewinding the Coils on a Synchronous Motor

The **rewinding process**, when done correctly, is a very detail-oriented process that begins with a careful inspection that includes dimensions, bracing, and coil

insulation details. The windings are then stripped using a temperature controlled oven with water suppression. Winding data is then gathered and analyzed, and (depending on who you go to for repairs) design improvements will be suggested. Detailed electrical tests are performed throughout the winding process to ensure the winding integrity, carefully follow **IEEE standards**.

## **Re-insulating the Coils on a Synchronous Motor**

When re-insulation is performed (often as a part of the rewinding process), it begins with a careful evaluation of the current insulation system. A new insulation system is generated with a focus on improving both heat transfer and **dielectric integrity**. The insulation is applied with precision based on the design and then the **vacuum pressure impregnation (VPI) process** is used to penetrate and coat the windings with a 4 to 5 ml build of solventless epoxy resin.

## **Repairing Imbalance and Alignment on Synchronous Motors**

Both **imbalance** and **misalignment** can become major issues for electric motors. Rotor balancing, also referred to as dynamic balancing, typically begins with collecting vibration measurements. One of the key tests performed is a vibration **spectrum analysis via a fast Fourier transform (FFT)**. What this test does is provide data to correlate the amplitude of the vibration to the frequency. This not only provides helpful information about the nature of the vibration and whether it may be related to a structural issue or imbalance or shaft misalignment. Other possible causes include bearing defects, broken welds, loose fasteners, rotor/stator faults, and resonance conditions. **Vibration analysis** is a great tool to use in identifying these!