

DC Motor Repair

Nobody has done more DC motor repair than HECO

You've got a DC (direct current) motor down and you need it repaired, but you aren't just responsible for keeping things running but keeping the repairs within budget. How can you tell if you are getting a reasonable repair quote if you don't know what kind of repairs are common for DC motors? That's the purpose of this article: to provide solid facts so you can make an informed decision about repairing that DC motor that has brought production to a grinding halt.

Basics of DC Motors

DC motors can be found in elevators, hoists, steel rolling mill drives, turntables, conveyor belts, mixers, printing presses, extruders, and more. These motors used direct current (DC) as opposed to alternating current (AC) and their speed can be adjusted by either adjusting the static field current or the voltage that is applied to the armature.

Types of DC Motors

The four types of DC motors are shunt wound motors, series wound motors, permanent magnet, and compound motors. Shunt motors are typically used for speed regulation made possible because the shunt field can be excited separately from the armature windings. Series motors generate excellent starting torque but don't offer much in the way of speed regulation. Permanent magnetic motors are typically limited to low horsepower applications. Compound motors offer a good starting torque but don't do well in variable speed applications. You also have other variations of DC motors that are unique variations and designs of these 4 types.

Basic Components of a DC Motor

DC motors will have a field frame that contains the field coils and an armature with windings wrapped around a core made of iron. The ends of the armature

windings are connected to a commutator which allows each of the armature coils to be energized in turn via carbon brushes (except in the case of a brushless motor, which makes use of electronics to achieve the same effect).

Typical DC Motor Repairs

DC Motor Rewinding

DC motors often have to have field coils and armatures rewound and insulated. In some cases, repairs can be made but, sometimes, rewinding is necessary to achieve acceptable motor performance. If rewinding isn't necessary, then the issue may be mechanical in nature or a build-up of carbon dust that can be addressed by steam cleaning and baking the field coils or armature.

When rewinding is necessary, careful measurements and documentation of the existing design are recorded. Making new field coil and armature coils are accomplished with precision by a skilled professional. The windings are then insulated, using either **VPI** or the more traditional **varnish dip**. The rewinding process includes careful testing and documentation at every stage.

Bearing Failure

Most instances of **DC motor bearing failure** are due to natural wear and tear or accelerated wear due to improper lubrication. Improper lubrication includes overgreasing, too little or too much lubrication, lubricants contaminated with abrasive particles, and mixing lubricants that just are not compatible. In some instances, there can be electrical issues due to the passage of current through bearings that results in surface damage called **fluting**. In cases like this, the bearings will need to be replaced and measures taken to ensure that the bearings remain electrically isolated.

DC Motor Commutator Replacement

The commutator has a major impact on the performance of a DC motor, and issues with the commutator manifest themselves in different ways. In most cases, damage to the commutator means that it must be repaired -- but not always, especially if it is caught soon enough.

Grooving

You can spot grooving by looking for smooth grooves appearing on the commutator brush path. This is usually caused either by arcing due to an incorrectly installed brush (low spring pressure) or the use of the wrong type of brush (abrasive). This can also be caused by low humidity and temperature.

Streaking

You can see streaking in a commutator by thin dark marks in the brush path. This can be caused by a few reasons such as contamination, high humidity, low current load, or low spring pressure.

Threading

Another form of DC motor commutator damage is threading. You can spot threading because it results in very thin lines that look like threads on the brush paths of the commutator. This will lead to faster brush wear, more carbon dust, and other issues. If spotted earlier, threading can be repaired by machining the commutator.

Photographing

You can see photographing from seeing larger dark streaks that are the complete width of the brush and brush path. This can be caused by two primary reasons. Condensation under the brush face or a jolt on the brushes while an interruption of contact or electrical spike at the same time and the same point in rotation of the commutator.

Marking and Burning & Copper Drag

Marking and burning on the commutator can indicate issues with the DC motor. Slot bar marking can be seen as every other or every few commutator bars being darkened and discolored. This is from an uneven current distribution or a bad armature winding. Burning of the commutator bar edges indicated that there is incorrect brush alignment, bad interpoles (if applicable), incorrect brush grade, or even low spring pressure. You may also see copper drag happen which looks like you smeared the copper of the commutator with the brushes. This is due to excessive heat that softened the commutator surface. This is an indicator of a potential larger issue.

DC Motor Brush Replacement

The carbon brushes on a DC motor will wear over time and will eventually need to be replaced. Worn brushes can cause loss of power to the armature, damage to the armature winding, and damage to the commutator. Premature motor brush wear can result from incorrect installation as well as issues with the windings, voltage surges, overloading, and sparking. An added complication from carbon brush wear is the generation of carbon dust which can lead to grounding of the field coil or armature winding.

DC Motor Repair Time

Let's face it, there is a lot that can go wrong with a DC motor, but most of it involves fairly straightforward repairs, such as bearing replacement or a simple brush replacement. These repairs won't take as long as a more complicated repair like an armature or field coil rewind. Keep in mind, however, that a fast repair isn't always a good repair. Quality DC motor repair shops will work to track down not just what is wrong with your motor but what caused it to fail in the first place. This takes time, as does redesign for improved performance and careful quality testing. The extra time invested in repair will, in turn, result in significantly better downtime and much better motor performance.

Conclusion

Are you in the market for a DC motor repair service? Here at HECO, we provide high quality, EASA accredited repair solutions that will result in a DC motor with a longer mean time to failure, lower M&O costs, and significantly better performance. We follow strict procedures for repair and reconditioning that allow us to provide you with the highest quality repairs. Contact us today to find out how we can help your electric motor powertrain achieve peak performance!