Dodge® mounted bearings: how to maximize investment and minimize downtime

Replacing bearings is often a time-consuming and costly experience. Not only do bearings require occasional replacement but at times it is necessary to replace the shaft and mating components as well. The worst time to replace a bearing is when it is unexpected, when downtime is the most costly and when production uptime is expected. Current theories based upon Lean principles of manufacturing suggest that scheduling machine downtime to properly maintain equipment aides effective long-term use of machinery. Inspection and observation of bearings should always be included in the preventative maintenance guidelines for a machine.

Bearings are wear components; this means they will fail, it is just a matter of when. Current statistical-based approaches help users select bearings for a given life, commonly referred to as L_{10} life. The L_{10} life, commonly expressed in units of hours, is the length of time 90% of a given group of bearings will meet or exceed under a given load and speed. It is basically used as a predictor of when a bearing will fail. However, one problem with the prediction model is that it does not account for maintenance, it only accounts for fatigue of the steel under a given load and cycle. Therefore, routine maintenance and proper lubrication is required to achieve the bearing's maximum life span.

Standard maintenance will include re-lubrication but should also include checking alignment, cleaning away contamination and recording general observations of the bearings.

Effective lubrication is critical to prevent premature bearing failure. If the bearing is not re-lubricated properly then the bearing life is essentially equal to the service life of the grease. The service life of the grease will be affected by bearing type, speed, temperature and load. Therefore, re-lubricating the bearing at predetermined intervals is recommended. Most bearing instruction manuals have re-lubrication intervals based upon speed and hours of operation per day. Note that these are typically general recommendations. Temperature and environment will affect the ideal re-lubrication interval. Contact the bearing manufacturer for more detailed recommendations.

When it is time to re-lubricate the bearings it is important to lubricate with the proper type of lubricant. Not all lubricants, whether grease or oil, are compatible. Make note of the initial grease provided with the bearing and insure grease compatibility through the bearing manufacturer or the lubricant dealer. It is often good practice to label the bearing with the type of grease and the re-lubrication interval.

Other common practices include checking for proper bearing alignment and cleaning the exterior of the bearing. Upon installation assemblers are often attentive to proper alignment. However, most misalignment issues occur after initial assembly. If a motor, gearbox, or shaft is replaced the equipment can be forced into place rather than realigning the system. Good practice is to recheck alignment anytime a component is replaced in a machine.

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Contamination, including dirt, dust, moisture, etc. will wreak havoc on a bearing once it has penetrated the seal cavity. Keep any foreign particles far away from the bearing to ensure they do not affect bearing performance. It is not recommended to use cleaners or high pressure water/air guns near the seal area. Clean the areas nearby with a soft rag and wipe in a circular motion in the direction of the seal. Don't press hard against the seal as this could force local contamination through the sealing cavity.

It is good practice to lubricate just before shutdown, especially in moist or humid environments. If moisture has penetrated the seal cavity of a properly lubricated bearing, the internal turbulence from operation could assist in preventing contamination. However, when the bearing stops rotating the moisture could rest on the raceway leading to contamination and moisture stains. If the bearing is lubricated just before shut-down then the moisture will be driven out and fresh lubrication will be provided to the rollers and raceways.

Finally, good practice is to note the general observations of a bearing. Keep the observations on hand and in a common location so trends can be detected. The best way to know when a bearing is about to fail is to listen to the trends and identify the signals indicating problems. General observations should include heat, noise, vibration and even power draw.

Bearings will generate heat during operation. Fast speeds as well as high loads will affect temperatures. A bearing operating under consistent conditions should generally maintain a constant temperature. If the temperature were to double over a period of time then the bearing should be inspected. Lubrication may cause the bearing temperature to increase briefly but the temperature should reach its original temperature once an internal equilibrium is reached.

Many tools are available to measure bearing temperatures. Commonly used are temperature guns and pyrometers as these are portable, easy to use and affordable. Thermocouples are also used on critical bearings as the temperature can be fed digitally to a computer or data acquisition system to identify trends in real time. The other option is to judge temperature by feel. The threshold of pain for humans is about 130°F, if one can keep their hand on a bearing for a few seconds then the temperature will be below that. If the bearing is too hot to keep a hand on then place a few drops of water on the housing. If the water boils or steams over then the temperature is over 220°F.

Noise and audible vibrations are other easy characteristics to identify. When bearings begin to show audible signs of noise and vibration there is something wrong and a scheduled inspection is due.

Vibration is a key characteristic growing in popularity to identify bearing trends and predict failure. Accelerometers can be used to measure vibration on the equipment. Bearing frequencies that correlate with vibration measurements might identify inconsistencies on the raceways or rollers; signs of on setting fatigue failure. Routine measurements should be recorded for future comparisons.

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Finally, amp draw recording can be beneficial on occasion. In applications that are generally uniform the amp draw should be consistent. Large increases in amp draw could indicate binding or excessive work in the system reflecting conditions such as misalignment, unidentified bearing failure, etc.

All of these methods should help a facility increase proper uptime and insure successful long-term operation.

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