WALKER PROCESS TURNTABLE BEARING IS NOT JUST ANOTHER LAZY SUSAN!

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Walker Process Equipment spur gear drives rely on turntable bearings with replaceable raceway inserts. The Walker raceway inserts or liners are annealed, aircraft quality, vacuum degassed, AISI E4340 steel, which meets or exceeds the requirements of ASTM A331; US Military Specification, MIL-S 5000; and Aerospace Material Specifications, AMS 6415 and AMS 2310. The raceway liners are ground and through hardened to a minimum 43 Rc and maximum 48 Rc hardness.

The hardness of the raceway material is of course a parameter in the bearing L_{10} life rating equations. The hardness of the raceways taken in the Vickers hardness scale is used to increase or decrease the bearing capacity and thus fatigue life of the bearing compared to the hardness initially set by Palmgren and expanded by the American Bearing Manufacturers Association, ABMA, formerly the Anti-Friction Bearing Manufacturers Association, AFBMA.

The use of a bearing specifically designed for water/wastewater collector drives ensures optimal operation and service. The higher hardness of conventional bearing raceways at 58-60 Rc increases the potential for stress corrosion of the raceway material in the presence of water. High humidity over collector surfaces in the region of the collector drives dramatically increases the potential for this type of corrosion in high alloy heat-treated steels. This problem has been greatly reduced by the use of the medium hardness raceway material as found in the collector drive turntable bearing systems of the major drive manufacturers, such as Walker Process Equipment, Eimco, and Envirex. Additionally, the replaceable raceway material is less susceptible to impact cracking than the more brittle higher hardness raceway material.

Turntable bearing life is determined by equations based on bearing component materials and the bearing system geometry and the applied loads. The resulting L_{10} life rating of the insert raceway bearing system is equal in validity to the L_{10} life ratings for ABMA rolling element bearings. Both the ABMA bearing and insert raceway bearing system are rated by equations developed from the same basic equations of Lundberg and Palmgren for hertzian fatigue life.

Of equal importance is the rolling element, in the case of the WPE turntable bearing, a 1 ½" diameter, ABMA Grade 50 OK gauge, AISI E52100 chromium alloy steel, bearing ball having a hardness range 60-65 Rc.

The standard method of rating bearing life is to statistically establish a ninety percent survival rate at the established load. This rating predicts only Hertzian contact fatigue failure. The majority of bearings fail due to reasons other than Hertzian contact fatigue, such as corrosion and abrasive wear due to contaminated lubricants. These failure modes are not predicable, as they depend largely on environmental conditions and human actions.

One way to maximize the operating life of the bearing is to eliminate water contamination. Some manufacturers have increased the sump capacity in the hopes that more volume would reduce the effects of condensate in the spur gear housing. Unfortunately, most of the lubricating oils used in modern gearing have specific gravities less than one and, therefore, float on the water, which migrates to the bottom of the sump. As the water accumulates, the oil surface rises within the sump until it over flows from the housing.

Reliance on sump capacity alone is obviously not enough to prevent water contamination or accumulation problems. The condensate must be systematically removed either by the maintenance crew or by an automatic condensate removal system. With the proper and timely removal of water from the spur gear housing, the capacity of the sump is reduced to the volume necessary to hold the lubricant and allow for separation of the water from the lubricant followed by discharge from the housing. Depths and volumes greater than these will do little or nothing to prevent or mitigate condensate contamination.

Some manufacturers claim that a large diameter bearing is better than a smaller diameter bearing and others will claim just the opposite. They hope that by specifying a minimum or maximum diameter for a certain application, the competition will be eliminated or dissuaded from offering their product. The truth of course, is the bearing size is dependent on the bearing design, materials and application. Bearing and for that matter spur gear, diameters should be determined by the design parameters and supported by calculations that are accurate and that can withstand review by those expert or knowledgeable in the field. There is no need, therefore, to specify a diameter or diameter range, but there is a great need to carefully examine both the design calculations and design premises of the bearing and spur gear drive.

In some cases, only radial loads have been applied when establishing turntable bearing L_{10} Life. In other cases, only axial or thrust loads have been applied. A bearing L_{10} Life must statistically account for all loads resisted by the bearing. It must be admitted that in some cases the failure to statistically combine the radial and thrust components of bearing life ratings has come more from ignorance than deceit, however, the ratings are erroneous, nonetheless. Another method, used by some manufacturers, of increasing ratings fictitiously is to assume a weight load spectrum or to use Miner's rule on assume loading conditions. If the spur gear is to be designed for a 24 hour 365 day per year continuous load for a specified number of years, then the bearing rating must use the loads resultant from the continuous torque and not a mere portion of those loads to establish the bearing L_{10} Life.

Walker Process Equipment has taken the pains to determine the appropriate rating equations and to have the validity of those equations reviewed by experts such as the late John E. Sague and others.

Some turntables may be Lazy Susans, but not the WPE replaceable race insert liner bearing system.