

Bearing Isolators

Isolators provide protection for rotating equipment

A bearing isolator is a noncontact, nonwearing, permanent bearing protection device. It has a rotor and a stator, and the two are unitized so they do not separate while in use. Typically, the rotor turns with a rotating shaft, while the stator is pressed into a bearing housing. The two components interact to keep contamination out of the bearing enclosure and the lubricant in. Bearing isolators do not require lubrication or any particular shaft finish or condition.

Bearing isolators use blocking features that inhibit the free transfer of contamination when the rotating equipment is cycled on and off.

The first bearing isolators were applied to process pumps in the food and chemical processing industries. Next, they were applied to severe-duty TEFC industrial motors. Now, bearing isolators are used in all types of rotating equipment in heavy industry.

Contact seals

Before the introduction of bearing isolators, bearing protection for industrial and process equipment was generally limited to contact seals such as lip seals and face seals. A rubber lip seal, with a maximum useful life of 3000 hours (4.1 months) was used to protect rolling element bearings with a design life rating exceeding 150,000 hours (17 years). As the lip seal condition deteriorated, it grooved the shaft or carbonized at the point of contact with the shaft, and lost its ability to effectively

seal the bearing enclosure. Lip seals are rarely replaced when they wear out.

Because of their temporary nature and unpredictability, contact seals proved to be inadequate to protect heavy duty bearings in severe duty process equipment. As a result, rotating equipment in the process industries was quite unreliable and catastrophic failures due to bearing degradation were commonplace.

All types of contact seals consume power and cause heating of the lubricant and the bearings. According to their manufacturers, the average power consumption of a lip seal is approximately 147 W/seal.

Bearing isolator progress

Beginning in 1977, bearing isolators gradually began to replace lip seals in industrial pumps in process industries. One by one, they proved that they could be an economic alternative to conventional contact sealing methods because of their longevity and their ability to perform in an absolute manner with respect to complete and permanent bearing protection.

Because of customer demand, bearing isolators were first installed by manufacturers of pumps and motors as options, and then as standard equipment on top-of-the-line products. Pumps that used to cycle in and out of the maintenance shops now performed for years without attention. Motors that previously had little or no standard bearing

protection were able to survive in hostile environments for five or more years. Manufacturers' warranties were adjusted to conform to field experience.

Bearing isolators generally cost five times more than a common rubber lip seal, but the cost of installation is about the same. As rotating equipment is routinely maintained and repaired, metal bearing isolators can be used over and over.

Cost justification

Because the cost of bearing isolators is greater than standard rubber lip seals, how can the additional expense be cost justified? The energy cost savings is one major consideration. For example, contact seals, including lip seals and face seals, consume significant energy

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while they are engaged with a rotating shaft and working effectively.

If a company has 200 contact seals (for 100 pumps) that operate 8766 hr/yr (continuous operation), the total energy consumed is 29.4 kW. If the energy cost is \$0.07569/kWh, the total energy consumption would be \$19,507 annually.

The payback period for the project can be calculated by plotting the cost to replace the contact seals with bearing isolators against the annual energy savings.

The savings are even greater when the repetitive cost of seal replacement, shaft repair, and component damage is factored into the decision. While bearing isolators may appear to be expensive when compared to contact seals, then savings may justify the replacement.

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