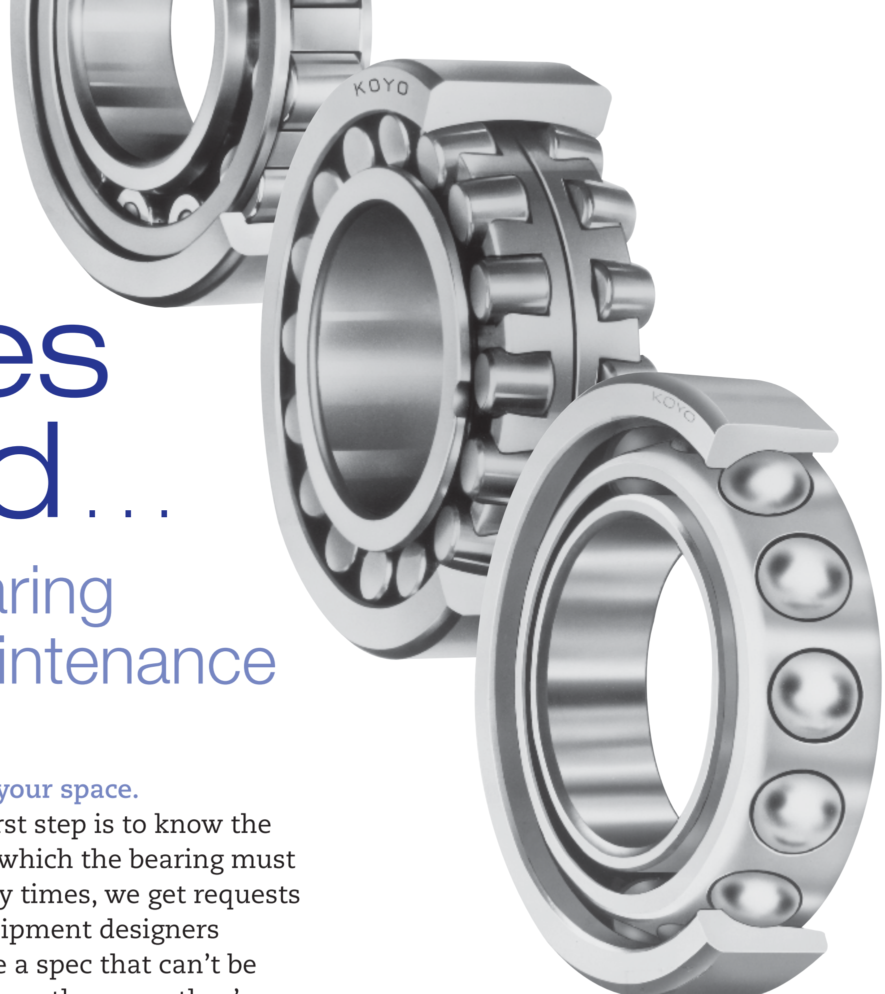

What goes around…

. . . depends on bearing selection and maintenance

BY CLAIR URBAIN

In every facet of production, the work rides on bearings. Whether you are an OEM engineer or the head of a maintenance department, you fully understand the importance of bearing selection on keeping equipment working.

Bearings fall into two main categories – naked or mounted. While both types require similar thought processes for proper selection, installation and maintenance, there are enough differences that it's best to approach them separately.

Naked bearings

Don Leonard, bearing engineer with Koyo Corporation of USA, says bearing selection is a logical, step-by step approach that can be used to leverage the capabilities of a wide variety of bearings available. "As bearing design becomes increasingly diversified, their application range is increasingly extended," he says.

To select the right bearing for the job, he recommends gathering the following information:

1. Know your space.

"The first step is to know the space in which the bearing must run. Many times, we get requests from equipment designers who have a spec that can't be met because the space they've allotted for the bearing is too small. Shaft rigidity and strength are essential in equipment operation, which drives the shaft's required diameter. The bearing's space needs to be adequate to accommodate the style of bearing to take the loads caused by the shaft," he says.

2. Know your loads.

The types and magnitudes of loads exerted upon the bearing must be known to select the right bearing. "Are the loads radial or axial? If it is an axial load, does it exert force in more than one direction? Does that load contain vibrational or impact forces?" he asks.

Leonard says that deep-groove ball bearings are able to handle radial loads with small axial loads; and angular-contact and tapered-roller bearings, in that order, can handle increasing axial loads. Pure thrust bearings cannot handle any radial load. "Spherical-roller bearings are best designed to handle mixed radial and axial loads with high misalignment," he says. "Cylindrical-roller bearings and needle-roller bearings are best suited for applications with high radial loads and no axial loads."

3. Identify shaft speed.

Once load type and magnitude are calculated, selection must consider rotational speed. Expressed as allowable speed in bearing specifications, it's driven by bearing size, cage, accuracy, load and lubrication. "Deep-groove ball, angular-contact and cylindrical-roller bearings are most often used in high-speed applications," Leonard says.

4. Level of running accuracy.

Just as a bearing may be required to run at a certain speed or load, running accuracy is often a critical factor. "Machine tool spindles require high running accuracy; gas turbines require high speed rotation and control equipment require low friction. All of these applications require bearings in Class 5 or higher," he says. Deep-groove, angular-contact and cylindrical-ball bearings are the most common choices for these applications.

5. Rigidity requirements for deformation resistance.

The rigidity, or ability of the bearing to resist deformation from the loads and forces placed on the rolling elements and raceway surface, can influence bearing selection. "Typically, roller bearings resist elastic deformation better than ball bearings and rigidity can be enhanced with a preload. In these cases, angular-contact and tapered-roller bearings are specified. The higher the rigidity of the bearing, the better they control elastic deformation," he says.

6. (In)tolerance for misalignment.

No installation is perfect and some are more imperfect than others. That's why certain bearings must be specified to compensate for shaft deflection from loads, engineering design or poor installation. "Excessive misalignment can damage bearings. The higher the self-aligning capability of a bearing, the greater the angular misalignment it can absorb. Self-aligning ball and spherical-roller bearings are most tolerant to misalignment, followed by angular-contact and deep-groove bearings, then tapered-roller bearings. Cylindrical-roller and needle-roller bearings are least tolerant of misalignment," Leonard adds.

7. Mounting/dismounting ease.

One final consideration in bearing selection is the frequency that the bearing will be mounted and dismounted for component or equipment inspection. "Cylindrical-roller, needle-roller and taper-roller

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Top reasons why bearings fail prematurely:

- Over/under lubrication
- Misalignment
- Improper fit or mounting that causes vibration, creep/scuffing
- Shaft burrs
- Improper bearing selection based on speed, operating temperature or improper seals
- Debris and dust contamination from the environment or in lubricant
- Improper grease/lubricant selection
- Water contamination

How to prevent bearing failures:

- Adhere to proper/consistent lubrication schedule
- Calibrate grease gun
- Clean grease fitting before re-greasing
- Identify the type of grease being used and make sure the grease used for follow-up lubrication is compatible
- Keep operating environment as clean and dust/debris free as possible

bearings with separable inner or outer rings work well in applications where the bearing must be mounted and dismounted frequently. A sleeve makes mounting self-aligning ball bearings and spherical-roller bearings with a tapered bore easier to mount and dismount for inspection purposes," he adds.

IDC Owner-Distributors can readily tap into bearing experts to identify the optimal bearing for your application.

Mounted bearings

Selecting and replacing mounted bearings for a specific application takes an organized approach, says Andrea DesCoteaux, vice president at Moline Bearing Company, a leading supplier of mounted bearings to IDC.

"Before you pick up the phone or get ready to send a fax asking for help in bearing specification, answer these questions," DesCoteaux says. She recommends gathering the following bearing and application information:

1. Type of application: Be specific. Your information may trigger additional questions from bearing professionals to hone in on an even better bearing option.

2. Type of operating environment. What's the ambient temperature and does it differ from the operating temperature at the site of the bearing? Are there any contamination factors?

3. Type of load. Are there radial, axial, heavy or impact loads? If there are, what are their magnitudes?"

4. Range of operating speed in rpm.

5. Precise shaft size.

6. Type of mounting. Is it vertical or horizontal? Two- or four-bolt pillow block, four-bolt or piloted flange or wide-slot take-up M mounting?

7. Specific lubrication requirements?

If it's a bearing replacement, the best place to start is by identifying the failed bearing. DesCoteaux says the failed or worn bearing offers helpful information. "Check the face of the bearing's insert and housing for part numbers and also check for a metal tag that's usually found around the grease fitting. Also, know your shaft size, housing style and whether the bearing is on the drive/fixed or free side of the shaft. Also note its locking mechanism – is it a set screw, eccentric or adaptor type of mechanism?"

"Like specifying a new bearing, you need to know the amount and type of load, the operating environment application speed and any specific reason for bearing failure," she says.