LUBE TECHNI-GRAM

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POTENTIAL CAUSES OF GEARBOX NOISE

Manufacturing plants and other work environments can be noisy. According to industry publications, the noise level one is subjected to standing only ten feet from a standard double-reduction speed reducer equates to about 90 decibels in acoustical terms. This sound, combined with sounds from other equipment such as pumps, motors, conveyers, compressors, and fans, can easily put certain quarters of a plant into the 140 decibel level . . . equal to that of a jet during take-off?

While a certain amount of noise is associated with gear drive units, excessive noise can be signs of potential problems. Take a speed reducer, for example. As a reducer turns, its components ... gears, bearings, shafts, cooling devices and lubrication, even its housing ... begin to vibrate. This structural vibration causes pressure pulsations in the surrounding air that a human ear detects as sound. Let any one, or more likely, a combination of those components get out of synch and the results are generally excessively noisy vibrations.

The vibration generated by gear mesh action creates the impetus for the most noise within a gearbox. Noise level and frequency are effected by:

- Type of gear teeth.
- Gear tooth geometry.
- Finished gear tooth surface
- Lubrication.

Factors such as transmission load and motor speed effect noise levels as well. Often, noise controlling factors can't be altered due to the machines performance requirement. In some cases, however, simply changing from a spur type gearing to a helical gearing can solve the problems with noise and vibration as this design offers the best maximum-to-minimum contact length ratio. However, one should always consult with their gear drive manufacturer to determine whether or not this solution is appropriate.

The quality of the gear manufacturing and finishing techniques also help reduce gearbox noise level. A smooth finished surface is desirable as normally, the finer the finish, the lower the

noise level. One should also be aware if the gears in machinery are hardened before cutting and finished after heat treatment. This process reduces errors and inconsistencies which can cause noise. Again, gear drive manufacturers can recommend the best finishing method for particular applications.

The housing of gearboxes should also be looked at as a means for controlling gearbox noise. The housing itself is not the source of the noise since it must be excited to vibration by rotating elements. However, using stiffened or ribbed housings may help combat resonant frequencies that contribute to objectionable noise levels.

What not to do

In an effort to quiet noisy gearboxes, the temptation arises to put in a thicker gear lubricant. Noise developed by friction forces not only varies with the roughness of the gear surface but also with the thickness of the lubricant film. While higher viscosity oils and greases can cut down on noise, they may not be well suited for the conventional gear unit and can create greater problems. Always consult the gear manufacturer's owners manual for the proper gearbox lubricant recommendation. Better to reduce noise levels using other methods than to tamper with thicker, less effective lubricants. Using a higher quality/High Viscosity Index (HVI) gear lubricant such as SWEPCO's 200 Series Gear Lubricants can assist in gearbox noise reduction through its superior thermal stability and ability to maintain proper viscosity thickness and film strength between gear teeth.

Troubleshooting noisy drives

One needs to be able to identify possible system conditions that cause noise within gear drives. Listed below are possible causes of excessive noise and suggestions for remedies:

Shaft misalignment. Both input and output shaft misalignment can cause noise within a speed reducer. Misalignment may be present on start-ups or on drives which have operated for a long time.

Coupling wear. Usually the result of shaft misalignment or improper lubrication.

Cascading load by the application. If driven equipment operates with less than constant velocity, gear mesh oscillation occurs resulting in an erratic noise. To correct, disconnect the output coupling and operate the drive. Listen if the noise goes away or changes its pattern. Typically, this problem occurs on new start-ups or with system upgrades.

Bumps on pinion or gear. May occur at installation or after repair. If the noise seems random, inspect gear teeth for tiny, shiny sports.

Flexing foundation. A solid, flat foundation is needed to support the reducer and its transmitted torque. Check for flexing at start-up or after a system upgrade.

Loose foundation bolts. Inspect bolts for proper tightness. Loose bolts allow the reducer to move or deflect about the foundation and result in noise.

Excessive tooth wear. Listen for a rumbling noise. Compare both sides of the tooth profile. If there is a significant difference in the shapes, contact the manufacturer.

Failed bearing. First, measure axial float. If the float is within specifications, visually inspect for surface distress. Catching roller bearing damage early minimizes related damage.

Torsional problem. Every system has a critical range of operation either below or above normal operation speed. A torsional problem produces an erratic noise and may show up at a new start-up or after system upgrade.

Today, there is a variety of good monitoring equipment that can measure noise and vibration levels. It's designed to provide hard copies or vibration signatures that establish a history or baseline for a customers drives. Once again, when other checks prove negative, the customer should not hesitate to contact their manufacturer for assistance.