BOOK REVIEW

The Gear Analysis Handbook by James L. Taylor Vibration Consultants Inc.

Reviewed by Robert E. Smith

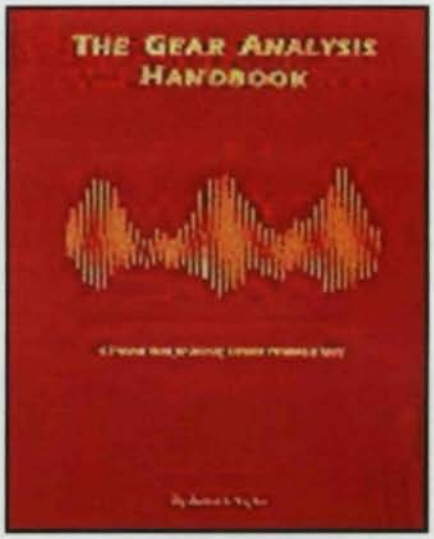
The author has written this book primarily from the viewpoint of analyzing vibrations on heavy industrial and mill gearing that may have been in service for a prolonged time. The purpose is to diagnose problems, especially the source or cause of failure. However, the principles and analysis techniques can be used for all types and sizes of gears, as well as for gear noise analysis.

Gears are of complex geometry, and there are many possible sources of problems, including the mounting or assembly (housing). The author has done a very thorough job of describing the techniques of analyzing vibration signals, both in the time domain as well as the frequency domain (FFT). He has stressed the importance of looking at time-based signals. Many times, engineers look at only the frequency spectrum and will miss some very important data or the fact that something about the gears has distorted the spectrum or made the data useless, such as nicks and burrs or overloaded signals.

There are many bits of information in a gear vibration or noise spectrum besides just mesh frequency. The author has been very thorough in describing the causes of "unusual" peaks in a spectrum (other than mesh frequency and harmonics of mesh). These are such things as 1/2 and 1-1/2 harmonics of mesh, which occur quite often.

Some other unusual peaks are "ghost harmonics." In the gear trade, these are peaks caused by "undulations," which are a unique form of waviness on the gear teeth, caused by kinematic errors in the gear train of the machine that produced the gear teeth. The culprit is usually the final drive gear, mounted directly on the workspindle. There has to be an integer number of waves around the product gear, which is equal to the number of teeth on the workspindle drive gear. Ghost harmonics are the type of thing that submarines have looked for in the analysis of sonar data. They were used to identify ships and the machines that produced the marine drive gears on the ships. Current AGMA and ISO standards on gear tooth surface finish and texture describe this ghost harmonics phenomenon.

Chapter 10 is a good place for any technician or engineer to start when thinking about making vibration or noise measurements of gears or a gearbox. The rest of the book goes a long way to guide the person in methods and techniques of getting the most information out of the analysis. ○



The Gear Analysis Handbook, ***ISBN 0-9640517-1-0, was published in 2000 by Vibration Consultants Inc. The 256-page book costs $109.95 plus shipping. It can be ordered through Vibration Consultants Inc., by calling (813) 839-2826, by sending e-mail messages to*** **info@vibcons.com** ***or by visiting*** **www.vibcons.com.**

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