Book Review

Machinery Vibration: Measurement and Analysis, by Victor Wowk. Published by McGraw-Hill, New York, NY, USA, 1995, 358 pp.

This book is intended to be a companion text to a 3-day workshop designed to demonstrate concepts and to practice techniques in the field of vibrations. The objective is not to provide a solid mathematical foundation, but instead to train engineers to take vibration measurements and interpret the results. In the reviewer's opinion the author did a good job explaining the use and characteristics of a wide variety of transducers and in sharing his personal experiences. Besides helping field engineers and technicians interpret vibration data, this book can also be of great help to engineers who have a solid mathematical background in vibrations but little practical experience.

The book is organized in 10 chapters and four appendices. **Chapter 1** is an introduction to the field of vibration analysis and uses practical examples and financial considerations to illustrate the importance of studying vibrations. **Chapter 2** gives a very brief overview of the field of vibration analysis and its history. The areas of wind and earthquake loading, music, acoustics, finite element analysis, modal analysis, vibration testing, shock, and machine monitoring are briefly explained and related to the study of vibrations.

The basic concepts and theory necessary to study vibrations are covered in **Chapter 3**. No previous knowledge is assumed and the approach taken is to present only the mathematics necessary for machine monitoring. This chapter can be skipped if the reader has some knowledge of vibration analysis.

The largest chapters of the book are **Chapters 4 and 5**, where the use of transducers and vibration analysis techniques are explained. **Chapter 4** covers the instruments used in vibration analysis and measurement, starting with the oldest ones: the ears, hands, and watch. The use of displacement probes, velocity transducers, and accelerometers is discussed, with concentration on the latter. Most of the chapter is spent on fast Fourier transform analyzers and their characteristics. Discretization, aliasing, leakage, and windowing are explained in a simple and easy to understand manner. The most typical problems such as imbalance, misalignment, resonances, bearings, gears, and motor vibrations are covered in **Chapter 5**. This chapter also treats problems involving fluids in motion, such as vane passing, cavitation, and oil whirl. The author shares his experience throughout the chapter by presenting case histories.

Acquisition and analysis of vibration measurements are covered in **Chapter 6**. The issues of amplitude mapping, transducer mounting, and phase relationship are addressed. Frequency domain tools such as Bodé, polar, and waterfall plots are explained, as well as time domain tools such as orbit plots and time waveform analysis. **Chapter 7** is a review of the process of analyzing vibration data, including a summary of common machine faults with their cause, frequency, and amplitude characteristics. **Chapter 8** deals with the topic of trending, addressing the issue of predictive versus preventive maintenance and presenting general guidelines to be followed in planning a vibration monitoring program. **Chapter 9** covers acoustics, an important field often overlooked by most vibration textbooks. **Chapter 10** presents some final remarks.

The book has four appendices: the first has a electrical schematic diagram of a tuneable bandpass filter. The second presents general guidelines to be followed in solving a vibration problem. The third appendix has vibration specifications for acceptance testing of new

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or rebuilt machinery, including a list of industry standard **Appendix 4** has a few useful conversion formulas.

Overall this is a useful book, that has plenty of examples, personal insight, and case histories that are of help to engineers involved in solving field problems or who are trying to gain more insight into the practical aspects of vibration measurement and analysis.

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