

MECHATRONICS

BOOK SERIES

SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 2

Editors

Md. Raisuddin Khan

Md. Mozasser Rahman

Muhammad Mahbubur Rashid

Shahrul Na'im Sidek



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CHAPTER 6

VIBRATION BASED PREDICTIVE MAINTENANCE : COMMON ROTATING MACHINERY FAULTS AND THEIR SIGNATURES

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6.1 Introduction

Predictive maintenance method makes use of human senses or other sensitive instruments like audio gauge, amplitude meter, pressure/ temperature strain gauge, vibration analyzer, etc. In this maintenance, equipment conditions are measured continuously. It helps determine the condition of in-service equipment in order to predict when maintenance should be performed. Operating cost can be reduced caused by improved efficiency and productivity, and greater utilization of production time.

The predictive maintenance philosophy of using vibration information to lower operating costs and increase machinery availability is gaining acceptance throughout the industry. Vibration is one of the methods used to determine machinery condition. It is the most effective method in predictive maintenance. Figure 6.1 shows most common maintenance methods.

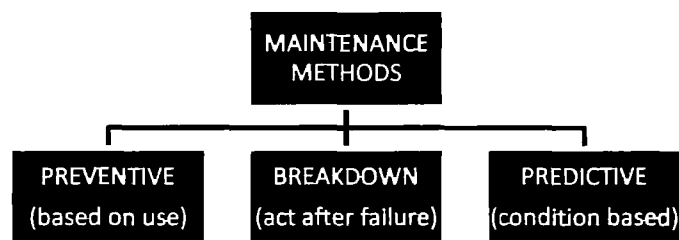


Fig. 6.1: Maintenance techniques

6.2 Common Rotating Machinery Faults

Every machinery fault generates different or unique set of vibration components and characteristics. Some of the most frequent faults patterns are imbalance, misalignment, bearing fault, bent shaft, critical speed and resonance, rotary perturbation and mechanical looseness. Their definitions and vibration signatures are given below.

6.2.1 Imbalance. Unbalanced rotary parts are primary cause of failure or disturbance. Simple unbalance (imbalance) occurs when the center of mass of a rotating object differs from the center of rotation (static unbalance). It also occurs when rotation axis does not coincide with the principal axis of inertia of the rotating body - often called dynamic unbalance. Figure 6.2 shows both center of mass and center of rotation.