

## **VIBRATION MONITORING AND CONTROL**

### **1. What are the ill effects of vibration in a plant:**

Vibration occurs in every rotating or reciprocating machinery as a consequence of forces which are generated in such machines. These could be due to a variety of causes, such as rotor imbalance, misalignment, faulty bearings or gears, eddy currents, electromagnetic forces etc. These forces act through the bearings to move the stationary parts of the machine. If these forces are left unchecked, the following consequences are to be expected:

- 1.1 Lower bearing life – unexpected plant shutdowns.
- 1.2 Energy wastage due to kinetic energy required for vibration.
- 1.3 Operator fatigue and nuisance.

### **2. How do we measure vibration in a plant or at site and with what accuracy?**

Unless specific standards for specific industry apply, the guidelines given in IS 11724 are a good guide for assessment of vibration severity on rotating and reciprocating machinery which runs between 600-12000RPM. The standard is identical to globally employed Standard ISO-2372. In essence, the standard specifies how and what to measure, and also classifies various types of machines into different categories depending upon their size and foundations. It then lays down relative quality grades depending upon the measurement of Vibration Velocity. It also emphasizes the use of True-RMS Velocity as the preferred parameter for severity assessment. However it does not mandate any acceptability criteria, and leaves that to the discretion of the user. This is where experience of the maintenance manager comes in. It is essential to periodically track the vibration severity as measured by Velocity (mm/sec true-rms) at specified points on the machine, and to gain insights into whether a Quality level B is good or C is acceptable for a given machine.

It is our experience that uncontrolled levels of vibration in Indian context normally hover around C to D levels, and it takes conscious efforts described later to get these to stay within B levels. It may take enormous efforts to reach A levels and this is generally done only in case of machines where vibration directly affects the quality of the output (As in surface finishing machines). It is also our experience that levels controlled to B levels result in an exponential reduction of breakdowns and bearing replacement costs.

It is also to be mentioned that in Vibration, the normal range of accuracy is  $\pm 10\%$ . Since a lot of factors affect the vibrations, such accuracy levels are considered adequate internationally. The action points normally occur at a change of 50% or more in vibration levels at the same point on a given machine.

### **3. How do we control vibration?**

Based upon our experience, we find that imbalance is the No 1 cause for vibrations in rotating machinery. Whereas in most cases, the imbalance can be controlled by simple field-balancing techniques, there are some cases where balancing does not seem to work very effectively. Such cases often pose challenge to the engineers and might require the services of outside experts, and yet sometimes the solutions can be amazingly simple.

In most cases, the technique of *Frequency Analysis of Vibration* (also known as *Spectrum Analysis*) is essential to get to the root cause of the vibration. This technique is based on the fundamental concept that if there is a vibration at a certain frequency, its cause must also be at the same frequency. Thus frequency information of the vibration is essential to fault-finding. A wealth of information exists on the internet and otherwise on interpreting the results of Frequency Analysis.

Further, a maintenance managers work is made easier by the installation of a system of Periodic Vibration Assessment. This is nothing but a systematic collection of Vibration Spectra at periodic intervals on specified points on critical machinery. Techniques such as *Spectral Enveloping* and *trending* are invaluable for keeping a check on vibration and also in effectively preventing breakdowns in a plant.

### **4. What are the benefits of vibration control in the industry?**

The benefits are obvious, to say the least. The cost of instrumentation and development of in-house expertise is often recovered in one single breakdown prevented by these. Payoffs are often immediate and long term effects by way of reduced breakdowns, energy savings and cost of replacement parts is so significant that almost all process plants find it better to invest in such systems.

### **5. What are the systems and service we offer?**

Baseline Technologies offers state of the art instruments for vibration measurement, analysis and in-position balancing. Details of the same can be found on our website [www.baselinetechno.com](http://www.baselinetechno.com)