Machine Vibration and Temperature Monitoring

Mine Monitoring

To monitor the vibration of a machine there are two basic conditions, which are:

1) **Monitoring of the High Frequency vibrations.**

   These occur when the bearings or rolling elements and races of bearings become worn or impeded. This measurement is a measurement of force and it is measured in G (1G = 9.81ms^{-2}).

2) **Monitoring of the Low (fundamental) Frequency.**

   This is a velocity measurement that is measured in mm/s and is used to detect out of balance conditions, such as those caused by fan blades catching, or out of balance conditions.

NOTE: The above frequencies are standard, irrespective of size or type of machine.

High Frequency Monitoring of Bearings etc

The frequencies that occur are a combination of the fundamental speed (see above) multiplied by the bearings and races. This gives a nominal High frequency (default frequencies are readily available from bearing manufacturers), however as a guide we use 500 RPM to 10,000 RPM. There is a standard sensor PCB Card suitable for these frequencies.

High Frequency is measured in G = Acceleration. G is a measurement of force. As a guide, bearings in good condition run at approximately 1G.

Trip levels are normally set at approximately 1G above nominal quiescent running level for the machine.

To determine the Low (fundamental) Frequency

Take the motor or drive units' rotational speed and divide it by 60.
There are basically 3 types of machine to monitor.
These are 2 pole, 4 pole and 6 pole.

If supply frequency = 50Hz

No. of poles:	2	4	6
N (RPM):	1000	1500	3000

In general, $N = \frac{60F \times 2}{P}$ (P is no. of poles).

Therefore, the Fundamental Frequency is 16.5Hz, 25Hz, and 50Hz for these 3 standard machines.

Vibration Sensor

Austdac can supply a low frequency PCB, designed to detect the frequency ranges from 1-100Hz. The measurement is in velocity, mm/s. As a guide, most machines in good order will run at between 1.0 - 1.5 mm/s.

Typical machines will run up to 5mm/s before they need attention. When a major fault occurs readings will go up to 30mm/s. Trip levels are normally set at say 1 mm/s above the quiescent level.

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Special Conditions

If a special condition needs to be monitored that is outside the above conditions, customised PCB's for these special applications are available. Details are available upon request.

Vibration Monitoring and Location Positioning of Vibration Sensors

The best place to mount the sensor (accelerometer is at a position that is directly opposite the loaded part of the curve i.e. on the rise after shaft bottoms out.

As an example, relative to a clock face, the ideal position is to locate the sensor at a position of "10 to", or, "10 past", the hour, eg for clockwise rotation the sensor needs to be situated at 10 past. For a machine with an anti-clockwise rotation the sensor is installed at the "10 past" the hour location.

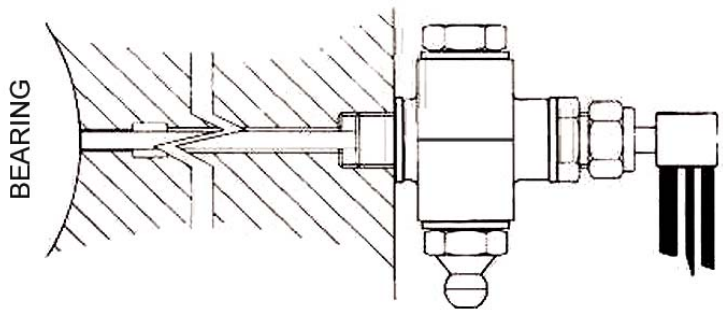
Temperature Monitoring of Drive End and Non Drive End

A machine grease pipe is usually fitted with 8mm, 10mm, or 1/4inch BSP grease nipples. A greaseway adaptor to suit the above threads is available. The adaptor is sometimes called a crucifix adaptor because of its shape.

To fit a temperature monitor the grease nipple is first removed and a greaseway adaptor fitted into the grease nipple threaded orifice. The right angle temperature probe is then inserted into one outlet of the greaseway adaptor and the grease nipple re-fitted to another outlet of the greaseway adaptor.

A probe to suit greaseway in PT100 or other models is available. A 1mm clearance all round the grease shaft allows for adequate greasing. Motor manufacturers such as Morley, Brush, etc have approved this.

A 5mm-temperature probe is ideal for a 8mm-grease pipe. The actual insertion length of the grease pipe is required to enable the correct PT100 or other unit to be supplied.



Greaseway adaptor with Temperature probe fitted

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