ECCENTRICITY ANALYSIS

IDENTIFIABLE FAILURE MODES

- Electrically induced vibration due to uneven airgap

DESCRIPTION

Eccentricity exists in a motor that has an uneven air gap between the stator and the rotor. Static and dynamic eccentricity are caused by different factors however the result of both is electrically induced vibration that reduces the life of bearings, has the potential for stator/ rotor rubbing and damages insulation systems by inducing vibration into the winding overhang.

Eccentricity analysis is carried out utilising specific current clamps and a FFT signal conditioner (high resolution frequency spectrum analyser). Software programs enable easy calculation of eccentricity frequencies and their amplitude for analysis.

For low voltage motors the current signal is captured utilising current clamps directly on the motor phase cables (up to 5000 Aac). For high voltage motors the signal acquisition is by utilising the motors current or protection transformers.

ANALYSIS APPLICATION

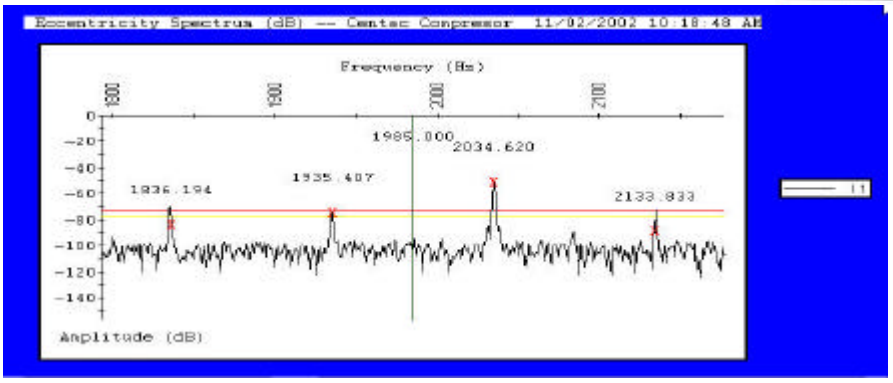
Eccentricity analysis is performed on AC induction motors, AC synchronous motors and AC wound rotor motors. Eccentricity analysis is particularly useful on large HV motors with separate bearing pedestals that are separate from the main frame of the motor.

The eccentricity frequency must be calculated and identified from the spectrum to allow for accurate analysis. The eccentricity frequency will normally be between 600 and 2000 Hz based on the rotor construction and motor speed.

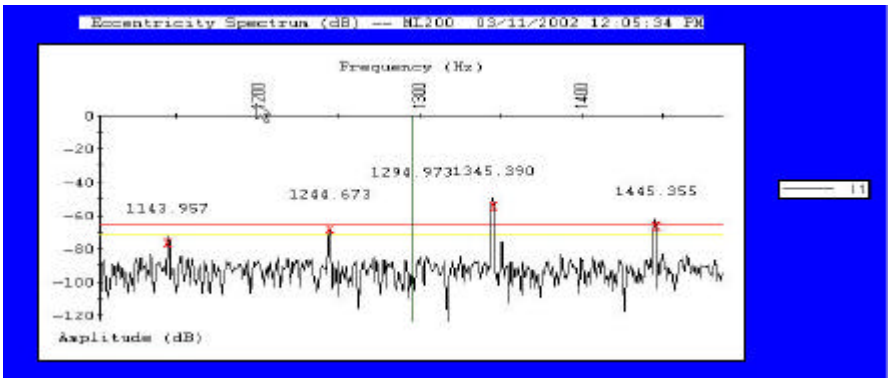
APPLICABLE STANDARD / ACCEPTANCE CRITERIA

There is no applicable standard for this test.

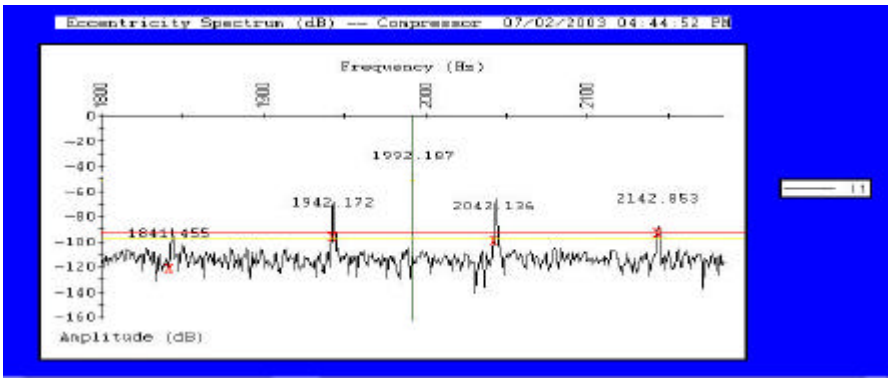
The guidelines for identifying alarm level eccentricity frequencies are : 4 peaks at 2 times line frequency that are not synchronous to the line frequency and are 20 dB higher that the average floor noise level.



Electrical induced vibration in Centac compressor identified as eccentricity in motor due to mounting problem.



Eccentricity identified in belt driven equipment due to improper alignment and maintenance procedures.



Eccentricity identified in HV motor. This motor failed in service 2 months after these readings were taken. Root cause analysis of the failure indicated vibration of the endwindings had caused the coil insulation to fail.

Excessive heat generated in rotor due to severe eccentricity.
This motor was constantly tripping on vibration sensors fitted to the compressor. The vibration would cease with the cutting of power to the motor.
The heat was transferring to the stator windings causing advanced thermal aging to the stator windings.
Dimensional checks identified the stator core was misaligned in the frame by 3.4 mm.