

Case History No.3 BEARING OUTER RACE DEFECT

A request came into AVT's site office to carry out a vibration survey on P9917 (VIL) pump on the Shop PU, as there was a suspected fault with the electric motor.

This machine did not form part of the routinely monitored items and therefore no historical vibration data was available

Once the speed and bearing types were identified random points could be set-up in the data collector for the 5 locations on the motor, these being the NDE in both the vertical & horizontal planes, and the DE in the same planes, along with an axial position

A frequency bandwidth of 2000 Hz was selected, as this was regarded high enough to capture any possible bearing defects.

Overall and spectral vibration data was collected from all the databased points and then uploaded to the Vibration database held on the AVT office computer.

Examination of the vibration spectrum indicated frequency components that would be attributable to bearing damage, with the highest overall reading recorded at the motor NDE bearing in the horizontal direction, however, the spectrum indicating the most informative signature was recorded in the axial direction.

Evident on this signature is a peak at 155 Hz, along with harmonic activity thereafter, see Figure 1 below.

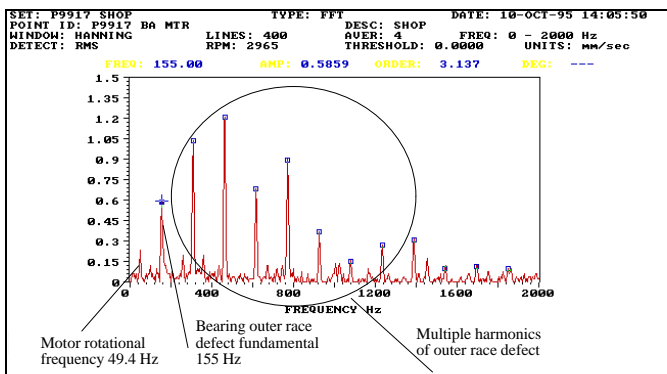


Figure 1 - Identification of spectral components.

This 155 Hz peak was attributed to a defect on the outer race of the motor NDE bearing, (ref SKF 6314-C3) and was determined by the following calculation :-

BPFO = 0.5 Nn (1-(d/D) COS β where :-

N = Motor speed divided by 60 = 49.4 (Hz)
n = Number of balls or rollers = 8
d = Ball/roller diameter (mm) = 24 mm
D = Pith diameter (mm) = 110 mm
β = Contact angle of ball to race = 0

$$\therefore 0.5 \times ((49.4 \times 8) \times (1 - (24/110))) \times \text{COS } \beta = \underline{\underline{154.5 \text{ Hz}}}$$

Figure 2 below shows the vibration spectrum taken from the same test point on the motor after bearing renewal.

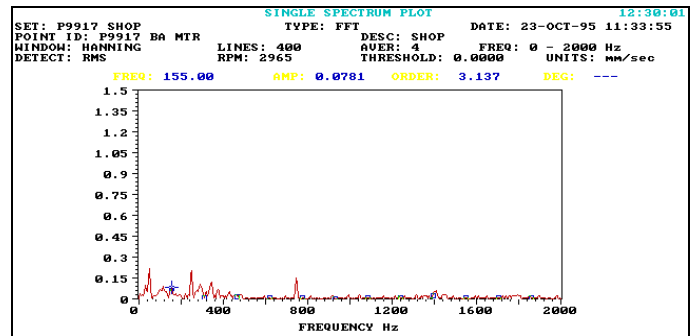


Figure 2 - Spectral activity recorded from the new bearing.

Findings. On examination of the motor NDE bearing, an area of metal loss, (flaking), of approximately 6mm diameter was evident on the outer race of the bearing, see Figure 3 below.



Figure 3 - Pictorial evidence of correct defect analysis.