

Case History No.11 MOTOR DRIVE END BEARING FAILURE

P9801A & P9801B pumping units are responsible for the circulation of Santotherm 66 (a heating medium typically at an operating temperature of 296°C). Both machines form part of the C.I.M.A.H regulation 1984 (Control of Industrial Major Accidents Hazards) and are critical to the SHOP PU manufacturing process.

Each pump is powered directly by a 950 kW (1200 hp) Mather and Platt AC motor with a rotational speed of 1485 rpm of which both units form part of a 5 weekly routine vibration monitoring schedule.

This case history highlights how machinery vibration data (both overall and spectral) was used to detect a particular component defect on P9801A's motor drive end bearing.

Vibration data is collected from the motor non drive end and drive end bearing locations in the horizontal, vertical and axial directions. The overall vibration levels for the motor bearings up to April 1997 were typically around 1 mm/s rms and had never given cause for concern during this period. P9801A machine was taken off line and P9801B machine was put into service (only one machine is in service at any one time).

When the two machines were again service rotated some 4 months later a 'step change' in the overall vibration levels was observed at both the non drive end and drive end of the P9801A motor see Figure 1 below, the pump vibration levels remained unchanged. Vibration levels recorded at the motor drive end bearing were higher than the non drive end bearing thus indicating the source of the problem to be in this area, however the cause was not yet known.

Vibration spectra were collected from all the motor test points as it is this spectral information that enables the analyst to determine the fault type(s) and thus make the necessary recommendations.

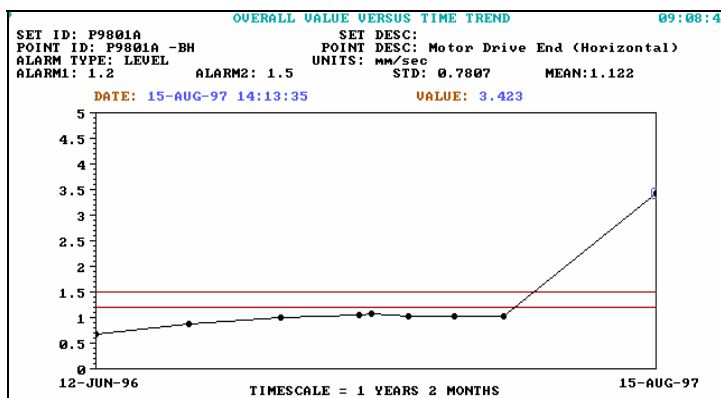


Figure 1 - Step change in overall vibration

Analysis of the vibration spectrum indicated a large amount of spike energy along the 2kHz frequency range, from this information several fault types could be eliminated i.e. balance, alignment, coupling problems etc. The information

in the vibration spectrum initially pointed to a suspect drive end bearing, however, further analysis of the vibration spectrum would have to be carried out. Once the bearing fundamental defect frequencies had been determined I was able to link some of these frequency values to the frequency peaks evident in the vibration spectrum. In doing so, I identified a fundamental defect frequency of 215Hz strongly suggesting a fault on the outer race/roller of the single row roller bearing at the motor drive end, see Figure 2 below.

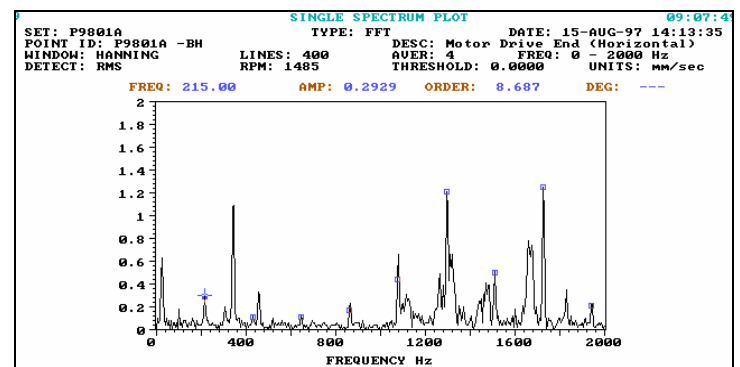


Figure 2 - Vibration spectrum indicating a bearing problem

Examination of the original bearings proved the analysis to be correct as several areas of damage were evident on the roller bearing outer race, and also on the rollers themselves. The photograph below is clear evidence of this damage.

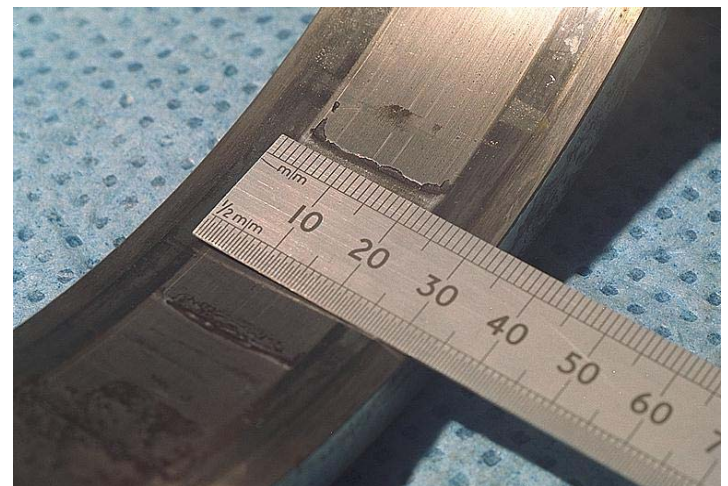


Figure 3 - Damage to roller bearing outer race

Due to accurate analysis and prompt action secondary damage to the motor components was prevented with an estimated repair cost saving in the order of **£20,000** and clearly indicates that **'Machines Talk and it Pays to Listen'**.