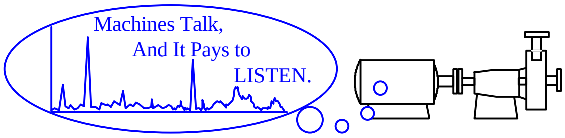
A V TECHNOLOGY LIMITED



Case History No.5

K9451 COUPLING IMBALANCE

It all started with a 'phone call to the on-site office from a concerned PU Engineer, who requested a vibration survey on one of the units large steam turbine driven Demag compressors during commissioning back into service after a planned shutdown. The Engineer had been informed that the Bently Nevada on-line condition monitoring system was registering higher than previously experienced vibration levels on the turbine.

Historical data recorded on our on site database revealed that vibration levels prior to the process unit shut down were normal for all bearing cap readings and also the Bently Nevada displacement probe data. Bearing cap readings that day were typically below 2mm/sec rms and gave no cause for concern. However, during start-up with the machine running at 7170 rpm, the Bently Nevada probes indicated the highest overall shaft vibration relative to the bearings of about 32 microns. When the running speed was increased to 8500 rpm the highest overall shaft displacement increased to over 43 microns see Figure 1 below.

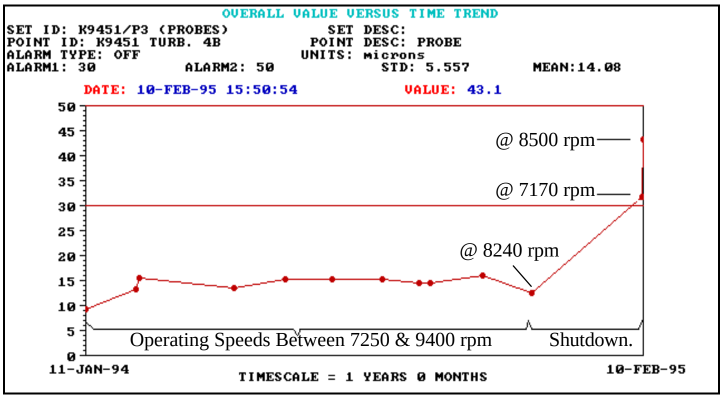


Figure 1 - Trend plot indicating overall vibration level changes.

Examination of the vibration spectrum exhibited a dominant component at the running speed frequency with an amplitude of 38 microns pk-pk indicating a probable imbalance condition of the turbine rotating element. Further questioning revealed that a new rotating element had been fitted to the turbine during the January 1995 shutdown, strongly suggesting the turbine as the source of vibration, as levels on the compressor exhibited little change from previous tests. To confirm this, the turbine was uncoupled from the compressor and run up to 7250 rpm with the coupling boss still in place. The running speed component was now less than 10 microns, clearly the turbine rotor itself was not at fault and attention switched to the coupling.

As this was the same coupling that was producing under 15 microns prior to the shutdown, suspicion turned to the build up of the coupling and its associated packing pieces/shims. During inspection of the coupling it was noticed that the spacers between the coupling bosses and the spool piece had been fitted in a different configuration to that prior to shutdown. The coupling was re-fitted according to all the match-marks and the coupled unit was run up to 9000 rpm. Highest reading of around 10 microns clearly indicated that the source of the imbalance had been correctly located and rectified. See Figures 2 and 3 below (before and after)

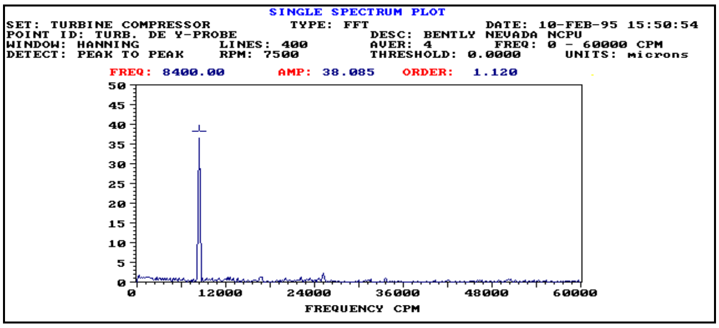


Figure 2 - Before coupling correction

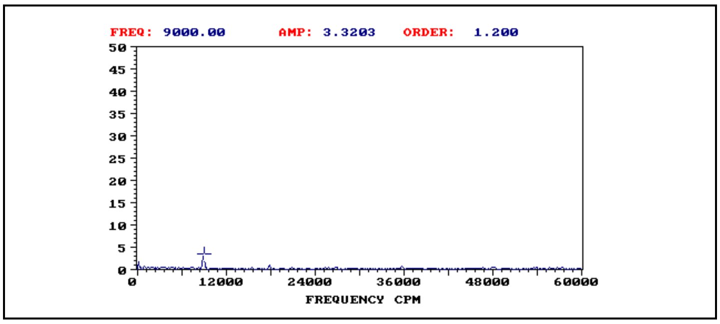


Figure 3 - After coupling correction.

The process unit was brought on-stream 12 hours ahead of the planned schedule, generating approximately £50,000.00 of extra production. Due to the prompt action in determining and correcting the problem, thus preventing any secondary component damage such as a wiped turbine drive end bearing, it is estimated that the cost savings due to this action would be as follows :

assuming damage to the turbine bearing had occurred,

time to repair bearing	2-3 days lost production at £50000.00/day
material costs	£25000.00
Total estimated savings	**£175,000.00**

David Stevens IEng MIET Consulting Engineer