

Case History No.14 K3851A CENTRIFUGAL COMPRESSOR STAGE IMBALANCE

This machine K3851A forms part of the two weekly condition monitoring routine carried out on unit 3850, which is part of the PPLS plant at Montell Carrington. This machine is one of three machines which provide the instrument air for the whole of the site, so breakdown or failure of any of these machines could have an impact not just on the plant area where they are situated but the site as a whole.

The trend plot shown in Figure 1 shows a step change at the bull gear drive end during the vibration survey conducted on December 6th 1996. The overall value of 9.0 mm/s was the highest value that had ever been recorded.

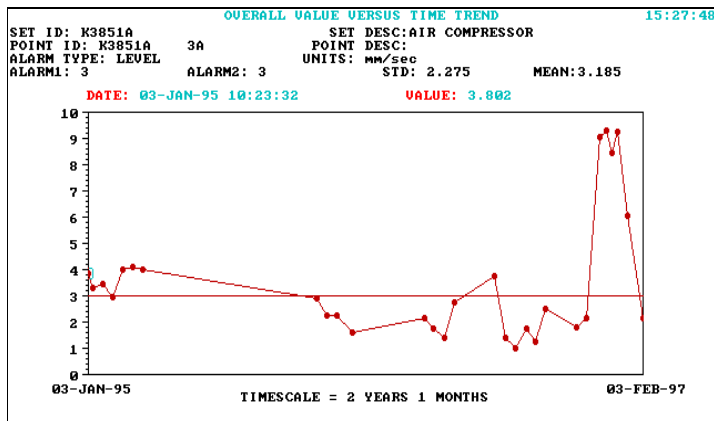


Figure 1

The spectrum plot shown below in Figure 2 was examined and it revealed a dominant peak at 1075 Hz was the major cause of the step change seen in the trend plot as shown in Figure 1.

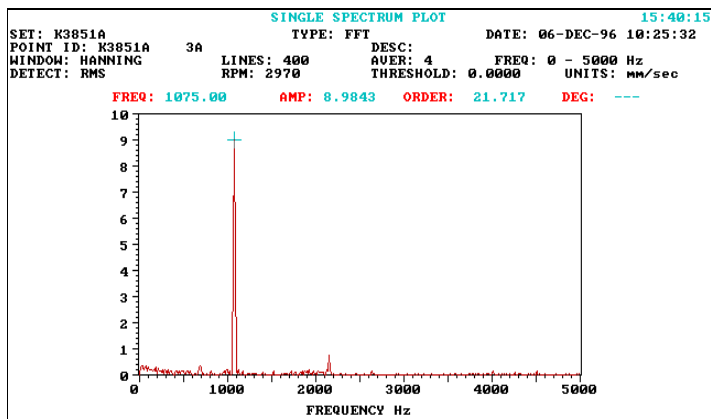


Figure 2

The spectrum plot shown in Figure 2 also indicates that an imbalance as the probable cause of the problem. The machine operating handbook was consulted and it was found that the running speed of the second stage was 64515 rpm which equates to a frequency of 1075 Hz.

This indicated that there was an imbalance in the second stage. The plant maintenance team were informed via the action note system and it was recommended that the second stage impeller assembly was checked for signs of a build up of debris and for signs of damage which would cause an imbalance.

The machine was due to be serviced in approximately three months but the plant maintenance team decided to bring the service forward. The service report found that there was a build up of dirt and corrosion on the impeller vanes. The deposits were also found on the diffuser intake ring. There was also evidence that the impeller had been in light contact with the intake ring but there was no obvious damage to the second stage impeller. All the findings of the initial inspection are contributory to the step change in the overall value shown in Figure 1.

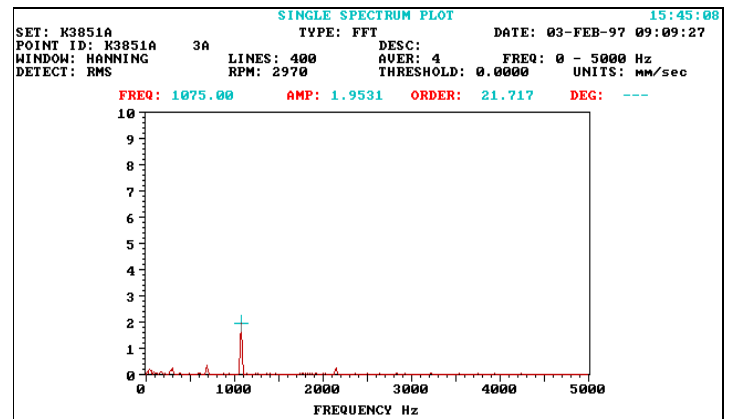


Figure 3

As can be seen the spectrum plot shown as Figure 3 taken after the service, the running speed component had reduced to an acceptable level of 1.8mm/s from the initial value of 9.0mm/s.

Taking into account the cost of a second stage assembly against the cost of the repairs, the findings of the vibration survey resulted in a cost saving of **£10,000**.

Mark Oliver Vibration Engineer