

## Case History No. 35 G3610A GLYCOL INJECTION PUMP GEAR COUPLING FAILURE

G3610A is one of two pumps which injects Glycol into gas separators, in order to remove any water. The normal process configuration is to have one pump running whilst another is on standby.

The machine is a three cylinder reciprocating Ram Process pump, driven at 194 rpm, through a step down Radicon gearbox, with a 7.6 : 1 ratio.

The running pump has vibration data collected as part of a monthly condition monitoring routine.

The trend plot shown in Figure 1 identifies a step change at the Pump NDE Vertical position, during the vibration survey conducted on 21 June 2003.

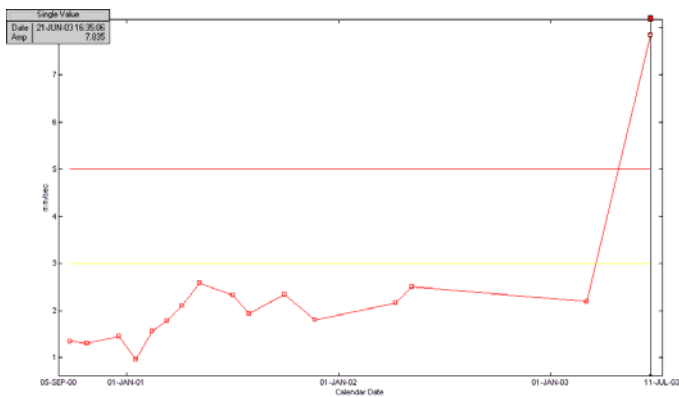


Figure 1

There are similar increases in both the axial planes on the pump and the axial plane on the gearbox DE output shaft. The spectrum plot in figure 2, shows that the dominant component is at 10Hz. The spectra taken from all the axial positions of the gearbox output shaft, had similar results.

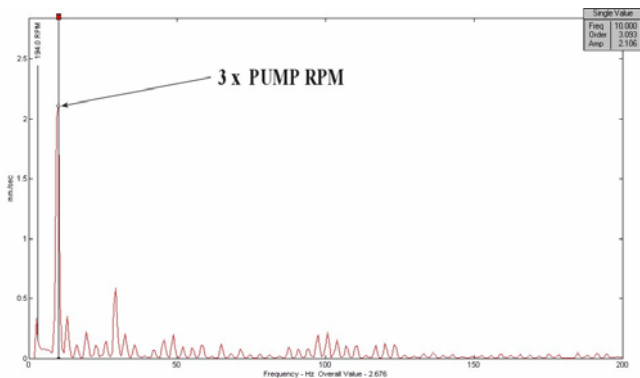


Figure 2

10Hz equates to 3 x fundamental frequency, which is being generated by the 3 torque reactions, as each piston is being driven in the pump.

In the radial plane, the vertical vibration was much greater than the horizontal and combined with high axial vibration, indicates probable misalignment had developed across the output shaft coupling.

The coupling between the gearbox and pump is a gear coupling, as shown in Figure 3.

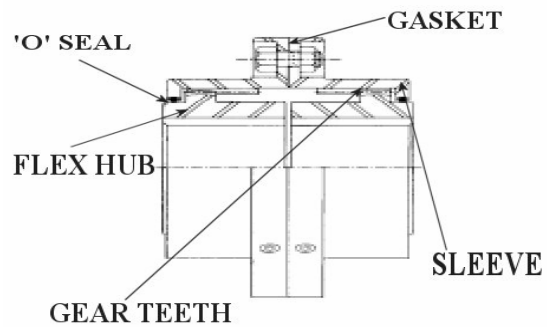


Figure 3

The gear teeth allow for any axial movement and angular offset, as well as transmitting torque; they also have a certain amount of backlash, allowing for lubrication. If there is no lubrication, these couplings can become locked and will develop high axial and radial forces.

It was decided to inspect the coupling between the gearbox and pump.

It could be seen that some of the internal gear teeth on the sleeve had disintegrated and that there was damage to the flexible hubs outer teeth, as shown in figure 4.



Figure 4

This prevented any angular or axial movement in the coupling, causing high axial and radial forces to be transmitted as vibration.

The coupling, the gearbox DE bearing and both the pump DE & NDE bearings were replaced.

Figure 3 shows the spectra taken at the pump DE axial position before and after the coupling was replaced.

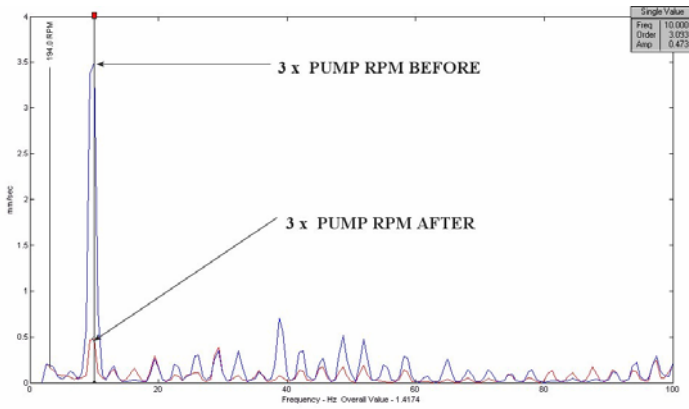


Figure 5

The vibration levels are now at an acceptable level of 1.72 mm/sec, having been 7.84 mm/sec prior to the coupling change.

The findings of the vibration survey saved potential damage to the gearbox and pump. Taking this into account, the total cost of a gearbox and pump overhaul plus labour costs would have been around £20 000.

The second pump would then have become a critical part of the production process. Should this pump fail for any reason it would result in a total loss production.

The cost of a new coupling and 3 bearings were less than £1000.

John Sykes CM Consultant