DIAGSOL

CASE STUDY

A pre-2000 PET Bottling Line Main Gearbox/ Pinion Bearing

Scope

Diagnostic Solutions (DIAGSOL) specialises in the monitoring of canning and bottling assets across Europe. This case study illustrates an example of the type of mechanical wear issue that can cause days of production downtime in a production environment that operates customer-demanded-batch Just-in-Time manufacture.

The Asset and Monitoring Regime

This case study involves a Krones PET Rinser/ Filler / Capper installed within a UK factory from new in the mid-1990s. DIAGSOL has been monitoring key prime movers on this asset remotely since 2005. The monitoring system acquires several sets of machine-running datasets a day using vibration sensors fitted to the main drive/ main gearbox/ transfer gearbox/ rinser gearbox and capper gearbox. This fault was detected on the output shaft of the main gearbox driving the main filler carousel gear train.

Chronology of the fault

Initially, the velocity levels on the main gearbox output increased from typically 2mm/s to exceed 5mm/s in early April 2021 *(as seen in Figure 1)*. The site engineers were informed and asked to check for any looseness or signs of low lube as is normal in this type of increase. Engineering feedback stated there was no looseness and the gearbox oil levels were correct; an oil sample analysis showed no obvious wear particles.

The levels increased again through May 2021 and a more detailed inspection showed gear wear – *(see Figure 2, picture of damage)*. DIAGSOL engineers looked at the raw FFT and time domain data and multiple gear-mesh harmonics were dominant. The OEM gear set was 10-week delivery; hence the site engineers had a pair of gears printed as a temporary measure; these were fitted two weeks later.

The levels increased again fast through July (using the temporary printed gears) – as you can see from Figure 1; after the OEM gears were fitted in early August 2021, the levels dropped to pre-fault velocity levels of around 2mm/s RMS.

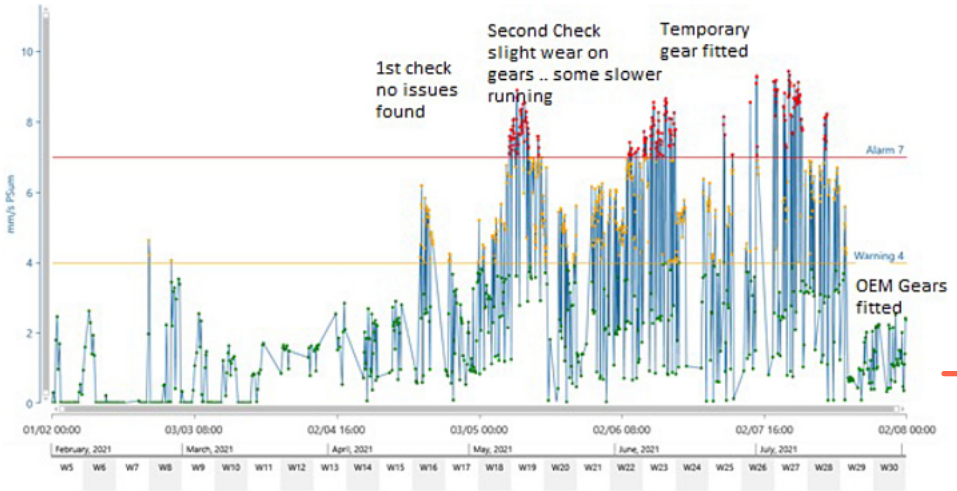

Figure 1
– GBX O/P ISO velocity trend

Figure 2
Damaged gears (after removal of guards)

Estimated Savings
of the Detection and Repair

All of the engineering interventions described in this case study were completed within scheduled maintenance slots.

We achieved a best-case scenario: the gears were wiped, and no secondary damage was incurred (it would take two days to remove, measure and have the temporary gears printed and installed, costing £10k/hour in downtime if unplanned intervention had been necessary **(the best-case LOSS avoided was £480k)**.

In the likely event that the main gearbox and pinion bearing was also damaged, losses would have run to one to two weeks, at a cost **in excess of £2M**.

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