CASE STUDY: MAINTENANCE & RELIABILITY

BEARING FAILURE INVESTIGATION

Problem

A large process machine was experiencing repeated angular rolling element thrust bearing failures. The periodic vibration data collected by the operator showed limited trend information and not sufficient information immediately prior to failure to provide clear indication of cause of failure. There was no vibration information available from their DCS or data historian as there were no permanently installed transducers, however, there were temperature inputs on each of the bearings.

Solution

The initial review of documentation confirmed that the angular contact bearings installed were the correct bearings.

We were able to gather data from the site DCS for the bearing temperature probes. These appeared to show no significant change from normal operating temperature, however, when examined in more detail, this was also found to be the case when the machine was off. As we investigated the field wiring for the temperature instrumentation we discovered that the temperature probes had been disconnected from the system and load resistors had been connected across the barriers instead to 'simulate' normal operating conditions.

Through the course of the investigation it was also discovered that the motor and gearbox driving the machine had been uprated to allow increased production. This had been done to allow the plant to move to a campaign-running regime to reduce utility costs. Analysis of the lubricating oil at the time of failure showed no contamination from any sources other than the damaged bearing.

A temporary system was installed to measure the end float of the machine during operation.
Over a period of approximately three months it was determined that changing process conditions were causing shuttling of the machine shaft. It was also evident that the thrust bearing was not capable of sustaining the increased loading as a result of the uprating of the machine. The bearing temperature monitors, since reconnected, were regularly in a warning state.

The short term solution to the problem was to re-rate the machine, reducing machine loading, and also change the control logic for the upstream process so that the process conditions that were causing the shaft shuttling were prevented. A business review was planned to determine whether it was cost effective to upgrade or replace the machine to allow increased production again.