



Case study

Investigating Cause of Bearing Failure

Frazer-Nash Consultancy was asked to investigate bearing failures on the 825kW diesel generator sets which provide the essential services electricity supply at a nuclear power station. Using a combination of on-site vibration measurements and root cause analysis, we identified the source of the problem as the clutch which transmits torque between the diesel engine and the electrical machinery. We proposed an interim fix to prevent further bearing failures, and re-designed the clutch mechanism for improved long term performance.

PEDESTAL BEARING FAILURES

The drive train comprising a DC motor and an AC generator is supported on pedestal bearings of Michelle tilting pad design. The pedestal bearing closest to the clutch between the electrical machinery and the diesel engines was suffering frequent bearing “wipes” where the white metal bearing surface is partially sheared off the backing pads.

It was believed that the bearing failures were due to misalignment between the two halves of the drive train, causing excessive journal loads and loss of the hydrodynamic film of oil between the shaft and the bearing pads.

ROOT CAUSE ANALYSIS

We carried out some vibration measurements to establish the dynamic behaviour across the entire range of drive train loading. It was demonstrated that the onset of the vibration was linked to a critical level of torque transmission through the clutch. It was proposed that an earlier modification aimed at improving clutch reliability had compromised the internal alignment of the clutch, leading to vibration and the bearing failures. This theory was substantiated by means of a Root Cause Analysis (RCA) based on the fault history and maintenance records.

DESIGN SOLUTION

The earlier modification to the clutch mechanism was implemented to reduce susceptibility to single point failure, and thus improve reliability.

This action was prompted by a long history of wear and stiction problems associated with the clutch components. We modified the design of the clutch to remove these problems.

Re-design of the centripetal clutch involved the following tasks:

- ▶ Solid modelling to re-engineer the main problem areas with respect to wear and stiction
- ▶ Centripetal finite element analysis to determine the internal dynamic loads
- ▶ Selection of materials for low friction and wear compatibility
- ▶ Selection of low friction bushes
- ▶ Production of manufacturing drawings

TROUBLESHOOTING SERVICE

By applying a powerful combination of on-site measurements, numerical modelling, and engineering design, we provided an effective troubleshooting service for resolving plant failures and plant reliability issues.

Client

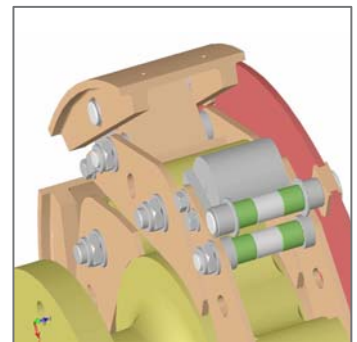
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Business need

Determine the cause of component failure in a diesel generator and rectify the problem with a long term solution

Why Frazer-Nash?

Frazer-Nash has a strong expertise in design and structural analysis using FEA modelling



For more information please contact Frazer-Nash Consultancy on **01306 885050** or **info@fnc.co.uk**