

Diagnosis of Intermittent High Vibration Peaks in Industrial Gas Turbine Using Advanced Vibrations Analysis

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Abstract : This paper provides a comprehensive study pertaining to diagnosis of intermittent high vibrations on an industrial gas turbine using detailed vibrations analysis, followed by its rectification. Engro Polymer & Chemicals Limited, a Chlor-Vinyl complex located in Pakistan has a captive combined cycle power plant having two 28 MW gas turbines (make Hitachi) & one 15 MW steam turbine. In 2018, the organization faced an issue of high vibrations on one of the gas turbines. These high vibration peaks appeared intermittently on both compressor's drive end (DE) & turbine's non-drive end (NDE) bearing. The amplitude of high vibration peaks was between 150-170% on the DE bearing & 200-300% on the NDE bearing from baseline values. In one of these episodes, the gas turbine got tripped on "High Vibrations Trip" logic actuated at 155µm. Limited instrumentation is available on the machine, which is monitored with GE Bently Nevada 3300 system having two proximity probes installed at Turbine NDE, Compressor DE & at Generator DE & NDE bearings. Machine's transient ramp-up & steady state data was collected using ADRE SXP & DSPI 408. Since only 01 key phasor is installed at Turbine high speed shaft, a derived drive key phasor was configured in ADRE to obtain low speed shaft rpm required for data analysis. By analyzing the Bode plots, Shaft center line plot, Polar plot & orbit plots; rubbing was evident on Turbine's NDE along with increased bearing clearance of Turbine's NDE radial bearing. The subject bearing was then inspected & heavy deposition of carbonized coke was found on the labyrinth seals of bearing housing with clear rubbing marks on shaft & housing covering at 20-25 degrees on the inner radius of labyrinth seals. The collected coke sample was tested in laboratory & found to be the residue of lube oil in the bearing housing. After detailed inspection & cleaning of shaft journal area & bearing housing, new radial bearing was installed. Before assembling the bearing housing, cleaning of bearing cooling & sealing air lines was also carried out as inadequate flow of cooling & sealing air can accelerate coke formation in bearing housing. The machine was then taken back online & data was collected again using ADRE SXP & DSPI 408 for health analysis. The vibrations were found in acceptable zone as per ISO standard 7919-3 while all other parameters were also within vendor defined range. As a learning from subject case, revised operating & maintenance regime has also been proposed to enhance machine's reliability.

Keywords : ADRE, bearing, gas turbine, GE Bently Nevada, Hitachi, vibration

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