

Motor / ID Fan System for Main Crude Unit at Refinery

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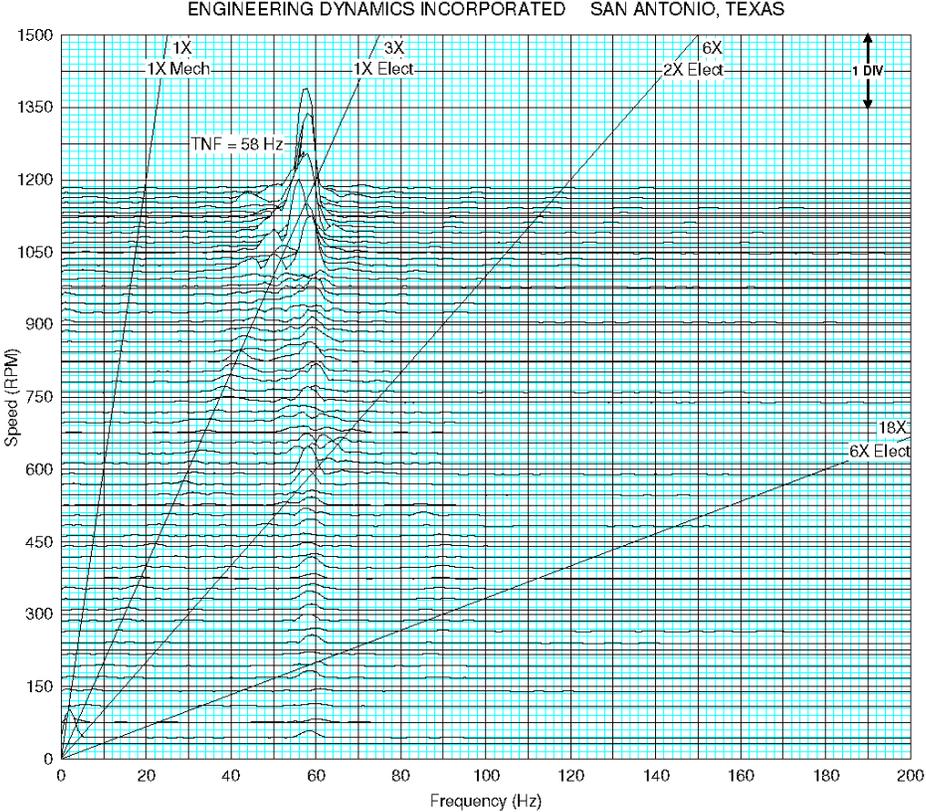
Engineering Dynamics Incorporated (EDI) performed a field test of an induced draft (ID) fan system at a refinery that was experiencing failures of couplings, flexible disc style. The fan is part of an atmospheric furnace that heats approximately 152,000 barrels of crude per day. The ID fan is driven by a 350 HP induction motor. The motor speed is controlled by a variable frequency drive (VFD) from 0 to 1200 RPM. The trouble began when the motor was changed out for one of similar electrical performance, but of different physical size.



The failure of the original flexible disc coupling consisted of a crack in the spacer, which appeared to originate at a bolt hole. Initially, plant maintenance was blamed for possibly over tightening the coupling bolts. The 45 degree angle of the crack in the coupling spacer is a typical indication of high torsional vibration.



To quantify the transmitted and dynamic torque in the coupling, a TorqueTrak 10K telemetry system from Binsfeld Engineering was used. The waterfall plot below shows a torsional natural frequency (TNF) of the system near 58 Hz, which was being excited by 1x electrical frequency of the VFD. This resulted in high dynamic torque in the coupling when operating the fan at 1000 – 1200 RPM.



EDI performed a torsional analysis of the system and selected an alternate coupling with standard rubber blocks in compression to detune the TNF away from the 1x electrical frequency of the VFD. The new coupling was installed and the equipment has been working satisfactorily ever since. This case history shows the importance of performing a torsional analysis on a new system or when a system is modified. The TorqueTrak 10K strain gage telemetry system from Binsfeld Engineering was very valuable in collecting data and determining the cause of the original flexible disc coupling failure.