

Motor current signature analysis (MCSA) is regarded as an effective technique for motor and its downstream equipment fault diagnostics. However, limited work has been carried out for motors based on a sensorless variable speed drive (VSD). This study focuses on investigation of mechanical fault detection and diagnosis using electrical signatures from a VSD system. An analytic analysis was conducted to show that the fault can induce sidebands in instantaneous current, voltage and power signals in the VSD system, rather than just the sideband in a drive without closed loop control. Then different degrees of tooth breakages in an industrial two-stage helical gearbox were experimentally studied. It has found that even though the measured signal is very noisy, common spectrum analysis can discriminate the small sidebands for the fault detection and diagnosis. However, it has found that the power signals resulted from the multiplication of the current and voltage can provide a better diagnostic results.