

## Documents

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**The interference of variable frequency drives (VFDS) on the vibration signature analysis of machine defects**

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**Abstract**

VFDs are the most commonly used modes to drive induction motors in applications requiring speed variations. However, vibration analysis for fault diagnosis of such systems poses serious challenges as the signatures are complicated due to the inherent design of the VFD. This paper will explain the basic operation of a typical VFD and present vibration signatures of machines operated using VFDs. VFDs control motor speed by varying the supplied line frequency. This is done in three stages. Firstly, the line voltage signal is rectified via diodes to obtain a DC signal. This is then smoothed and stored using a set of capacitors. Finally, the constant DC voltage is used to construct a pseudo AC voltage using a set of transistors, which act like switches (gates). The switching frequency, or carrier frequency, is typically set in the range from 2-15 kHz. The vibration content as a result of using the VFD contains peaks of discrete frequencies spaced at the carrier frequency and its harmonics. Each peak also contains sidebands around the carrier frequency (and its harmonics) spaced at both the rotor speed and the VFD frequency. Analysts examining high frequency content of their data signals needs to be aware of the carrier frequencies and the associated side bands of their VFD.

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