

Reciprocating compressors (RC) are widely used in different industrial sectors such as petrochemicals, petroleum refineries, and refrigeration plants, etc. These machines usually work under different operating conditions (high pressure and high temperature), which in turns cause failures to its system including driver motor. Leakage within compressor system is a common failure mode caused by the harsh working environment of RC. Nonetheless, it degrades operating efficiency and leads to other major failures such as valve failure and catastrophic breakage. This paper investigates the use of advanced signal processing methods for RC fault diagnostics. It studies the vibration characteristics of different fault conditions when the compressor operates under a wide range of discharge pressures. Both the conventional spectrum analysis and the state of the art modulation signal bispectrum (MSB) analysis are used to process the vibration responses from structure resonances and operating speeds for attaining an accurate characterisation of the nonlinear vibration responses due to mechanical impacts of valve plates upon their seats, fluctuation of airflow and nonlinear transfer paths. Thereby obtain stable and accurate features to indicate the root of the faults. The results show that MSB produces more reliable and better performance in extracting fault features for more accurate detection and diagnosis of different RC faults compared with spectrum analysis.