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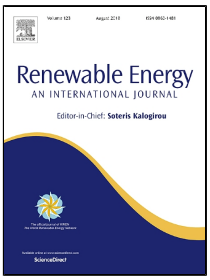

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Abstract

The use of signal processing for condition monitoring of wind turbines data has been on-going since several decades. Failure in the analysis of high modulated data may make the machine break. An example of this is the reported real case of bearing failure on a Repower wind turbine, which could not be detected by currently applied methods. The machine had to be out of service immediately after a faulty bearing outer race was visually ascertained. Vibration dataset from this faulty machine was provided to facilitate research into wind turbines analysis and with the hope that the authors of this work can improve upon the existing techniques. In the response to this challenge, the authors of this paper proposed Spectral Kurtosis (SK) and Signal Intensity Estimator (SIE) as proven time-frequency fault indicators to tackle the question of data with different modulation rates. Extensive signal processing using time domain and time-frequency domain analysis was undertaken. It was concluded that SIE is well established mature approach and it provides a more reliable estimate of wind turbine conditions than conventional techniques such as SK, leading to better discrimination between "good" and "bad" machines.

Keywords: Wind Turbines, Condition Monitoring, Vibration Dataset, Modulated Data, Bearings, Signal Intensity Estimator, Spectral Kurtosis.

1. Introduction

Power can be generated in several ways. In every case conventional energy resources are used to drive turbines which in turn drive generators that feed the grids. Unlike the fossil fuels, wind is both free and clean fuel to drive the wind turbines. As the size of wind projects keep on increasing, the need of reducing the downtime and making best use of