Analysis of generator bearing vibration data for diagnosing rotor circuit malfunction in DFIGs

Doubly fed induction generators (DFIGs) are the most popular configuration met in the wind energy sector occupying approximately 65% of the total market share. Condition monitoring of wind turbine generators is performed based on vibration data collected from accelerometers mounted on the drive end and non-drive end bearings, meeting the requirements of numerous turbine operators for condition based maintenance. In a DFIG the voltage applied to the rotor is controlled by a converter, where electric connection between the two is accomplished by using slip rings. Improper connection between the slip ring unit and the rotor circuit is manifested as excessive vibration seen in both ends of the generator. The consistent and accurate diagnosis of a rotor circuit malfunction is of crucial importance in regards to proper troubleshooting of the fault and the overall health of the generator. In this paper generator bearing vibration signature for a DFIG under operation with one rotor phase coil open is analysed and presented. Further this failure mode is compared to rotor dynamics fault, such as rotational looseness, and the difference in signature is discussed. Vibration data from a multi-mega watt DFIG wind turbine subjected to the above described failure mode is illustrated as scalar values and frequency spectra. It is shown that detailed analyses have resulted in a successful identification of disconnected rotor phase by detecting sidebands around the generator running speed harmonics matching the pole pass frequency.

General information
State: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Brüel and Kjær Sound and Vibration Measurement A/S, University of the Faroe Islands
Pages: 1740-1745
Publication date: 2014

Host publication information
Title of host publication: Proceedings of 21st International Conference on Electrical Machines
Publisher: IEEE
ISBN (Print): 9781479943890
Keywords: Condition monitoring, Vibration analysis, Doubly fed induction generator, Slip ring unit, Pole pass frequency
DOI: 10.1109/icelmach.2014.6960419
Source: PublicationPreSubmission
Source-ID: 100175568
Research output: Research - peer-review › Article in proceedings – Annual report year: 2014