Deployment of large scale wind turbine parks, in particular offshore, requires well organized operation and maintenance strategies to make it as competitive as the classical electric power stations. It is important to ensure systems are safe, profitable, and cost-effective. In this regards, the ability to detect, isolate, estimate, and prognose faults plays an important role. One of the critical wind turbine components is the gearbox. Failures in the gearbox are costly both due to the cost of the gearbox itself and also due to high repair downtime. In order to detect faults as fast as possible to prevent them to develop into failure, statistical change detection is used in this paper. The Cumulative Sum Method (CUSUM) is employed to detect possible defects in the downwind main bearing. A high fidelity gearbox model on a 5-MW spar-type wind turbine is used to generate data for fault-free and faulty conditions of the bearing at the rated wind speed and the associated wave condition. Acceleration measurements are utilized to find residuals used to indirectly detect damages in the bearing. Residuals are found to be non-Gaussian, following a t-distribution with multivariable characteristic parameters. The results in this paper show how the diagnostic scheme can detect change with desired false alarm and detection probabilities.
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