

Detection and identification of a damaged blade without stopping the wind turbine

It was previously shown that rotor anisotropy caused by a blade damage affects the periodic mode shapes of an operating wind turbine and this phenomenon can be utilized for detecting and identifying the damaged blade. The current approach assumes that the vibration sensors are placed on each blade, which is not practical. In addition, this approach requires modal identification, e.g. by operational modal analysis (OMA), which significantly complicates the damage detection and localization process. The current study presents another approach to blade damage detection/localization, which utilizes the same phenomenon but uses only one vibration sensor located at the tower top and the information about the rotor azimuth. The suggested approach uses only basic signal processing and does not involve modal analysis.

The presented study explains the utilized effect of rotor anisotropy and introduces the new method. It also compares the sensitivity of the presented method with the original modal-based method.