

New Developments in Grease Sampling and Analysis for Wind Turbines

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Wind turbines are spreading across Europe and the World to increase the contribution of renewable technologies in power generation. While many of these designs include a critical oil lubricated gearbox, and an important hydraulic drive system, the majority of drivetrain components are grease lubricated. These include one or two main bearings, three blade bearings to support the rotating blades, two generator bearings, and a yaw drive. With limited access to the wind turbines, especially those sited in remote or offshore locations, sensors are used to provide real-time monitoring and diagnostics. However, the slower moving bearings provide limited indication for typical vibration sensors to adequately predict common failure modes.

The Danish Offshore wind industry assembled a team of turbine operators, researchers, and industry experts to evaluate methods and techniques for sampling wind turbine bearings, and determine the best practices for monitoring grease lubricated drivetrain components. The results of this research were the development of sampling tools for main and blade bearing locations, selection of analysis techniques proven to provide accurate condition information for bearings, and creation of procedures to ensure consistent and meaningful data. This paper will introduce the sampling tools and techniques, analysis methods uniquely suited to grease analysis, and case studies that demonstrate the cost-effective use of grease sampling and analysis for wind turbine reliability.