Advanced Oil Monitoring™

Predictive Analysis for Wind Turbines

Industrial Wind Turbines

WIND TURBINE COMPONENTS REQUIRE THE COMPREHENSIVE OIL TESTING PROVIDED BY WEARCHECK ADVANCED OIL MONITORING TO ENSURE THE CONDITION OF THE LUBRICANT.

OVERVIEW

- Monitors wind turbine systems for harmful particulate, moisture, varnish and sludge build-up.
- Comprehensive testing and reporting makes the decision between oil extension and oil replacement easy.
- Provides a level of confidence on the operating condition of your critical wind systems.
- Suitable for all vertical and horizontal axis wind turbine gearboxes, bearings and integrated hydraulic systems.

BENEFITS

North America's reliance on sustainable energy from wind turbines increases every year. Wind turbines have some of the most demanding lubrication requirements and even routine maintenance tasks on these behemoths are time consuming and difficult. The wind turbine gearbox is especially susceptible to particulate and moisture contamination and the lubricants utilized in this application must be able to withstand high contact point loads under drastic temperature fluctuations. The oil must be able to endure long drain periods in order to provide a reasonable maintenance cycle, as a complete oil change requires significant effort on part of the maintenance personnel.

Undetected, contamination of the lubricant from particulate and moisture will lead to premature failure of the main bearing and gears. Unmonitored, poor oil condition will lead to varnish and shellacking resulting in gearbox failure. Repair costs for wind turbine gearboxes are exorbitant. Crane rental and gearbox removal alone costs $40,000 or more, not including gearbox repair costs and lost energy revenues.

In order to achieve peace of mind on the operating condition of your wind turbine lubricants you need the comprehensive testing that WearCheck Advanced Oil Monitoring™ provides. Specifically designed for wind turbines, WearCheck's advanced oil monitoring combines well established industry tests with more recent advances in industry testing to provide an unparalleled view of the operating condition of your critical lubricants.

WearCheck's Advanced Oil Monitoring™ determines the levels of remaining anti-oxidants in the oil, detects for unwanted oil contamination and will accurately determine the suitability of the lubricant for continued use. A comprehensive diagnosis will warn you of any potential for damaging contamination including water, particulate and varnish build-up and includes recommendations for any necessary maintenance actions to remove contaminants and restore the lubricant to proper operating conditions.

WearCheck's Advanced Oil Monitoring™ is intended for use with horizontal and vertical axis wind turbine gearboxes, bearings, and integrated hydraulic systems.

WEAR CHECK

THE LEADER IN OIL ANALYSIS

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TESTING METHODS

		IND2	IND3	AOM2	AOM3
	**ICP Analysis** ASTM D5185	Determines the parts per million (ppm) of all wear metals (Fe, Cr, Ni, Pb, Cu…), contaminants (Si, Na, K….), and additives (Ca, P, Zn, Mg, Mo…) in the oil.	●	●	●	●
	**Viscosity @ 40°C** ASTM D445	Measures the kinematic viscosity of the oil at 40°C to determine if oil is still within specification. High viscosity can indicate oxidation, low viscosity can indicate contamination, improper make-up oil.	●	●	●	●
	**Acid Number** ASTM D664	Determines overall acidity of the oil which is an indication of oil oxidation and degradation. Used to determine appropriate change-out interval.	●	●	●	●
	**Karl Fischer** ASTM D6304	Determines level of moisture or water contamination in the oil.	●	●	●	●
	**Particle Count** ASTM D7647	Determine cleanliness levels of oil and generate an ISO Cleanliness Code (i.e. 17/15/12). High particle count levels can indicate gross contaminant ingress, wear, filter by-pass or all of these issues.	●	●	●	●
	**Particle Quantifier (PQ)** WC Method	Determines the level of ferrous wear debris present in the sample, wear debris that may be missed by ICP analysis.	* ●	●	●	●
	**Analytical Ferrography** ASTM D7690	Detailed morphological analysis of the wear particles present in the oil. Determines the wear modes present in the system.		●	●	●
	**Membrane Patch Colorimetry** ASTM D7843	Varnish potential rating that measures the relative amount of insolubles present in the oil and the resulting potential for sludge and varnish formation.			●	●
	**Voltammetry (RULer)** ASTM ASTM D6810	Measures the levels of aminic and phenolic anti-oxidants remaining in the oil. Determines the necessity for oil replenishment or replacement.			●	●
	**Foaming Characteristics** ASTM D892	Multi-stage test (stages I, II, III for both foaming tendency and stability) Determines the oils tendency to entrap air and cause oil foaming as well as the ability of the oil to dissipate this foaming tendency (stability).				●
	**Rust Test** ASTM D665	Indicates how well the oil inhibits the formation of rust in the presence of water contamination.				●
	**Copper Corrosion** ASTM D130	Determines the suitability of the oil with copper components in the system.				●

** PQ Analysis conducted on gearbox samples only.*

TEST SCHEDULING RECOMMENDATIONS

Wind turbine components should be sampled every 3 months. The gearbox/bearing systems are critical and require IND 3 which includes Analytical Ferrography to monitor for the early signs of catastrophic failure. Additionally, yearly AOM 2 testing will provide you with a measure of the remaining useful life of the lubricant allowing you to maximize oil drain periods and minimize complete oil change-outs. At the oil change out point, AOM3 testing is conducted to make a determination if they fluid can be used for an additional year (and each year subsequent to that). Integrated hydraulic systems require IND 2 testing which monitors for moisture and particulate which are the most damaging contaminants for hydraulic systems. At the oil change out interval AOM2 testing is conducted to determine if the oil is suitable for continued usage.

Gearbox / Bearing	Q1	Q2	Q3	Q4
Year 1	IND 3	IND 3	IND 3	AOM 2
Year 2	IND 3	IND 3	IND 3	AOM 2
Year 3, 4, …	IND 3	IND 3	IND 3	AOM 3
Hydraulics	**Q1**	**Q2**	**Q3**	**Q4**
All years	IND 2	IND 2	IND 2	IND 2

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