

The best way to avoid turbine downtime is to follow quality maintenance procedures throughout its performance life. SKF shares the following pointers.

WITH THE GROWTH OF WIND FARMS, users are turning to condition monitoring and automatic lubrication systems for increased reliability. The following questions, and answers, may provide helpful insights:

What are some of the fundamental challenges associated with wind turbine maintenance? Given the operating conditions a wind turbine experiences throughout a 20-year service life, maintenance problems are not a question of “if,” but “when.” Nevertheless, for many wind farms the number of maintenance technicians trying to delay the inevitable is limited and their deployment for service may be sporadic. When maintenance problems ultimately occur, farms face the downside of exorbitant crane mobilization costs, lost energy production, escalating costs per kilowatt-hour, and limited supplies of spare parts due to intense industry demand for components.

What types of proactive maintenance activities can be applied to wind turbines for improved reliability? An integrated online condition monitoring system can serve as an effective tool for managing day-to-day maintenance routines for a wind turbine and consolidating risky, costly maintenance activities. By tracking component performance with condition monitoring technology, maintenance activities can be coordinated across the wind farm, service calls can be better planned and combined, and operators can take advantage of planned shutdowns to service several turbines at the same time, since machinery conditions are known from the monitoring.

What types of operating faults can be detected with condition monitoring? By regularly measuring physical parameters and their variances, a variety of operating conditions can be targeted for early detection, diagnosis, and remedial action. When implemented properly, condition monitoring can forecast trouble inside or outside the nacelle, including unbalanced turbine blades, misalignment, shaft deflections, mechanical looseness, foundation weakness, gear damage, blade or tower vibrations, inadequate lubrication, and others.

In general, how does a wind turbine condition monitoring system work? A system spe-

cially developed and dedicated for wind turbines allows for continuous monitoring of key turbine components by regularly measuring physical parameters such as vibration, temperature and lubrication particles. Mounted sensors and enabling software pinpoint the problems. Systems have become quite sophisticated and some can handle any number of turbines and multiple data points for analysis. They can provide a maintenance-forecasting service by continuously recalculating fault frequencies and delivering accurate values based on reliable trends. This ability can facilitate the assigning of alarms at various speeds and loads, including low main shaft speeds, and form the basis for trend-based root cause failure analysis. Wireless capabilities expand system potential by offering the capability to review data from any location with a computer or handheld device with Internet access. This can shorten lead-time from alarm to solution. One system installed in hundreds of wind farms worldwide can fit every turbine's nacelle and includes an intelligent monitoring unit featuring 16 different channels that connects multiple measurement points. The typical wind turbine configuration incorporates the main bearing (one channel), gearbox (four channels), generator (two channels) and tachometer (one channel). In addition, other monitoring points may be added, including tower/structure vibration, blade vibration, oil temperature, oil pressure, oil quality and generator temperature.

What other technologies can help wind farms improve turbine reliability and reduce maintenance costs? Centralized automatic grease lubrication systems can aid sustained reliability. Systems engineered for bearings, pitch and yaw gears, and other locations in a wind turbine can efficiently and precisely deliver exact, clean quantities of the appropriate lubricant. The associated maintenance benefits from timely and effective lubrication include reduced wear, minimized lubricant consumption, maximized efficiency and less unscheduled downtime. The automatic delivery of lubrication can be credited with lifting a heavy burden from the shoulders of the maintenance staff. ↵

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