Bearing considerations for offshore wind platforms

MAY 16, 2024 BY MIKE SANTORA

Byline: Mark Hampton, Product and Innovations Manager, Trelleborg Sealing Solutions

Wind power is the most developed alternative energy source globally with growth driven by rising fuel prices, an increasing concern for the environment and a need for countries to enhance their energy security. After nearly 40 years, installed wind power capacity reached a milestone of one terawatt (TW) worldwide in 2023 and global policies are driving this towards two TWs by the end of 20301.

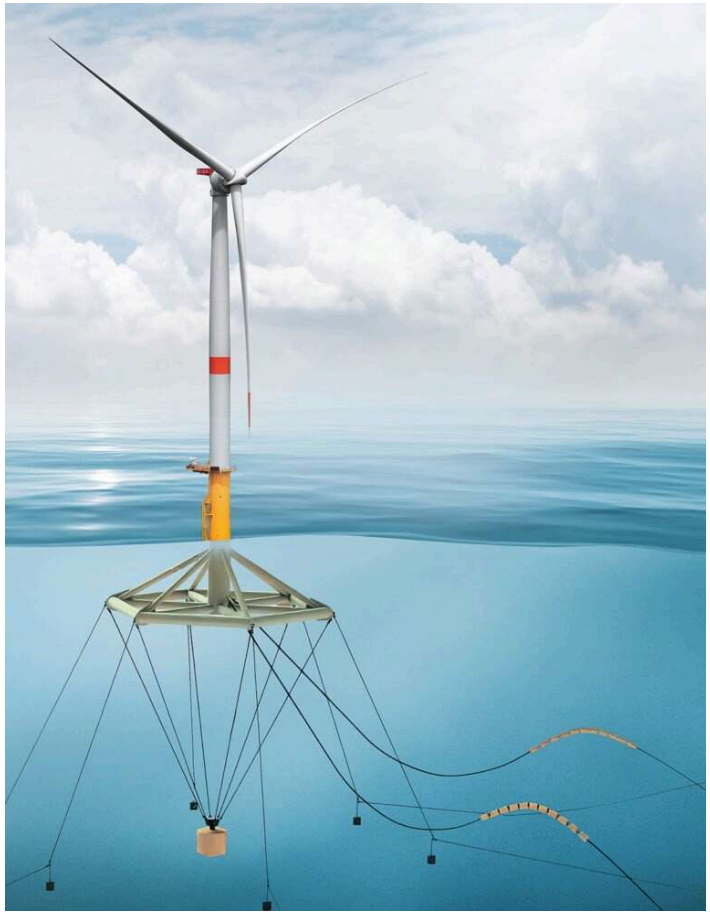
Clean electricity produced by wind power plays an important role in the future of sustainable energy. Wind turbines are key in working toward the International Energy Agency's goal to reach net zero emissions by the year 2050 and limit the global temperature rise to 1.5 ˚C2. The energy sector must balance its CO2 emissions so there is no overall increase in the atmosphere which is one of the factors driving a significant increase in wind power investments.

Offshore platforms take advantage of higher wind speeds and greater wind consistency, generating more power than onshore turbines. Constructed on platforms tethered to the seabed, they potentially allow for an even greater number of turbines in deeper waters further offshore. All the leading floating foundation concepts for offshore wind turbines require mooring to the seabed.

Mooring systems are comprised of mooring lines, anchors, and connectors. They keep ships and floating platforms stationary on the surface in all water conditions. Selecting the optimal materials to construct these long-lasting, environmentally sensitive, and efficient offshore wind platforms is critical.

The bearing components in offshore wind platform mooring systems must be dimensionally stable, have a minimal environmental impact, be durable with long service life, and have a minimal negative impact on adjacent parts. Original equipment manufacturers (OEMs) of offshore floating platforms should work with a components partner that offers a solution with

low wear rates during continuous operation while enhancing the performance of the fairleads and tensioner risers (see sidebar for more details).



Trelleborg's Orkot composite bearing materials are well suited for demanding high-load applications like offshore wind platforms. Orkot C620 has an outstanding ultimate compressive strength of 470 newtons/square millimeter (N/mm2). The design limit of 400 N/mm2 allows engineers to meet the ever-increasing needs of larger wind turbines and platforms. In the mooring system, Orkot C620 provides a strong bearing material with excellent impact strength to protect against shocks, has very low swell (<0.1 percent), and excellent dimensional stability.

Tell me moor

Fairleads: A fairlead is a device used to guide ropes, wires, or chains to control their direction without chafing or excessive wear. In a mooring system, fairleads are typically located at the surface side of the mooring system and mounted on the offshore wind platform. Low-wear radial bushes and thrust washers are needed in fairleads to help ensure continuous operation without compromising performance. A low-friction bearing material with excellent stick-slip properties will ensure smooth running with no sudden release or whipping of the mooring lines.

Tensioner risers: A tensioner riser is a mechanism used to apply a controlled force to the mooring lines, compensating for changes in environmental conditions such as waves, currents, and wind which can cause variations in tension. Tensioner risers help keep the moored structure in a stable position and require wear rings to ensure smooth movement, reduce wear, and decrease maintenance.

Mid-water arches (MWA): Mid-water arches support the mooring lines of floating structures such as offshore wind platforms. The connections holding the arches in place require a high-performance bearing to ensure the arch can move as designed and help prevent galvanic corrosion.

Spreader bars: A spreader bar is a structural element that helps distribute loads over a wider area, reducing stress concentrations on the mooring system. Spreader bars provide multiple attachment points for mooring lines, improving the overall stability and load distribution of the mooring system.

Padeyes: Often used in conjunction with spreader bars, padeyes are reinforced metal fittings or brackets welded or bolted onto the mooring structure, providing secure attachment points for lines, rigging, or lifting equipment. Padeyes require bearing solutions with a very low coefficient of friction allowing smooth operation at high loads and low speeds.

A lasting solution

Orkot bearings were fitted in 1998 into mooring line links for a floating production storage and offloading (FPSO) unit in West Africa. In 2023, after 25 years of permanent use underwater, the top parts of the spiral strand wires of the mooring line were recovered and inspected. After examination, the operator determined that the original bearings were still in excellent condition and fit to extend the life of the FPSO unit.

Orkot TLMM bearings were originally chosen as the impregnated fillers in the material to provide a low-friction bearing surface and exhibit little wear when submerged in water. TLMM has a high load capability and does not promote corrosion on the counter faces, helping it to protect not only the hardware but the bearing itself.

Key considerations for floating offshore wind power materials

• Dimensional stability – will materials change with time and in response to environmental conditions, e.g. do they swell in seawater?
• Environmental impact – will materials avoid any negative impact on ecosystems and the environment, e.g. do bearings require lubrication and grease that can leak or leach?
• Effect on adjacent parts in the system – will materials contribute to corrosion or wear; is cathodic protection provided?
• Service life – will materials last for the system's lifetime; are they low-wearing and long-lasting?
• Durability – will materials perform in harsh environments and resist prevailing temperatures, seawater, grit, and contamination?

Trelleborg Sealing Solutions
www.trelleborg.com/en

FILED UNDER: FEATURED
TAGGED WITH: TRELLEBORG

SEARCH