

Press Release

Angular contact ball bearings and spherical roller bearings from Schaeffler ensure reliability of 4Navitas Vertical Axis Wind Turbines

- **Schaeffler UK has provided engineering support and guidance on bearing selection for a new, groundbreaking 55kW Vertical Axis Wind Turbine, which is being manufactured in the UK.**
- **As well as supplying angular contact ball bearings to support the main rotor hub and housed spherical roller bearings to support the drive shaft, Schaeffler UK has also advised 4Navitas on assembly methods, mounting tools and lubrication.**

Sutton Coldfield, UK. 9th December 2016. A UK-based manufacturer of Vertical Axis Wind Turbines has specified angular contact ball bearings and housed spherical roller bearings from Schaeffler UK for use on its 4N-55 wind turbine, the world's first commercially viable medium-sized 55kW Vertical Axis Wind Turbine.

Based in Blackpool, 4Navitas designs and manufactures Vertical Axis Wind Turbines (VAWT). These turbines offer a very reliable, efficient and cost-effective alternative to conventional Horizontal Axis Wind Turbines. VAWTs are quieter, more bird and bat-friendly and are less costly to maintain compared to horizontal turbines.

The 4N-55 is a 55kW rated VAWT. Three years in development, this radical new design is manufactured in the UK and incorporates a range of patented design features, which greatly enhance power-generating output at low wind speeds and significantly reduce the total costs of ownership.

As Paul Cook, Design & Engineering Director at 4Navitas comments: "The 4N-55 is a self-starting turbine that can be programmed to suit a site's specific wind characteristics. It does not require sensors or motors to position itself into the wind, thus eliminating the need for complex control gear, which in turn eliminates a major cause of horizontal wind turbine failures."

"Unlike most wind turbines, the 4N-55 has very few serviceable components at height.

Due to its design characteristics and the fact that the majority of serviceable components are at ground level, repairs and servicing can be carried out expeditiously without the requirement for expensive craneage and cherry-pickers,” states Mr. Cook.

Bearings are a key element of the design of the 4N-55. In early prototype versions of the wind turbine, spherical roller bearings (not supplied by Schaeffler) were used to support the main hub spindle. However, as Mr. Cook explains, these bearings were not fit for purpose: “The original bearings were skidding due to fluctuating loads from the wind. This caused discolouration and wear of the bearing raceways, which would have led to catastrophic failure of the bearings had we not intervened. We therefore looked for an alternative bearing supplier, one that we could work closely with to find the right type of bearing for the application. We approached Schaeffler UK for help and have been delighted with their attitude and proactive, professional approach.”

Schaeffler UK has been working with 4Navitas for over three years, providing engineering support and supplying bearings for both the main rotor hub of the 4N-55, as well as housed spherical roller bearings that support the main drive shaft.

Initially, engineers from 4Navitas sat down with an application engineer from Schaeffler UK to discuss the dynamics of the wind turbine, including the loads on the rotor hub and all the other technical details required to enable Schaeffler to select and size the most appropriate bearings.

Main rotor hub bearings

As David Robson, regional sales engineer Industrial at Schaeffler UK comments: “By engaging with 4Navitas early in their design and development phase on the 4N-55, we were able to select a more suitable bearing for the main rotor hub. The bearings we selected were single row angular contact ball bearings arranged in a pair supporting the top and bottom of the rotor hub. We also suggested the use of housed bearing units to support and guide the 2.5 tonne, 25-metre long main drive shaft. These are housed spherical roller bearings in a plummer block design with tapered sleeves. As well as supplying bearings, we also advised 4Navitas on methods of assembly, tooling and lubrication.”

By changing the main rotor hub bearings from spherical roller bearings to angular contact ball bearings, 4Navitas achieved the high performance levels and high reliability that it required on the 4N-55. The prototype version of the 4N-55 is now in full production phase, the first turbine is already installed with a customer in the agricultural sector and 4Navitas are currently in manufacturing to fulfill orders for the next 10 units, and are in discussions regarding licensing their technology worldwide.

As Mr. Cook states: “The main rotor hub on a wind turbine is absolutely critical to its performance and reliability. By changing from the original spherical roller bearings to angular contact bearings, we achieved the high reliability and performance that we wanted, but we were then faced with new challenges in terms of how to assemble the rotor hub correctly and how to ensure that the main drive shaft was manufactured to much tighter tolerances and run-outs than was previously the case. We also had to completely redesign our assembly tools. In fact, the whole philosophy of how we manufactured the main rotor hub changed. However, Schaeffler has supported us all the way through this process, advising us on assembly methods, lubrication volumes for the grease pockets on the rotor hub and bearing mounting procedures.”

“We’re a small company that relies heavily on private funding, so we cannot afford to waste time and money on incorrectly specified components for the wind turbine. For us, this project has demonstrated just how essential it is to engage with the bearing supplier early in the design phase in order to ensure that the design is fit for purpose, reliable and cost effective,” concludes Mr. Cook.

Simplifying assembly

In addition to bearings, Schaeffler UK also supplied an induction heater to assist 4Navitas in mounting the bearings to the rotor hub and tower shaft. Prior to mounting, bearings must be heated uniformly. If heat output is too high, this can cause temperature differences between the inside and outside of the workpiece, which in turn, can lead to cracks or distortions in the material. In order to prevent this, Schaeffler’s FAG induction heaters are equipped with various features, including temperature-time (ramp) controls, which prevent overheating of the bearing. Schaeffler supplied its HEATER600 induction heater, which is also equipped with a sliding table to help reduce the risk of damage whilst positioning the bearing.

Schaeffler also supplied its BEARING-MATE mounting and carrying tool. Designed to allow easier and safer transport and mounting of heavy rotationally symmetrical parts such as rolling bearings, BEARING-MATE comprises two aluminium handles and two steel strips. After mounting, the bearing and BEARING-MATE form a unit, with the two opposing handles allowing secure lifting and transport of the bearing.

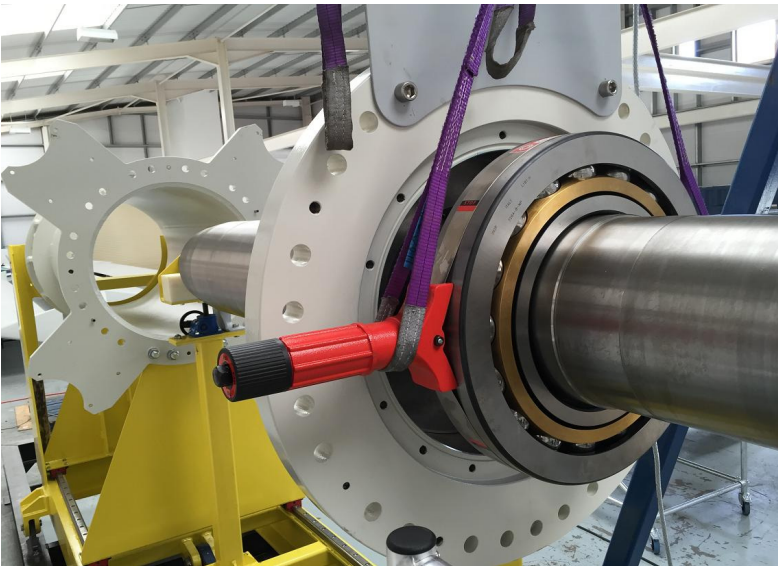
For more information, please contact Schaeffler UK's Communications & Marketing Department on info.uk@schaeffler.com

For more information on the 4N-55, please contact 4Navitas on info@4navitas.com or visit www.4navitas.com

Pictures: 4Navitas



The 4N-55 can be programmed to a site's specific wind characteristics. Power electronics, motor and gearbox are all at ground level, enabling easy, low cost maintenance.



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About Schaeffler

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