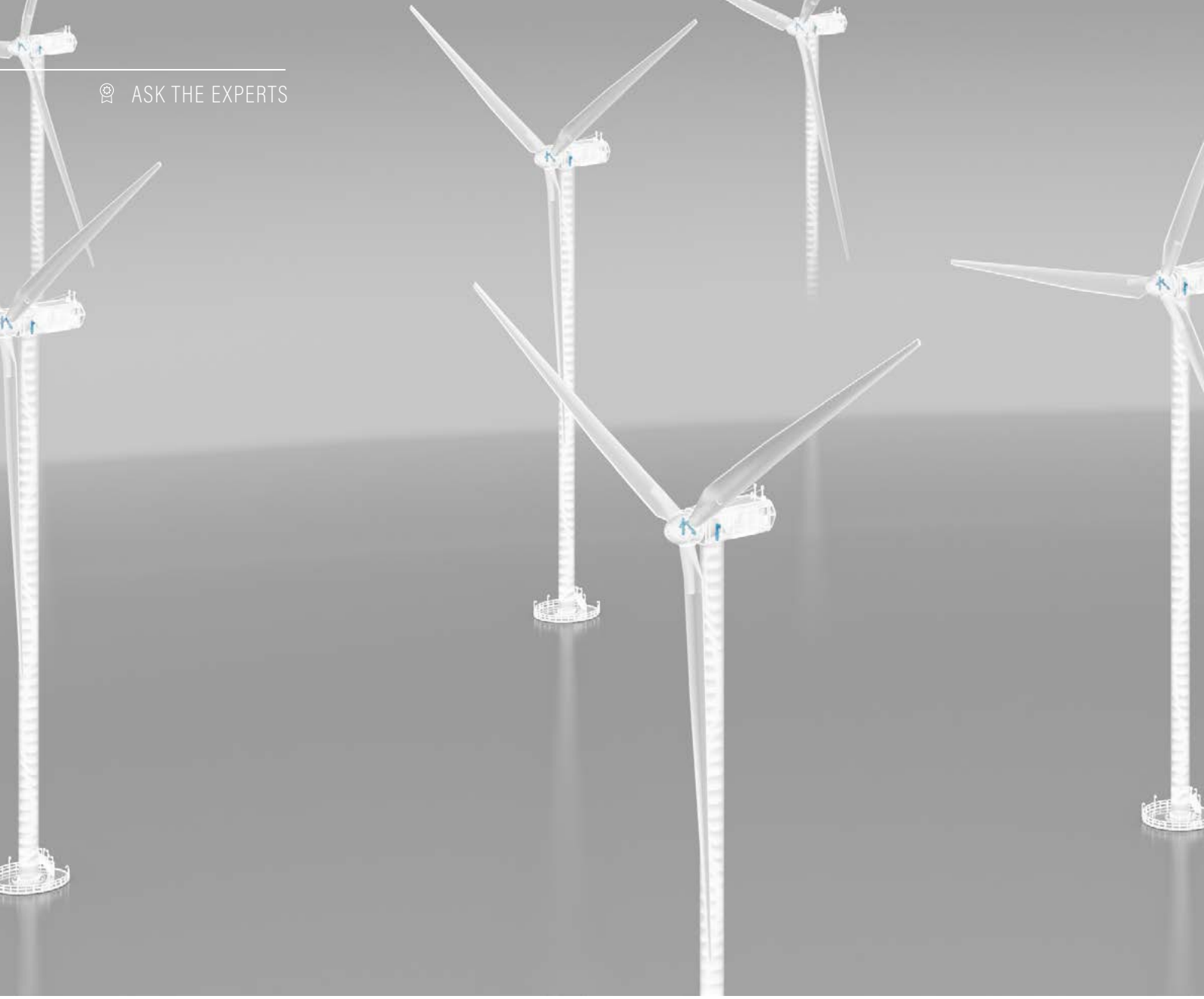


Pitching in to maximise turbine performance

Bonfiglioli is a well known name among many in the sector. Holding a market share of over 35% in wind turbine drives and acting as a supplier to top-tier global OEMs, its influence is evident. In a discussion with Roberto Pasqualini, Wind Sales and Business Development Manager, PES delved into how its products undergo continuous optimisation to elevate wind turbine performance in both on and offshore applications. There is a persistent commitment to enhancing the end-user experience by strategically reducing maintenance costs through meticulous condition monitoring.

PES: Welcome to PES Wind Roberto. Perhaps a good place to begin the interview is with a brief history of Bonfiglioli. Established in the UK since the early 1980s and with a global presence, today the company offers a full range of services, including pre-sales and after-sales support to meet the demands and growth of the industrial OEM sector. Can you tell me more about the service you offer?

Roberto Pasqualini: Thanks for the opportunity. Since its foundation, Bonfiglioli has put the customer at the center of every process, trying to identify their needs and offer customised solutions. Thanks to an international network of 26 commercial sites and closely interconnecting 20 production plants, we can guarantee the same high quality in 80 countries.

We know that our direct presence in local markets, thanks to more than 550 distributors around the world, is the key to long-lasting success. Our organisation is always close by, offering complete and efficient solutions and supporting our customers with dedicated services, such as co-engineering or after-sales assistance.

PES: For the wind industry, would you consider yourself to be a complete solution provider, and if so, what does this mean?

RP: Bonfiglioli offers solutions that can combine mechanics, electrics, and electronics. So yes, we are a complete solution provider. We also like to be referred to as a 'one stop shop', as we are responsible for the whole system, reducing the complexity of managing separate components at the customer end.

PES: Are we correct in saying that six of your 20 production plants, in Italy, Germany, Vietnam, India, China and Brazil, are dedicated to serving the wind industry and its customers all over the world?

RP: Yes, that is right. But it is important to highlight that the presence of Bonfiglioli is not just limited to those countries. Thanks to over 30 years of experience with the world's major wind OEM, one out of three wind turbines globally is equipped with our Yaw & Pitch drive.

PES: Which is your biggest market globally? Why do you think this and how does your market offering differ from continent to continent?

RP: Our largest market for wind energy is Europe, because of the presence of both on and offshore installation. China is also an extremely big market, but in this case with a lot of strong local competition.

Experienced in working with the world's major players, our team of experts create, design, and produce advanced technology solutions for a wide range of applications, such as excavators, drilling machines, building cranes, milling machines, and many others.

Our range of products, including planetary, drum , track, slew and winch drives, is excellently crated to meet a broad range of specifications.

PES: A market share of over 35% in wind turbine drives and supplying to leading worldwide wind turbine OEMs makes Bonfiglioli a major player in the wind industry. How do you ensure this remains the case, as the demands of the industry change over time?

RP: This is correct. No one can guarantee that today's market will be the same tomorrow. However, we have been able to adapt to even

the most dynamic market conditions, thanks to global R&D centers, creating breakthrough solutions that integrate the most advanced mechanical, electrical, and hydraulic technologies.

Working side by side with our clients for our co-engineering projects also helped us understand the OEM's needs and develop solutions to fulfill them. We intend to continue on this path.

PES: Is it possible to optimise your products to improve wind turbine performance for both offshore and onshore applications, without increasing size and weight? If so, how?

RP: Due to our ongoing product redesign efforts, we constantly strive to enhance performance while maintaining consistent weight and dimensions. As an illustration, torque density has increased by over two-fold in the past decade.

PES: The end-user experience is an important part of the supply chain of course. What steps does your team take to improve this through minimising maintenance costs?

RP: The so-called 'first-time quality' is in the DNA of the company, as we aim to improve efficiency and effectiveness, identifying areas in need of improvement and preventing losses. Our goal is to reduce waste to zero, with no need for replacements or work repetitions.

Our team also strives to improve the end-user experience by minimising maintenance costs by developing innovative solutions such as double mechanical and electrical control for more precise monitoring of the turbine system.

Being a member of the APQP4Wind organisation further ensures our capability in such a direction: thanks to our standardised quality assurance methodology we are by our customer's side to reduce risks and lower costs.

PES: What are some of the innovative solutions you offer for more precise monitoring of the turbine system, how do they differ from other methods available and what are the advantages of these?

RP: The Bonfiglioli IoT condition monitoring system is under development, aiming to provide real-time load measurement and offer a model capable of estimating the residual life of the component. Today, with more than 60 years of know-how in the automation sector, this constant innovation allows us to deliver new and advanced digitalisation solutions, with a portfolio of products ranging from sensors to cloud-based services.

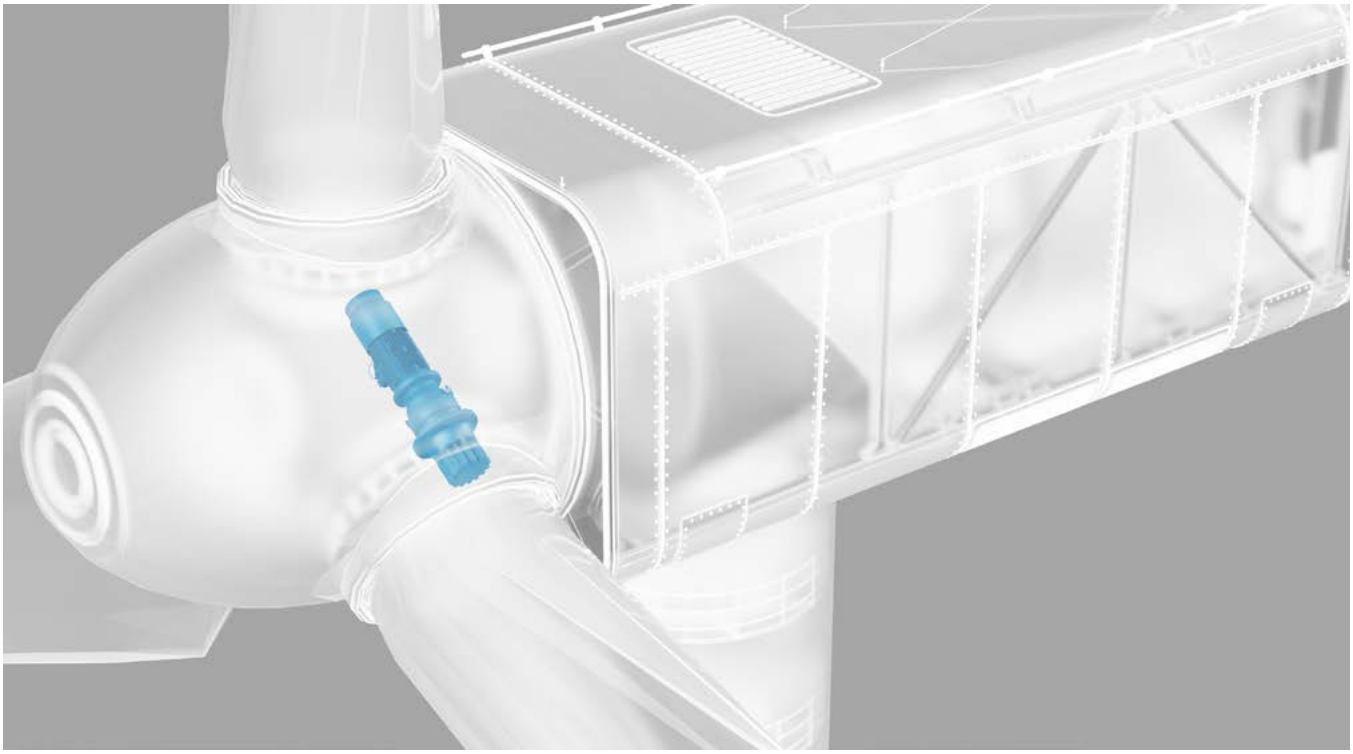
The advantage lies for sure in a reduction of costs for OEMs, not only because maintenance interventions are reduced, but also thanks to the cost of sensors for yaw and pitch drives, which are getting lower and lower. Secondly, sensors, data, and information prevent unexpected production stops and downtime, maximising energy production.

PES: Focusing on your pitch drives; these offer a wide range of output torques and gearbox sizes to meet the OEM requirements of wind turbines. These are completely custom-made, aren't they? Tell us more.

Roberto Pasqualini

RP: Of course, the OEM works with us on the product development. We don't consider it as a unilateral approach with 'frozen specs', but rather as a co-engineering task, which is possible thanks to the long-term partnership built over the years. As a result, our wide range of pitch drives offers a flexible solution to wind turbine manufacturers.

PES: Bonfiglioli also provides custom-made yaw drives; can you tell us more about the recent new features of these, including an integrated load cell and a torque limiter?



RP: This is where we aim to be even closer to our customers. For instance, the torque limiter is a device created to prevent unexpected failures, which may lead to downtime with loss of energy generation. Instead, the integrated load cell is located between the e-motor and the first stage of transmission. It quickly and precisely measures torque and enables torque monitoring in real-time.

The system provides an automatic engine shutdown to protect the drive or reduce the capacity of the frequency converter and provides information to the PLC. It also has an anti-seize function which prevents blockages.

PES: As offshore wind becomes an ever more integral part of global energy infrastructure, technology like IoT can help turbines operate with greater efficiency. Would you agree?

RP: Definitely yes. Offshore is a segment where you cannot afford the wind turbine to stand still because the cost in such cases rises exponentially. In this regard, it is becoming more and more important to think about how to optimise predictive maintenance. The Bonfiglioli IOT solution is under continuous improvement to support our customers in leveraging the cost of the ownership.

PES: How are you using this technology to the advantage of your customers?

RP: As mentioned before, the advantage of condition monitoring is not just a better tuning of the predictive maintenance, but it also helps in measuring in real time the real-time load and making sure they are consistent with the ones described in the tech speech. All the information relating to the Residual Useful Life, the operating conditions of the main product components, and any malfunctioning is obtained through algorithms that take into account fundamental aspects such as speed, temperature, relative humidity, operating torque, and operating vibrations along the entire spectrum of frequencies.

This allows the operating conditions of critical components to be constantly monitored in real-time and to prevent unexpected downtime by optimising maintenance interventions, particularly relevant for offshore wind applications where early fault detection is critical.

PES: Do you think this is the future of the industry?

RP: Certainly, it will remain so, even if the real business case study needs to mature a bit in close cooperation with our partners.

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