INCREASED INTEGRATION OF REMOTE TECHNOLOGY WILL TRANSFORM MARITIME OPERATIONS AND MAINTENANCE PRACTICES

Robotics and automation advance the offshore wind industry

During the life cycle of offshore wind farms (OWFs), operators must maximize the uptime of wind turbines to generate as much energy as possible. As OWFs are constructed further from the coast, maintenance and inspection with crewed vessels becomes increasingly risky, time-consuming and expensive. To overcome this challenge, the industry is turning to remote and autonomous technology solutions that can support OWFs far out at sea.

The integration of autonomous technologies brings significant benefits for the offshore wind industry, including improved safety and efficiency and reduced overall environmental impact. A key example is the accelerated design and development of uncrewed surface vessels (USVs) that can perform tasks in remote offshore locations while being controlled from remote operations centres (ROCs) as far away as in different time zones. With a wide range of applications, from seabed and asset data acquisition to research, surveillance and marine exploration, USVs are set to transform the maritime business and lay the foundations for a new way of working in the offshore wind industry.

Fugro-designed Blue Volta electric ROV, performing a seabed inspection off the coast in Australia.

Uncrewed surface vessels: improved safety and efficiency

USV technology does not replace the need for skilled personnel within the industry; rather, it has the potential to allow them to work more efficiently and in a safer ROC environment. The ability to deploy, manage and operate uncrewed vessels from ROCs anywhere in the world means that fewer people need to work in extreme and potentially hazardous offshore environments. Additionally, USVs offer an extremely efficient mode of data acquisition, allowing maritime staff to prioritize complex analytical tasks rather than spend time supporting the delivery stages. This leads to another advantage: increased output and speed of delivery of high-quality insights to clients, using cloud-

based processing and reporting solutions so that clients can receive the first results just hours after initial data acquisition, anywhere in the world.

The integration and adoption of USVs will also significantly benefit the overall environmental impact of marine expeditions and operations. Some USVs have hybrid diesel-electric engines that allow vessels to operate further offshore, increasing the operational window while also significantly lowering the carbon footprint. At Fugro, we see USVs playing a prominent role in the future of maritime exploration and operations and, as such, we have partnered with SEA-KIT International, a global provider of hi-tech solutions to maritime and research industries. Through this partnership, we are helping to drive the development of USVs to support the greater use of remotely operated vehicles and autonomous underwater vehicles to inspect marine assets.

Impression of the Fugro Blue Essence USV, preparing to RoboDock at IJmuiden port, The Netherlands.

Innovation brings new challenges

While the benefits of USVs are undeniable, these technological advances have uncovered further challenges. Offshore robotic solutions work most efficiently when there is a local, in-field facility that can accommodate the systems for safety, recharging and data transfer in an autonomous capacity that does not need onboard personnel. Without this offshore support, USVs and other autonomous robotic solutions regularly have to travel large distances to coastal locations such as marinas or ports for recharging and data transfer, which consumes time and fuel that could otherwise be used to deliver operation and maintenance plans.

Thus, to ensure that OWFs can maximize the capabilities of autonomous solutions, Fugro is developing an automated docking platform from which uncrewed vessels can perform inspection and maintenance operations. This ‘RoboDock’ platform will enable various uncrewed vessels and drones to carry out inspection tasks both above and below the sea’s surface, as well as serving as a recharge station. Effectively eliminating the need for autonomous assets to return to shore, RoboDock will incorporate storm-resistant docking points, automated launch and recovery, and charging points. The platform will also facilitate data download to and communication with the onshore ROCs, and ongoing monitoring of wind farms.

Fugro Blue Essence USV performing inspection off the coast in Australia.

Setting a new industry standard

This cutting-edge technological breakthrough will not only allow the offshore wind industry to accelerate the adoption of remote and autonomous solutions, but will also have huge safety advantages. By deploying RoboDock, the offshore industry can remove human workers from extreme environments to de-risk offshore operations. Additionally, compared to current practices that require large support vessels, robotic operations will consume far less energy, making them a more sustainable long-term solution.

RoboDock is designed to be operational year-round and will withstand challenging weather conditions. While the initial prototype will be small-scale, the platform will demonstrate its potential as a scalable technology that could be used to create large floating offshore hubs and maintenance islands for deploying robotic and autonomous technologies. For example, RoboDock stations could offer coastal security and coastguard operations support, aiding in maritime search and rescue, and shipping traffic and environmental monitoring.

RoboDock also offers a number of potential applications within the scientific community. These include advanced monitoring, research and acquisition of environmental and metocean data via the addition of sensors to the RoboDock platform, or cameras for advanced subsea flora and fauna surveys. In this way, the platform could help scientific researchers gain a better understanding of the pressures affecting marine and coastal environments, and therefore support environmental protection programmes. As a support system, RoboDock could benefit activities as varied as wind farm security, coastguard operational support, maritime aid, search and rescue, monitoring of shipping traffic and many more.

The future is remote

The offshore wind industry will significantly benefit from the uptake of remote technology at every level. Innovations such as RoboDock will help to bring about faster, more efficient and safer operations, functioning on a significantly more sustainable scale and accelerating the maritime industry’s digital transformation. Robotics and automation will ensure a continued drive to increase the maximum energy output of wind farms throughout their entire life cycle and will expand the capabilities of offshore wind and other maritime operations.

Aerial view of Fugro Blue Essence USV performing a survey using Fugro Blue Volta electric ROV.