Riding the IoT wave for improved workability

Words: Chris Grock and Emilie Dorgeville, Miros

Safe and efficient offshore wind operations are reliant on accurate, instantaneous and trusted information from many parameters including environmentals, such as the sea state or weather conditions. With the advance of digitalisation, a considerable volume of data sets is now even more accessible than before. However, while the amount of data is plentiful, analysing and validating its relevance to widen operational windows and support improved cost efficiency is challenging.

There is currently a vast spectrum of technology providers in this arena each dealing with an array of technology systems which, like the weather and waves they are monitoring and measuring, are in constant flux. Knowledge of where such technologies fit in, ensuring sensors and data sets can connect and communicate (through IoT capability), and understanding how the selected data streams interact within a digital ecosystem, is essential. Well configured system architecture will enable a better and simpler understanding of how each environmental parameter links to both safety and efficiency.

Once connectivity and data flow are streamlined, leveraging the combination of gathered and processed data is possible to determine correlations as well as validating

complex AI and machine-learning algorithms. In addition, with society demanding less carbon intensive activities, there is now more pressure on both the large power operators and the supply chain to ensure a qualitative approach to decision making that will reduce carbon output and accelerate the energy transition. Smart application of technologies is fundamental in achieving those goals.

For Miros, a provider of proven high-performance sensors monitoring real-time sea state data, data accuracy is just one element. Ensuring easy and secure data access in real-time at the right place at the right time seems to be the defining factor. This is achieved by an IoT enabled solution providing data access in the secure Miros cloud.

Streamline situational awareness from day one. Miros dry-mounted sensors are operable from moving vessels, floating objects, and fixed sites alike. From initial planning to decommissioning, monitoring wave, current, tide, and weather at the chosen location will support operational feasibility analyses and forecasts for project timelines.

Miros sensors are radar-based, dry IoT sensors providing reliable, highly accurate, real-time measurements of the ocean state to enhance safety, efficiency, and performance of operations while reducing costs during the lifecycle of an offshore wind farm.

Digitalising offshore wind for better operational performance

To help meet the EU's goal of climate neutrality by 2050, the European Commission's EU Strategy on Offshore Renewable Energy proposes to increase Europe's offshore wind capacity from its current level of 12 GW to at least 60 GW by 2030 and to 300 GW by 2050.[1]

In a bid to access stronger and more stable winds, wind farms are moving ever farther out to sea. As a result, operations related to new projects are expected to become more complex with new variables and unknowns, and construction and servicing, all at a greater distance from shore. The benefit these new wind farms will have is inheriting digital ecosystems that have already gone through a refinement period to ensure more valuable insights can be extracted as early as possible.

In introducing more challenging environmental conditions, safety risks related to crew transfer will grow ever more significant as well as the risks related to timely project completion. Forecasting of motion and sea states will play a key role in contributing to reducing risk, but real-time environmental data ensure models, on which all forecasting algorithms are based, to be validated and continuously calibrated, cementing the need for IoT capable sea state sensors in the future.

Engaging technology providers early

Weaving together a well-structured operational solution during early project planning makes a lot of sense. For Miros one aspect is to identify the most suitable sensor locations using bathymetrical studies during planning and development, which proves to significantly reduce costs.

Not only can placing sensors at specified foundations at the fabrication yard mean less effort than installing offshore, it also ensures that data streams are later representative of the seabed characteristics, which are unique to every offshore wind development. With complex client IT security frameworks, a secure and seamless integration with the cloud for immediate access, storage or integration has become a prerequisite for happy IT and operational departments alike.

The combination of appropriately chosen locations to source data from and full IoT capability is a powerful symbiosis to facilitate real-time decision support, post-operation analyses, future planning and long-term asset integrity calculations. For wind farm operators, this dynamic approach gives more influence and control on operations, while for service providers, it gives credibility and assurance that contract expectations can be delivered on schedule and importantly, on budget.

Real-time knowledge of environmental conditions can contribute significantly to personnel safety and avoid the deployment of vessels in weather conditions that can ultimately inhibit the completion of a mission.

Streamlined situational awareness at the click of a button

A small, Norway-headquartered business with a clear track record reaching back to the mid-1980s, Miros like to call itself a 35-year-old start-up. It maintains a personable, flat organizational structure, short communication lines, and fast adaptability to technological and user changes in the market. As a technology provider, this is probably the only way to create resilience - providing future-facing applications designed to deliver top-notch insights easily and reliably.

Miros currently boasts three distinct and proprietary sensors, each of which is certified and based on proven technology to deliver invaluable insight and instant data on ocean conditions to the maritime market. To meet today's requirements for a smart 'plug and play' system, all are now available as IoT-enabled sensors.

In line with this, the company has also adapted its business model providing a Sea-State-as-a-Service (SSaaS) solution echoing the models of many digital platforms. This facilitates adoption of the solution from a business and procurement perspective where Miros take on all operational risk of the system and provides purely the data, customisable to the needs of the client at a click of a button.

Such a SSaaS model not only includes access to the company's range of cloud-integrated sensors, like the Wave & Current Radar, the RangeFinder and Wavex, but also its cloud service, whereby functionality is based on Microsoft Azure technologies for easy and secure access to real-time sea state data. Start-up configuration and basic training as well as all maintenance and upgrades, remote device management and remote support are included in an all-inclusive, low-risk monthly fee.

Significant savings for the customer

Launched in 2018, the service has proved invaluable and even more relevant during the

Wave, current, and weather data are displayed on a user-friendly and customisable real-time dashboard for easy and secure access to sea state information.

COVID-19 pandemic when investment in new equipment has dropped down the list of many businesses' priorities and remote working has become mandatory for many. The risk of owning, insuring and maintaining sensors becomes the responsibility of Miros meaning significant savings for the customer by eliminating the need to purchase sensors or software outright. Remote system control means no one has to be sent offshore, saving in travel, extra training and avoiding COVID-19 regulations.

Technology challenges of buying organisations are seen to traditionally fall within three areas: accessibility to information (including those systems can talk to each other), ease in procurement and IT security. Miros has packaged these three together to move from being purely a hardware company to an operational insights' provider. From a technology company's perspective, clients require:

- Access to sea state data, anywhere, anytime for all project stakeholders

- Data to be easily transferred and linked to any digital ecosystem

- All data being stored so that any insurance

related query can be addressed, hindcast data are accessible for modelling and structural integrity analyses

- Minimal logistical complications - buyer and user do not want to consider insurance costs, or maintenance. All they wish is for uptime to receive data and operational insights, configured to their needs

- High uptime and secure IT - Continuous software updates ensure sensors are working harmoniously with other systems within the digital ecosystems (both from a coding and security perspective).

Major Norwegian operator adopts SSaaS solution to mitigate cost and risk

The Miros SSaaS solution allows data to be easily integrated directly into a customer's existing platform or interface. This was successfully used by a major Norwegian operator to accurately monitor the surrounding sea state around one of Europe's largest gas processing plants located on the west coast of Norway.

The offshore wind industry is highly dependent on the link between environmental factors and a wind farm's

The IoT-enabled sensors give decision-making solutions that provide everyone involved in offshore operations access to real-time and historical data, anytime on any device.

Mitigate challenges. Whether it is crane operations or cable laying, mobilising personnel at the right moment relies on the accessibility to immediate and reliable sea state data

servicing needs in order to maintain profitability. The operator, which had previously relied on buoys and weather forecasts for gathering information, opted to use the dry, cloud-integrated Miros Wave & Current Radar to mitigate the costs and risks associated with regular maintenance. The SM-050 is the only sensor in the world which utilises a dual footprint pulse Doppler method for wave measurements as well as a microwave dual frequency method for measuring surface current.

The dry-mounted radar observes the ocean surface in a semi-circle at 180-450 meters, depending on the installation height, which is typically 25-80 meters. The selected frequency of operations ensures a high degree of penetration through precipitation and sea spray and provides accurate measurements in harsh weather situations of any kind

As a high-performance, remote, IoT-enabled dry sensor for the measurement of directional wave spectra and surface currents, it only needs power and an internet connection to give secure access to immediate, real-time data.

Wave goodbye to uncertainty

As offshore sites have varying bathymetry and water depths, inconsistencies in data gathering require higher in-situ data resolution to improve decision making. Likewise, as wind, waves, and current differ constantly, creating a feedback loop (actual observed wave data with an associated wave forecast) will expand understanding of site-specific parameters and sharpen decision making on when and when not to deploy vessels.

The extent to which offshore wind can become super-efficient will depend to the largest extent of how effective digital technologies can be embedded allowing cloud platforms and smart applications to gather, store, rationalise and share accurate insights both real-time and forecasted to support humans better understand and manage their risk.

Planning, defining a digital ecosystem and assessing how so many technologies all need to co-exist is no easy undertaking. How are you approaching this subject and what have your experiences been? Miros are open to speaking with all market stakeholders to partner and research under their quest to continually develop the tools of the future!

🖥 https://www.miros-group.com/markets/renewables/

References

1. https://ec.europa.eu/commission/presscorner/detail/en/IP_20_2096

About the authors

Emilie Dorgeville, VP Business Development Renewables & Ports, Miros applies her 20 years of maritime industry experience gained from developing novel solutions measuring the sea state to helping maritime operators to improve and optimise offshore wind farm operations, and port efficiency and safety by leveraging local, digital sea state data in real-time.

Christopher Grock, Independent Consultant Business Development for Miros, works with several organisations in the field of maritime logistics for Offshore Wind. Since 2007 he's seen how this market has evolved from regulatory, business and technology perspectives. Together with Miros he supports clients in acquiring and integrating wave radar systems that provide the link and context for transparency in operations and vessel motions in the field, which allow for a holistic approach to improved workability and operational efficiency.