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MARINE MONITORING – THE BIGGER PICTURE

Amy Thompson, oceanographic data engineer at OceanWise discusses how environmental monitoring is changing and improving safety in an unpredictable world

Photo: Oceanwise

An environmental monitoring station in the Caribbean

Maintaining the safety and efficiency of marine operations year-round has never been more imperative.

With increased investment being put into offshore renewable energy (including wind, tidal and even marine solar in some areas of the globe), there is now a higher demand for marine and offshore movements than at any time previously.

The Covid-19 pandemic has highlighted how intrinsic maritime operations are to global supply chains and the transit of commodities to meet consumer requirements.

Reliable forecasting

Whilst the marine environment is being utilised in ever more ways, marine operators must contend with increasingly extreme and unpredictable weather conditions due in part to climate change, including an increase in disruption and potential damage caused by waves and swells during storms and more severe surges and cuts associated with tidal level.

These contribute to operational safety concerns but also have a major impact on efficiency and hence profitability. As vessel size and the quantity of marine traffic continues to increase, accurate real-time meteorological and oceanographic (metocean) data is vital to ensure efficient cargo loading and unloading, the safe berthing of commercial ships and subsequently the smoothglobal transportation of goods throughout the world's ports, preventing backlogs and shortages.

The ability to forecast the tides many years in advance has historically been possible due to the trackable and measurable influence of various physical factors within the solar system (including the harmonic influences of the moon, sun, and other celestial objects). Ports, harbours and marine operators have historically been able to plan vessel movements in detail, based on this. This predictability also makes, for example, tidal-stream energy a highly exciting and lucrative opportunity, as energy production can be planned well in advance based upon the tidal stream predictions for a given location and forecasted energy demand.

For today's real-time operations where individual centimetres can make the difference between bringing a ship into port or not, relying on predictions alone is no longer a viable option. Whilst the impact of, for example, atmospheric pressure on sea level is well known (the inverse-barometer effect), the increase in frequency and severity of wind events and storms have an exaggerated effect on the local conditions of a port, harbour, or marine resource.

Storm surges and cuts (i.e. a lowering in tidal level thus reducing the depth of water available to vessels) are becoming increasingly extreme, often exceeding the predicted values given by forecasting organisations. Accurate real-time data is required to allow marine operations to take place efficiently.

Installing real-time monitoring systems for tidal level, meteorological parameters, waves and currents at strategic

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locations allows port operators to make informed decisions in relation to vessel movement and operational safety, allowing near-instantaneous decision-making with regards to pilotage.

For example, our customer Associated British Ports maximises its environmental monitoring data by having a suite of tide and weather sensors installed across their UK sites. In addition to these sensors, it utilises data from wave buoys at key locations, to make informed decisions on both port operations (for example where a surge or cut in tide will impact the size of vessel they can berth) and pilotage, with wave height thresholds used to make decisions on whether a pilot can safely board a vessel to bring it into port.

Real-time monitoring also allows ports and harbours to operate more efficiently with regards to personnel and assists with staff absences where required – for instance, during pandemic-related lockdowns. Having multiple sources of real-time environmental monitoring data co-located in a centralised location significantly reduces the time required to make informed decisions in support of safe navigation and marine operations within a port.

This data can easily be fed into Portable Pilotage Units (PPUs), alongside bathymetric data and electronic navigational charts, to give pilots and crews as much information as possible to assist with vessel movements with limited time and space to operate. This combined approach to data dissemination is used by Peel Ports and several of our other customers.

Good advice

When it comes to choosing the best monitoring system for your port there is no "One size fits all" approach. In fact, it is quite the opposite. Each port, harbour or marine operator will have their own unique set of influencing factors, which will determine what system, sensors and software will be most suited.

A small harbour for example may have minimal large vessel traffic but require a higher amount of data around environmental impact such as air pollution, turbidity or marine noise. Ports are also equally individual as they have a different marine approaches, scope and size of vessel traffic, range of marine users, environmental conditions and different land-side infrastructure and layouts.

To select the right system, first make sure you understand what you already have, what you need and importantly who requires the data. A wide variety of people can benefit from your data, inside and outside of your organisation, so consulting with other departments within your organisation and external stakeholders brings a wider benefit. Where you can, future proof your system and make sure that you can add, build and develop the system as you go.

Lastly, and arguably just as important, ensure it has good data management and interoperability at its heart. Why?

Creating the data is only half the battle, how it is organised, stored, managed and maintained has a direct impact on how any business will function. We are constantly creating, storing and sharing data even when we don't realise that we are doing it and often this data exists in 'silos' which cannot or do not enable data sharing. The result of this leads to data inconsistencies, replication, inefficiencies and ultimately confusion.

Photo: Oceanwise

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Translate this into port scenarios and it could mean that despite the data being available, a pilot may not have real-time access to critical tide and wind data on their hand-held device (tablet/PPU etc). A bathymetric survey may be duplicated unnecessarily because the metadata is missing. An individual spends valuable time retrieving and sending files to other team members when they could find this information quicker by locating and accessing it themselves.

Bad data management can cost time and money and cause unnecessary confusion and frustration. In terms of metocean data, better understanding and efficiency is achieved only when data from multiple sources is combined and communicated in a way that makes it relevant, interesting and digestible by the non-expert.

Unfortunately, there is not an easy fix – good data management requires policies, procedures, information systems and architectures to be established. However, some of these may already be in place. Small incremental steps can be taken relatively cheaply and painlessly. 'Smart' technologies can also support good data management and interoperability is now becoming a 'must have' feature of any new policy, system or software.

With global meteorological conditions becoming more and more uncertain due to climate change, it has never been more important to have real-time, accurate data informing decision making. Being able to monitor the weather and sea conditions in real-time ensures that windows for marine operations, such as pilot boarding/disembarking and vessel berthing, are optimised and taken full advantage of whilst maintaining personnel safety.

As the pressures of the global economy and consumer demand continues to increase, having reliable and accurate data to aid decision making will continue to become increasingly important in our changing world. I believe that technology can also support this with the ongoing development of smart technologies, improvements in telemetry and the notion that data and data sharing are now being taken seriously and at all levels, not just by the IT department.

Help is out there. You can find more information on marine data management for ports, help guides and even request a free training course from OceanWise - we're dedicated to supporting the marine and maritime sectors improve the way they govern and manage their data.