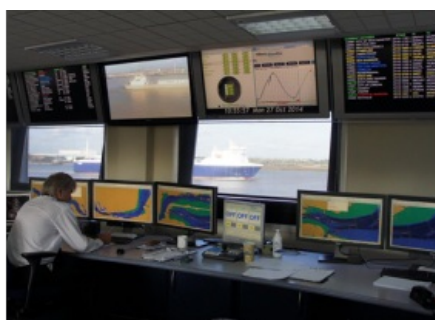
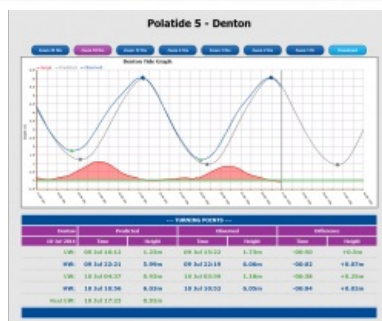


A NEW TIDAL MONITORING SYSTEM FOR PORT OF LONDON AUTHORITY

Environmental Data – Sharing and Publishing



The Port of London Authority (PLA) has had an extensive tide gauge network for many years. However, the existing system, installed in the 1990s was becoming increasingly unreliable providing inconsistent information due to a number of factors. There was a pressing need to develop a state of the art tidal monitoring system across the outer area of the PLA responsibility utilising the latest communications technology whilst ensuring resilience to guarantee 24/7 working of the port could be maintained at all times. OceanWise, working with Valeport, was asked in 2013 to design, build, install and test a new monitoring system to replace the existing facility that included tide gauges, telemetry equipment, servers, databases, system control, data management and display software.

The Port of London is the UK's second largest port handling over 46 million tons of cargo per year with 30,000 shipping movements and stretches from the tidal limit in West London out to the southern North Sea covering over 400 sq. miles.

With up to 8m tidal range, reliable real-time tide observations are critical to the safe operation of the port, reducing survey and dredging operations, and improving tidal analysis and predictions. System installation and rigorous testing was completed in April 2014. The system, colloquially known as 'POLATIDE 5', demonstrated how OceanWise and Valeport collaborated with PLA to create a robust and reliable system that met PLA's stringent requirements. The output is now available as an EMC certified, 'off-the-shelf' system, easily and efficiently deployed at any similar maritime organisation

worldwide.

System Design

The POLATIDE V system includes eight monitoring stations, four base stations and a data feed from seven existing upriver tide gauges operated by England's Environment Agency, as well as the Port of London. OceanWise acted as system designer and integrator and provided all of the system control, data management and web-based user display and administration software. Valeport assisted with the system design and provided the monitoring equipment, battery chargers and waterproof enclosures.

Hardware

Valeport's TideMaster water level recorders are used at each tidal monitoring outstation with Druck pressure transducers and/or the VRS-20 Water Level Radars used as sensors. Output from the TideMaster provides data input to a dual telemetry system, which uses UHF radio modem and a serial to Ethernet/GSM transceiver. The dual system provides backup data telemetry and allows the TideMaster to be interrogated and controlled remotely.

Power to the monitoring outstations is provided by a battery charged from AC power, solar panel and/or wind turbine and designed to meet

PLA's requirement to collect data for up to 7 days. All equipment, battery and charging units are housed in reinforced wall-mounted enclosures providing IP 66 protection to IEC 60529 standards and resistant to external mechanical impacts. A locking device outside the sealed area guarantees the tightness of IP 66 over time. Door switches are cabled to the modems to trigger alarms, doors are opened or closed. Each enclosure design was EMC tested and all sensors, antennae and other external cables connected through the enclosure, ensuring water tightness.

UHF telemetry data transmission uses modems installed at four base stations around the Thames Estuary co-housed with PLA radar stations and connected to the PLA local area network (LAN), which sends data to the POLATIDE 5 data servers installed at Gravesend and the Thames Barrier. A secondary telemetry system transmits via GSM/GPRS on a purpose-built Mobile to Mobile Virtual Private Network (M2M VPN) providing data security and ensuring modems retain the same IP address and contactable by the POLATIDE servers. Data is sent from the M2M VPN to the servers via the PLA Internet gateway and firewall.

Software

Data loading, management and display components installed on the POLATIDE 5 data servers use OceanWise off-the-shelf Ocean Database (ODB) and Port-Log software products. ODB is a complete data management solution that loads and stores most types of simple and complex marine and environmental monitoring data. ODB is accessed through a variety of software applications including GIS, Microsoft Excel and MATLAB, as well as through Port-Log web pages. Full administration of users, stations, sensors, quality assurance parameters, tidal predictions and surge and synchronisation of all data between the two databases is included. Components were improved during delivery of the system in response to feedback from PLA vessel traffic service (VTS) and Navigation System Users.

Deliverables

Port-Log software provides views on the system and data through a map interface showing the status of the overall system, each outstation, sensors and telemetry units and provides an access point to the actual data. It is able to handle different base maps and overlays stored locally within ODB or from OceanWise ENC Web Map Service. Alerts and triggers are generated according to editable parameters and thresholds (e.g. battery levels, data transmission rates, QA failures, water levels). Port-Log provides total control, administration and comprehensive visualisation of system performance and scientific data, as well as access to external systems and websites. Once the outstations became operational, the main QC, logging and data retrieval and display components were installed and tested.

Conclusions

The complexity of designing and installing a tidal system over such a large geographic area, with sensors in remote and inhospitable sites, whilst maintaining an existing 24/7 operation over linked radio systems running in parallel, should not be underestimated. Doing so served as a safeguard for PLA operations staff. POLATIDE 5 has been fully operational now for 9 months and outages due to atmospheric interference and equipment failure have been dramatically reduced. PLA staff are now taking advantage of a more intuitive and interactive interface which it hopes to pass to the general public in future using a web-based system designed for wider community access.