Metocean Data for Design and Structural Monitoring: Instrumentation, Analysis and Industry Challenges

Evening Meeting, London

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By Iain Knight

The London and SE Branch endeavours to cover a wide variety of topics in our monthly evening presentations. For our last evening meeting of the year, we were fortunate to have two presentations provided by Fugro. The first presentation by Ambre Trehin covered "Metocean Data for Design: Why models and measurements are not an alternative but a complement"; the second presentation by Stuart Killbourn covered "Structural Monitoring: Instrumentation, Analysis and Industry Challenges".

Ambre started by explaining why the demand for reliable information on extreme metocean conditions and more generally on metocean climate is increasing. Metocean data is typically needed for the planning (short term operations), exploration (temporary condition) and design (permanent condition) phases of a project.

There are two means of sourcing the required metocean data: measurements or numerical modelling. Measurements provide an accurate reflection of the metocean conditions at the point and time of measurement but whether these measurements are reflective of a wider area or longer time period can be uncertain. Numerical modelling can provide a larger spatial and temporal coverage but there is then a requirement to validate the accuracy of the model. The solution is to use both the measured and numerically modelled data together.

Fugro has developed several long-term hindcast databases of wind, wave, current and/or water level for a variety of locations in the world. These models were designed using a selection of fit-for-purpose modelling tools and, whenever possible, were developed in combination with dedicated in-situ measurement campaigns that enabled the general quality and the local accuracy of the models to be assessed.

Ambre concluded her presentation with a case study set in the Bay of Bengal for which a long-term wave hindcast database was developed. Validation of this database was performed using satellite altimetry. Good correlation between modelled and measured values was achieved in the central Bay of Bengal but with some under estimation in shallower water; this could be resolved with finer resolution models suitable for shallow waters.

Stuart started out by explaining that wellheads are experiencing greater fatigue due to deep water operations, heavier BOPs and deployment in areas of high ocean currents. Existing fatigue life models were complex and were likely to be conservative.

Stuart explained that the motion of the LMRP could be used as a proxy for wellhead strain; this motion could be measured using motion pods populated with accelerometers and angular rate sensors. The results from these motion pods can be retrieved either offline or online for further analysis and determination of the fatigue damage of the wellhead.

In the second half of his presentation, Stuart described how online monitoring of jackets had been used to detect missing foundation grout in one instance and a broken structural member in another.

After a session of questions from the audience; we adjourned to refresh ourselves on the usual cheese and wine.