



Offshore Dynamic Foundation Testing

Test Procedure

Using the Offshore Wave version of the GRLWEAP14 wave equation analysis of piles software program, GRL evaluates if the proposed hammer and cushion system is suitable for the project and anticipates installation conditions that may require special precautions.

Once pile driving starts, GRL monitors driving stresses and the actual efficiency of the hammer (energy transferred to the pile) with a Pile Driving Analyzer® (PDA). GRL may also provide equipment and expertise to assess hammer performance (stroke, potential and kinetic energy), an important concern on an offshore platform. Pile driving monitoring requires strain transducers and accelerometers attached to the pile to supply the data required for analysis with a PDA. If necessary, special underwater strain transducers and accelerometers are used.

Underwater Dynamic Testing

The foundations of many offshore oil platforms and wind turbines are designed for driving by underwater hammers. GRL has the equipment to perform underwater dynamic testing in these situations. Underwater strain transducers are coated with polyurethane and the internal components of the accelerometers are protected with a waterproof sealer and O-rings to prevent water intrusion.

Data Collection and Analysis

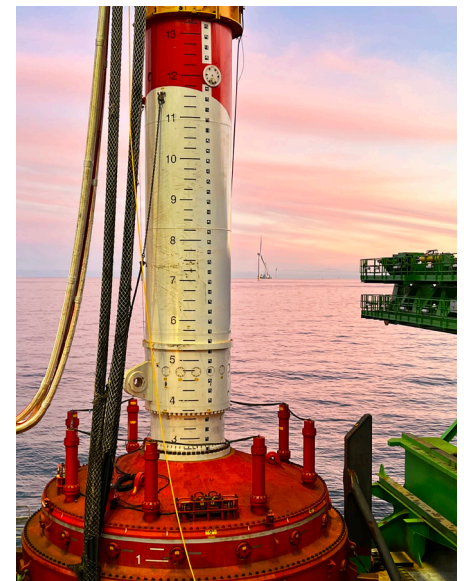
Immediately following pile driving, GRL uses the measurements collected during pile monitoring to complete the dynamic load test by performing CAPWAP® Signal Matching analyses. This provides an assessment of shaft resistance and end bearing at the time of testing. GRL often repeats the dynamic load tests during a pile re-strike. To ensure continuity of offshore operations GRL provides backup equipment and personnel to the site.

CAPWAP® utilizes an algorithm that is very accurate for long and non-uniform piles that are common in offshore installations. It calculates wave equation parameters including soil damping, quake, shaft resistance and end bearing for discrete points along the shaft of the pile.

GRL Engineers often use site-specific parameters, calculated by CAPWAP® to repeat the GRLWEAP14 Wave Equation analysis. This refined wave equation analysis may resolve discrepancies between predicted and observed blow counts, serve as a basis of pile acceptance in case of early refusal, and improve installation criteria of other piles in similar soils.

Benefits of Dynamic Foundation Testing for Offshore Wind Farms

- Pre-construction driveability studies predict driving stress levels which can be used to reduce the risk of pile damage
- Dynamic pile monitoring and hammer performance checks the predictions from pre-construction driveability studies
- Evaluation of geotechnical static resistance at the time of driving and distribution along the pile length
- Underwater dynamic testing and monitoring to depth of up to 300 m



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