Silent Installation of MonoPiLEs in prevailing Clay and Sand soils

Publieke samenvatting / Public summary

Aanleiding

Offshore wind development in the Netherlands is accelerating, with 11,3 GW of capacity to be tendered before 2030 and an additional 10 to 20 GW expected in the following decades. One of the drives for offshore wind farms arises from energy transition, aiming to provide the Dutch industry and households with renewable electricity, replacing fossil fuel-based energy including their CO2 emissions. Many future Dutch wind farm zones, such as Nederwiek, Doordewind and IJmuiden Ver, present challenging soil conditions, including very-dense sands and very high-strength clays. These soil types pose difficulties for conventional foundation installation methods, like impact driving and vibro-hammering, which either exceed underwater noise thresholds (thereby prohibited as per legislation for offshore industry) or fail to achieve the targeted penetration depths (early refusal). The Vibrojet technology is the enabler to more silently install monopiles in challenging offshore subsoil. Using Vibrojet technology comes with less CO2 emissions because no noise mitigation measures are required and thinner monopiles are feasible when impact hammer as mitigation method is not needed anymore.

Doelstelling

The project aims to move the current state-of-the-art of Vibrojet forward by extending the applicability of Vibrojet technology to more challenging soil conditions. The focus is on proving performance in very high-strength clays and very dense sands. The

Projectinformatie / Project information

Projectnummer / Project number
DEI1250155
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€ 3.292.239,00

Algemene informatie / General information

Penvoerder / Secretariat
GBM Works B.V.

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project goals are defined as: 1. Clays: Develop and validate Vibrojet penetration in very high-strength clay (undrained shear strength Su up to 300 kPa) 2. Sands: Extend Vibrojet capabilities to very dense sand (cone resistance Qc up to 125 MPa) The project targets to achieve TRL-6 for clayey soil profiles and TRL-7 for sandy soil profiles. Sand tests are intended as additions to the existing validated Vibrojet setup, the calculation models and expertise developed during earlier (completed and running) SIMPLE projects, as have been confirmed by a Technical Qualification issued by DNV-GL. The project fits the DEI+ goals by achieving a significant reduction in CO2 emissions by applying the Vibrojet technology compared to traditional installation methods and MP designs.

Korte omschrijving

The following activities are undertaken for each of the above project goals. 1. Clay Development: Prototype engineering, procurement and manufacturing. Field testing (onshore / nearshore, e.g. harbour of Antwerpen). Geotechnical modelling. Post-processing of data and reporting. 2. Sand Development: Expansion of existing fluidisation model (from previous SIMPLE projects). Lab testing (small scale). Geotechnical LBC/ABC benchmarking. Post-processing of data and reporting. GBM Works is responsible for project management. The clay work package will be executed by GBM Works, in support with a contractor and OEM supplier. In the sand work packages, GBM Works will closely collaborate with Deltares and OEM supplier during execution. Deltares, being a research institute, supports with knowledge and input in the clay work package. In the sand work packages, Deltares takes the responsibility for execution in close cooperation with GBM Works and OEM supplier.

Resultaat

Having completed SIMPLECS project, the following results will be obtained. For the Vibrojet development of pile installation in CLAY (Final TRL = 6): • Proof of Vibrojet driveability in very high strength clay; • Geotechnical calculation models for prediction of clay driveability and intended failure

mechanism by Vibrojet. • Reporting, including lessons learned on geotechnical (e.g. clay failure mechanisms), as well as operational (e.g. optimized installation method) and mechanical (e.g. prototype structural integrity) expertise fields. For the Vibrojet development of pile installation in SAND (Final TRL = 7): • Proof of Vibrojet driveability in very dense sands; • Lateral Bearing Capacity (LBC) and Axial Bearing Capacity (ABC) comparison between Vibrojet (several jetting methods) and Vibrohammer; • Geotechnical calculation model for prediction and back-analyses sand driveability and fluidisation by Vibrojet technology, extending the existing fluidization model; • Reporting, including lessons learned on geotechnical (e.g. several jetting methods), as well as operational (e.g. optimized installation method) and mechanical (e.g. prototype harmonics) expertise fields.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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