

Dynamic Cone Pressure Meter (DCPM)

Publieke samenvatting / Public summary

The role and share of offshore wind in the energy transition will become more and more relevant. Offshore wind turbines increase in size and so does the size of their foundation piles. The interaction of the large diameter foundations of offshore wind turbines with the surrounding soil is one of the key research areas where the offshore wind industry expects to cut conservatism and reduce uncertainty in design. This expectation comes from the facts that (1) currently prescribed design models were not designed for large-diameter monopile foundations that are applied nowadays, and (2) available measurement techniques capture the relevant soil characteristics only partially.

Objective

The current project aims at developing knowledge about and novel tools for the measurement of frequency-dependent in-situ soil properties relevant for offshore monopile foundations, as well as at developing models that enable direct use of the extracted soil properties in the design community. The frequency-dependent in-situ stiffness and damping of the soil, their strain dependence, as well as the frequency-dependent cyclic properties are uncertain and have never been truly measured. It is envisaged that these in-situ soil properties can be measured by a Dynamic Cone Pressure Meter (DCPM) with significantly higher accuracy than that in the current practice. Therefore, the DCPM will pave the way for the reduction of uncertainty in the soil-structure interaction models. This results in a decrease in the conservatism and thus an increase in cost efficiency in the future design of monopiles

Projectinformatie / Project information

Projectnummer / Project number

TEWZ118001

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Algemene informatie / General information

Penvoerder / Secretariat

Technische Universiteit Delft

Publicaties en materialen / Publications and attachments

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**Dynamic Cone Pressure Meter
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- 14.11.2023

Eindrapport TEWZ118001

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supporting offshore wind turbines.

Short description

Fugro will modify an existing Cone Pressure Meter device to a Dynamic Cone Pressure Meter (DCPM) device that can excite soil harmonically, at the frequency band and strain levels relevant for offshore wind turbine monopiles. TUD will develop a model to simulate the DCPM test in order to investigate the sensitivity of the DCPM response to the undisturbed in-situ soil properties. In addition, the model will serve as a basis for a parameter-identification scheme to translate DCPM recordings into actual frequency-dependent in-situ soil parameters; the scheme will also be developed by TUD. Fugro will execute on-shore field experiments to test the DCPM and validate the device together with the parameter-identification scheme and the model. SGRE will develop practical design models that employ the extracted in-situ soil parameters as direct input, to ensure that the design will benefit from the progress made in in-situ dynamic soil characterization.

Result

The project will deliver a prototype of a device, the DCPM, for in-situ dynamic soil investigation. Other tools – a model and parameter identification scheme – will be delivered together with the device, enabling identification of frequency-dependent in-situ soil parameters relevant for OWT monopiles. The project will also deliver the results of on-shore field experiments aimed at testing and validation of the DCPM together with the model and the parameter-identification scheme. Furthermore, the knowledge regarding the true frequency dependence of in-situ soil parameters will be enhanced through the project. Practical design models for the design of offshore wind turbine monopiles employing the DCPM-identified soil parameters will be delivered to facilitate the industry. Overall, the development of the DCPM has the potential to serve the entire offshore wind industry with enhanced knowledge on in-situ dynamic soil parameters that have not been explored before.

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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