

PhD position available at Ifremer

Suction caisson anchor and piles in gassy sediments: installation and in-place performance

Recruiting Institution: Ifremer - <https://www.ifremer.fr/en>

Contact name: Nabil Sultan - e-mail: nabil.sultan@ifremer.fr

Project and partners: BETTER project - MSCA-DN

<https://www.linkedin.com/company/better-project-msca/posts/?feedView=all>

Pre-requisites and mandatory documents

The position is addressed to candidate with MSc in geotechnical engineering or civil engineering

Researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before their date of recruitment. Compulsory national service, short stays such as holidays, and time spent as part of a procedure for obtaining refugee status under the Geneva Convention¹ are not taken into account. For international European research organisations², international organisations, or entities created under Union law, recruited researchers must not have spent more than 12 months in the 36 months immediately before their date of recruitment in the same appointing organisation. Note that the mobility rule applies to the (first) beneficiary where the researcher is recruited. In case of multiple recruitments, the mobility rule only applies to the first recruitment.

Position description

The installation of foundations in gassy sediments can create pathways for gas migration or induce gas expansion and exsolution. These processes can degrade the sediment's mechanical properties and affect installation procedures. Over the long term, stress fields and fluid pressure are continually disrupted by the cyclic stresses exerted on the foundations and offshore wind structures due to waves, underwater currents, wind, and rotor rotation. This PhD thesis focuses on addressing the influence of free gas on the mechanical properties of marine sediments through two complementary approaches. The first approach is experimental, involving detailed laboratory-based tests on fine clayey sediment and coarser silty sediment. The tests aim to investigate the effects of varying gas saturation and distribution under static and cyclic loading scenarios, simulating the installation and operational stresses of offshore wind turbine foundations. The experimental data will be used in the second, theoretical phase, which involves numerical simulations using advanced constitutive models that incorporate the influence of free gas on sediment behaviours.

Expected Results:

Free gas can significantly alter the hydro-mechanical properties of marine sediment, leading to increased compressibility, reduced shear strength, and disrupted permeability. However, its potential role as a hazard to the foundations and structures of offshore wind turbines is often overlooked in calculation standards and foundation design protocols. The degradation caused by the presence of free gas may occur during the installation phase as well as throughout the operational lifespan of a wind turbine (approximately 30 years).

The main objectives of the proposed PhD thesis are:

- To experimentally characterize the effect of gas on the static and cyclic behaviour of two distinct sediment types: fine clayey sediment and coarser silty sediment.
- To evaluate the impact of gas on the installation and operational stability of two foundation types (pile and suction anchor) in these sediment types.
- To develop practical design guidelines that integrate the influence of gas into engineering practices for offshore wind turbine foundations, thereby enhancing their reliability and performance.

Supervisors

Supervisor / PhD Director: Nabil Sultan

Co-supervisor: Patrick Mutabaruka

Employment details

The candidate will receive a three-year doctoral contract with IFREMER, in accordance with the regulations established by the EU for MSCA fellowships. The amount is determined based on the country-specific lump sum provided by the European funding agency, adjusted for the employer's contribution to social insurance (see <https://www.horizon-europe.gouv.fr/sites/default/files/2025-02/french-salary-explained-pf-dn-from-2024-pcn-2025-en--11413.pdf>). The candidate will be employed by IFREMER (French Research Institute for Exploitation of the Sea). For more information, please visit the institution's website: www.ifremer.fr

ESR specific requirements and skills

We look for a highly motivated candidate with MSc in geotechnical engineering or civil engineering. We look for enthusiastic persons, which like to work and study with other young researchers and with a particular interest to international relationships.

ESR workplace description

The workplace would be at Geo-Ocean research unit at IFREMER, located in Plouzané, France (<https://www.geo-ocean.fr/>)