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OFD®

OFD®: Offshore foundation drilling

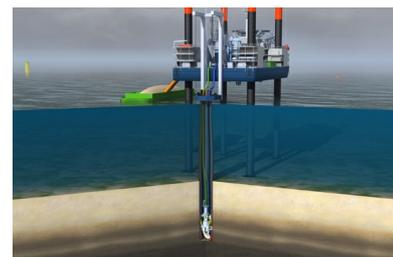
Drilling technology for building the foundations for offshore wind power plants

In Germany, offshore wind power is a key factor on the way to establishing energy supplies from regenerative energies. To achieve the goals of the Federal Government, the share of wind power in Germany's gross electricity consumption should increase from 6.6 percent (as per 2008) to 25 percent by the year 2030, it is vital not only to expand construction onshore, but also drive forward the development of offshore wind farms.

The flexibility of the VSM principle is also proving its worth offshore

The feasibility and concept study funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) delivers a machine technology that is based not only on the VSM technology, but has also been adapted and modified for maritime use. VSM is used onshore to sink shafts such as launch and target shafts for tunnel boring machines, ventilation shafts for metro lines and the like. The VSM machine works below groundwater level. The material excavated using a Roadheader is sucked away with the surrounding water using a pump and conveyed to the surface. There the cuttings are separated from the slurry.

The OFD® machine works according to a similar principle. A variable gripper system enables the machine to be fixed in different positions in the monopile. This means that the OFD® machine can be introduced through a tapered pile for installation and removal. The movable cantilever also ensures maximum flexibility in diameter. The drilling diameter can thus be adapted to the diameter of the monopile, while also making it possible to drill in the pile interior and with an overcut below the pile base. The material is excavated under water by a cutterhead that rotates in concentric circles around the pile axis thus excavating the bottom surface. The excavated material is transported to the surface using a submersible pump. There the solids



OFD® is based on the well proven VSM technology - adapted to the maritime conditions.

are separated from the water and temporarily stored. The cleaned water is then transferred back to the drilling process.

Advantages compared to conventional installation techniques

The usual installation practice at the present time for foundation structures in offshore wind power plants is to drive the piles in. To do this, a hydraulic hammer is fixed to the pile to be driven. This hammers the pile into the seabed with around 30 hits a minute and up to 8,000 hits per pile. When using this method, peak emission sound pressure levels of 195dB as well as continuous sound pressure levels of 178dB are perceivable even 750 meters away. The effects on maritime fauna, especially on the porpoises in the North and Baltic Seas, are dramatic. In these animals, which communicate and find their orientation acoustically, levels above 164dB can cause temporary threshold shifts in their hearing or even lead to fatal injury.

Working together with the institute for technical and applied physics (itap) from Oldenburg, measurements were carried out on a VSM working on land. These formed the basis for forecasting the underwater noise emissions of OFD® technology. The estimated figure for the continuous sound pressure level was only 117dB (re1µPa) at a distance of 750 meters. The peak emission sound pressure level was max. 3 to 4dB above that. In comparison to ramming, the OFD® method is therefore an improvement that undercuts the current reference value of 160dB - which was established by the Federal Maritime and Hydrographic Agency (BSH) - by more than 40dB.

In many regions the geology presents difficulties in installing the piles through ramming. These can occur due to very high ground compactness of the geology, rock layers or boulders in the ramming area. As such, the ramming method often comes up against its limits. This means that establishing foundations successfully often means a great deal of work and expense. By using the OFD® method, construction companies have access to a tool for the first time with which such problems play a secondary role. The cutterhead of the OFD® drilling rig can be equipped with different tools and thus adapted to the varying geologies.

"Sponsored by the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) based on a resolution passed by the German Bundestag"



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