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PILE-DRIVING WITH WATER

Since 2010 Fistuca BV, a spin-off of the TU Eindhoven, Van Oord and TNO, have been developing BLUE Piling Technology, an innovative method of driving hollow piles into the seafloor that is quieter and more cost effective than traditional methods. This revolutionary offshore piling method, BLUE Piling, is currently being tested at scale at a Van Oord shipyard.

Most offshore windmills are built on, for the most part, hydraulically driven large steel monopile foundations, which produces considerable underwater noise. Since this may be harmful to marine life, many countries stipulate a maximum noise level and/or period within which piling is allowed to take place.

The innovative thing about BLUE Piling Technology is that a heavy steel ram is no longer needed to drive the pile into the seafloor; instead a column of water is used to generate the pile-driving pressure. The principle works in the following way: a hollow pile is sealed off at the bottom by a steel plate, above which a gas mixture is pumped in a combustion chamber. The rest of the pile is full of water. Then the gas mixture is ignited and through the mass inertia of the water column, the gas is not able to expand more quickly than it combusts, which increases the pressure of the gas. This pressure drives the water column upwards and the pile downwards. Subsequently the water column falls and drives the pile downwards again.

The large surface area on which the pressure works enables a high enough force to be exerted to drive the pile into the seafloor. It is a method that is particularly suitable for large pile diameters. The duration of the force and its more gradual accumulation, compared with conventional piling, ensures that the pile goes deeper with each blow and there is less fluctuation in the tension. This form of piling is expected to be considerably quieter and cause less fatigue in the pile itself, which could lead to significant cost reductions in the long term for the construction of offshore windmill foundations.

A subsidy from the Offshore Wind TKI is enabling a two-year project in which TNO, Fistuca BV and Van Oord will develop the technology in stages. In August 2013 the first test was carried out in which two piles were driven in the water. The extensive acoustic measurements performed by TNO during this test are being incorporated into an acoustic model to predict offshore piling in different conditions.

The results of the tests were certainly positive, with a very significant reduction in the noise measured compared with the traditional method. Also the accelerations and tensions registered in the pile were very low compared with traditional piling.

Based on these measurements Fistuca BV is currently scaling up the technology to test again on a much larger scale in 2014. If these tests go well, this technology will probably get to market in 2015.

INTERESTED IN BLUE PILING?
Please contact Harald van der Mijle Meijer

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