Project Experience

Bi-directional O-Cell® testing of Wind farm Foundations

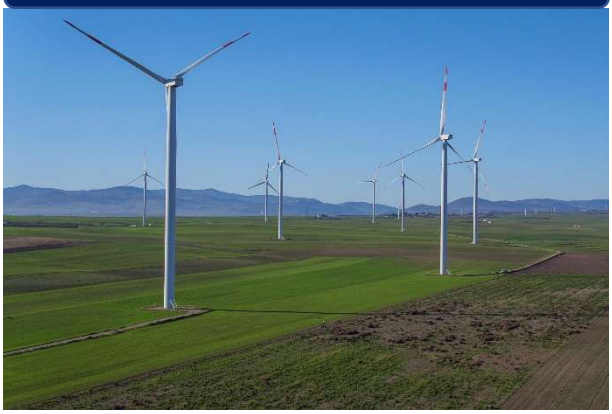
Fugro LOADTEST have been performing O-Cell® tests for wind farm foundations for many years and has been present in some of the most challenging wind farms developments around the world. From the important Italian investments to produce clean energy to one of the most important offshore wind farms for France.

In the last decades the search for clean energy has been one of the most important missions of nearly every country around the world. Wind remains the leading non-hydro renewable technology anticipated to be capable of production of sufficient energy to maintain millions of households around the world.

With the evolution of wind technology and a greater demand for power from an increasing population, bigger and more modern wind farms are required, and the geotechnical challenges to construct them, both on and off-shore, are even becoming more complex. To help solve these challenges, the O-Cell method of testing pile capacity used for wind farms foundations provides numerous advantages with its adaptability to any project and client's requirements, even in the most remote areas.

The following examples are just a small selection of some of the most interesting projects that have successfully used O-Cell technology to test the foundation elements for wind farms.

Ponte Albanito Wind Farm - Italy



Italy is among the top ten world's largest producers of wind power and Ponte Albanito wind farm was a substantial governmental investment to construct 8 Eolic turbines near the city of Foggia.
Due to the well-known advantages of the O-Cell methodology compared to traditional top-down load testing, Fugro Loadtest was commissioned to test 3 piles for this project in a very remote location.
The ability to directly distinguish the end bearing and skin friction of the foundations is one of the key advantages of bi-directional load testing.
The three test piles, with lengths between 28 and 32 metres were successfully loaded up to 18 MN to evaluate the pile behaviour in these ground conditions in remote locations without needing to transport additional reaction frames or install anchor piles.

Rahman & Casimcea Wind Farms – Romania

The Eastern part of Romania is assessed to be one of the preferred places in Europe to construct wind farms due to its large wind potential. For the construction of these wind farms, the acquisition of geotechnical information was necessary to validate and optimise the design. Fugro Loadtest was contacted to execute load tests on two 1000 mm diameter piles using O-Cell methodology.
Since the designers already predicted a comparable or greater end bearing in relation with the skin friction, the O-Cell assemblies were installed at the bottom of the excavation to directly measure and determine the end bearing behaviour.
Both piles were successfully tested to loads above the desired 16 MN, allowing the characterization of the foundation behaviour in the weathered schist bedrock.

Melfi Wind Farm - Italy

In the Region of Melfi, an important wind farm was created to take advantage of the region's wind conditions. Consisting of 13 turbines, the wind farm can produce the necessary energy to meet the needs of 30,000 households during a year.
To obtain crucial geotechnical data for the turbine foundations, a 1200 mm diameter preliminary pile was tested with the O-Cell method. The 21.5 metre deep pile was founded in silty clays with the concrete cut-off level left several metres below ground. A maximum load of 13.9 MN was applied to the pile during testing mobilising the full skin friction of the pile.
The excellent test data collected allowed the use of the Cemsolve® pile settlement analysis program to determine the foundation behaviour and confirm the design parameters.

Saint Brieuc Offshore Wind Farm - France

62 offshore wind turbines, 20 km offshore and spread over an area of 75 km^2 in the English Channel off the North West coast of Brittany will constitute one of the biggest commercial-scale offshore wind farms in the world. The wind farm is planned to generate enough electricity to provide the power requirement of 825,000 households daily.
To obtain the necessary geotechnical information to support the extremely sensitive designs for this project, 14 steel pipe test piles were drilled, grouted into rock sockets, and tested extensively in comparable ground conditions at the Routin Quarry near Cap Fréhel, Brittany.
Nine of the larger piles were load tested bi-directionally with O-cells.
An additional requirement was for extensive rapid cyclic loading requiring in excess of 1000 cycles to simulate both wave and wind loadings to assess any degradation in geotechnical behaviour.

Alisea Wind Farm - Southern Italy

Alisea - Macchialupo Windfarm (Baywa-Devizia), in the Municipality of Lacedonia (AV), Campania Region, Italy is home to a 40 MW field.
Fugro Loadtest were commissioned to perform two full scale static loading tests on 2 x 1200 mm diameter, 25 metre deep, piles using a pair of 330 mm O-Cells in each to verify the original geotechnical design used for some of the foundations already installed but not previously tested.
Sub-surface conditions at the test pile location consist primarily of silty clays, sands and gravels. A maximum test load of 12 MN was applied (over 6MN in each direction).
The location was very remote – perfect for O-Cell bi-directional load testing as no reaction beams with anchors or kentledge needed to be transported.

Barenburg Wind Farm - Germany

Germany is one of the largest electricity producers from wind power in Europe and invests millions every year to increase its production. The Barenburg wind farm is one of these.
Due to the location of this project within the German oil fields, many of the site locations would mean excavation of potentially contaminated materials.
To obtain the needed geotechnical data, a Fundex pile was tested using O-Cell methodology. The O-Cell method was adapted to this type of pile without reducing its quality or reliability. At same time this pile was tested, another pile was tested using the traditional top-down method, which allowed the comparation of the test results. With the O-Cell test, the client was able to obtain more accurate data regarding the end bearing characteristics and mobilised skin friction.