

CASE HISTORY

Application: **Geo Subsurface Expertise**

Technology: **PS Logger**

Location: **Thor Offshore Windfarm, Hvide Sande, Denmark**

As part of the Energy Agreement of June 29th, 2018 all political parties in the Danish Parliament have agreed to establish 3 new offshore wind farms before 2030.

Fred. Olsen Windcarrier's jack-up vessel Jill (Pictured right) is nearing completion of the preliminary geotechnical surveys at the Thor offshore wind project in Denmark. The wind farm is planned to have a capacity of minimum 800 MW and maximum 1000 MW and to be in full operation no later than ultimo 2027. The offshore wind farm will be established in the North Sea, west of Nissum Fjord, min. 20 km from shore and will be named "Thor" after the name of the town "Thorsminde".

As part of the preliminary geotechnical surveys, Robertson Geo conducted PS Logger operations on four 70m boreholes over a two-week period. The geology encountered was mainly moderate to stiff clay with some dense sands, predominately producing excellent data from the PS Logger with both the compression and shear waves being well defined.

Robertson Geo's 2000m winch secured to the drilling deck with the PS Logger laid out to its left and ready to be deployed.



The probe:

The PS Logger probe measures P (compression) and S (shear) wave velocities in a single borehole without the need for external energy sources, making it simple and quick to deploy. When combined with bulk density values (from a density log or in this case from core sample tests) small strain moduli (Young's, Shear and Bulk) can be calculated using simple formulae.

The data:

This is logged and processed in-situ by the engineer and then further assessed at the Robertson Geo head office by a senior engineer. Sound practice, good QA.

Full waveforms are recorded digitally at acquisition time across 6 channels (P wave, S wave left & S wave right at the near and far receivers) at a predetermined sample rate as low as 2.5 μ sec. The sample rate is carefully selected to be as small as possible to provide the best resolution but high enough to capture the arrivals within the listening window. Using the acquisition software, the waveforms can be displayed, scaled and filtered to allow for the picking of the first arrivals at each receiver.

