

# INTEGRATED SOLUTION FOR INSTALLATION OF OVER 300 PILES ON MAJOR WIND FARM

**ACTEON**

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## PROJECT OVERVIEW

A global offshore wind operator required a strategic partner to provide an integrated solution for the monitoring and installation of 349 piles; 111 wind turbine generator (WTG) jackets, and two offshore substation (OSS) jackets, offshore South East Asia. The solution involved the integration of services from Acteon brands 2H, Deepwater, LDD, MENCK, Pulse, and UTEC.

Claxton provided abrasive cutting and recovery services to support the test installation phase of six piles. This involved working alongside LDD to combine Claxton's water-abrasive pile cutting tool with LDD's internal lifting tool (ILT).

MENCK provided two of the world's largest hammers to support the marine contractor's activities for the project. LDD, supported by 2H, was contracted for the design of the pre-piling template (PPT).

Pulse, supported by Deepwater, provided the design, fabrication, yard installation and commissioning of its market-leading monitoring instrumentation on three wind turbine foundations for the end operator. UTEC provided a long-term real-time kinematic (RTK) solution to cover the entire offshore wind farm site.

## THE CHALLENGE

Support throughout the design and installation phases was required with piling hammers, pre-piling template design and structural health monitoring equipment as part of a complete solution for jacket installation.

Hydraulic hammers with an underwater MENCK Noise Reduction Unit (MNRU), and a live penetration depths measurement system was required to install the piles in water depths of 27-38m whilst mitigating the high risk of pile runs.

The installation phase involved mitigating the challenges associated with the large jacket pile dimensions, challenging soil conditions and regional underwater noise limitations. This project would also be the highest number of piles ever driven in one renewable energy project globally.

## CUSTOMER GOAL

The end operator required data and insight on the development, as well as corrosion and anode monitoring to enable the digital measurement data required. The operators and all contractors involved needed a reliable solution to install 349 piles on the wind farm.

## OUR SOLUTION AND ITS COMMERCIAL BENEFITS TO THE PROJECT

### Market leading services and integrated solutions

- The piles were installed in a test environment and a survey period was observed. Following this, Claxton dredged the soil from inside the pile to access a cut location below seabed and then deployed an integrated cut and lift tool to sever and remove the piles in a single trip. This was also useful to the field owner to trial run the decommissioning of the piles on cessation of production in years to come.
- Delivery and operation of the MENCK MHU 4400S hydraulic hammers and the newly developed MENCK underwater noise reduction unit (MNRU) and a live penetration depth measurement system.
- LDD designed a bespoke pre-piling template to integrate with the hammer based on pile dimensions, installation tolerances and on challenging environmental conditions. The hammer also integrated and interfaced with the PPT, and all other equipment provided by Acteon brands to ensure the transfer of knowledge, and collaboration of engineering and fabrication teams, which simplified the process and avoided the risk of misdesign.
- Pulse provided the design, fabrication, yard installation and commissioning of its market-leading monitoring instrumentation on three wind turbine foundations.



- Pulse also supplied its cutting-edge NX2 digital platform for acquiring a range of high-quality measurements that include bending and torsional strain, inclination, displacement, and acceleration in key components of the jacket legs, nodes and wind turbine generator towers.
- Provision of corrosion and anode monitoring equipment to provide the full package of digital measurement data required. Deepwater worked with Pulse to provide anode monitoring systems.
- UTEC and our local partner provided a long-term real-time kinematic (RTK) solution at the offshore wind site. Three permanent RTK stations were installed: one onshore and two offshore at offshore substation (OSS) platforms, each with 100% backup. Prior to the installation of the permanent offshore RTK station, a temporary station was installed at the OSS jacket.

#### Operational bases across the world

- The essential hydraulic drive unit and the external shock absorber ring were manufactured and assembled at MENCK's headquarters in Kaltenkirchen, Germany and mobilised to Rotterdam for integration with the hammer housings and the 220-ton ram weight assembly.
- Local personnel supported the installation of the RTK stations and provided regular maintenance.



#### Work at scale with a proven track record for delivery

- This contract followed a recent sequence of successful projects in the renewables arena using the largest MENCK hammers.

#### Minimise the environmental impact

- The MNRU was used to reduce the piling noise before it was transferred into the water on all 349 piles.
- The soft start procedure used during piling where the hammer was adjusted to start with 3% energy level and increase gradually, from the initiation of piling activity until required blow energy was reached for installation of each pile, ensuring excessive energy was not used.
- All 349 piles were driven without a single pile run, thanks to a combination of the use of digital smart sensors used during the operation to detect and avoid pile run before it occurred, and 3% minimum energy level integrated into the monitoring of the hammer.
- The installed structural integrity and corrosion sensors allow for remote control of the health of the assets, reducing the need for extensive boat trips.
- The installed structural integrity and corrosion monitoring system provides meaningful data and insight for the life of the asset and allows for data transmission from the offshore locations to the onshore base and provides for an optimised O&M interventions program.

#### Combine digital technology and data to enhance our expertise

- Live depth penetration measuring system was used to deliver 3-5 times per second life data in conjunction with 2 x GNSS antennas on the hammer to achieve the highest possible resolution.
- We installed market-leading data loggers, corrosion prevention instruments and our proprietary NX2 data hub technology, an integrated platform for collection, storage, analysis and visualisation.
- The RTK station was fully autonomous and powered by solar panels.
- RTK stations are remotely controlled from UTEC's offices in the East Asia region.

#### Products used

- NX2 digital platform
- MA-1™ monitored anode
- MENCK MHU 4400S hydraulic hammer x2
- MNRU
- Follower
- Live penetration depth measurement
- Pre-piling template
- Integrated pile cutting and lifting tool (Claxton IPC and LDD ILT)