



INNOVATION IN ACTION

WIND POWER TRANSPORT AND
INSTALLATION CASE STUDY PACK



THE RIGHT TOOL MAKES ALL THE DIFFERENCE

INNOVATION IN ACTION

WIND POWER TRANSPORT AND
INSTALLATION CASE STUDY PACK

INTRODUCTION

Thank you for downloading our case study pack and expressing your interest in the future and progress, of wind power generation. Please find, within this pack, examples of Enerpac being instrumental in creating and implementing lifting and fixation solutions, across the Offshore Wind Turbine Industry.

Referencing numerous industrial experts, and highlighting specific projects achieved at the key points in the process to build solid foundations for individual turbines, we hope you are inspired. Enerpac solutions are consistently innovative, always safe and efficient, and always deliver to enable and empower challenging and inventive industries.

Enjoy your reading, be inspired, join the journey.

CONTENTS

USING THE ENERPAC SYNCHOIST SYSTEM FOR INSTALLING OFFSHORE GRAVITY BASED WIND TURBINE FOUNDATIONS.	03
THE ENERPAC TROLLEY SYSTEM SPEEDS UP OFFSHORE WIND TRANSITION PIECE LOAD OUT.	04
USING THE ENERPAC SYNCHRONOUS LIFTING SYSTEM TO LEVEL TRI-PILED OFFSHORE WIND FOUNDATIONS.	05
REMOTELY RELEASING SHACKLE PINS ON A LIFTING FRAME USING THE ENERPAC XC BATTERY-POWERED HYDRAULIC PUMP AND CYLINDERS.	06
HYDRAULIC CYLINDERS USED FOR OFFSHORE WIND TURBINE LEVELLING AND FIXATION.	07
PRODUCT SUMMARY	08



LEARN MORE.
CONTACT AN ENERPAC
WIND SPECIALIST.



USING THE ENERPAC SYNCHOIST SYSTEM FOR INSTALLING OFFSHORE GRAVITY BASED WIND TURBINE FOUNDATIONS

CUSTOMER
Suomen Hyötytuuli

LOCATION
Tahkoluoto Offshore Wind Farm,
Pori, Finland

CHALLENGE

The Tahkoluoto Wind Farm is the world's first offshore wind farm designed for operating in sub-zero ice conditions.

Operated by Suomen Hyötytuuli Oy, the Tahkoluoto Offshore Wind Farm includes 10 offshore wind turbines, each with a capacity of 4.2 MW. Following preparation of the seabed to provide a level surface, the hollow gravity base foundations, weighing over 500 tonnes, have been carefully and successfully installed.

SOLUTION

During lowering through the splash-zone and positioning on the seabed, the Enerpac SyncHoist system is positioned below the crane hook, to precisely manage and control that the foundation remains vertical.

Thus preventing damage to the prepared and levelled seabed, and the base of the gravity foundation as it comes in to contact with it.

The SyncHoist Lifting System was used within an X-frame lifting tool to manage connecting loads - avoiding damage to the transition piece flange, used to connect the foundation to the crane. It comprised of a lifting frame incorporating four SyncHoist double-acting, push-pull hydraulic cylinders at each corner, a self-contained PLC-controlled, diesel-powered hydraulic pump unit with battery back-up.

During installation, the level of the foundation was accurately measured and, where necessary, adjusted. This was controlled wirelessly by a single operator on the crane vessel working alongside the foundation installation team.

This allowed the operator to receive instruction, to control each cylinder's position independently, or synchronously, to safely and precisely balance, tilt and manage the load, confirmed by sensors on the foundation.

“We wanted the X-frame lifting tool to be completely self-contained without any hoses or wires connected to the vessel. This way we had maximum flexibility in the movement of the foundation,” says Xavier DeMeulder, Marine Operations Manager at Suomen Hyötytuuli Oy, who goes on to say

“The SyncHoist's wireless control was excellent, enabling us to make adjustments of as little as 5cm during the installation. SyncHoists made the job of installing the gravity base foundations a good deal easier than using a tailor-made levelling system. The first foundation took 12 hours to install, later foundations took 8 hours as the installation team became more proficient.”



PRODUCTS

SHS-Series Synchronous Hoist System
EVO-Series Synchronous Lifting System

Enerpac, combining the SyncHoist and EVO-Lifting Systems, efficiently installing offshore Gravity Based Foundations.

THE ENERPAC TROLLEY SYSTEM SPEEDS UP OFFSHORE WIND TRANSITION PIECE LOAD OUT

CUSTOMER

GeoSea Geotechnical & Offshore Solutions

LOCATION

North Sea, Germany - Hohe See and Albatros Offshore Wind Farms

CHALLENGE !

To provide a fast-performing solution that minimizes the time in port, during load-out of foundations to offshore, installation vessels.

SOLUTION ✓

Heavy lifting equipment specialist, Enerpac, has supplied GeoSea Geotechnical & Offshore Solutions with an integrated trolley system, for loading transition pieces onto a jack-up vessel for the foundation installation of the Hohe See and Albatros offshore wind farms, Germany.

The innovative Enerpac trolley system is mounted on two 90m steel tracks running from the quayside onto the deck of the jack-up installation vessel. Three 500 tonne transition pieces are securely held

by hydraulic cylinders in the fastening frames. Each frame is powered by four electrically driven trolleys, allowing faster and smoother movement than traditional skidding systems. The trolley system is easily managed by a single operator, via the Enerpac Intellilift wireless control HMI, ensuring a safe and synchronised operation.

The transition pieces are advanced along the trolley's tracks to within reach of the on-board crane for subsequent deck positioning and offshore installation.



PRODUCTS

Enerpac ETR50, ETR100 and ETW125 electrically driven trolley systems

HCR-Series High Tonnage Cylinders

USING THE ENERPAC SYNCHRONOUS LIFTING SYSTEM TO LEVEL TRI-PILED OFFSHORE WIND FOUNDATIONS

CUSTOMER

Bard Engineering GmbH

LOCATION

North Sea (100km NW of the German island of Borkum)

CHALLENGE

Wind turbine manufacturer Bard Engineering GmbH developed a unique concept for the foundations of offshore wind turbines.

Their innovative design comprises of a tri-piled foundation supporting a 90m tall wind turbine and mast. The transition piece, unlike traditional methods sits above the water line, on top of three foundation pilings in the seabed.

Before the mast and turbine can be installed, the transition piece needs to be raised - so that it is perfectly level to receive the mast and turbine.

SOLUTION

Enerpac has provided an efficient solution for levelling the supporting transition piece, using synchronously controlled hydraulic cylinders, verifying the target position of the transition piece with linear stroke sensors and a bi-axial inclination meter.

Once the supporting cross piece is level, concrete is poured into the hollow space between the walls of both the supporting transition piece and the three piles, to make a 13cm thick x 5m tall rigid concrete ring.

The Enerpac synchronous lifting system, efficiently manages all lifting movements with single operator – precisely, accurately and safely.

Enerpac also provided full training for Bard employees who operate the Synchronous Lifting System.

“One of the unique things [about] our foundation is that this part, and all connections, are above the water surface,” says Robert Ebert, Deputy Managing Director at Bard Building GmbH & Co. KG. Commenting further,

“The mast usually rests on foundations that are below the water surface. [However] We chose to have all installation activities performed above the water surface. The practical advantages are that we need fewer divers, that we are less dependent on weather conditions, and that it allows us to carry out maintenance much more quickly and easily. The connection flanges aren’t always straight and manual correction, to the millimetre, of any flange deviations turned out to be impossible. That is why we looked for options for installing the 500 ton support construction quickly and accurately.

The nice thing about this Hydraulic Synchronous Lifting System is that it works completely automatically. Human errors when levelling manually, such as turning on the wrong valve are totally eliminated by the system,” concluded Robert Ebert.



PRODUCTS

Enerpac Hydraulic Levelling Cylinders

EVO-Series Synchronous Lifting System

Enerpac’s Synchronous Lifting System and levelling cylinders, answers the performance challenges required for offshore wind turbine installation, with impressive precision and efficiency.

REMOTELY RELEASING SHACKLE PINS ON A LIFTING FRAME USING THE ENERPAC XC BATTERY-POWERED HYDRAULIC PUMP AND CYLINDERS

CUSTOMER

Smulders

LOCATION

Newcastle upon Tyne, UK.

CHALLENGE

Steel construction company Smulders, manufacturers of offshore wind turbine tower bases, needed a better way to lift 1000 tonne, 85m high, turbine bases from quayside onto pontoons for shipping.

More specifically, they needed a simpler and safer method of engaging and releasing the shackles, without using long hoses trailing down to the quayside, and minimise personnel working at height.

SOLUTION

The engineering team at Belgium-based REM-B Hydraulics have developed a system to engage and release the shackles on a three-point lifting frame remotely.

Self-contained units were developed for attaching to each leg of the lifting frame. Within each unit is an Enerpac XC-Series cordless battery-powered hydraulic pump, and a bi-directional valve connected to a cylinder. Weighing 9.9kg, the cordless, lightweight Enerpac XC-Series battery-powered hydraulic pump is equipped with an efficient electric motor powered by an industrial-grade 28-volt, Lithium-Ion battery. This delivers exceptional speed and run time, making it an ideal pump solution for remote, untethered outdoor locations. In addition, the high-strength fiberglass reinforced composite shroud

for superior durability in demanding job site environments and a bladder reservoir prevents contamination and allows pump usage in any position and the unit is CSA and CE compliant. The cylinder is activated by the XC pump, which activates the pin connected to the shackle. External aerials on each unit connect to a remote wireless controller. For increased safety, the system allows the shackle pins to be activated sequentially.

Benefits include - simplifying the use of shackles - while maintaining a reliable and efficient operation method, remote operation - through units being controlled from a safe distance eliminating trip hazards from long hydraulic hoses and power cables, and minimise personnel working at height.



PRODUCTS

Enerpac XC-Series Battery Powered Hydraulic Pump.

Enerpac XC Battery Powered Hydraulic Pump improves port side efficiency and safety.

HYDRAULIC CYLINDERS USED FOR OFFSHORE WIND TURBINE LEVELLING AND FIXATION

CUSTOMER

Offshore Wind Farm Installation Contractors

LOCATION

North Sea and Bay of Biscay

CHALLENGE

Considering the height and weight of an Offshore Wind Turbine, and the severe forces it is required to withstand, during its long service life, it is vital that the transition piece is securely and accurately fixed to the mono-pile, to create an integral foundation for the wind turbine to operate.

The transition piece needs to be accurately lifted, vertically aligned, and rigidly held in place, whilst high-strength grout is pumped between the transition piece and the mono-pile, and the hydraulic system, must ensure that no movement occurs during curing, to ensure integrity of the foundation.

Fixation usually occurs subsea – which also creates environmental and demobilisation complications.

SOLUTION

Levelling is managed by activating and lifting with groups of Enerpac Levelling Cylinders, designed specifically to meet the project's performance requirements, to precisely position the transition piece vertically.

Many projects also require synchronous multi-point control of a cylinder's position, stroke and load using Enerpac's EVO-Series Synchronous Lifting System.

After levelling is confirmed, by survey, fixation cylinders - pre-mounted horizontally in the transition piece before deployment offshore, are energised to clamp the transition piece in place prior to grouting.

The Enerpac lifting and fixation equipment is prefilled with a Bio-degradable oil approved for the specific installation location.

The fixation cylinders remain pressurised, held by ball or check valves, and pressure is monitored throughout the grouting process.

Once the grout has fully cured, and the foundation established, the fixation cylinders are retracted to eliminate metal to metal contact and conductivity. Their hoses then need to be recovered from subsea - using the Lloyds certified Enerpac Remote Hose Disconnecter® system, which is operated topside - negating the need for divers, mitigating any oil leakage, or the need to cut hoses, and permitting hoses to be reused.



PRODUCTS

Enerpac Hydraulic Fixation Cylinders

Enerpac Hydraulic Levelling Cylinders

Remote Hose Disconnecter®

ZE – Series Electric Pumps

EVO-Series Synchronous Lifting System

HCG/HCR Series – High Tonnage Cylinders

Enerpac products and solutions delivering safe innovation to complex Wind Industry challenges.

PRODUCT SUMMARY



SYNCHRONOUS HOIST SYSTEMS

The Synchronous Hoist System is a below-the-hook sling adjuster (hydraulic turnbuckle) that gives the operator the freedom to precisely monitor and adjust each lifting point independently. The system enables a single crane to precisely position heavy and unbalanced loads.



LIFTING YOKES

Assembling a wind turbine involves complex and heavy lifting challenges, particularly installing items at great heights such as nacelles, blades or other large components. Enerpac can work with you to design and manufacture lifting yokes that maintain the highest level of quality, reliability and safety.



LOW HEIGHT SKIDDING SYSTEMS

Enerpac LH-Series includes low-height skid beams that can fit in tight spaces while still offering high capacity when picking up a load from below. We also offer a track support for added rigidity when the surface is not fully supported.

ELECTRIC TROLLEY SYSTEMS

Enerpac ETR-Trolley Systems provide stable load movement thanks to its smooth continuous movement and precision control of speed, acceleration and deceleration. They offer the versatility for manoeuvring heavy wind turbine components around manufacturing sites, and when loading and unloading to and from offshore transportation vessels.



SEA LOAD FASTENING & ASSEMBLY TOOLS

Enerpac controlled bolting solutions are a reliable, safe and secure way to fix heavy wind turbine components to the deck of sea transport vessels. The range includes hydraulic torque wrenches, bolt tensioners and cylinders.



REMOTE HOSE DISCONNECTOR

The Enerpac Remote Hose Disconnecter® (RHDC) is a revolutionary device to depressurize and detach a hydraulic cylinder up to 100 meters subsea. The RHDC will contribute to the vision of a circular economy as it completely prevents oil spillage.



LEVELLING & FIXATION CYLINDERS

For the precise and accurate levelling of the transition piece on the foundation pile, Enerpac can provide a hydraulic levelling system, that includes aluminum spring return cylinders - each with a capacity and stroke that complies with your design of the application. The system can be supplied complete with Enerpac hoses and HPU's.



LEARN MORE.
CONTACT AN ENERPAC
WIND SPECIALIST.

