
OOSTENDE

Thinking outside the box

Words: Chris Burns, Global Marketing Communications Director, Enerpac

The demands of wind energy projects for efficient and safe turbine installation and maintenance have prompted new developments in tool portability and compactness. These, in turn, are enabling innovations in wind turbine deployment and installation, as well as reducing their impact on the marine environment.

Wind energy turbines are deployed in places with access to higher wind speeds, either on higher ground or offshore. In both cases, sites are remote with little or no access to traditional power sources. The need for power torque wrenches and other tools in remote locations has driven the growth in hydraulic pump portability.

Pump up the portability

For Ritchie Services, a supplier of major component repairs and replacements of onshore wind turbine gearboxes, pump portability is essential. The company carries out up to 15 gearbox exchanges per year. 'Torque wrench speed and accuracy is vital to meeting the project's technical requirements and on-time completion. We use a portable E-Pulse electric torque wrench pump that weights around 18 kg and can support simultaneous operation of up to four torque wrenches,' says Iain Ritchie, Managing Director, Ritchie Services Ltd.

Pump portability is critical for applications at sites that do not have access to power or where having extension cords or air hoses could cause trip hazards. One of the smallest and lightest Battery Torque Wrench pumps weighs just 9.9kg. It is equipped with an electric motor powered by an industrial grade 28 volt, lithium-ion battery. One company that has taken full advantage of the pump's compactness and portability is Belgium based company REM-B Hydraulics.

The company has developed self-contained, remote-controlled hydraulics power packs for connecting and releasing 1,000 tonne, 85m high, offshore wind turbine bases during quayside lifting onto a pontoon, for leading international steel construction company, Smulders. Based on the cordless, hydraulic pump technology described earlier, the hydraulic shackle release powerpack is a safer alternative to dangling long lengths of hydraulic hoses connected to a quayside pump.

Lifting 85m high fabricated turbine bases from the quayside onto a barge for shipping offshore uses shackles to attach the turbine base to a three-point lifting frame and crane. Engaging and releasing the shackles is done using a double acting valve arrangement powered by a quayside pump connected by long hoses. Smulders was looking for a simpler and safer method of engaging and releasing the shackles without the need for long hoses.

Attached to each leg of the lifting frame, the REM-B Hydraulics' system removes the requirement for long hoses by using a battery powered pump to operate a bi-directional valve connected to a cylinder that moves the pin connecting the shackle. The entire system is contained in a compact metal case with an external aerial linking each unit to a wireless controller. For increased safety, the shackle pins are activated sequentially.

'The remote controlled powerpack is the ideal solution for lifting and positioning offshore structures,' notes Sam Briels, Enerpac product specialist, REM-B

Hydraulics. 'It simplifies the use of hydraulic shackles by removing the need for long hoses as well as improving lift safety.'

On the level

Faster retraction, harder wearing and reduced weight are just some of the recent advances in hydraulic cylinders for wind energy construction projects. One area that has received a lot of attention recently is the role of cylinders in levelling and fixation systems, commonly used during monopile installation.

Grouted connections are widely used in offshore wind turbine construction to transfer multiple loads from the transition piece (TP) fitted on top of the monopile foundation (MP). The transition piece is first lowered onto the monopile and levelled. It is then grouted into position to fix the transition piece to the monopile. Levelling is important to ensure the turbine will generate maximum yield.

For example, hydraulic levelling and fixation systems are being used by Smulders and T&I contractor DEME Offshore for installation of 80 GE Haliade 150-6MW turbines at the Saint-Nazaire Offshore Wind Project in the Loire-Atlantique region in coastal France. The Enerpac system allows accurate levelling and fixation of the transition pieces on the monopile foundation.

Levelling uses twelve pre-installed 150 ton aluminium hydraulic cylinders inside the TP such that the cylinders rest on the MP. By adjusting the spring return cylinders precise levelling of the TP is achieved, even if the MP was not completely level in the first place. Once levelled, the 25 ton steel fixation cylinders positioned subsea at the bottom of the TP are activated to hold the TP in position during completion of the grouting process.

The fixation cylinders must remain pressurised, via a hydraulic manifold, during the grouting and the subsequent curing time, which can take several days. At the end of this period, the cylinders and hoses need to be recovered.

Greener levelling and fixation

A new development aimed at reducing the environmental impact of the hydraulic fluid being released into the marine environment is an Enerpac Remote Hose Disconnector designed to eliminate the release of hydraulic cylinder fluid into the sea during transition piece installation on offshore wind farms. The environmentally friendly development also allows full recovery of all connected equipment for reuse.

Until now, cutters have been used to cut the hose to depressurize the cylinders, releasing hydraulic fluid into the sea. Using a Remote Hose Disconnector will allow the cylinders and hoses to be depressurised and recovered without hydraulic oil being released into the sea, as well as, avoiding the need to use a hose cutting tool and associated waste materials.

The Remote Hose Disconnector is fitted directly onto each fixation cylinder. It comprises two, non-interchangeable, hose connections: one connector ensures oil flow to the fixation cylinder, the second one operates the disconnector itself.

After the grouting has cured, a pump is connected via the same manifold with the second set of hoses. Operating the pump recovers all hydraulic oil and ensures full retraction of the plungers, the complete hose disconnector is then released from the fixation cylinder and ready to be re-used to install a new foundation. During the disconnection, no fluid is spilled into the sea. Potential residual oil in the cylinders is sealed to prevent contact with seawater, making this method fully sustainable.

The Remote Hose Disconnector approach is consistent with the 'Circular Economy', installation companies can extract maximum operational and environmental value from the remote hose disconnector, and fully recover it for reuse. The Remote Hose Disconnector is tested and certified by Lloyds to 100 metre subsea and can be reused.

Addressing vessel shortage

Demand for offshore wind developments is such that there is a shortage of specialised heavy lift vessels needed to install larger next generation wind turbines. Innovative use of hydraulic cylinder clamping systems, in conjunction with deck-based trolley systems, is one way of increasing the vessel options for transition piece load out and installation.

On some jack-up vessels the crane is unable to reach all deck areas. This means that the deck space is underutilised, making the vessel impractical and uneconomic for offshore wind projects. The trolley system is designed to overcome the problem by bringing the transition pieces within reach of the crane.

The trolley system comprises two steel tracks running across the deck of the jack-up vessel. The electrically-driven trolleys attached to clamping frames are mounted on the track. Transition pieces are loaded onto the clamping frames and securely held in place with hydraulic cylinders. Each clamping frame is powered by four trolleys. During load out the transition pieces are moved along the track, and more transition pieces loaded.

As monopiles are installed, the transition pieces are advanced along the track to bring them within reach of the on-board crane. During operation, the trolley system is controlled by a single Intellilift wireless control unit allowing fully integrated, synchronised operation. In use the trolley system has been shown to have clear commercial advantages by minimising the time in Port during load-out of transitions on board the jack-up vessel.

In common with many other areas of engineering, wind generation is challenging hydraulic tools makers to be more inventive in their product design and operation. Producing integrated systems that take advantage of these developments will ensure the wind energy industry is well placed to streamline turbine installation now and in the future.

www.enerpac.com