Taking up position with heavy load handling

PES sat down with Darren McQuillan, Vice President, Global Business Development, at Bardex Corporation, to find out more about the company's positioning as an engineering solution provider and how it brings together all aspects of project management, execution, contract management, and everything else associated with floating offshore wind.

PES: Thanks for taking the time to speak with us Darren. Can we begin with a brief introduction to Bardex and what you do? How has your role developed in recent years, as the sector itself has grown and moved further offshore and into deeper waters?

Darren McQuillan: I joined Bardex in January of this year to support its global business development for offshore wind. I'm doing a lot of mentoring and coaching within key industry working groups and renewable energy groups in the UK.

The focus is on educating them about proven solutions from other market segments that apply to floating offshore wind (FLOW). Solutions used in Bardex lifting and mooring projects, for example, apply to FLOW industrialisation and installation.

PES: How can ports be optimised to meet the increasing demands of offshore wind projects, addressing industrialisation challenges, and ensuring compliance with evolving environmental regulations?

DM: The problems posed by mass production in ports and shipyards are many, but they can be resolved. First, we need to make a distinction between a port and a shipyard. They have different operational profiles and environmental regulations that impact them when looking at the industrialisation of FLOW platforms. For example, ports function as coastal locations where ships can shelter or dock to load and unload cargo or passengers.

In contrast, shipyards are where ships and offshore structures are built and repaired.

For FLOW platforms, we are now asking the ports to get more involved with the fabrication, assembly, integrations, pre-commissioning, and load-out. This is not their typical operational profile, but their real estate is necessary to support the evolution and execution of FLOW. We will inevitably be looking at a multi-port execution model to meet the demand.

Except for ports involved with operations and maintenance (O&M), utilisation of port real estate will be cyclical. We must communicate with the ports, as they are critical to the long-term success of FLOW.

Prior to FLOW, ports had long-term visions to maximise revenue, like any other business. We need to understand their visions and unite them with FLOW industrialisation infrastructure developments.

We have to look at the bigger picture and invest in the ports to prepare them with a technology- and market-agnostic solution, one that can be used in multiple ways, not just exclusively for FLOW. For example, Bardex offers a streamlined FLOW technology- and market-agnostic industrialisation solution that can be

used for other markets as well. This also addresses the evolving environmental regulations, which is a subject I will touch on in a moment.

How do ports optimise? They don't know what to do, but they've been told to be ready.

It's a bit nebulous, so what I'm trying to do is talk with the ports and listen to what they feel they need, both for the future and for incorporating the industrialisation of FLOW.

We are at a global inflection point for FLOW platform industrialisation, where the work can be brought back to the local markets through a multi-port execution strategy to maximise local content.

This is all possible if we focus on standardisation, automation, and the right technologies. That's what's needed to set the ports, shipyards, and supply chain up for success.

We need to pick technologies that have common component types, utilise similar scantlings, and support a common build strategy so that we can standardise and automate the assembly of FLOW platforms at the ports and yards.

Mooring/tensioning equipment is the most important aspect of installation success at scale. A requirement for safe operations is that no personnel are on board, but quite often this comes up too late in the design to make a decision.

This has a huge impact on offshore operational safety and weather window installation targets, which in turn have a huge impact on the upstream activities associated with wet storage size, quayside integration sites, assembly sites, and the whole supply chain. All of this ultimately impacts installation costs and O&M costs, which are the biggest cost profiles for a FLOW farm.

Get in touch with me and we can discuss this.

Ports are unfairly stigmatised as the bottleneck. But how can they prepare when developers have not yet picked their technology, their build strategy, or components?

Unless you are the O&M port for the wind farm that is going to be utilised for the next 40 years or more, your port or shipyard real estate is subject to cyclical utilisation: OSW work, no OSW work. What do they design their facilities to do, and how will the facilities be managed if they don't know what they will be doing to support OSW?

PES: What factors should be considered when choosing floating semi-submersibles for the load-out of FLOW platforms, and how do they compare with other load-out methods in terms of efficiency and cost-effectiveness?

DM: Semi-submersibles serve a purpose and are perceived by the industry as a conventional solution for load-out. However, they make load-out time-consuming and heavily diesel-driven, which negatively impacts the schedule, cost, operational safety requirements, and CO_2 footprint of every FLOW platform

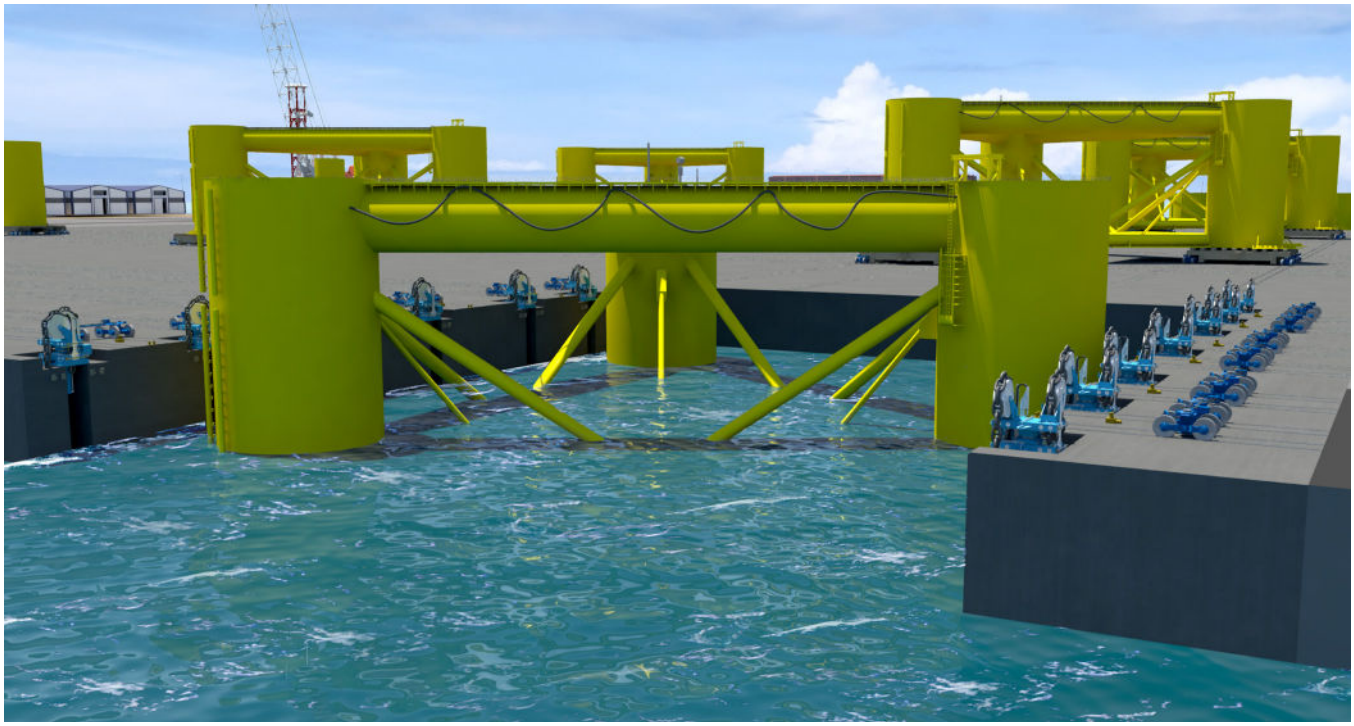
Darren McQuillan

installed, as well as regulatory requirements for port emissions control.

Now picture this at an unprecedented scale, operating 24/7/365. Are the local communities ready for these emissions?

Bardex OmniLift™, shiplift, and rail-based solutions eliminate the need for the semi-submersible. With our approach, a static platform supports tower, nacelle, and blade integration, and significantly reduces the CO_2 footprint per installed FLOW platform.

Furthermore, it improves the net zero profile of ports and sets the bar regarding regulatory requirements for emissions and clean water. Environmental consideration



is huge and must be part of the solution; otherwise, why are we doing this? Our agnostic solutions set ports and shipyards up for long-term success.

You may have a perfect port that can support FLOW, but the ship channel is too busy and cannot support having a semi-submersible and tugs blocking the channel. The Bardex solution opens up these ports for use.

Bardex puts the ports in a position to say to FLOW developers, 'We have a market agnostic, FLOW technology agnostic solution that supports our future needs and LEAN industrialisation of your FLOW platforms...we are ready.'

As a note, the Bardex OmniLift™ is the only solution that will enable the developer to bring their FLOW platform back onto dry land. This is a perfect solution for decommissioning, O&M, and even life extension, as the FLOW platform could be upgraded and put back in the field for another 40 years.

Eliminating operations saves time, saves emissions and saves money.

PES: Can you describe some of the strategies that can be employed to reduce the CO_2 footprint per FLOW platform installation, promoting environmental sustainability in the offshore wind industry?

DM: A way to significantly reduce the cost, schedule, and CO_2 emissions per installed FLOW platform, as well as pick the right technology, is to eliminate operations that use diesel-driven heavy equipment and unsafe operations wherever possible.

The Bardex rail-based OmniLift™ solution removes many of the diesel-driven Self-Propelled Modular Transporters (SPMTs) and cranes on site, as well as the need for diesel-driven semi-submersibles used for load-out, reducing capital expenditures (CAPEX) and CO_2 emissions per installed FLOW platform.

Remember, when using a semi-submersible, you are working over water. Safety operations requirements are different. You have ballasting operations that tend to be driven by diesel generators to keep the semi-submersible level with the quayside for load-out. Ballast water, which is not the cleanest, is going in and coming out.

Semi-submersibles are tethered to the quayside, where their mooring lines are under tension. This generates a safety zone that MUST be respected in the event of a mooring line snapping.

During load-out, you need two or three tugs to assist in keeping the semi-submersible pushed towards the quayside and prevent the mooring lines from snapping. This is extremely dangerous; plus, diesel-driven tugs have a large impact on CO_2 emissions.

When you are delivering one or more FLOW platforms from the same facility per week, these operations have a huge impact on cost and schedule and come with a huge CO_2 footprint for every FLOW platform installed. This is in addition to the potential operational safety issues.

Ports and shipyard facilities are also subject to regulations driving the reduction of emissions, and they are more stringent for ports. This is not a pretty picture, but there is an existing solution that can mitigate this in many cases, significantly reducing CAPEX, schedule, and CO_2 emissions per installed FLOW platform. Reduced CAPEX ultimately lowers the levelised cost of energy (LCoE).

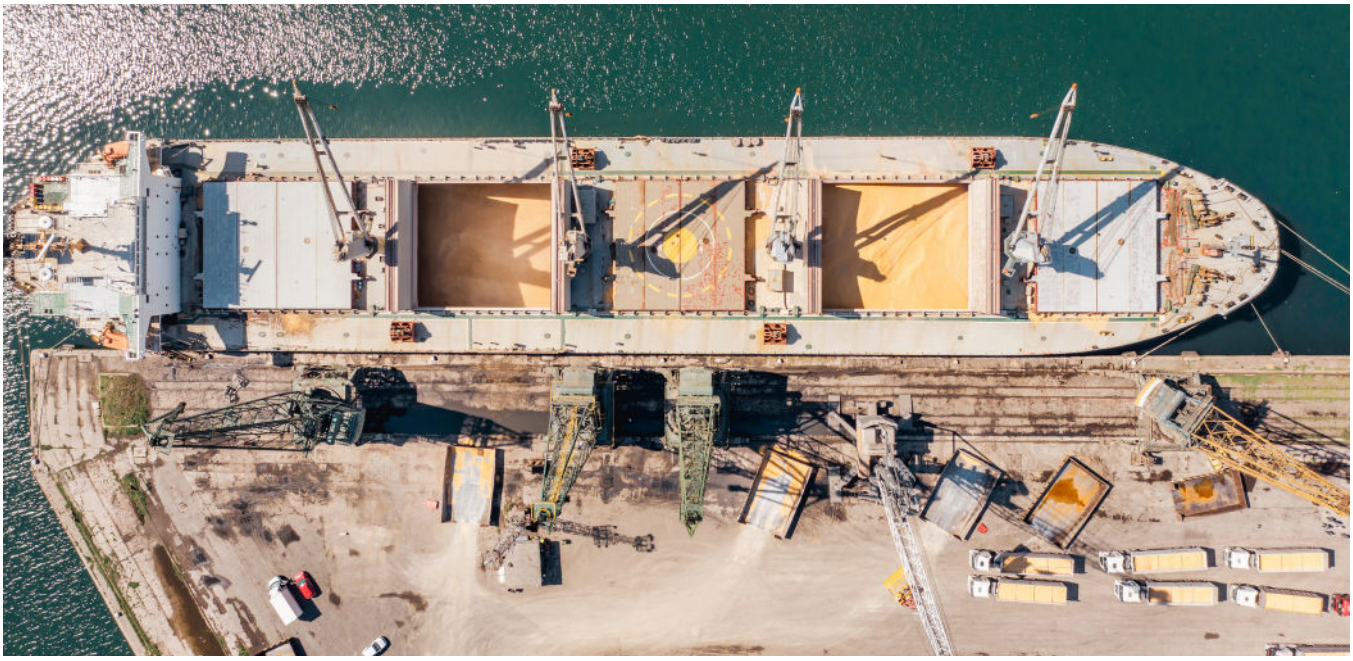
This opens possibilities to other ports that may be perfect to support FLOW but have a narrow, busy ship channel. The conventional thinking is to use a semi-submersible, but the semi will block the channel continuously 7/24/365.

PES: Do floating semi-submersibles address specific load-out issues associated with FLOW platforms, and what are their advantages over conventional load-out solutions?

DM: Semi-submersibles serve a purpose and are perceived by the industry as the conventional solution because this is what they know. This is a critical part of the equation, but has the biggest impact for every FLOW platform built when looking at schedule, cost, CO_2 footprint, and operational safety. Its significant impact on LCoE, and ultimately the consumer, means we should be looking towards other solutions just as we are with the 80 assorted designs of FLOW platform. Solutions need to not only help the developer but also support the long-term benefits for the ports and consumers.

PES: Is it possible to optimise the installation process during Pre-FEED and FEED stages to avoid potential bottlenecks and ensure timely project delivery without compromising industrialisation goals?

DM: Yes, Bardex is doing this now with our patented proven Off Vessel Tension (OVT)



solution. We are working with clients in Pre-FEED, FEED, and EPCI.

Mooring and tensioning solutions, in most cases, are not included in the initial concept but have an enormous impact on the design, assembly, integration, and offshore operational safety, as well as O&M execution, vessel spread optimisation, cost, and CO_2 footprint. A more thorough Pre-FEED will save a lot of headaches and changes later in the design process.

Why are we involved in Pre-FEED? We have to do this because of the upstream impacts caused by the installation process of hundreds of turbines in each project. If there is a slow mooring hook-up and tensioning process, it'll have an impact on everything.

If you are installing 100 FLOW platforms and target one or more launches per week, then you must maximise how many you can install within the weather window. If you have a shortfall and don't meet your installation targets, what is the risk and impact on the upstream processes? Wet storage can only hold so much. There is only so much integration space and assembly space. The entire process becomes at risk of slowing down, not supporting the weekly targets, and potentially coming to a screaming halt.

The Bardex OVT solution is proven: no personnel needed on board, storm safe in 36 hours, full installation of six lines in 72 hours. The OVT significantly reduces the bollard pull, which has an impact on the size and types of vessels being used.

PES: Could you name some of the innovative approaches that can be adopted to enhance the overall efficiency of offshore wind ports, facilitating seamless integration with the rapidly growing offshore wind sector?

DM: Many of these questions are interconnected, and Bardex has solutions that mitigate many of the industry issues and risks. For example, a lean process line, like a car or aircraft assembly line, is needed to support efficient, safe assembly. To support the FLOW developer and the port's long-term vision, solutions must be agnostic regarding technology and markets.

A tidal-independent solution that can be designed to load-out and retrieve the FLOW platforms and a multi-use platform that can also be used to load-out monopiles, jackets, and other structures and can serve as a marine off-loading facility (MOLF) for other markets.

A solution that eliminates the semi-submersible and all the associated diesel-driven operations, saving schedule time, cost, and CO_2 emissions per installed FLOW platform and a solution that opens other ports with a busy ship channel that can be used to support FLOW now that the semi-submersible is not needed.

The OmniLift™ solution can also be used for ship repair/servicing by being able to lift ships out of the water and move them onto dry land using the same rail-based system. This enables you to service multiple ships at the same time more effectively, efficiently, and safely compared with a floating dry dock (FDD) or graving dock.

The OmniLIft™ also provides a stable platform solution for one of the biggest issues with FLOW: the installation of the tower, nacelle, and blades. These are designed to be installed on a fixed platform; current integration models, however, have the floater at the quayside, which oscillates due to tides and currents. This necessitates using a crane, which is subject to the wind.

All of this has an impact on cost, schedule, and CO_2 for every FLOW platform.

PES: Evolving environmental regulations have an impact on the design and operation of offshore wind ports, so what measures can be implemented to remain compliant while supporting sustainable energy development?

DM: Yes, environmental regulations are coming, tightening up on emissions, port water cleanliness, and the global goal of net zero in support of mitigating climate change!

This will have a significant impact on the technology chosen. The technology should have an execution strategy that fully embraces a construction-driven execution and an environmental strategy.

These need to include standardising components and automation for manufacturing, assembly, integration, and installation.

Bardex has solutions that help streamline many of these issues with proven industry solutions that have already been addressed in other Q and A's for industrialisation at scale, installation at scale, and O&M and end platform life opportunities.

PES: What are the key lessons learnt from past offshore wind projects that can inform decision-making in selecting the most suitable load-out methods for FLOW platforms?

DM: We need to embrace LEAN manufacturing and construction-driven environmental strategies.

There are also commodities that FLOW needs that may be in short supply. In these cases, we really need to think about simpler alternatives that do exist to address issues of cost, schedule, safety, and environmental

regulations. For example, there are not enough vessels for transporting components and assemblies from Asia to meet local demand of one FLOW per week.

Globally, there are not enough installation cranes or semi-submersibles. We need to rethink all of this and take advantage of existing alternatives.

O&M costs are about 36% of the cost of the power produced by fixed platforms. Now we are moving further offshore, and this number is going up. So how can we reduce it?

There will be an estimated 450 new vessels needed to support FLOW in the future. How and where are they going to be serviced, as there are not enough FDDs and graving docks now to service the current market conditions? Also, these FDDs and graving docks can only service one vessel at a time. The Bardex shiplift and transfer solution enables you to work on more than one vessel at a time on dry land and, if embedded in the O&M port, will provide greater efficiencies, reducing fuel emission, wait times, and cost. This will help drive down the LCoE and reduce CO_2 emissions for the life of the FLOW platform.

We must engage with the port and all the supply chains as early as possible and include them at the beginning to better manage risk.

Because we are industrialising, we need to collaborate and integrate more and move away from the oil/gas contracting and execution methodologies that served only one floating platform at a time.

We will be building thousands of these and beating up supply chains, though contracts to drive down costs are not the answer. Competing markets are starting to converge. Shipbuilding and oil/gas are picking up, not slowing down, and they use the same supply chain.

So, working with the supply chain and bringing them into your construction-driven, environmental execution strategy with a focus on standardisation and automation will get us to a continuous improvement mode much quicker. Then we can focus on improvements and drive down the LCoE together.

PES: Do you think it's possible to leverage an advanced simulation and modeling techniques to improve the planning and execution of FLOW platform installation, optimising project outcomes?

DM: Yes, in the past, I utilised tools that enable you to look at the holistic execution within a virtual reality/simulation model that can be connected to a program-level schedule. This technology can be used from concept through to delivery and installation of the final FLOW platforms.

It can be used to look at change management and to help map out what will be a multi-port execution strategy. Having a tool that enables you to identify and mitigate bottlenecks early, forecast more accurately, and track actual progress against advanced work packaging (AWP) is invaluable. And this can be done before you cut the first steel. We need to spend more time planning.

PES: Are there collaboration opportunities among stakeholders, including developers, engineering firms, and port authorities, to streamline the industrialisation process and foster innovation in offshore wind projects?

DM: We've found that engineer involvement on the front end leads to unique, unexpected solutions on the back end. In October alone I travelled to Floating Offshore Wind 2023 in Aberdeen, the Wind Energy Tradeshow in Dublin, and Reuters' Offshore and Floating Wind Europe in London to continue building relationships with our key industry stakeholders.

In addition to industry events, remote meetings have opened the door to effective communication at virtually every step of the project, with any combination of stakeholders, and across time zones.

The key is to work with developers, ports and installation contractors early in each project to identify opportunities to improve the build process and installation procedures offshore. A slow-down at any point in the production or installation can cause a bottleneck backing up the entire project schedule.

PES: What role can technology advancements play in reducing the carbon footprint of offshore wind operations, aligning with global sustainability objectives?

DM: New technological advances in infrastructure usher in a new paradigm for sustainability. For instance, choosing the right technology can remove the need for on-site diesel-driven machinery.

Using the right choice of infrastructure investment and ensuring that investment remains in the region for the benefit of the public who funded it, can shorten the distance offshore wind maintenance vessels must travel for servicing, in turn reducing the fuel consumed for the required journey.

PES: Is it possible for risk assessments and contingency plans to be integrated into the planning stages to ensure smooth and efficient installation processes, mitigating potential problems in project delivery?

DM: What's driving this is the risk from start to finish. Risk management is very important and must be included in the planning stages. What's driving and managing the risk from start to finish is your contingency plan and this is based on the level of risk you see.

The risk assessment must continuously be managed for the life of the project, from early proposal phases through project completion and handover.

The risk assessment gets more detailed as you move through the project life cycle from FEED to EPCI and final handover.

You need a live controlled risk register that is reviewed and updated regularly, and it needs to be managed for the life of the project to fully support successful execution.

PES: Do you anticipate more challenges ahead as the sector develops over the next few years?

DM: People are focused on 2030, and we are seeing pullback and delays in the industry because of cost and other factors. Yet, there are solutions that already exist but are overlooked because they are not conventional approaches. If we don't embrace these other solutions in technology, execution methods, installation, and so on, how do we expect industry sentiment to change in the future?

We need a step change in the cost associated with FLOW platform execution, assembly, integration, and O&M, as well as in the CO_2 footprint for every FLOW platform installed and for the life of that platform. We all need to work together beginning early in the project planning phases to optimise and standardise our approach to the challenge of serial production.

- www.bardex.com
- www.linkedin.com/company/bardex-corporation-inc.

Bardex Corporation

Bardex provides proven engineering solutions to the offshore wind industry, taking on many industry challenges with proprietary equipment.

Its offshore wind product line covers:

Heavy-lift, tidal-independent, environmentally safe (DRY) solutions that support marine offloading, launching, and retrieval of Floating Offshore Wind platforms and other structures, eliminating the need for a semi-submersible while improving operational safety and efficiencies.

Onshore rail transfer solutions to streamline the industrialisation process for marshaling, assembly, integration, and O&M ports. These improvements in operational safety mean fewer cranes and SPMTs on site, supporting the Net Zero goals for the ports by reducing the CO^2 footprint of every OSW Platform installed.

Bardex's Shiplift is safer and more efficient for vessel servicing operations, replacing the traditional dry dock option.

Off Vessel Tensioning (OVT) is a proven wind farm mooring method that makes both installation and disconnection for major repairs quicker and safer.