Capable of withstanding some of the roughest sea conditions, the E1000 can transfer personnel as well as cargo up to 1 ton

The North Sea: the cradle of offshore access

The North Sea is the epicentre of offshore wind energy, vital for Europe's renewable strategy with ambitious targets. Ampelmann's innovative gangway systems have revolutionised offshore access, ensuring safe operations in challenging conditions, and are now crucial for the growing global offshore wind sector.

Unquestionably, the North Sea is the cradle of offshore wind. Even if the world's first offshore wind farm, Vindeby, was built just outside its boundaries in the Danish Baltic Sea, it was here that offshore wind matured.

Considered a key sea basin in the European Offshore Renewable Energy Strategy, the North Sea was recently dubbed Europe's 'green power plant' in the Ostend Declaration of 2022. The declaration sets the ambitious target of 120 GW of offshore and floating wind capacity by 2030, and 300 GW by 2050. The region is a key growth area for offshore renewables and central to Europe's commitment to reduce carbon emissions. Yet, there is a long road ahead before achieving net zero.

For nearly 15 years, Ampelmann's gangway systems have been an integral part of the North Sea's offshore renewable infrastructure. What began as a novel concept at a time when offshore wind was still in its technological and commercial infancy has become deeply entwined with the growth of the sector. Active motion compensated gangways now dot the seas around Europe, providing safe and efficient, year round, access for millions of skilled workers and kilogrammes of cargo.

Offshore operations in the North Sea

The North Sea is well known for its challenging working conditions. Flanked by the British Isles, Scandinavia, and mainland Europe, its funnel-like shape channels and amplifies tidal currents and swells from the Atlantic Ocean. As swells, created by distant storms, travel, they interact with strong wind waves caused by rapidly changing atmospheric pressure. Consequently, high, steep waves and turbulent seas not only make the North Sea amongst the most dynamic bodies of water in the world but also make it an ideal place to consistently generate energy from the high winds that are prevalent in the region.

Vindeby was commissioned well before the advent of modern Walk to Work (W2W) systems. Without helipads or direct access to helicopters, aerial support for such construction projects is severely limited. Marine based access was and is the main method to transfer crew. Simple gangways without active motion control and what is commonly known as 'bump and jump', when a small vessel such as a CTV pushes against the turbine to minimise the gap, were among the few ways to transfer personnel from the vessel to the turbine. Before the growth of W2W, offshore operations were not just risky, but highly dependent on weather conditions and sea states.

Since Vindeby, the infrastructural requirements, safety regulations, challenges, and solutions have changed noticeably. Not only have economies of scale developed, but significant technological advancements have characterised the growth of the sector as a whole. W2W and the use of motion compensated gangways, more generally, are amongst those developments, having deeply impacted the fundamentals of operations by extending weather windows and enabling safe, year round offshore access.

The birth of Walk to Work

Ampelmann has become well known for its gangways that can compensate for motions in six degrees of freedom. Originally designed for the rough conditions in the North Sea, the system's six hydraulic cylinders that make up its hexapod ensure that the gangway remains stable during operations by counteracting waves of different heights, frequencies, and directions. As the hexapod compensates for most motions, the gangway's telescoping speeds during normal operations are less than 0.5 m/s, no higher than that of an escalator, making these relatively lightweight systems ideal for work in variable weather conditions.

Used in the offshore wind sector since the very beginning, the A-type is the company's flagship system that now sees much use globally. Since its release in 2008, the world's first gangway that can compensate for motions in six degrees of freedom has transferred more than 7.5 million people globally and together with the A300, a cargo hoisting version, more than 3 million kilogrammes of cargo, tools, and equipment.

Since the very first operation of the A-type, Ampelmann has expanded its portfolio considerably to meet the rising demand for safe and efficient access in an increasingly diverse market. The one and a half times bigger E-type sees frequent use in the global offshore wind sector. Capable of withstanding the roughest metocean conditions, the E-type and its variations, such as the E1000 and E5000, offer the additional versatility of a crane function capable of carrying loads of one to nearly five tonnes, respectively, making them ideal for work during the entire life cycle of a turbine.

The E1000 working at Equinor's Hywind Tampen floating wind farm during the winter

As wind farms are increasingly constructed in more remote locations, further away from port areas, they require dedicated vessels that can stay longer offshore to ensure continuous maintenance and operation. In the mid 2010s, this need for enhanced accessibility and efficiency gave rise to new W2W vessels, also known as Construction Service Operation Vessels (CSOVs).

Ampelmann's A-type was the first ever gangway to be used on a purpose built SOV, the Esvagt Froude, but in response to the changing requirements of the offshore wind sector, the company recently added a new system to its fleet: the W-type, designed specifically for C/SOVs. Poised to set a new benchmark for energy and design efficiency, this electric modular tower system is fully integrated into the vessel and has a wide, height adjustable, gangway to allow continuous, horizontal access for trolleys and personnel.

Doubling up as a crane with a cargo bearing load of two tonnes, this offshore access solution is ideally suited to facilitate the increasing need to build, commission, and maintain a growing number of wind farms.

The new frontier: floating wind

When the final parts and components of the turbines at Vindeby Offshore Wind Farm were dismantled and stripped for recycling, W2W had already firmly established itself within the offshore wind sector. As it was fully decommissioned in September 2017, work on the first commercial floating wind farm at Hywind Scotland was already nearing completion. Officially commissioned just 40 days after Vindeby was relegated to the annals of history, the new wind farm opened a new frontier of untapped resources.

Floating wind opens up new areas for wind energy generation that were previously inaccessible. Already earmarked as a critical component of the world's global renewable energy supply, these turbines offer key advantages by enabling deployment in deeper waters where fixed bottom turbines are impractical. They access stronger and more consistent wind resources further offshore, allowing for larger, higher capacity turbines.

Yet, like the early wind farms before them, floating wind also poses additional, unexplored challenges. Situated in deeper seas, in more remote locations, sea conditions are unpredictable and considerably harsher than near the coast. Unlike bottom fixed turbines, floating turbines exhibit motions of their own, posing additional challenges for marine based access solutions.

Having experience on three out of four of the world's floating wind farms, Ampelmann's systems already have an excellent track record in the sector. Recently, two E1000s were used during the construction of Equinor's Hywind Tampen, the largest floating wind farm to date. Situated right on the edge of the northernmost North Sea, between the Shetlands and Norway, rough conditions and its remote location make offshore operations particularly challenging.

Since the hexapod, rather than the gangway, compensates for most motions, it can simultaneously counteract the motions exerted on the vessel as well as the divergent movements caused by the buoyancy of both the vessel and the floating structure. Keeping telescoping speeds within a safe, human limit, the E1000 was able to work throughout the winter months in one of the roughest locations in the North Sea.

As one of the biggest systems in Ampelmann's portfolio, the E1000 is ideally suited for work on floating wind turbines because of the high workability and safety it provides. There is still much to learn about the long term infrastructural requirements of floating wind farms, but it is clear that motion compensated gangways not only can but will play an important role in their development.

Beyond the North Sea

In the last 15 years, Ampelmann has matured together with the offshore wind sector. A critical cog in the larger framework that facilitates its growth and operation, for obvious reasons Europe has always been an important market for motion compensated gangways. Developed in Delft, built in Rotterdam and delivered to the world, Ampelmann's systems have deepened their roots in the North Sea while branching out globally.

Pledged to continuous innovation, Ampelmann has diversified its portfolio through its modular design approach and has begun to electrify its fleet to further reduce its environmental footprint. The electric A-type consumes 90% less energy than its hydraulic counterpart and has already been operational since 2020.

With new technologies on the horizon, tried and tested access solutions will continue to play a crucial role in the evolving offshore wind sector. As offshore wind markets in Taiwan and the USA emerge, soon to be followed by Brazil, Japan and South Korea, the North Sea's position as the cradle of wind, and the birthplace of W2W, is sure to be given new meaning as the world steers ever closer to the energy transition.

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