TALKING POINT

Avoidance of high-potential incidents in port operations

No single measure can eliminate risk from offshore wind port operations. Dennis Jul Pedersen, Chief Executive Officer of Port Esbjerg, explores how weather forecasting, vessel data, pilotage, simulator training and agreed operational limits must work together to prevent high-potential incidents.

On the morning of 10th June 2026, a wind installation vessel was preparing to leave Gemini Quay at Port Esbjerg. During departure, the vessel appeared to lose control. The blades stored onboard struck another wind installation vessel and subsequently two gantry cranes. No personnel were injured, but nine blades were damaged and both wind installation vessels experienced downtime.

Speculation about the root cause of the incident was widespread, while blame and disagreement over the facts circulated around the port and in the media. Following its inquiry, the Danish Maritime Authority

concluded that the root cause of the incident was a lack of situational awareness.

By contrast, port control recorded strong wind gusts, and control-room camera footage indicated that the vessel began to drift when the wind exceeded its manoeuvring capability.

Time is money, but it is also critical to achieving first power from an offshore wind farm. Efficient load-out operations in port are therefore essential and may provide a competitive advantage to the company managing the project. However, it would be unreasonable to conclude that commercial pressure necessarily results in unsafe operations, as the damaging consequences of an incident far outweigh any potential short-term gain from such behaviour.

Offshore wind projects in the North Sea are prone to weather delays, and the same applies to port operations. A delay can result in a missed weather window and disrupt the installation schedule to which the turbine manufacturer is committed. The date of first power is crucial for offshore wind developers.

Incidents can occur even among the most experienced crews, and contact between a vessel and the quayside is not uncommon. On 19th July, another incident involving a wind installation vessel at the Port of Tyne was reported in the media. The question, however, is whether the incident rate involving wind installation vessels exceeds that of conventional vessels. Statistics may provide an answer, but manoeuvring wind installation vessels into and out of ports is undoubtedly complex.

These operations may require more robust planning, supported by extensive data and training, while all parties involved must have an appropriate understanding of the vessel's manoeuvring characteristics.

Characteristics of wind installation vessels and port operations

As wind turbines have increased in size, wind installation vessels have also grown to exceptional dimensions. Nevertheless, they are among the most manoeuvrable large vessels operating in confined ports.

Many wind installation vessels carry Dynamic Positioning Class 2 notation. This provides redundancy so that no single system failure should lead to a loss of position. However, the system is often not used while manoeuvring in port.

Dynamic positioning is designed primarily for station keeping and isn't always suited to the extensive manoeuvring and rapid changes of position required when entering or departing confined ports.

A dynamic positioning capability plot describes a vessel's station-keeping limitations and might therefore appear easy to compare with the weather forecast for the port. A dynamic positioning operator may argue otherwise, however, because the capability plot is designed specifically for station keeping.

In port, manoeuvring is required and other vessels may be navigating in close proximity to the installation vessel. The consequences of a station-keeping failure can therefore be severe. Capability plots do not account for these factors, meaning manoeuvring limits in port are often more restrictive.

The dynamic positioning system receives position data from several reference systems and environmental sensors, processes that information and sends commands to the propulsion systems. It takes time to build an accurate station-keeping model, and using the system to move a vessel within port limits is not always feasible.

Official industry guidelines published by the International Marine Contractors Association do not specifically address wind installation vessels.

This does not mean that port operations lack control mechanisms, rules or regulations, but it raises the question of whether dynamic positioning mode is feasible for every port operation.

Nevertheless, dynamic positioning capability plots can provide an indication of the weather conditions within which safe port transit may be possible. Port control should therefore have access to this information when planning vessel movements.

It must, however, be considered alongside prevailing and forecast weather conditions.

Weather data for piloting within port limits

The Port Esbjerg incident occurred during wind gusts of 22 m/s. Without detailed knowledge of the vessel's station-keeping capability, it may be concluded that the resulting drift could not be compensated for by engine power and forward thrust. Conversely, had the gust occurred slightly later, the vessel would have entered another section of the channel and encountered a headwind instead.

The question is whether the wind gust could have been forecast. Port Esbjerg asked i4cast® to reconstruct the forecast.

i4cast® works differently by drawing on a network of sensors located offshore and upstream of the prevailing weather. When a potentially dangerous signal develops at sea, the model tracks it towards the port, converting a remote event into an advance warning. In this case, the offshore signal moved the gust forecast from a calm morning state into the red-alert band, providing approximately 1.5 hours' warning beyond what the port's own instruments could detect.

This was a convective event, and i4cast® detected lightning as the storm developed. An active, electrified weather system moved through the Esbjerg area that morning. The event could have been forecast from a storm cell that produced lightning within 11 km of the port approximately one hour before the gust. Further strikes were detected offshore to the west, in the direction from which the wind approached.

The conclusion is that the squall could have been foreseen in this instance, although the same cannot be assumed for every event. A forecast alone does not prepare captains and pilots for unexpected situations in congested ports. Training may support decision making, but it must reflect the real navigational challenges encountered within port limits.

Simulation training for real-world situations

The principal advantage of simulator training is the ability to test a range of situations in a safe environment. It is therefore used extensively throughout the maritime sector. Simulator training forms part of the curriculum at nautical colleges, shipowners use their own simulators to train crews and every maritime nation has training centres offering this service.

Following the Port Esbjerg incident, the port administration and pilot recreated the conditions of 10th June 2026 in a simulator. Port Esbjerg subsequently arranged simulator training.

The subsequent simulations indicated that manoeuvring the wind installation vessel under those conditions was problematic and was considered unsafe by those taking part. However, the captain and pilot on the day of departure evidently did not consider the situation unsafe. They may have been unaware of the approaching squall, raising the question of whether departure should have been delayed or whether training could have better prepared them for such severe weather.

One limitation of simulator training is that participants operating on a mock-up bridge in a safe environment may adopt a more cavalier approach than they would in real life. The argument that, because something can be achieved in a simulation, it must also be possible in the real world does not hold true. The final decision remains the captain's responsibility, although consensus is often reached with the pilot onboard. Simulator training is also commonly used to assess bridge resource management.

Communication and information exchange between crews are of the utmost importance, but joint simulator training for pilots and vessel crews is more difficult to arrange. The ideal approach would be simulator training for captains and pilots before offshore wind projects begin. This cannot replace a detailed understanding of the manoeuvring characteristics of a wind installation vessel carrying major components, nor the need for accurate weather data. Instead, safety depends on controlling and reducing a range of possible risks.

Layered safeguards for port operations

Professor James Reason introduced the Swiss Cheese model in Managing the Risks of Organizational Accidents in 1997. Applied retrospectively to the incident of 10th June 2026, the model illustrates how port procedures, training, technical assurance, pilotage and reliable information can act as overlapping safeguards. At Port Esbjerg, the port administration and companies operating within the port have met regularly for years to discuss safety matters and lessons learned. These safety discussions now also need to include owners of wind installation vessels so that appropriate barriers can be agreed across all parties.

In this case, the event indicates that one or more of these barriers may not have operated as intended.

The Swiss Cheese model was not developed specifically for the maritime environment and may not fully encompass the constantly changing conditions associated with vessel movements in ports. At Port Esbjerg, port control uses a matrix of permitted operations. This matrix defines which operations are allowed, under what conditions and when restrictions apply.

A matrix of permitted operations is an extensive document that sets out which vessels may operate alongside one another in particular areas of the port, when other vessels may pass, the speeds at which they may pass to minimise interaction and the applicable weather restrictions. Its purpose is to ensure that vessels, pilots and the control room operate within agreed limits, ideally established through studies and simulation. The matrix should evolve in line with the operations, vessel types and projects planned for the port.

The matrix of permitted operations must be continually developed and updated using relevant information and data. More importantly, the parties involved must reach agreement on how it is applied. When one operation is prioritised, its effect on other operations must be recognised, accepted and agreed. Operational limitations can therefore have commercial and competitive consequences.

Regardless, the incident at Port Esbjerg on 10th June 2026 demonstrated that all parties must engage actively in planning and seek the best available information before operations begin.

Finally, it must be remembered that operations involving vessels manoeuvring in ports inherently involve risk. Risk cannot be eliminated. It can only be understood, respected and managed.

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