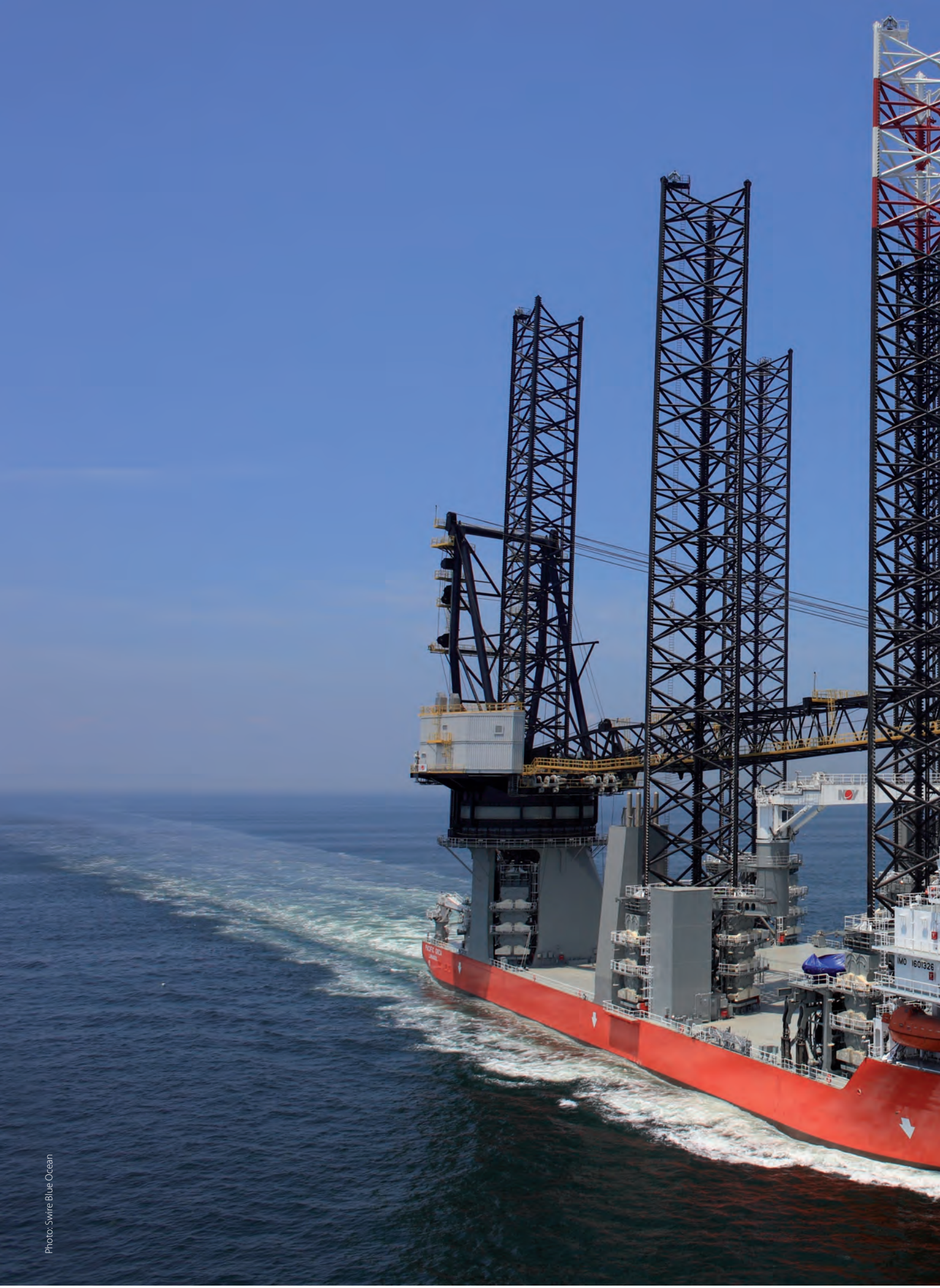
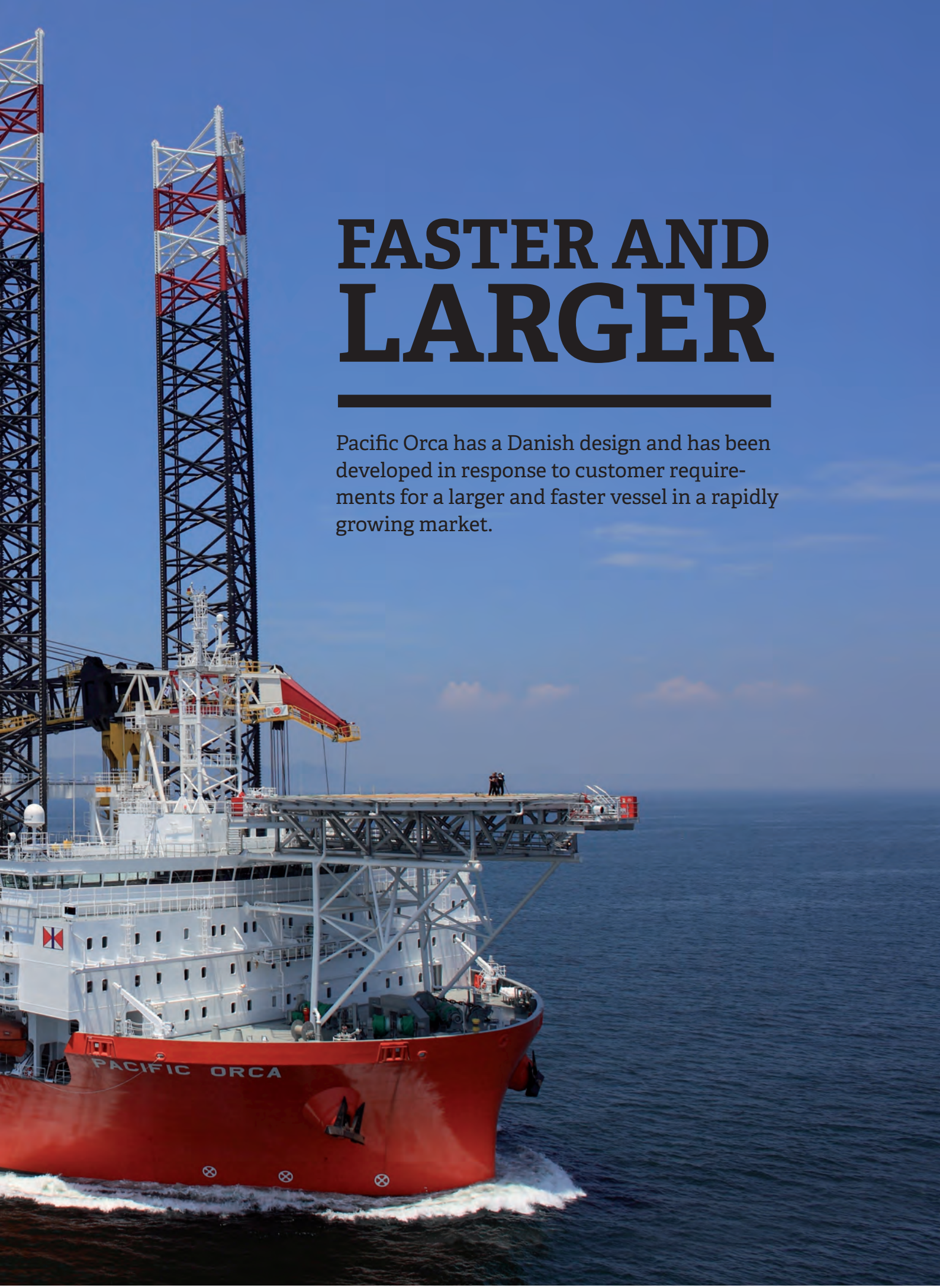


Photo: Swire Blue Ocean

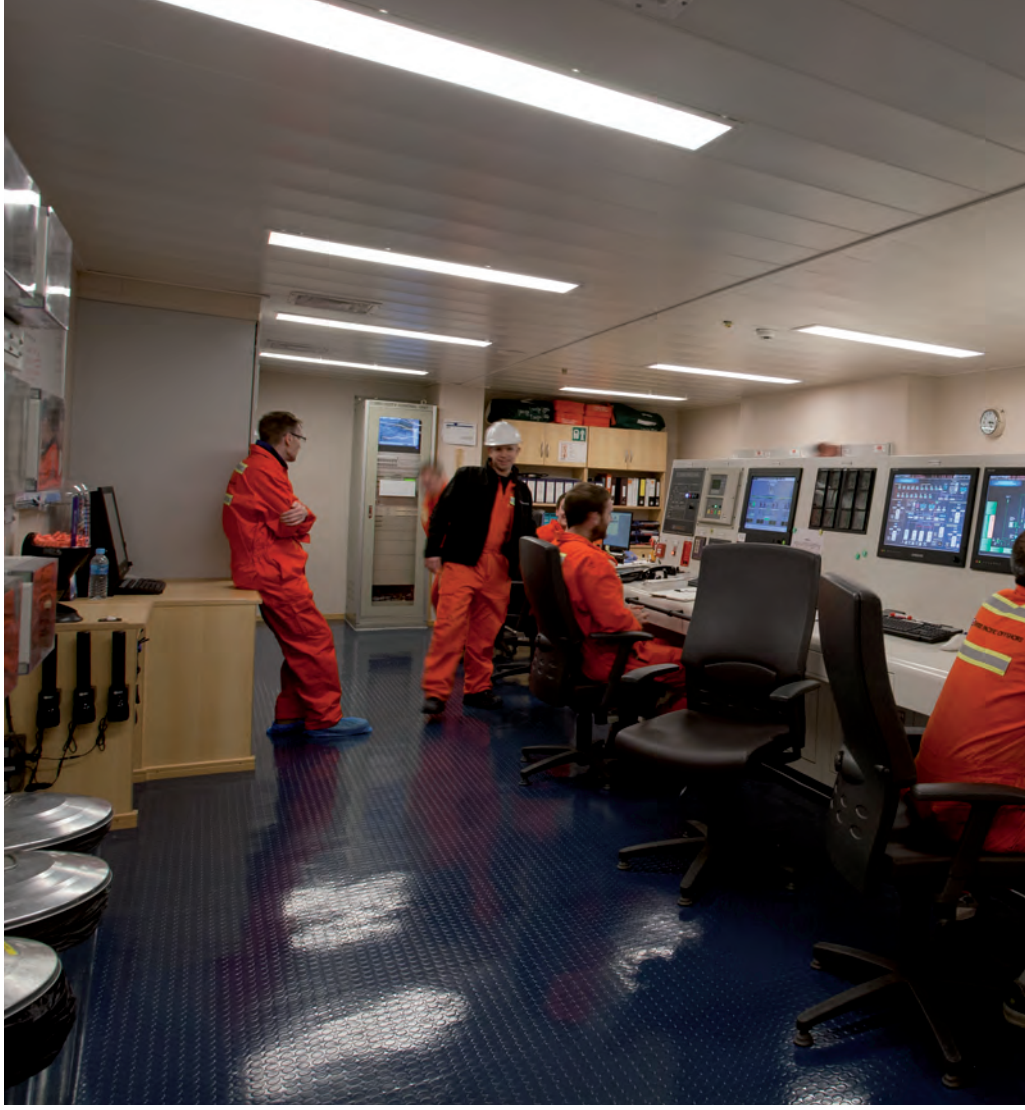


FASTER AND LARGER

Pacific Orca has a Danish design and has been developed in response to customer requirements for a larger and faster vessel in a rapidly growing market.

FACTS

Type:	DP II Jack Up - Windfarm Installation Vessel
Design:	Knud E. Hansen A/S
Class:	Germanischer Lloyd
Notation:	100 A5 Offshore Support Vessel Self-Elevating Unit WTIS EP Helil SPS (except SRtP)
IMO no.:	96013226
Register:	Cyprus, 5BRE3, Limassol
Owner:	Swire Pacific Offshore Services Pte., Ltd., Singapore
Operator:	Swire Blue Ocean A/S, Copenhagen
Shipyard:	Samsung Heavy Industries Co., Ltd., Geoje
Yard number:	1940
Delivery:	July 2012
Accommodation:	111 people in single-occupancy cabins
Length (LOA):	160.9 m, LBP: 155.6 m
Width:	49 m
Draught (max):	5.5 m
Deadweight:	8,400 t
Jackable payload:	6,600 t
Working deck:	4,300 m2
Propulsion:	Diesel-electric
Gensets:	8 x 3,150 kW.
Total output:	25,200 kW.
Azimuth aft thrusters:	4 X 3.4 MW
Bow retractable azimuth thrusters:	2 X 2.2 MW
Bow-tunnel thrusters:	2 X 2.2 MW
Speed:	13 knots
Main crane:	1,200 tonnes, 31 m SWL (in tandem)
Auxiliary crane:	35 tonnes, 6.5 m – 30 m SWL
Contract price:	Not disclosed



Pacific Orca is spacious throughout, even in the control room.

PACIFIC ORCA

Blue Ocean Ships chose Knud E. Hansen as the consulting naval architecture company to develop Pacific Orca. It was practical for the small, newly started shipping company to complete the development of the new ship with a partner in Denmark, and Knud E. Hansen had already designed a similar ship – MPI Resolution from 2004. During the establishment and concept development phase, Blue Ocean Ships had also been in close contact with the offshore wind turbine industry to gather customer requirements and needs for the next generation of installation tonnage.

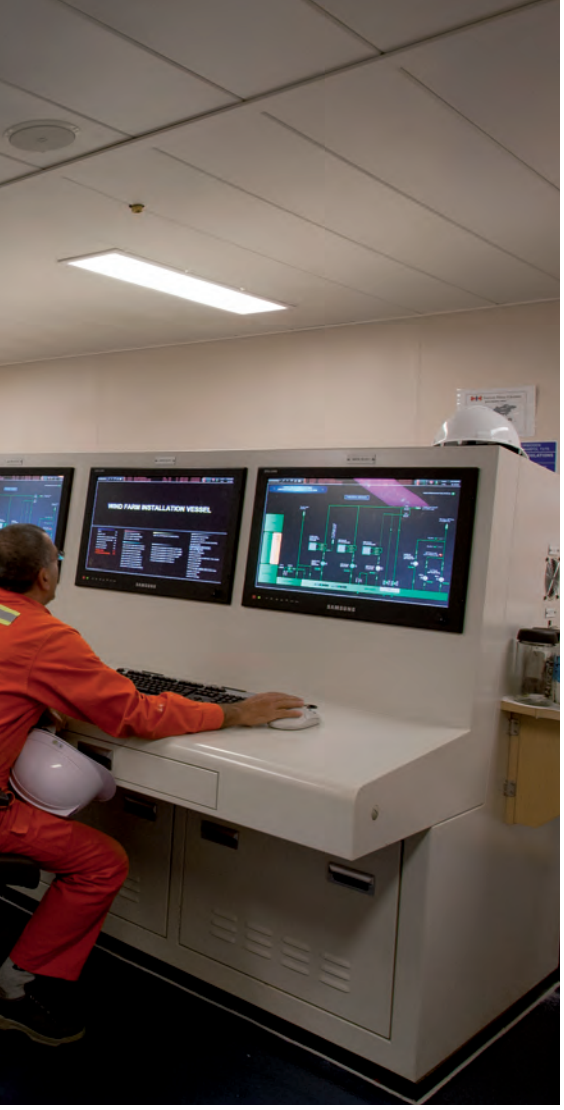
A real ship

A key goal was for Pacific Orca to be more of a real ship than jack-up tonnage usually is. The hull therefore has a more classic bow shape, and is generally less box-shaped than many other jack-up vessels, which resemble self-propelled barges more than actual ships. The advantage is higher speed and better seaworthiness during repositioning. This actually gives the ship greater capacity when it has to regularly collect turbines from the base harbour throughout a project.

Speed

One of the requirements expressed by customers was that the ship should be able to jack up at greater depths than previous vessels have been able to. This meant that metal-plated legs, as have previously been used for similar vessels, were replaced with lattice legs. The former type would demand far more of the dynamic positioning system when the ship is jacking up at greater depths, due to a combination of greater surface area and exposure to sea currents.

The speed of the crane is also an important competition parameter. It requires several lifts



Birds eye view of Pacific Orca.

to completely install an offshore wind turbine, so even minor improvements to crane speed significantly increase the ship's total efficiency.

Pacific Orca's main crane, with a maximum capacity of 1,200 tonnes, was developed by NOV specifically for the shipping company. While it is normal on many installation vessels for the crane to have two different hoist modes – a fast, lightweight mode typically limited to 30-40 tonnes, and a slow heavy lift mode which exploits the crane's full lifting capacity – the Pacific Orca has an extra mode between the two. The ship's crane can thus lift elements weighing up to 500 tonnes up to the maximum height of 65 m above the main deck in just one minute – which is much faster than heavy lift mode.

Weather window

For a jack-up vessel, the jack-up speed is obviously also an important efficiency parameter. It

Photo: Swire Blue Ocean

is estimated that Pacific Orca will have to jack-up on average once a day during a typical offshore wind turbine project. The jack-up speed is 2.4 m per minute under no load, and 1.2 m per minute during the final phase of the process when the ship jacks up out of the water. How high the vessel is jacked up above the sea surface depends on the swell, which determines the 'splash zone' up to the bottom of the ship. The system is 50 per cent over-dimensioned. This means it is never loaded at more than half of its capacity. The jack-up system has also been designed to last 25 years, with an average of 200 jack-ups per year.

The weather window in which it is possible to jack up is limited to a significant wave height of 2.5 m. The crane can be operated in winds of up to 20 m/s, but individual turbine components such as blades have lower margins for wind speed when they are being handled. In reality, it is therefore not ships such as Pacific Orca that are the limiting factor today, but rather manufacturers' turbine component designs.

Sonar surveys

Prior to each jackup, sonar surveys are carried out for the specific area on the sea floor where the ship is to stand on six spud cans, each 100 square metres in size. Pacific Orca therefore has its own sonar equipment on board to carry out these surveys, to ensure that no wrecks or other large objects have settled in the given area since the earlier sea floor survey carried out during the wind farm's planning phase.

The sonar system is also used afterwards to record documentation for the customer showing that the ship has not caused damage to the sea floor during the jack-up.

Low noise level

Pacific Orca is fully diesel-electric. It has eight 3,150 kW gensets, divided four and four into two separate engine rooms, and two separate transformer rooms and control boards. The strict separation is due to the vessel's DP2 status, which requires full redundancy for the engine room and propulsion.

Pacific Orca's main crane and auxiliary crane, and the six sets of 18 motors which drive the jack-up system are also fully electric. Virtually no hydraulic systems are used on board, which has the positive side effect that the noise level on the working deck can be kept at a very low level. A noisy outdoor working environment has been a problem on similar vessels. The main factor has been large ventilation casings for the air-cooled machinery. Drawing on this experience, Pacific Orca's machinery will be water-cooled, as on a conventional ship. The solution used is that the cooling system is fed via hoses in one of the six legs when the ship is jacked up out of the water.

Propulsion during normal navigation is primarily via four 3.4 MW aft azimuth thrusters. Pacific Orca is also equipped with two retractable 2.2 MW bow thrusters and two 2.2 MW bow-tunnel thrusters.

The ship has been dimensioned to carry up to twelve 3.6 MW offshore wind turbines, disassembled into three blades, a nacelle and a tower.

Many Danes on crew

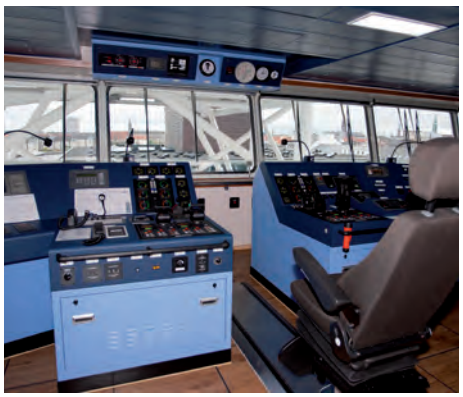
Pacific Orca has an operating crew of around 30. There is single occupancy accommodation for up to 111 people on board. The ship was built for Danish registration, but Swire Blue Ocean has decided to register Pacific Orca under the Cyprus flag. This is because the tonnage taxation rules in DIS (Danish International Ship Register) do not consider jack-up vessels to be navigating internationally and therefore entitled to DIS registration.

However, due to the extensive expertise in Denmark from the offshore wind turbine industry, many of the ship's crew are Danes. The rest of the crew are citizens of other EU countries, primarily Great Britain.

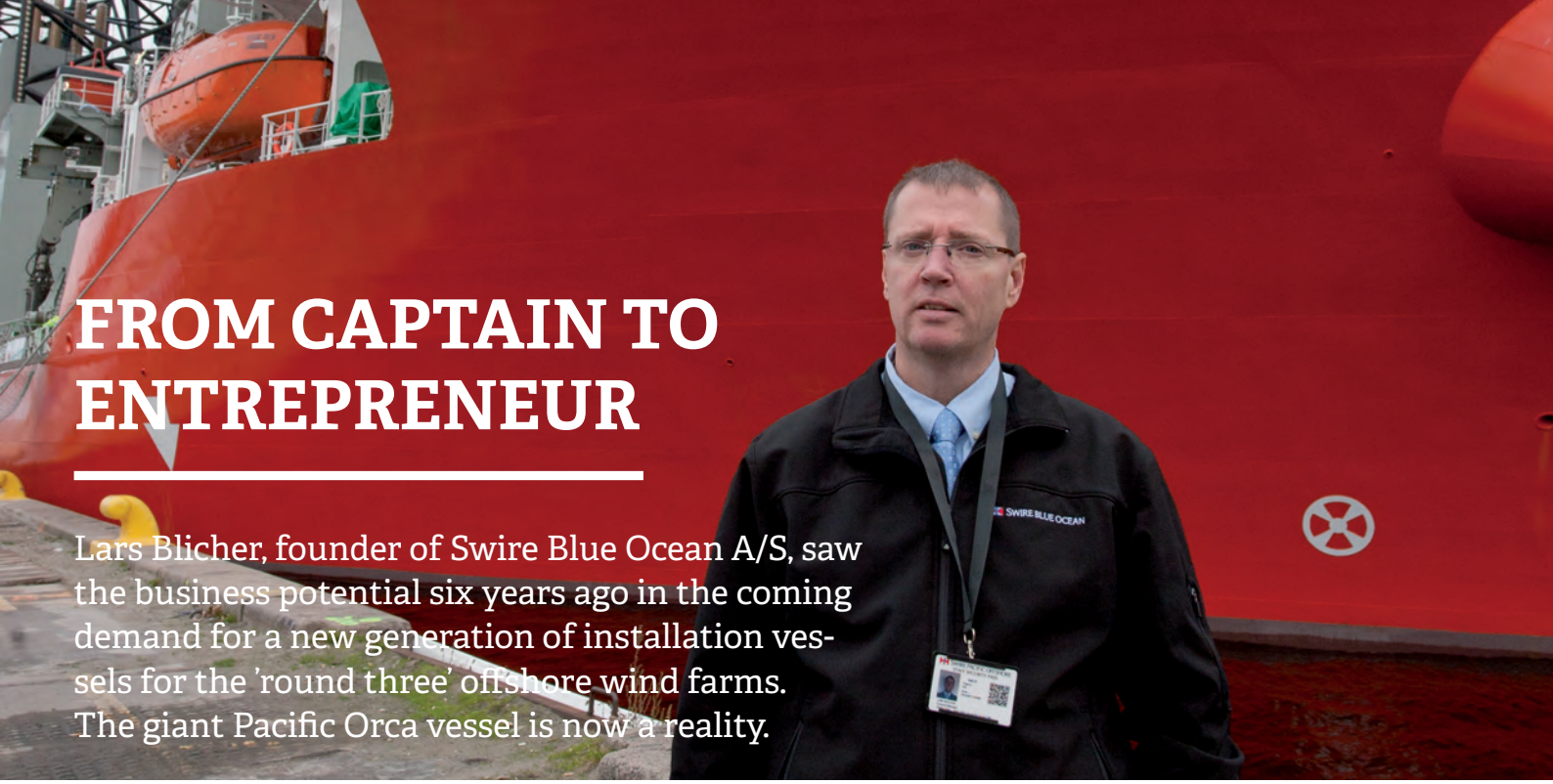
UK citizens account for a major proportion of the crews in the 75-ship fleet of the parent company, Swire Pacific Offshore, and many of these have been recruited to Pacific Orca and its sister ship, Pacific Osprey. ■

One of the two tunnel thrusters.

All crew ranks share all the facilities in the accommodation, in good Scandinavian tradition.



The forward facing part of the bridge, where the navigator looks out under the helipad.



FROM CAPTAIN TO ENTREPRENEUR

Lars Blicher, founder of Swire Blue Ocean A/S, saw the business potential six years ago in the coming demand for a new generation of installation vessels for the 'round three' offshore wind farms. The giant Pacific Orca vessel is now a reality.

Lars Blicher standing in front of the result of years of hard work.

Major offshore construction projects require extensive financing and long political decision processes, and do not happen overnight.

In 2006, Lars Blicher noted a disparity between the planned very large offshore wind farm projects and the availability of special tonnage.

He had left his job as a captain for Elite Shipping eight years earlier to focus on being a self-employed entrepreneur. By 2006 he had been involved in a couple of IT companies, when he turned his attention to his original maritime occupation.

"It all began after a chat with my cousin, Sigurd Hoffman, who is an expert in installing offshore wind turbine foundations. We looked at the market and decided that there was only one suitable ship in existence at that time, and there did not appear to be any others of sufficient size in the pipeline. It became apparent that the capacity needed for the many planned projects simply did not exist," explains Lars Blicher, General Manager and Director of Swire Blue Ocean A/S.

The ship Lars Blicher is referring to is MPI Resolution, delivered in 2004 to MPI Offshore of Great Britain. Last year the company took delivery of an additional two slightly larger vessels with cranes rated at 1,000 tonnes.

Since then, A2Sea has also taken delivery of Sea Installer, with a crane capacity of 800 tonnes.

From the outset, Lars Blicher sought a ship with an even larger capacity of 1,200 tonnes.

Blue Ocean Ships

"With help from Maersk Broker, I searched the market for suitable ships. It quickly became apparent that we would never achieve what we wanted to using refitted second-hand ships – they would quickly become outdated given the rapid development the industry is undergoing," explains Lars Blicher. Instead he decided to build a new custom-made ship.

In November 2012, on the top floor of the exclusive Winghouse building designed by the world-famous Danish architect Henning Larsen, with panorama views of the blossoming new Ørestad region, Swire Blue Ocean A/S now has 13 employees – with more on the way.

At the end of 2012, the shipping company took delivery of its first new vessel, the offshore installation ship, Pacific Orca. Depending on how you measure it, Swire Blue Ocean's new ship appears to be the world's largest specialised vessel targeting the installation of offshore wind turbines, and a sister ship, Pacific Osprey, has just been delivered from Samsung HI in South Korea.

According to Lars Blicher, the realisation of ship number two will not in itself have a major impact on the number of new employees at the office in Ørestad, but all the project management which lies ahead will. When the young company seriously gets underway with the two new vessels and its portfolio of contracts up to 2015 begin to be implemented, the need for project management and customer consultancy will also increase.

In January 2008, Lars Blicher established Blue Ocean Ships with his own capital, supplemented by a few external investors already engaged in the energy sector. The company's advisory board was put together from hand-picked industry people, such as Peter Høstgaard-Jensen (Chairman), ex Managing Director for Elsam, Palle Nørgaard, ex head of Siemens and former Mærsk shipowner, Tage Bundgaard.

Later in 2008, Rikke V. Stoltz also bought a share of the company. She had formerly had 10 years' leadership experience from A. P. Møller - Mærsk, but like Lars Blicher, she had been a self-employed entrepreneur for a number of years. She is currently Business Development Manager and Director of Swire Blue Ocean A/S. Together, she and Lars Blicher comprise the executive board.

Acquired by Swire

In 2009, Blue Ocean Ships and consultant naval architects Knud E. Hansen had completed the design for Pacific Orca, and were ready to receive specific bids from shipyards. However, the most important element of the commission was missing – the financing.

"We found that the Danish banks we presented our idea to were completely disinterested. However, we found sufficient investor capital in Norway to be able to commission the first ship. But it is one thing to be able to finance one ship, and something else to follow up with vessel number two and also have enough resources to build up a proper support organisation and

Auxiliary crane, three of the six support legs and the main crane.

View from the aft towards the accommodation, with the main crane resting on monkey island.

be able to fulfil the necessary guarantees in relation to contracts. It therefore became increasingly clear to us that we needed to find a major partner," explains Lars Blicher.

This ended up being the Singapore shipping group, Swire Pacific Offshore.

"We had been in contact with Swire in Singapore for some time. The original idea was to do a joint venture. They were interested in expanding their involvement in offshore to include the offshore wind farm growth sector. However, in the end the solution chosen was that they acquired Blue Ocean Ships. This ensured we had the necessary capital behind us to be able to exercise the option on ship number two, and to be able to quickly commission new vessels when the market so demands," says Lars Blicher.

Purchased on speculation

Blue Ocean Ships therefore became Swire Blue Ocean in 2010 – a Danish limited company owned by the Singapore-based Swire Group, which owns and operates one of the world's largest DP II fleets with over 75 offshore ships.

The company currently has more than 20 new vessels in the pipeline, so the small Danish shipping company not only received the backing of a major player, but also access to a very large shipbuilding department. This was important, as Pacific Orca and Pacific Osprey are advanced prototype ships, placing great demands on both shipyard and shipbuilding department.

When Pacific Orca was commissioned in August 2010, it was pure speculation.

At the time, Swire Blue Ocean was competing for several tenders with competitors who already had ships in the pipeline, so the company felt it was necessary to place the order. According to Lars Blicher, the decision to commission Pacific Orca was a deciding factor in the company securing its first contract. The project involves the transport and installation of eighty 3.6 MW offshore wind turbines to be shipped from Esbjerg to Vattenfall's DanTysk offshore wind farm west of the German island of Sylt.

The option on the sister ship, Pacific Osprey, was exercised after entering into a contract with DONG Energy. ■

WHAT GOES UP MUST COME DOWN

Pacific Orca is not exclusively a wind turbine installation vessel. It will also be used to decommission offshore installations – which like offshore wind turbines is a growth area.

Swire Blue Ocean's new ship, Pacific Orca, was designed with a business model in mind where the installation of offshore wind turbines was the definitive driver. Yet the new vessel and its sister ship also strengthen the company's position in another offshore growth area – decommissioning. After all, everything which is erected has to also be removed again.

The expected lifetime of an offshore wind turbine is generally 20 to 25 years. After that time the wind farm must either be completely removed or upgraded with new foundations and turbines.

The same is true within the fossil fuel area of the offshore industry. According to Swire Blue Ocean, around 400 installations have currently been identified which need to be either decommissioned or replaced with modern installations. Decommissioning is therefore also an important component of Swire Blue Ocean's business. Both Pacific Orca and its sister ship, Pacific Osprey, have been assigned to projects for AF Decom of Norway. Decommissioning jobs are typically of shorter duration and more flexible in terms of timing than wind farm projects. They are therefore attractive in relation to ensuring the ships are continually utilised. ■

COULD HAVE BEEN BUILT IN DENMARK

Pacific Orca was close to being commissioned at Odense Staalskibsværft, but this was thwarted by the Mærsk decision to close the shipyard.

Before Swire Blue Ocean placed the order for Pacific Orca in South Korea, Odense Staalskibsværft had long been the preferred supplier. "We had actually come a long way towards placing the order for our ships with Odense Staalskibsværft. We had worked closely with the talented engineers from the shipyard's drawing office for a long period to get the price designed properly. Our project had been approved by the board of the shipyard when it was reported that Mærsk was going to close the yard. When we later went to Samsung in South Korea, they actually arrived at close to the same price as Odense Staalskibsværft had offered. Yet looking back one might reasonably question whether Odense Staalskibsværft would have been capable of carrying out the project," reflects Lars Blicher, having witnessed the construction process at Samsung in South Korea. The process basically went without hitch, even though it was a challenge for the giant shipyard. However, he notes that it would have been good for the ego and a good signal to send if it had been possible to build this type of ship in Denmark. ■

Swire Blue Ocean presented Pacific Orca to business connections and the general public during a week long stay at the wharf opposite Copenhagen Opera House in October 2012. Over 8,000 people went aboard.

ROUND THREE SHIPS

Denmark has been a leading nation in the area of wind energy since the 1980s. Twenty to thirty years later, wind energy has spread offshore, and has now become one of the most rapidly growing areas in the Danish shipping community. The same trend seen in the 1970s fossil fuel offshore adventure has therefore repeated itself in the maritime industry, starting with small vessels refitted in a makeshift fashion for the offshore wind turbine industry. These were later followed by larger tonnage, often still refitted from other roles, but more customised, based on experience from the early years. Offshore wind farms have undergone a similar evolution. The first round of wind farms were in close proximity to the shore. These were followed by the large wind farms in round two – such as Horns Rev 1 and 2 and Anholt – just to mention a few wind farms on the Danish continental shelf. The major overall project volume in the market in future years will be on the British and German continental shelves. Some of these large wind farm projects are categorised as 'round three'. This category entails challenges such as even greater distances from the shore, greater water depths and even larger wind turbines. The market is therefore demanding, more than ever, highly efficient and custom-made ships such as Pacific Orca, which in parallel with the offshore wind farms can appropriately be called third generation tonnage. ■