Boarding a new ship is always an exciting experience, and the offshore service operation vessel *Esvagt Froude* was no exception. This nautical innovation significantly enhances offshore service and maintenance operations for wind projects, particularly those located far from the shore.

Text: Onno Groß  Photos: Claus Sjödin
The offshore wind industry plays a key role in the global energy mix. Today, more than 30 gigawatts are planned for installation globally, with more to come. Offshore innovation is one of the strengths of market leader Siemens. “We are the first and the most pioneering company in this field and the only company offering an integrated solution throughout the lifetime of the wind turbine,” says Mark Albenze, CEO Global Wind Power and Renewable Service, based in Orlando, Florida. “We currently have the largest wind power plants in commercial operation, and we collect and analyze enormous amounts of data that can lead to future evolutions in design and provide for operational flexibility. And we have a very long history of services. It’s a full life cycle approach, which is part of our core business, and we are sharing this knowledge with our customers.” For offshore wind farms, the latest Siemens solution is a brand-new custom-designed service operation vessel (SOV), which sets a technological benchmark.

In the Harbor
Near the beach of Esbjerg in Denmark, a group of four huge men sit staring stoically out to sea. Made from white concrete, *Mennesket ved Havet* (“Men at Sea”) by Svend Hansen is a remarkable, 9-meter sculpture that honors the long history of the country’s most important North Sea port. On a day in mid-February, however, a dozen people gathered on top of a shipping office building, staring not out to sea but toward the pier at a rather distinctively shaped ship. The arrival of the brand-new, 84-meter SOV *Esvagt Froude*, constructed by Havyard Ship Technology in Norway, opened a new chapter for Esbjerg, which today is famous as the “wind industry port.” With its large windows, and its sophisticated deck structures, it certainly stood out among the cargo ships in the vicinity. René Wigmans, Head of Maritime and Aviation Solutions at Siemens Service Wind Power, was one of the first on board. “The vessel is groundbreaking for our service and for the scheduling of maintenance,” says Wigmans. “As it will be positioned within the wind farm for weeks at a time, it will allow our technicians to literally ‘walk to work.’ Another key benefit is that with the unique access features on this new vessel, we can significantly reduce weather downtime, which in turn increases efficiency; and we can make sure that we are able to deploy technicians safely and transport them comfortably to the turbines. Additionally, we use the vessel as an independent warehouse in the wind farm. All this innovation and effective use of resources can lead to greater value for our customers.”

The contract for the SOV *Esvagt Froude* – named after William Froude (1810–1879), an English naval architect who helped lay the first transcontinental ocean cable – was signed with the Danish shipping company Esvagt back in 2013. While the raw hull of the ship was built in Turkey, final assembly was done in the shipyard of Havyard Ship Technology in Norway. The company has extensive experience in building special vessels for the oil and gas industry, but this one was unique in its own way, as it required meticulous planning and a lot of technical know-how. “The further the service area lies from the shore, the more you have to come up with solutions,” explains Søren Thomsen, CEO of Esvagt. “The ship has many new features, such as the engine system, and it will certainly heave and sway much less, which will help the people on board substantially.”

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*Ingo Bischof, Siemens Project Manager Service Offshore for CWP Butendiek.*
The brand-new SOV Esvagt Froude has an overall length of 83.7 meters, its breadth is 17.6 meters, and the draft is 6.5 meters. The so-called Havyard Design has a high bow, a surround asymmetric bridge, and a large cargo deck. The ship has a maximum speed of 14 knots. It has 60 single cabins, a duty mess, and features a conference room, two cinemas, and a fitness studio.

The deck equipment includes a number of cranes and the Ampelmann gangway system. The ship has powerful diesel engines, equipped with a Siemens Blue Drive System®. This active and passive roll damping system is used for optimized comfort and the gangway operations. In addition, the ship navigates in dynamic positioning mode inside wind farms. The name of the ship refers to William Froude, an English engineer and naval architect.

Inside the Esvagt Froude

The Havyard ship design with its prominent inverted bow and large stern decks serves to achieve higher speed and calmer motion in rough seas. The high front is further characterized by an asymmetric glass-surrounded bridge and big cabin windows, which is reminiscent of a research vessel. But more than half of the ship is dominated by a huge afterdeck with cranes, and space for the Safe Transfer Boat Wind 1 as well as two other specialized Esvagt Froude boats. In the superstructure decks up front, modern corridors run through four decks with comfortable cabins, and various stairways lead from the engine rooms up to the top bridge.

Beneath the afterdeck is an impressive storage hall with as much as 430 square meters of space and storage capacity for six standard 20-foot containers. This is the heart of the ship’s body: Here are the workshop rooms, dry rooms for special equipment, and a transport elevator for moving the heavy spare parts up to the main deck. Since around 1,000 spare parts are expected to be utilized in an offshore wind power plant, a vast number of them have to be on hold for annual maintenance. Previously, any missing spare part had to be picked up in a small crew transport vessel, a trip of several hours.

The Wind Farm Office

On the port ship decks, the wind farm control room is situated where the logistics and systems will be operated. Here, big windows offer a close view of the wind farm once the ship arrives in its service area. The control room will soon be packed with computers, Wi-Fi equipment, and direct communication channels to the bridge.

“The SOV is a long-anticipated puzzle part in offshore logistics,” says Ingo Bischof, Siemens Project Manager Offshore Service for OWP Butendiek in the North Sea. The wind farms are operated and controlled remotely from the main office in the city of Brønde in central Denmark. But once spare parts and maintenance duties are on the agenda, the SOV comes into play. “Managing a wind farm requires sophisticated service planning, and with the SOV, we can deliver that efficiently and accurately,” says Bischof.

“At present, North Sea offshore wind farms consist of up to 80 turbines, and we expect 30 minutes of approach...
Steady Crossing in Rough Seas

Vessels like the Esvagt Froude improve offshore wind turbine maintenance, for instance with the Ampelmann hydraulic gangway.

The Ampelmann system uses a simulation tool to calculate the optimal paths within a wind farm, which will reduce travel time and save costs. That is why all eyes are on the new SOV.

The Gangway

Another important feature of the ship is the gangway, which allows for safe passage to the turbines even under harsh conditions and with significant wave heights. The gangway was built by Ampelmann, an innovative Dutch company from Delft. Instead of a moving cockpit, the Ampelmann system features a gangway platform that stays stable while the ship underneath heaves and sways.

In reality, it looks like a fire ladder built on six insect-like legs. While the ship moves under this structure, the motion sensors and most valuable parts of the Ampelmann system stabilize the platform and its 25-meter gangway automatically. One million crossings to offshore structures have proven this to be a safe technology. By the way, the system’s name “Ampelmann” refers to the green man in walking lights, signaling that it is safe to cross the road.

In the Bowels of the Ship

But maneuvering offshore demands more than a stable gangway. That is where the Siemens Blue Drive System® comes into play. It is located in the engine room, far below the water level, where the sound of the diesel engines has an almost calming effect. The engines are fully operated by computer terminals and come with a basket of benefits, as Kristian Ole Jakobsen, COO of Esvagt, explains. “One feature of the Blue Drive System is that it saves fuel, reduces emissions, and makes propulsion and the power system as efficient as possible. Our diesel generators can run on low revolutions per minute, which saves fuel, just like in a car when you take your foot off the pedal. This is significant, because in the wind farm, the ship has to stay on the spot for a long time. In addition, the Blue Drive System accesses each motor separately, so we have a high redundancy should one motor fail. Further interesting features of the vessel lie under the waterline. There are two propulsion units with contra-rotating propellers in order to facilitate a better water flow. Beside the two bow thrusters for going sideways, there is a retractable azimuth engine in front. A stable dynamic positioning system and active roll damping ensure perfect steering.

Maintenance at Sea

Operation and maintenance of offshore turbines involve sophisticated teamwork. Most of the monitoring is done from control centers on land supported by remote diagnostics, but when service technicians have to go out to sea, they are transferred via a crew transfer vessel. Seasickness, extensive travel times, limitations due to harsh weather, a time delay due to acclimation before entering the turbine, and difficulties in transporting necessary spare parts are only some of the obstacles to optimal performance, especially for distant offshore wind farms. A logistic solution such as the SOV Esvagt Froude makes offshore operation more efficient. The ship will deploy its technicians either via the gyroscopic Ampelmann gangway directly to the turbines, even when waves are head-high, or by using its own Safe Transfer Boat. It has a large storage capacity and workshops, while dynamic positioning enables it to maintain a set position, and an active roll damping system improves onboard safety and comfort. In addition, computerized cruising programs will help to design optimized work schedules and will greatly improve the efficiency of offshore maintenance, thus contributing to reducing operating expenditures for wind power at sea.

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Ingo Bichof, Siemens Project Manager Service Offshore for OWP Butendiek

At Sea

Once it is out at sea, the SOV Esvagt Froude’s reliability will be put to a first test at a UK wind farm during the installation process. Later in 2015, it will be in charge of long-term service and maintenance at the Baltic 2 wind farm. Its sister vessel, the SOV Esvagt Paraday, will start its working life in the North Sea wind farm Butendiek. “Looking forward, we are interested in maximizing the predictive and preventive maintenance tasks as opposed to reactive maintenance,” says Mark Albenze. “So to be even more efficient, we remotely translate data into operational recommendations for the SOV based on each wind turbine’s condition. And the SOV has the right features to bring this proactive idea to life.”

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