

Offshore wind power: Continental develops sound insulation for marine life

- **Air bubble curtain with innovative hose system from Continental has a double effect: It saves time and effectively reduces noise when building wind farms**

Hanover, July 2018. The technology company Continental has successfully tested a new generation of the Big Bubble Curtain in a pilot project together with a specialist hydraulic engineering company. More energy efficiency and fewer greenhouse gases and as soon as possible – these are the declared objectives of the German “Energiewende”, energy turnaround. The expansion of wind power at sea is therefore under high pressure. Currently, offshore wind farms with a total output of more than 5.3 gigawatts are in operation in Germany. By 2030, wind turbines on the local coasts are expected to reach a total capacity of 15 gigawatts. According to the German Offshore Wind Energy Foundation, this could generate clean energy for up to 15 million households.

In order to achieve this, new wind farms are being built in the North and Baltic Seas. But for marine life, these projects mean one thing above all else: all sorts of construction noise and vibrations. Mammals such as protected porpoises, but also seals or fish like cod and herring use sound to orient themselves, to communicate, and to locate prey and predators. In order to protect the animals, a noise level of no more than 160 decibels applies in German waters at a distance of 750 meters from the construction site. This legal requirement of the Federal Ministry for Environmental Protection Building and Nuclear Safety has spurred the development of new technologies for the quiet installation of foundations.

When installing wind turbines, the foundations (which are up to eight meters thick) are driven as deep as possible into the seabed. Otherwise, wind and waves would simply knock them over. Each individual impact causes enormous noise of up to 225 decibels. This is about twice the amount of noise as a circular saw and can be heard for miles in the sea. Torture for the noise-sensitive porpoises and other marine animals. The human pain threshold is about 120 decibels. A very simple but extremely effective solution is the use of an air bubble curtain.

The solution is in the air

“An air bubble curtain is created by using one of our heavily perforated hoses. The installation company places this around the construction site as a ring, before the wind turbine towers – which are up to 150 meters high – are driven into the seabed. The hose ends are connected to powerful superchargers on ship decks. During the work, they pump 10 bar of oil-free compressed air into the hoses, which escapes through the holes according to a well-defined pattern. The result is a curtain of millions of small bubbles that rise to the water surface, forming a kind of whirlpool around the construction site. The air bubbles change the density of the water and thus break down the sound waves. Depending on the nature of the soil and water currents, hydraulic specialists also use two-ring technology,” explains David Hoffmann, who is responsible for industrial hose solutions in the EMEA and APAC region for the Continental Corporation. “This clever technology reduces the noise level by up to 18 decibels, which is a volume reduction of 95 percent,” Hoffmann continues. But how can the hose remain at the bottom of the sea without additional steel chains when the pressurized air provides buoyancy? In order to find a solution to this challenge, the development partner commissioned the hose experts from Continental.

So far, installation companies are pursuing two approaches to keeping the hoses on the seabed. In the first, the hose is provided with additional weights that anchor it to the ground. The disadvantage of this method is that it is complicated to transport it back to the water surface after the work. The second variant consists of a pipe system. However, this is difficult to install on the seabed.

“As with all construction projects, it's about doing the work as quickly and with as little effort as possible. That's why we have developed a solution with a hose that is flexible and works without complicated anchoring with additional weights such as steel chains,” explains Hoffmann. In addition to the flexibility required to allow easy handling, the hose should also be stable. Abrasion resistance, so that rubber components are not released into the environment, and resistance to salt water are among its other important properties.

A heavyweight in the field test

Contrary to a first description the bubble curtain hose has been tested in the Baltic Sea but not in area of the Arkona Basin Southeast wind farm.

At the end of last year, the application was tested in the Baltic Sea. The result: The field test was passed with flying colors. The Big Bubble Curtain hose system worked perfectly at a depth of up to 60 meters. It remained stable on the seabed while air bubbles reduced noise and vibrations by 95 percent. The recovery after the test also ran smoothly without leaving any traces on the seabed. After all, the application should be used several times. “Overall, the handling has improved significantly with Continental’s solution compared with the use of additional weights,” says Hoffmann with satisfaction.

The technology company has solved the task with a further development of its hoses. Each hose consists of different layers of different materials, such as rubber, as well as reinforcements. Even with the hoses used as air bubble curtains, one of these layers consists of a wire mesh. This spring wire spiral serves as bend protection during winding and unwinding of the hose line, and keeps the shape of the hose stable in case of over or under pressure at the same time. “The trick of our development is that we wrapped our hose with additional wire, like a spiral. The result is a real heavyweight that can be tared very well at the desired depth. A meter-long hose with an internal diameter of 100 millimeters now weighs an impressive 20 kilograms. A 1,000 meter hose weighing 20 metric tons is needed to wrap a ring around a construction site. The hoses are therefore wound up on huge drums aboard ships and transported to the marine construction site. This may sound rather complicated at first, but it’s much easier to use than the previous solutions using steel chains or pipe systems,” reports Hoffmann.

Innovations for climate and nature conservation

Continental has now applied for a patent on the hose. “The technical and environmental conditions and the requirements of offshore wind turbines are much more complex than those on land. With our innovative solution, we make a contribution to the expansion of regenerative energy sources on the high seas, thereby protecting marine life from construction noise,” adds Hoffmann.

But air bubble curtains for sound insulation are not only used in the construction of wind farms since they are suitable for many other applications, such as mine clearance, offshore oil drilling, seismic surveys or port and coastal development as well as bridge construction and the construction of artificial islands. The air bubble curtain is also suitable for keeping oil spills in a particular area, or for keeping seaweed, algae, jellyfish or flotsam from beaches, harbors and shores. In these cases it serves as barrier protection. This allows the system to protect fish from dams or contaminated areas in the sea and rivers, and lead them to safe areas.

Captions

Continental_pp_Hose_Bubble_Curtain.jpg

Smart solution for hydraulic engineering companies: The hose wrapped with an additional wire spiral facilitates the handling of air bubble curtains.

Photo: Continental

Continental_pp_Infographic_Bubble_Curtain_en.jpg

A sensible measure against underwater noise from construction sites in the sea is the use of air bubbles in the water with the help of a bubble curtain.

Graphic: Continental



Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. Founded in 1871, the technology company offers safe, efficient, intelligent, and affordable solutions for vehicles, machines, traffic, and transportation. In 2017, Continental generated sales of €44 billion and currently employs more than 240,000 people in 61 countries.

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