



# Guardians of the deep

In the dynamic world of offshore wind energy, safeguarding subsea foundations and cables poses significant challenges. Helping to address the various complexities faced by engineers and developers in protecting these vital components, innovative solutions are changing the landscape of offshore wind farm protection.

Ridgeway has been at the forefront of supplying the offshore wind sector in the UK, Europe, Africa, and the Middle East with the innovative and tailor-made Japanese Kyowa Filter Unit Rockbags® since 2009.

Originating in 1987, the filter units were initially developed to safeguard the foundations of the iconic Akashi bridge. With over 25 years of extensive application in civil engineering, predominantly in Japan, where they have adorned rivers and port works, they have earned their stripes with over 700,000 units deployed. Now, this time-tested and reliable system is readily accessible in Europe and the UK, offering unmatched protection and durability.

Made of 100% recycled polyester (PET) and constructed using a unique form of knitting, known as Raschel, the filter unit is a rock filled bag filled with aggregate making it a very flexible solution for marine construction work.

The process of installing loose rock around an offshore foundation has a number of drawbacks; firstly, the rock is normally sourced from another country, such as Norway, resulting in a higher carbon footprint. This is also regarded as a loss to the local economy and host country building the wind farm, whereby local vessel and stone supply is overlooked and sourced elsewhere.

Furthermore, during installation the benthic environment is significantly impacted. This is the result of excessive amounts of outsourced rock being poured onto the seabed, which can ultimately breakdown and migrate away from the asset, requiring unnecessary and expensive remedial works. At the wind farm's end of life, this stone needs to be removed or decommissioned from the seabed, a complex process which again causes major disruption to the benthic environment.

Made from 100% recycled PET material, Rockbags is a unique system that has proven to be more environmentally friendly and cost effective compared to traditional methods such as rock dumping.

The one-point lifting ring allows fast, accurate placement on the seabed. Designed

and proven to last 50 years in saline water, the system can be easily decommissioned as the net doesn't degrade or breakdown over time, making it a clean and sustainable solution for the subsea environment.

Available in four sizes of 2T, 4T, 8T & 12T, the system is available with both dual and single membranes that can be adapted for different protection scenarios and has the enhanced durability and strength to deal with the challenging nature of the offshore environment. Ridgeway Rockbags® fit harmoniously into the marine environment. Small fish, plants and other aquatic life can live in the interstices inside the units,

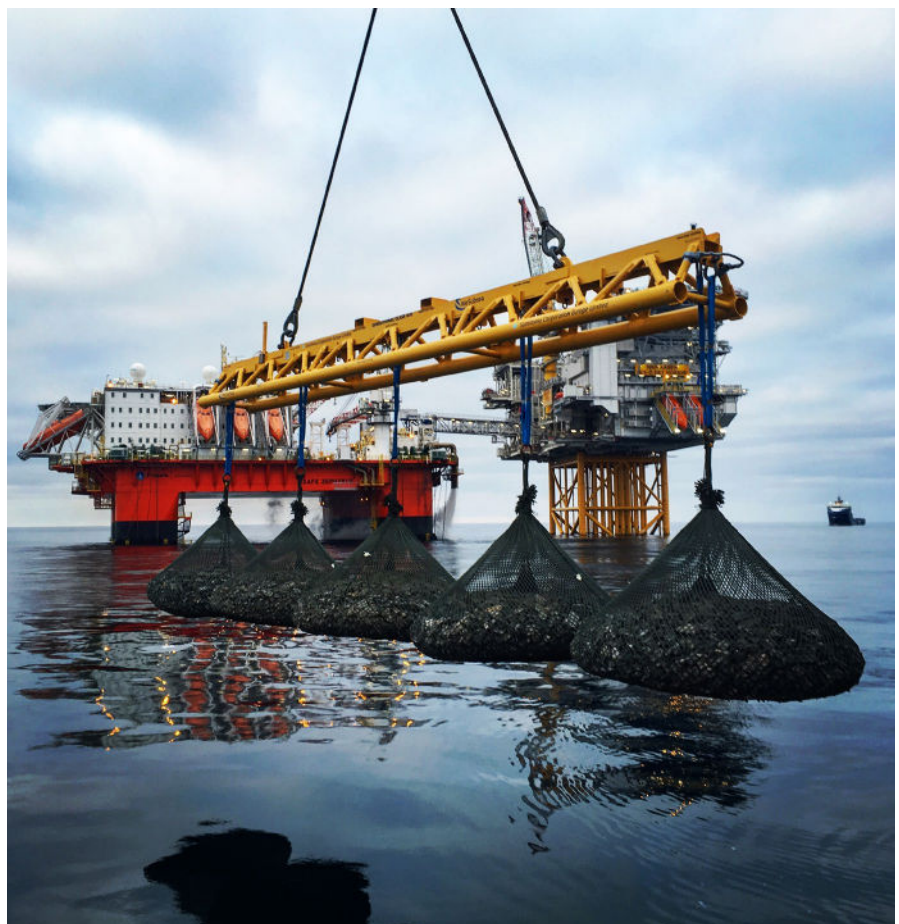
forming a natural habitat for marine flora and fauna.

## Erosion control

In offshore wind projects, they are often deployed to prevent erosion of shorelines or the seabed where wind turbines are installed. They act as armour layers, dissipating wave energy and tidal flow, protecting the seabed from scouring.

## Foundation stability

Offshore wind turbines require stable foundations to support the structure against the forces of wind, waves, and





currents. By integrating filter units into the foundation design, developers enhance stability and minimise the risks posed by seabed movement and scour. These units act as a protective barrier, absorbing and dissipating the energy exerted by underwater currents and tidal forces. As waves crash and currents swirl, the filter units serve as guardians, fortifying the foundation against erosion and displacement.

Moreover, the strategic placement of filter units offers an additional layer of defense against scour, a phenomenon where the seabed is gradually eroded by the relentless flow of water. By dispersing the force of water currents, the filter units help maintain the integrity of the seabed, preventing destabilisation and ensuring the longevity of the offshore wind turbine infrastructure.

#### Subsea cable protection

Power cables connecting offshore wind turbines to onshore infrastructure need protection from abrasion, impacts, and other hazards. Rockbags® can be used to cover and secure these cables on the seabed, minimising the risk of damage. They can also be utilised to level up uneven areas of seabed prior to, or in conjunction with, cable laying.

#### Pipeline and infrastructure protection

Similarly, pipelines and other offshore infrastructure associated with wind farms may benefit from the use of the filter unit for protection against natural elements and human activities.

#### Habitat enhancement

In some cases, they can be developed as artificial reef structures to enhance marine habitat and promote biodiversity around wind farm installations.

Production is a short process that requires reduced labour and machinery. And with the one-point lifting ring allowing fast and accurate placement for ease of installation, overall the system significantly reduces carbon emissions when compared to traditional offshore engineering methods. This is in addition to the CO<sub>2</sub> savings made using PET.

Traditional scour protection solutions emit high amounts of CO<sub>2</sub> during their production processes, in particular this is the case with concrete mattresses. Curing of concrete for marine applications usually requires harmful chemicals to be added, which can be hazardous to marine life over time.

Polypropylene rope is also used to join the concrete segments together to create the

mat structure. Over time the polypropylene will break down, emitting microplastics into the water column and becoming a hazard for marine life. Furthermore, recent research has shown that the shape and design of mattresses offer limited interstitial spaces for marine life to develop and flourish.

Unlike concrete mattresses, Kyowa Filter Unit Rockbags® are a highly flexible solution making them very adaptable to complex marine projects. Designed to encase the stone, preventing it from breaking down and migrating from its location, they offer a long-term maintenance-free protection solution.

Installation is achieved using high-resolution sonar imaging, ROV, Utrov or by divers. However, it should be highlighted that a diver in the water is not essential during installation, using ROV or sonar has proven to be the most efficient method of installation which, in addition, significantly reduces health and safety risks and insurances. Studies by offshore developers have shown that due to their flexibility the units put less stress on subsea cables both during and after installation therefore virtually eliminating the risk of damage.

The use of sonar technology for installation is proven and has now become the standard system used. Placement is very precise; with a tolerance of approximately 2 to 3 cm. In some instances, this type of technology can be complemented by an ROV, especially where a subsea spreader beam or multi-bag lifting tool is utilised.

Due to their porous nature, Ridgeway Rockbags® are designed to withstand high velocities of flow, making them an ideal solution for protecting subsea foundations and cables. Once installed, they can be easily retrieved or decommissioned when the wind farm has reached its end of life.

As the offshore wind sector continues to expand, they stand as a testament to the power of innovation and collaboration in driving progress towards a greener planet. They offer versatile and effective patented solution for addressing a variety of engineering challenges encountered in the offshore wind sector. These challenges range from remedial scour protection for shallow water sites to CPS and array/export cable stabilisation during the development of newly constructed wind farms.

The bespoke nature of this product contributes to the successful development and operation of wind energy projects in coastal and marine environments. The filter unit has a proven track record in UK and Irish waters as a simple and cost-effective solution for protecting the subsea foundations and cables of an offshore wind farm.

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