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FISH FARMING TECHNOLOGY

HOW IS AN EMERGING RENEWABLE ENERGY HELPING MOOR FISH FARMS SUSTAINABLY?

It is estimated that the UK could supply between 15 and 20 percent of its electricity demand from tidal energy.

What relevance does that have to aquaculture you may ask? The answer lies in the common need for technologies to allow access to environmentally energetic marine sites; as there is potential for an anchoring product developed in tidal energy to allow placement of fish farms in sites previously out of reach

by David Stoddart-Scott, Head of Project Development, Sustainable Marine Energy Ltd

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key obstacle to the delivery of commercially viable tidal energy is the capital cost associated with installing the infrastructure of a project whilst keeping it in the same place and connected to the seabed for the duration of its 25 year life. Whilst considerably more benign, the same essential challenge can be found in aquaculture.

Reaping the benefits of higher current flow

The benefits of siting fish farms in areas with higher current flow are clear and have been noted in a number of studies. They range from a lower incidence of sea lice to greater water exchange supplying fresh water and removing excess feed and waste. However higher current and increasingly exposed sites bring dual challenges of greater mooring loads combined with rocky seabeds, which are not suited to current anchoring technologies.

How do we more securely anchor cages and feed barges, and at the same time potentially open up the options for using sites with higher current flow and rocky seabeds?

Rock anchors are an enabling technology for sites with solid geology. As an established technology drilled and grouted rock anchors, or micro-piles as they are sometimes referred to have been trialled previously in aquaculture with limited success. A drilled-only rock anchor with a mechanical connection to the rock is a new concept in the marine environment, which has however had extensive use at smaller scale as rock bolts in the construction industry.

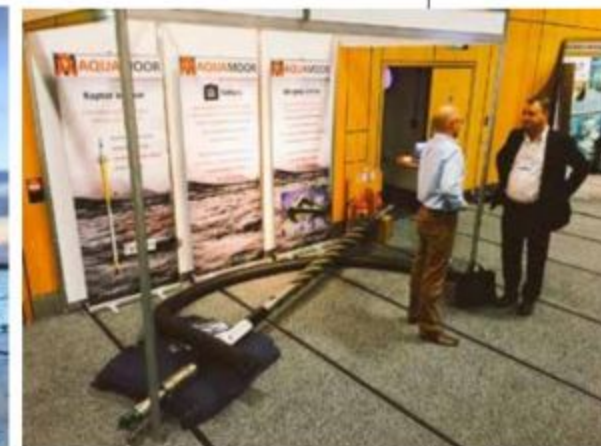
The new RAPTOR rock anchor

Sustainable Marine Energy, a tidal energy company has developed the new RAPTOR rock anchor in order to satisfy its requirement for anchoring a subsea platform in tidal conditions of up to 10 knots. The RAPTOR 150 anchor was recently displayed at Aquaculture Europe conference in Edinburgh to launch the product into the fish farming market. There was a lot of interest from the industry, and International Aquafeed Magazine spoke to Jason Hayman, Managing Director of SME.

"Once on the seabed, the anchor is drilled into the substrate using high torque hydraulic motors, thereby eliminating the need for loud percussive drilling. During this process the anchor expands to provide that mechanical connection to the rock, much like putting a rawl plug into your wall at home to hang a shelf. The anchor is then tensioned and the anchoring Remotely Operated Vehicle is retrieved. The full procedure for the drilling of one rock anchor and tensioning takes approximately 50 minutes."

"We are really excited to be bringing this new product to the aquaculture market," he continued. "We have been really impressed by the response we have got here in Edinburgh. Everyone is interested in what our anchors can do, and agree with us that there is great potential for it to open up new possibilities in aquaculture, not only in Scottish salmon farming but also globally and with other species. We have an exclusive distributorship agreement in place with AquaMoor to explore these options and find demonstration projects."

The RAPTOR anchors have undergone development over a period of 3 years including numerous cycles of on land testing to ensure performance before being deployed at subsea. Sustainable Marine Energy



successfully installed the first anchors at sea in the Orkney Islands in May 2016 at the European Marine Energy Centre.

The anchors themselves are manufactured from high strength and corrosion resistant steels with a number of cutting faces in addition to the tri-cone bit, which does the actual drilling, something you'd usually associate with oil and gas. The anchors are available in different sizes for varying applications, with the largest raptor currently having a holding power of up to 175t in Orkney rock. Raptor 150 anchor: can be deployed in tidal conditions of up to 10 knots.

"Obviously the strength and type of rock the anchor is installed into has an impact on its holding capacity" said Jason "but our reference rock is Rousey Flagstone from Orkney which will have common characteristics with most fish farming locations in Scotland. In fact the harder rocks found in the Western Isles will allow our anchors to perform much better. When you couple this with the fact that we originally designed the anchors for a site with up to 10 knots of tide, we don't think we will have any issues accommodating the loads that are required to moor a fish farm or feed barge"

Lawrie Stove is the Managing Director of AquaMoor Ltd. With a background in the marine industry, as well as in salmon farming, and as a member of the steering group that devised the Scottish Technical Standard, he understands the demands of the aquaculture market.

Farming companies are naturally seeking larger biomass consent at higher energy locations as they are looking to produce more premium quality salmon. As the site infrastructure gets bigger, so the larger nets on these sites create more drag and the mooring loads generated are significantly higher. To counteract this, suppliers have been specifying heavier weight of chain and a lot more of it" said Stove.

"There are potential new sites available that have greater tide and wind driven currents as well as larger significant wave heights. An altogether more challenging environment"

AquaMoor's aim is to introduce and develop short scope tension mooring systems that have higher performance anchors, synthetic fibre mooring ropes and peak load absorbing devices such as tri Marine tethers, eliminating the need for excessive amounts of chain lying on the seabed.

"It's possible to not use chain and move to high performance synthetic fibre ropes, but when you do that you still need two things; a reactive force on the seabed and a replacement for the spring self-weight of chain. In this instance the Raptor rock anchor is the enabling technology. It can have a mooring line coming off it at 22 degrees so you don't need anything on the seabed."

One of the key drivers is to try to make moorings more sustainable and environmentally friendly because at the moment, at a big farm site, there can be huge quantities of chain on the seabed – seven to eight kilometres – and the

seabed footprint to accommodate all this ground chain could be as much as 50 hectares."

"That is all interacting with the seabed so it is damaging the benthic environment. That is not necessary if you use high performing mooring systems. We can reduce direct environmental impact on the seabed whilst also indirectly reducing the carbon footprint of aquaculture moorings, by using smaller amounts of materials in far more efficient ways than they have been previously."

The Scottish salmon industry is continually looking to improve its sustainability and this new type of mooring system presents a real opportunity to do just that."

New technologies are emerging that have the potential to disrupt the long standing status quo in the mooring and structure of fish farming, with knock on benefits in fish health and seabed footprint and the ability to place farms in hitherto inaccessible locations.

Coupled with the considerably lessened environmental impacts and carbon footprint of these innovative technologies the benefits cannot be ignored, so don't be surprised if in the future high performance sustainable mooring systems become industry norm rather than the exception.

Raptor 150 Anchor: can withstand tidal conditions of up to 10 knots



Left: SME Anchoring ROV overboarding at the Falls of Warness, European Marine Energy Centre, Orkney

Middle: SME Anchoring ROV, Habbon, Orkney

Right: Raptor 150 Anchor on display at Aquaculture Europe 2016 in Edinburgh

PHOTOSHOOT

THE BIG PICTURE - ORKNEY



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