Electrification in aquaculture

1

For feed barge owners, moving to renewable energy has been a difficult choice, with a lack of suitable options – until now

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According to the Food and Agriculture Organization, in 2014 worldwide aquaculture figures (70 million metric tons) exceeded the production of fisheries (65 million metric tons) for the first time in history. The World Bank estimates that by 2030, two-thirds of seafood consumed will be farm-raised and the demand is set to rise by 40% by 2050.

Compared with meat production, fishing and aquaculture have relatively small carbon footprints, each reflecting about 0.5% of total global carbon emissions. But even though the fuel consumption of the industry is lower than that of other food production segments, the aquaculture industry is attempting to reduce its footprint even further.

A main challenge for feed barge owners when moving to electric or hybrid propulsion, however, lies in the nature of renewable energy generation. Most renewables are so-called non-dispatchable resources, meaning that the energy production cannot be controlled. Solar panels only produce energy when the sun is shining, and wind turbines only when the wind is blowing. Neither of these options are therefore particularly reliable sources for feed barge owners. The location of aquaculture operations in remote areas may therefore make the use of batteries a more practical and reliable option.

2

1 and 2. Fjord Maritime's Fjord Hybrid solution enables fish farms to streamline all aspects of their operations

Mobile and multifunctional

Based in Norway, a nation built on seafood, Fjord Maritime developed the Fjord Hybrid solution. This innovative concept is a plug-and-play system that reduces generator running time with the use of lithium-ion batteries, electric drives and smart software. It automates power generation and supply for an individual fish farm.

To design and create the most optimal and best performing solution for the feeding barges, Fjord Maritime worked closely with EST-Floattech and Bosch Rexroth. Over 50 inspections and power measurements on feeding barges resulted in the right dimensioning of the solution. The battery system consists of DNV-GL approved GO1050 modules with, depending on the need, a total capacity of 147kWh or 2 x 126kWh, delivered by EST-Floattech.

The energy storage system (ESS) delivered by EST-Floattech has a raft of integrated safety features. Its unique active balancing and passive safety system is applied at the module and string level. Heat is dissipated by a simple off-the-shelf air-con unit. The battery racks are a favorable option as they can easily be installed in a modular fashion.

3

3. Ships can run on battery power for 21 hours a day thanks to EST-Floattech's energy storage technology

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4. End users are already enjoying the benefits of the plug-and-play system

"We are delighted to be part of this innovative and successful project"

Remko Hitzert, managing director, EST-Floattech

The Fjord Hybrid is ideally suited for the challenges feeding barges face, as they often have no access to shore power, and are located in remote places and forced to use diesel to run their operations. Fjord Hybrid can be delivered in a container that can be placed at a suitable location on board, or the application can be installed in the vessel itself. The containerized concept can easily be moved to other ship platforms at any time. The entire operation is controlled remotely by Fjord Maritime via the Fjord Control system, which transmits information about the status and deviant or unexpected events. This way, corrections can be performed remotely to ensure maximum uptime.

The Fjord Hybrid, in combination with the Li-ion battery tech delivered by EST-Floattech, requires the generators to run for three hours per day, instead of 24 hours – which is the current norm. This cuts greenhouse gas emissions by up to 90% compared with traditional operations. Moreover, reduced running time extends the lifetime of fish farm power supply systems by up to 60%.

Greater energy efficiency and the use of batteries are not only beneficial in terms of reduced emissions, but also for operational reliability and uptime. Fjord Hybrid uses the spare capacity left on the generator to charge the batteries while the generator feeds the rest of the barge with electricity. When the batteries are fully charged, the generator stops and the system and grid solely run on the ESS.

The energy demand through production has large variations and fluctuations. The most energy-intensive periods constitute a very small total percentage during production, but this is the period that is the foundation and design criterion when sizing the diesel generators. This means that the user ends up with an oversized diesel generator, giving a low efficiency and minimum kilowatts per liter of diesel.

Sustainable business

With the purchase and installation of the Fjord Hybrid, the running time of the diesel generator is reduced to a minimum. Handling the energy peaks and different phases in production is no problem for the Fjord Hybrid. The system always gives the fish farmer the maximum kilowatts per liter of diesel fuel, which in turn reduces greenhouse gas emissions to a minimum. Fuel consumption and service requirements are greatly reduced and the life of the diesel generator is multiplied.

The Green Orca High Energy battery is one of the safest lithium NMC batteries developed and meets all safety standards. The result is an extremely robust and safe battery that makes no compromises with regard to high energy density and excellent specifications.

Its safety is guaranteed by an intrinsic and passive safety system that has earned certifications and type approval from the strictest classification societies. EST-Floattech batteries are built and delivered in 'box' modules. This way, the battery system can be designed and assembled very flexibly for any arrangement.

Norway leads

With Norway's famous fjords set to become zero-emission zones by 2026, EST-Floattech's solutions have been widely adopted in Scandinavia. Implemented already in feed barges in Norway, in 2020 Fjord Maritime will start to export the systems to the UK, Canada and Chile.

"We are delighted to be part of this innovative and successful project," says Remko Hitzert, managing director of EST-Floattech. "With Fjord Maritime's established reputation in the fishery and aquaculture sectors, we are extremely happy to partner with a company that understands the need to reduce our carbon footprint."