NEW HYDROGEN SYSTEM PROMISES WIN-WIN FOR INDUSTRY

Devon engineering firm Ecomotus made two announcements last week on progress that could lead to significant positive impacts across the UK fleet. **Andy Read** reports

Adrian Bartlett of Ecomotus (left) alongside the Emma Jane with, left to right, Andy Read, Emma Jane skipper Kevin Favis and Jason Munro of Ecomotus. *(Photo: Natasha Milne)*

The fishing industry is not immune from legislation requiring engines to reduce both their carbon footprint and their production of other pollutants, including small particulates and nitrous oxides (NO_x).

Reduction or prevention of these secondary pollutants has driven the move to the introduction of AdBlue across the road haulage industry and more recently into smaller diesel engines. It is believed that this is one way in which marine diesels can meet the new emission requirements, along with installation of selective catalytic reduction under the new 'Tier 3' requirements for all new vessels with engines over 130kW. These came into place in 2021, and will affect all new-build vessels from next year onwards.

AdBlue is a proprietary name for a long-established technology that injects minute amounts of ammonia into the exhaust of engines, which react there to reduce the nitrous oxides produced as a byproduct of engine combustion.

Whilst well-proven, this technology creates some real issues for fishing vessels, requiring as it does provision of space for an additional fuel tank, as well as additional supply lines. This can stretch even the best naval architects, already wrestling with the multiple constraints of designing boats that are safe, efficient and meet the demands of the UK licensing rules.

This, says Adrian Bartlett of Newton Abbot-based firm Ecomotus, is where its new EcoPro system, which produces hydrogen onboard through an electrolyser, has several advantages as a new technology, making it particularly appropriate for fishing vessels.

"Firstly, our system is extremely small and compact, and can be fitted very easily into any existing engineroom, without any change to stability or need for separate bulkheads, vents and similar. It can be fitted in a single day, is plug and play, and yet meets the same emission criteria as the bulky and expensive alternative technology that uses ammonia to break down the nitrous emissions.

"The EcoPro can demonstrate other great advantages too. Using hydrogen as a catalyst also provides for more efficient combustion of diesel, creating fuel savings of 10% or more."

The EcoPro electrolyser system works by using a small electric current (6A for a 24V system), to separate deionised water into hydrogen and oxygen. The hydrogen, produced in the small cylinders in this way, flows at ambient pressure into the air intake of the engine without need for valves or pumps.

The rate at which the hydrogen is produced is adjusted precisely according to the amount of diesel being combusted in the engine, and is controlled using the ICECU – the small control unit that also allows the system to be remotely monitored by Ecomotus and regularly calibrated for optimum performance. The oxygen produced is separated from the hydrogen and vented separately.

It really is as simple as that, says Jason Munro, the engineer who developed the process. "The benefits of hydrogen to increase efficiency of fuel has been known for many years – tanks used a version of this system in the Second World War.

"The difference now is that it is finely tuned, and removal of the oxygen from the system allows for very finely calibrated use that maximises fuel efficiency whilst removing pollutants, and without burning at higher temperatures or creating any additional stress to the engine.

"We have been working with the Royal Institute of Naval Architects, which has now granted type approval for use of the system in the marine industry. A further step has come with recent grant approval for the Emma Jane, one of the first boats we fitted with the EcoPro technology. This is sure to generate interest across the industry.

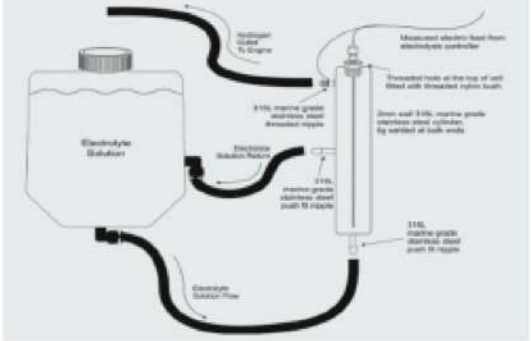
"We are just back, in fact, from a very busy two-week period installing our system ahead of COP26 on Glasgow City Council's Water Witch vessel, the St Mungo, for demonstration there.

"The EcoPro is a transitional solution to pollution, helping to work towards zero carbon emissions in the fishing industry. The EcoPro system is, effectively, buying time for the industry as it moves, in some way, shape or form, towards cleaner technologies.

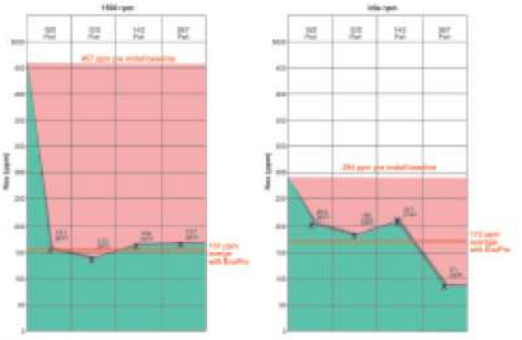
"Ten percent fuel savings, plus significant reductions in emissions, is a great first step along the way – one that won't need boats to be redesigned or re-engined, or spend weeks in port for installation of complicated equipment.

"The fact that it will also save fishermen money, rather than cost them, is a big bonus that I am sure will drive early adoption, ahead of further regulations which no doubt are in the pipeline." ■

EcoPro System Technical Diagram



Schematic diagram of the EcoPro system.



The reductions in nitrous oxides (NO_x) seen during testing on a 450hp fishing vessel. Whilst the fuel savings produced may be the greatest benefit seen by vessel owners, it is the need to reduce these pollutant gases that is driving the move to new and cleaner fuel systems.

Salcombe crabber sees instant results with EcoPro system

The Salcombe crabber Emma Jane was the first UK fishing vessel to fit the Ecomotus system. Owner Kevin Favis, part of the long-established crabbing family who have operated the 1989-built Emma Jane from new, caught up with *FN* shortly after the boat had made its weekly landing into Salcombe, consigning the bulk of the catch for export live to Portugal.

He said: "We fitted the system getting on two years ago. It was very straightforward, plug and play, and likewise, we basically forget about it during normal operation of the boat.

"The system is just having an upgrade, so that we can monitor the performance and fuel consumption in the wheelhouse, and even at home, but this is not yet operational.

"We noticed improved fuel consumption immediately on fitting. Steaming to the grounds, and between gear, we dropped immediately from 50 litres an hour to 45.

"The initial concerns we had were about what hydrogen may do to the engine itself. We had a fear the engine would burn much hotter, or that the hydrogen would be burned too violently and damage the engine. But we test the oil every second month, and send the samples for analysis, and there is no indication whatsoever of any change in the results since we started using the hydrogen.

"The Cat engine we have has done 30,000 hours now, and is coming towards the time for a top-end overhaul. We are not too worried about uncovering anything during this related to using the Ecomotus system."

The entire system fits onto a rear bulkhead, close to the air intake, and is deceptively small. The power unit has a small read-out to confirm the voltage, but otherwise, other than checking the level of the deionised water, and when it needs topping up, there is little to monitor or notice about the system.

Salcombe crab fisherman and owner of the Emma Jane Kevin Favis in the engineroom of the boat, with the Ecomotus system on the bulkhead behind him. Current from the control box is used to make hydrogen in real time in the small steel cylinders, where the current is used to split molecules of water into hydrogen and oxygen. The hydrogen is separated and fed through the small transparent pipe into the air intake.

Kevin Favis added: "We are pleased enough with the set-up that we've just this week received confirmation of a Fisheries and Seafood Fund grant from the MMO to purchase the system outright.

"This was processed and approved in just six weeks, and also includes funding towards shotblasting the vessel. The speed that the MMO turned this around was a nice surprise.

"We are also looking now at linking the system to the 100hp auxiliary we have. There is capacity with the existing four hydrolysis units to cope with this, and we may as well take the opportunity to reduce the emissions and fuel costs of the auxiliary, on top of those achieved with the main engine."

Water Witch Workboats Working Towards Emission Reduction Solutions Using Hydrogen

As delegates from across the world gathered in Glasgow for the United Nations COP26 climate summit, they needed only look over the River Clyde to see how the world is changing.

COP26 hosts, Glasgow City Council, have made significant steps towards their ambitious goal of reducing their environmental impact and improving air quality for all by upgrading their Water Witch Surface Dredger 'St Mungo' with the latest hydrogen catalytic technology.

Normally moored outside the COP26 venue, the 14-tonne vessel has worked on the River Clyde for the past 19 years removing debris and pollution from the City's River. The vessel has been retro fitted with a unique electrolyser system for producing catalytic hydrogen which offers immediate reductions in fossil fuel consumption and harmful air pollution. This system reduces diesel particulates, NOx, and CO2 emissions by improving the quality of the combustion process, and by extending the efficiency of the engine, reducing the amount of fuel being consumed. Emissions are reduced by up to 85%.

The 'EcoPro' is a RINA Type Approved, patented standalone catalytic hydrogen system designed to immediately reduce the vessel's engine pollution without any invasive modifications being required. Supplying a controlled quantity of pure hydrogen-on-demand to give a more complete fuel burn during combustion, it is neatly installed next to the vessel's main Perkins Sabre 6-cylinder 185hp 160 kwh diesel engine. Hydrogen is produced from its own electronic system whilst the engine is running and automatically ceases when the engine is switched off.

The system has worked exceptionally well since its recent installation and Glasgow City Council showcased their cleaner, greener, pollution control vessel to Climate Change Delegates at the Summit.

Jackie Caddick, Director at Water Witch says, "We have been committed to improving the carbon footprint of our vessels and working towards zero emissions – with MARPOL Tier 3 and 2050 compliance fast approaching we have been concerned as a builder that engine manufactures may not be able to meet the stringent emission standards. The EcoPro will allow us to directly reduce the diesel particulates, NOx and CO2 emissions of our larger vessels and offers an affordable and approved solution for both new builds and existing Water Witch boats."

Developed by Ecomotus, the EcoPro technology is a vital transition between fossil fuels and a hydrogen/electric economy. Jason Munro, Director says: "We are all aware that the marine industry needs to change away from fossil fuels and towards sustainable power to progressively reduce the greenhouse gases, harmful emissions and particulates produced. This standalone system is designed to work in harmony with existing combustion engines and reduces the operator's carbon footprint."

Ecomotus, based in South Devon, were awarded an Innovate UK grant for R&D testing and trials, enabling them to secure both RINA Type Approval and Maritime and Coastguard (MCA) accreditation.

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People

Veterans aiming to raise cash for four charities by competing in annual Screwball Rally across Europe

HMS Collingwood's Environment & Energy Manager Mark Powell will soon be facing a different kind of energy challenge as he embarks on a five-day rally across Europe - in an old banger!

By Simon Carter

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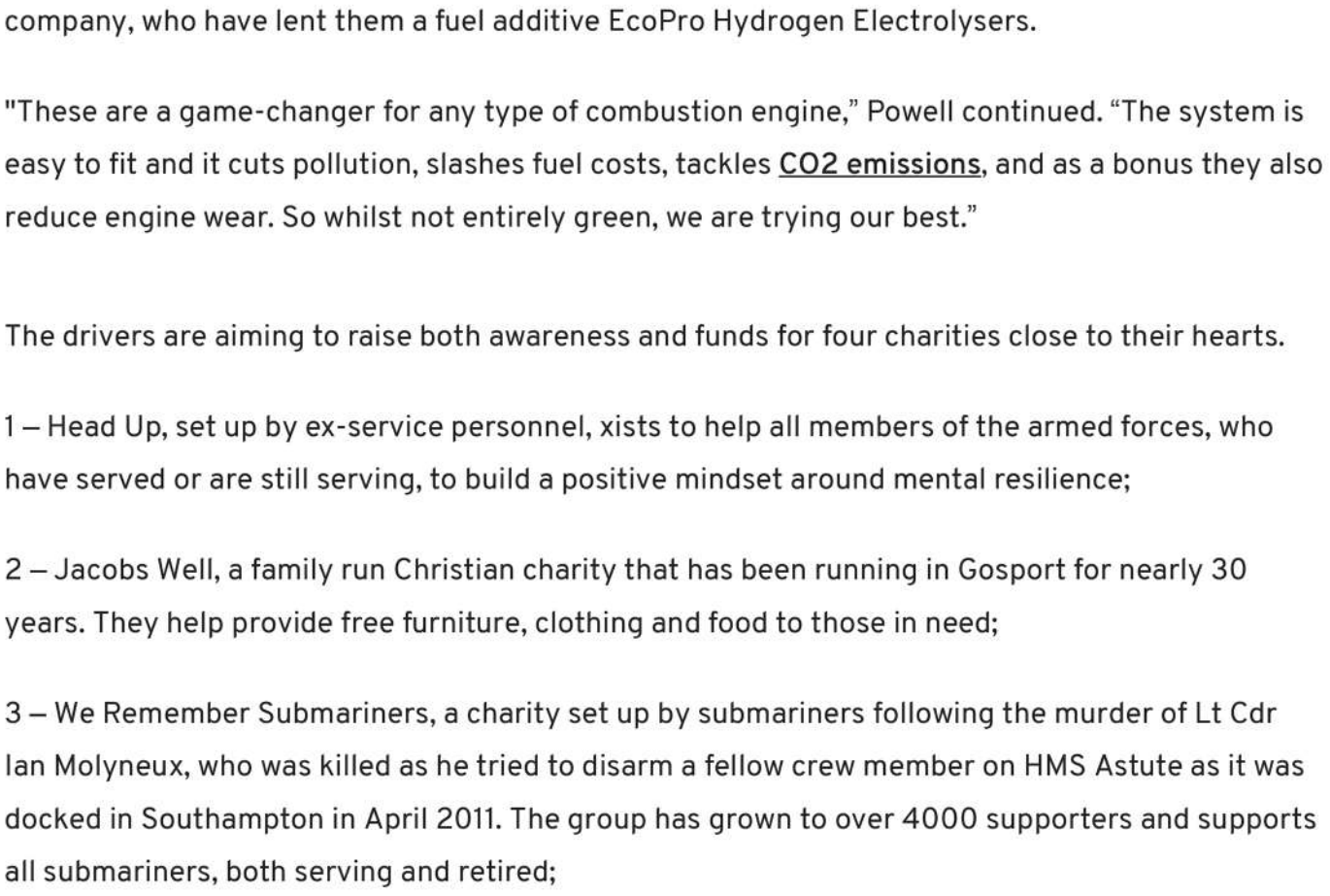

The team with the car and their sponsors (from left) Jason Munro, Andy Painting, David England, Mark Powell and Tony Wells.

Armed Forces veterans Powell and Andy Painting (Royal Navy), along with David England, are hoping to raise thousands of pounds for charity by competing in the annual Screwball Rally.

The Rally is an annual five-day event every September, a mere 1,496 miles taking in England, France, Belgium, Holland, Germany and Denmark.

There are few rules, but the premise is based around safety first and, ironically, not racing.

There are no prizes for being first, the race is simply an opportunity for entrants to raise money for charity.

Cars must be road legal and compliant with all road traffic regulations and have a value of £1,000 or less.

Powell said: "As car enthusiasts this seemed a very fitting way for us to raise money for local charities.

"I am very grateful in anticipation of any donations and want to thank the sponsors for allowing us to make this event possible.

"Our team name is Green by Design, but this is a little difficult to demonstrate using an old combustion engine car."

To become more environmentally friendly, the team contacted Ecomotus, a small Devon-based company, who have lent them a fuel additive EcoPro Hydrogen Electrolysers.

"These are a game-changer for any type of combustion engine," Powell continued. "The system is easy to fit and it cuts pollution, slashes fuel costs, tackles CO2 emissions, and as a bonus they also reduce engine wear. So whilst not entirely green, we are trying our best."

The drivers are aiming to raise both awareness and funds for four charities close to their hearts.

1 – Head Up, set up by ex-service personnel, xists to help all members of the armed forces, who have served or are still serving, to build a positive mindset around mental resilience;

2 – Jacobs Well, a family run Christian charity that has been running in Gosport for nearly 30 years. They help provide free furniture, clothing and food to those in need;

3 – We Remember Submariners, a charity set up by submariners following the murder of Lt Cdr Ian Molyneux, who was killed as he tried to disarm a fellow crew member on HMS Astute as it was docked in Southampton in April 2011. The group has grown to over 4000 supporters and supports all submariners, both serving and retired;

4 – Veterans Outreach Support, founded in July 2008 after the 25th anniversary Falklands pilgrimage. Starting off as a peer support group, they offer welfare, wellbeing and clinical provision to UK Armed Forces & Merchant Navy Veterans, as well as to spouses/partners.