



The Glasgow-based company specialises in an array of high-speed craft

Source for all images: Ultimate Boats

Scottish boatbuilder creates hydrogen-powered recyclable craft

DANU Glasgow-based Ultimate Boats has invented a new sustainable boat-building material, 'Danu', which can replace fibre-glass. A new partnership with Arizona hydrogen propulsion specialist RONN now seeks to push boundaries further with the creation of new hydrogen-powered workboats, according to Ultimate Boats founder, Shane Mugan.

With the ambition to develop a recyclable alternative to glass fibre and a high-speed craft hull design with improved load capacity, Shane Mugan has founded two UK-based organisations. ExoTechnologies is headquartered on the Isle of Man and has developed a recyclable material that can potentially be used across many industries. Ultimate Boats, based in Glasgow, Scotland, will use the material to develop workboats and high-performance military craft as well as motorboats for the leisure industry.

"Building in glass fibre is not a nice business," Mugan said. It is unpleasant to work with, and "you can't manage quality very well." It is also very difficult to recycle, leading to many boats being dumped into landfills or scuttled.

In searching for an ecological alternative, Mugan and his business partner Admiral Michael Silah discovered that Dutch

yacht racer Jeroen Wats was also exploring ecological boatbuilding and had begun developing a system that used a mineral fibre instead of glass. "We acquired Jeroen's business and brought him into the leadership of the organisation: he has such a wealth of knowledge of high-performance yachting and sailing at a competitive level," Mugan said.

Wats' material has a rare quality: once it reaches the end of its useful life, it will be possible to separate the fibres from the polymer and reuse both, Mugan explained. It is a property that aligns with the development project's title, Danu, which is the name of the Irish mythical god of Mother Earth, he added.

ExoTechnologies has secured the UK patent covering the material's manufacturing process, and although it can be used for many purposes, including wind turbine blades, ExoTechnologies is initially

focusing on its maritime potential. It has teamed up with leading planing hull hydrodynamics expert, John Moxham, who was for many years involved in designing high-speed aircraft before moving on to boat design about 40 years ago.

He had been exploring how to increase load capacity on planing craft by applying aeronautical concepts to their hulls, and his ideas have been incorporated into the designs being offered by Ultimate Boats. Using a 1:10 scale model of one of Moxham's existing military boat designs, a high-speed film of its performance was made before modifications that he proposed were applied and a further test was done. "It was immediately obvious that this was the breakthrough," Mugan recalled.

In June 2022, Ultimate Boats delivered the world's first fully recyclable workboat – an 11m high-performance patrol boat powered by twin outboard motors deliver-

ing a total of 700hp. Its design is dubbed the M-Class, and its first customer is Police Scotland.

More boats have since been built for other UK police forces and clients, including a major breakthrough in offshore renewables. In August, Ultimate delivered an 11m O-class workboat designed to transport up to eight engineers to Orbital Marine Power's tidal turbine, the biggest of its kind in the world, operating off Orkney.

Building on recent successes, Mugan wants to expand production. With its current resources, Ultimate Boats can build about 25 craft each year but could produce 100 per year with investment in facilities and recruitment to operate two shifts. It is working with corporate services provider KPMG to secure investment, in particular to increase the number of hulls that can be laid up at any time, which currently stands at two.

Alongside this expansion programme, ExoTechnologies and Ultimate Boats are extending the range of designs they can offer specifically for the offshore and defence sectors. The design range began with a 7.5m concept, quickly followed by 13m and 11m versions. Moxham is currently working on a 9-meter version and Mugan believes that its infusion method of creating the material should make 30m craft achievable, based on current practice in glass fibre boatbuilding.

"We are speaking to numerous defence partners as well as offshore companies," said Mugan. "We are further actively exploring innovative clean propulsion systems via a new partnership with Arizona-based hydrogen car and truck maker RONN. Here

we are aiming to develop a clean hydrogen electric propulsion solution for our boats."

"Both the military and renewable sectors are searching for more sustainable, environmentally friendly solutions. We have invented a sustainable circular solution to fibre-glass that saves money, improves performance, and prevents the ecological time bomb of fibre-glass-built boats littering the seabed or being dumped in landfills. Hydrogen propulsion will enable us to take another leap forward. This is the right place and right time to innovate for the workboat sector, hungry for change."

Mugan would like to explore how Danu could benefit wider defence operations. It is, for example, remarkably strong, to the extent that it has withstood bullets in ballistic tests, making it a perfect choice for the military workboat market.

Crafts such as those will clearly not use the planing hulls that Moxham is working on, and Mugan confirmed that Ultimate Boats will also build more conventional hull forms when requested. In addition, it could also supply Danu and their know-how to other builders keen to apply its benefits to their own projects.

> DANU OFFERS STRENGTH AND CONSISTENCY

Danu uses a mineral fibre that is set into a polymer resin using an infusion process, Shane Mugan said. It creates a composite material that is exceptionally strong but can be recovered, recycled, and reused repeatedly, and its patent application addresses how you formulate it, how you process it, and how you recycle and recover it," Mugan explained.

As with traditional fibre composites, Danu's fibres are formed into mats that are laid into gel-coated moulds. But each mat has a defined shape and location, making the process both precise and repeatable, Mugan said. Resin is then added using a vacuum infusion technique that draws it through the fibres. This is easier for employees to handle and delivers a more consistent product, he said.

In addition, a 2.4mm thickness of Danu has the same tensile strength as a typical glass fibre structure 7mm thick. But current regulations governing such materials require them to be 7mm thick, although Mugan hopes to challenge this.

Danu offers a higher impact resistance than carbon-reinforced material, and its mineral fibres are superior to glass, meaning that fewer are needed, leading to a weight reduction. Danu is also hydrophobic, so it will never suffer from osmosis.

After about four years of work and significant investment, "we have shown that you can create a sustainable composite material," Mugan said. And to get to the point of delivering its first boat, it took nearly two years working closely with Police Scotland, "giving them the confidence that what we were doing was going to have a credible outcome," he said.

There is still more to discover about the material, and ExoTechnologies has asked a number of organisations if they would like to be involved in research and development projects to explore its benefits. "The answer generally is yes," Mugan said.



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