



ALL CLEAR

by Nicholas Ball, *CEO and Co-Founder, XFuel*

Many shipowners face costly and unappealing choices to meet global emission regulations. There is, however, another way to connect the dots of being green and commercially sound. Namely, vessel owners can make strides to build their low-carbon fuel supply chain end-to-end, thus reclaiming some energy independence.

The shipping industry faces ambitious decarbonisation targets; from aiming to achieve net-zero emissions by 2050 to shorter-term objectives. In April, the International Maritime Organization (IMO) agreed on mandatory emission limits and a global price on emissions for ships that exceed them, set to come into effect in 2028 – subject to approval at its Marine Environment Protection Committee (MEPC) session in October this year. Shipowners will need to reduce the greenhouse gas (GHG) emissions of the fuel that powers their vessels by 30% by 2035, up by 65% five years later. Such regulations are putting pressure on the maritime sector to explore all viable decarbonisation pathways.

The clock is ticking

Low- and zero-carbon fuels are a critical solution to decarbonisation. Yet, despite rapid developments, the gap between the current state of low-carbon fuel production and distribution and the scale required for meaningful decarbonisation remains vast. Closing it at a cost that is accessible to operators and their customers is an additional challenge for the sector. With more than 95% of the global fleet still running on conventional fuels, shipowners need to find economically viable, low-carbon, drop-in solutions that can secure global and regional regulatory compliance.

Today, owners face tough choices: fleet overhaul means significant investment and paying a premium for newbuilds that incorporate low-carbon and clean technologies. Failure to act will expose companies

to financial penalties. Meanwhile, relying on vessel pooling to secure compliance will mean ceding some independence and aligning with the operational plans of somebody else. With the clock ticking on fleet compliance and costs on the rise, shipowners need reliable long-term solutions without delay.

Whose move is next?

The shipping industry has historically relied on an energy strategy that uses low-quality, low-cost bunkers. Today, regulations across all transport sectors are mandating higher-quality, lower-carbon-burning fuels, pushing demand and costs up. This very regulatory framework is defining the path and pace of the shipping industry's decarbonisation transition. As such, fuel buyers in the shipping industry need to rethink their strategies.

But this is easier said than done! The range and complexity of the alternative fuel choices mean many owners lack clarity about the best route to compliance. There is no silver bullet. Particular alternative fuels may suit the needs of different shipping segments, and the supply and technological maturity of alternative fuels are often determined by where in the world a vessel is operating. Consequently, many owners are waiting for suppliers to move first, aware that their return on investment will depend on the cost of alternative fuel 10-20 years in the future.

However, fuel suppliers and their clients have different expectations. To safeguard their investments in production and distribution infrastructure, energy suppliers are eager to secure long-term off-take

agreements. But such agreement structures are unfamiliar to the maritime sector. Shipping companies want the flexibility of the spot market, suited to their routes and charter agreements, and to hedge against the changing price of fuel.

The sector would greatly benefit from a fuel that's affordable, scalable, and proven to reduce emissions. One that can work as a drop-in fuel for over 50,000 vessels on the water today and help them strengthen their compliance with emission regulations.

Waste-to-resource

Sludge, found in the most familiar of places, is one contender to bridge this gap. The shipping industry produces millions of tonnes of residual waste oil every year, equal to 1-3% of all fuel oil used by vessels. MARPOL Annex 1 regulates this significant problem for the sector.

Vessel operators view MARPOL Annex 1-sludge as waste to dispose of as easily and cheaply as possible. In reality, though, its disposal is an expensive and time-consuming process. Sludge is a regulated waste stream that every ship has to manage. Processes for handling the waste material vary around the world. In the US, operators pay for disposal; however, in less regulated states, they may store waste in open 'lakes,' contaminating the environment and harming local wildlife. The illegal discharge of sludge still occurs – an estimated 3,000+ illicit dumping incidents per year in European waters alone. Adequately disposing of sludge with contained environmental impact often requires incinerating it on board – a process that offers no direct benefit to the vessel.



Photo: XFuel

There is another way, however. Sludge, along with other waste feedstocks, can be transformed into recycled carbon fuels (RCFs). These are cost-effective and proven to enable owners-operators to extend decarbonisation compliance for their vessels. RCFs can contribute to reducing GHG by extending the life cycle of carbon in waste fossil sources, substituting for traditional fossil fuels and avoiding low-value incineration or disposal that results in additional GHG emissions. Beyond an environmental choice, the adoption of RCFs and low-carbon fuels is a sound compliance strategy, one that avoids charges from the EU Emissions Trading System, carbon levies, or port emission rules. Evidently, these fuels must be produced to specific sustainability and environmental standards: the EU requires a minimum GHG reduction of at least 70% compared to its fossil fuel counterpart. That is no easy feat. It requires technological knowledge and expertise to transform feedstocks into ISO-compatible fuels that are proven to reduce emissions without compromising performance.

More than a fuel source

XFuel has developed a technology to do just that; one that is price-comparable

to fossil fuels. XFuel's Chemical Liquid Refining technology (CLR – 'CLEAR') can refine marine sludge and other waste hydrocarbons into a direct replacement (drop-in) low-carbon marine gas oil (MGO), which is ISO 8217 DMA compliant, and compatible with existing engines and infrastructure.

The technology is both modular and decentralised. Each fuel production facility is CAPAX efficient and supported by a local supply chain. A single module can produce 14,000 tonnes of refined MGO annually from 16,000 tonnes of dewatered sludge. Importantly, the CLR technology is feedstock-flexible: besides marine sludge, it can process a variety of waste hydrocarbon liquid streams, which are being expanded by our R&D team. Its modular design allows for rapid scaling, which enables production to grow in step with demand. Modules can be strategically

located near ports, ensuring proximity to both waste feedstock providers and fuel off-takers, minimising supply chain environmental impact and reducing operational costs.

For shipowners, this represents more than a new fuel source. By investing in modular production and partnering with XFuel's technical expertise, they can secure greater energy independence and exert end-to-end control over their fuel supply chain. This strategy supports decarbonisation goals affordably, without delay, and requiring no retrofits or infrastructure changes.

Converting waste into low-carbon fuel provides both environmental and economic advantages: it reduces the costs and emissions linked to waste disposal, delivers long-term operational savings, generates compliant fuel, and helps shield against volatile fuel prices – a win-win situation. □



XFuel is an SME with R&D headquarters on the Spanish Mallorca, making sustainable fuel a reality for hard-to-abate sectors of maritime, aviation, and HGV transport. The company has developed proprietary breakthrough conversion processes and technologies to produce high-grade, drop-in, low-carbon transport fuels from waste in a cost-efficient way. These meet fossil fuel specifications and performance, and are compatible with existing combustion engines and fossil fuel infrastructure, allowing for direct replacement today. Visit xfuel.com to discover more.