Quadrise Testing a Sustainable Substitute for Heavy Fuel Oil

Quadrise Fuels International, a London-based emulsion fuel and technology company, completed the first third-party testing of its new low CO_2 emission emulsified fuel, bioMSAR™, with positive test results.

Quadrise is known for its Multiphase Superfine Atomised Residue (MSAR®) synthetic fuel, a low cost, low viscosity alternative to heavy fuel oil (HFO), which is produced by using 70% residue, 29% water and less than 1% of additives. Quadrise developed the new fuel during 2020 based on its original MSAR® technology. bioMSAR™ consists of renewable glycerine and refinery residues of 40-50% each, as well as 10% water and less than 1% additives.

The main advantage of MSAR® over conventional HFO is economics. HFO is typically produced by blending, or diluting, viscous refinery residues with distillate cutter stocks to meet a viscosity specification. By emulsifying residues with water, MSAR® production simply reduces the costs associated with high value distillate cutters. The wider the price spread between HFO and distillates, the better economics that MSAR® provides. Compared with conventional HFO, MSAR® has a higher density and lower viscosity. For example, marine MSAR® has a max density of 1,050 kg/m^3 at 15 °C, a max viscosity of 180 cSt at 50 °C and a sulfur content between 0.5%-3.5% depending on the residue used. MSAR® also has 30% lower NOx emissions, reduced particulates/black soot and better combustion efficiency than HFO, and requires minimal heating.

The primary benefit of bioMSAR™ over HFO is lower greenhouse gas emissions including 20-30% less CO_2 and lower NOx and particulates. Other than density, which is slightly higher due to glycerine, bioMSAR™ has similar specifications to MSAR®. Quadrise conducted its initial testing of bioMSAR™ in a high-speed four-stroke diesel engine operated by UK-based Aquafuel Research Ltd. Although burning the emulsified fuel in a diesel engine was harder than in an engine designed for HFO, the test results showed significant NOx reductions and higher efficiency compared to diesel. Quadrise is also planning for further third-party testing in medium and low speed engines with original equipment manufacturers.

bioMSAR™ can be produced by using the same equipment for MSAR®, the MSAR® Manufacturing Unit (MMU) supplied by Quadrise. The MMU sits inside the overall MSAR® facility, which can be integrated into a refinery or operate as a stand-alone facility. The cost of bioMSAR™ compared to MSAR® will be mainly determined by the price of glycerine. Glycerine is a by-product from biodiesel production plants, and whilst glycerine prices historically have been fairly stable, as seen during COVID-19 pandemic, they can be volatile as there is also demand from non-fuel sectors. Currently, Quadrise is in discussion with glycerine producers for commercial glycerine supply. Quadrise could consider also self-producing glycerine by using other methods such as growing algae in salt water if bioMSAR™ production increases in the future.

bioMSAR™ is compatible and interchangeable with MSAR®, and shares the same applications for power generation and bunkering as MSAR® does. Over a decade, Quadrise has launched many projects for MSAR® trials worldwide with a host of companies spread across various industries. As marine fuels, MSAR® and bioMSAR™ are suitable for vessels equipped with scrubbers. In late-January, Quadrise reached an agreement with MSC Shipmanagement Limited of Cyprus to carry out an MSAR® operational trial on MSC's commercial container vessels in 2021. The initial trial may also include testing of bioMSAR™. The success of the trial will potentially lead to MSC's consideration of commercial use of MSAR® and bioMSAR™ in its global fleet.

Quadrise completed a MSAR® trial with Maersk Line in 2016-2017. Although the fuel was proven both operationally and commercially, Maersk chose not to proceed further with the project after the company announced that at that time it would use only 0.5%S compliant fuels after 2020. While Quadrise's technology and licensing for MSAR® and bioMSAR™ are available, commitments of both end-users and refineries will actually bring these products to commercial markets.