

"During the MSAR® trial programme Maersk has enjoyed a close and professional collaboration with our technology partner QFI and supply partner Cepsa, resulting in a smooth operation during which the MSAR® fuel has performed well."

Niels H Bruus
Head of Future Solutions of Maersk Line A/S

MSAR® is operationally and commercially proven as a marine bunker fuel in both 2- and 4-stroke engines. It can be supplied directly from candidate refineries and delivered to marine vessels using conventional infrastructure designed for marine fuel oil.

2-STROKE ENGINES

Quadrise and Maersk completed a comprehensive testing program, as part of a Joint Development Programme, over 7 years, which has proven the effectiveness of MSAR® as a marine fuel. This testing programme culminated in the Proof of Concept and operational trials described below:

2014: Proof of Concept trials on 2 Maersk vessels with 2-stroke diesel engines; the Seago Istanbul (Wärtsilä 12 RT-Flex 96C-B engine) and the Bogor (MAN B&W 7K80ME-C9 engine). MSAR® was deemed a viable fuel for commercial use by MAN, Wärtsilä and Maersk.

The Proof of Concept tests involved:

- The production of 1,000 tonnes of MSAR® at ORLEN Lietuva's refinery, from visbreaker residue.
- MSAR® was loaded on to a bunker barge at the Port of Klaipėda and transferred at Bremerhaven to the Maersk containerships by ship-to-ship (STS) transfer.
- Hundreds of MSAR® running hours were completed successfully on the 2 operational containerships. The FEED and Detailed Engineering were completed by a team comprising Quadrise, the client and an EPC Contractor in Q1 2016.



MSAR® bunkering at the port of Klaipeda.



STS MSAR® transfer at Bremerhaven.



The Maersk vessels were operational during the trial.



Maersk open ocean vessel testing of MSAR®.

2016-2017: Operational trial supplying MSAR® to Maersk's operational 52,000DWT/4,300TEU container vessel the Seago Istanbul. MSAR® was produced at Cepsa's Refinery Gibraltar San Roque in Spain in commercial quantities to fuel the 68MW main engine.

The operational trial involved:

- The production and supply of 7,000 tonnes of MSAR® at the refinery, from visbreaker residue (see refinery case study) derived from a variety of opportunity crudes. Production occurred over 6 campaigns and over an 8-month period.
- Loading onto a bunker barge at the port of Algeciras, and transfer to the Seago Istanbul.
- Seago Istanbul, an operational containership in normal service, completed ~1,500 MSAR® running hours, following its normal route and re-fuelling with MSAR® at Algeciras approximately every 6 weeks.

The MSAR® fuel performed well and feedback from Wärtsilä and Maersk was very positive. As a result of the successful operational trial, Quadrise received an interim Letter of No Objection (LONO) for MSAR® for Wärtsilä RT-flex96C-B engines.



The Seago Istanbul operated as usual during the trial, sailing its normal route.



MSAR® project implementation at Cepsa Refinery, San Roque.



Cepsa Refinery San Roque (240,000 bbl/d)

4-STROKE ENGINES

Over 150,000 hours of base-load operation has been demonstrated by Wärtsilä using V32 and V46 engines on oil-in-water emulsion fuel Orimulsion® (the forerunner to MSAR®). MSAR® has subsequently been tested by Wärtsilä in Vaasa, Finland and shown to result in improved system performance compared with Orimulsion®.

MSAR® fuel is compatible with exhaust gas cleaning systems (scrubbers) to reduce marine emissions. Following the IMO 2020 decision to reduce global marine fuel emissions to <0.5%S equivalence, it is likely that MSAR®, in conjunction with an onboard scrubber, will be the most cost-effective method of compliance with the new regulations.

Example using Mitsui Futures Prices for 2020 (as of February 2019), and the assumptions of a 30,000kW installed engine power, 50% engine load, and 185g/kWh SFOC.

Conversion to MSAR® for a VLCC would cost in the region of $400k. The MSAR® project margin share for the single VLCC would be $540k/y, which equates to $1,500 per day. This saving can be used to subsidise the cost of an Exhaust Gas Cleaning System (scrubber).

As well as benefiting from a significantly lower cost fuel, vessel operators benefit from MSAR®'s numerous environmental benefits.

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