# Fuel additive Aquasolve™ – lab analysis report

Client: CFCS Analytical Services Ltd

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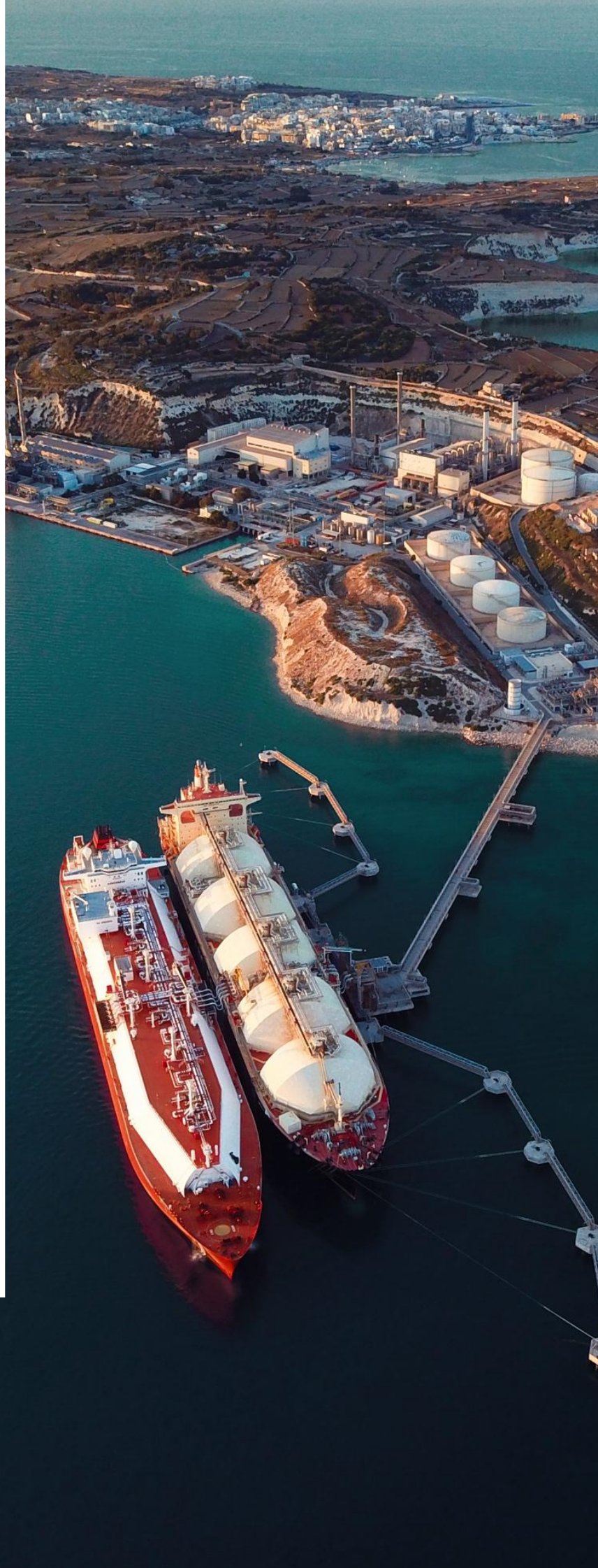

# Document control page

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# Introduction

The client: CFCS Analytical Services requested Lloyd's Register (LR) Fuel Oil Bunker Analysis and Advisory Service ("FOBAS") to carry out an impact assessment of their distillate fuel additive Aquasolve™. Primarily the additive claims to reduce the fuel consumption by improving the combustion in a diesel engine. Evaluating the improvements in fuel economy is not within the scope of this report. FOBAS was asked to perform lab testing on a couple of distillate marine fuel samples and dose them with the additive and compare the results. The testing programme was agreed between LR and the client as per proposal reference FOBAS/25-103/LAC.

# Methodology

To test the additive for full ISO 8217 (table 1) parameters twice i.e., with & without the additive requires significant quantities for each set of fuel. LR FOBAS receives thousands of samples per month in their labs from around the world however a single leftover sample quantity is insufficient to be reutilised for full ISO 8217 testing. Hence, it was agreed to make two composite samples for distillate grade (ISO-F-DMA) in the lab by reviewing the database, picking out similar fuels in terms viscosity, density, sulphur and other characteristics and named them 'Fuel A' and 'Fuel B' which are representative of the distillate fuels typically supplied as marine bunker fuels.

During this exercise, both these fuel samples were subjected to ISO 8217 (table 1) parameters + Ignition Quality Testing (IP 498) + Filter Blocking Tendency test (IP 387 – Procedure B).

# Analysis data

Table 1 provides an overview of all the testing performed in the lab for two sets of fuel samples.

*Table 1: Fuel analysis*

| Test Parameters | Test Methods | Units | Fuel A (Untreated) 253791111-1 | Fuel A (Treated) 253791111-2 | Fuel B (Untreated) 257759711-1 | Fuel B (Treated) 257759711-2 |
|---|---|---|---|---|---|---|
| Density @ 15°C | ISO 12185 | kg/l | 0.8749 | 0.8751 | 0.8369 | 0.8369 |
| K Viscosity at 40°C | ISO 3104 | cSt | 5.076 | 5.08 | 2.88 | 2.876 |
| Flash Point | ASTM D6450 | °C | > 70.0 | > 70.0 | 69 | 68 |
| Pour Point | ISO 3016 | °C | < -9 | < -9 | < -9 | < -9 |
| Cloud Point | ISO 3015 | °C | 11 | 10 | 0 | 1 |
| CFPP | ASTM D6371 | °C | -5 | -7 | < -9 | < -9 |
| MCR 10% | ISO 10370 | % m/m | 0.03 | 0.04 | 0.01 | < 0.01 |
| Ash Content | ISO 6245 | % m/m | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Water Content | ASTM D6304 | % v/v | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Sulphur Content | ISO 8754 | % m/m | 0.086 | 0.086 | < 0.030 | < 0.030 |
| Appearance | Visual | | C&B* | C&B | C&B | C&B |
| Colour | Visual | | Yellow | Yellow | Yellow | Yellow |
| Net Specific Energy | Calc | MJ/kg | 42.44 | 42.44 | 42.92 | 42.92 |
| Gross Specific Energy | Calc | MJ/kg | 45.16 | 45.15 | 45.76 | 45.76 |
| Cetane Index | ISO 4264 | Index | 45 | 45 | 52 | 51 |
| Derived Cetane Number | IP 498 | | 47.9 | 47.7 | 55.6 | 55.7 |
| Ignition delay | IP 498 | Milliseconds | 4.30 | 4.32 | 3.65 | 3.64 |
| Filter blocking tendency | IP 387 (Proc B) | At 20°C | Blocked Filter | Blocked Filter | 1.01 | 1.00 |

*Clear and Bright

### Comments

Both ‘Fuel A’ and ‘Fuel B’ are of a satisfactory quality and to the extend tested, comply with the ISO-F-DMA specification limits as outlined in ISO 8217 standard. Comparing the results before and after dosing, no significant difference can be observed, and results are generally within individual test methods reproducibility range.

# Concluding remarks

In summary, it has been observed that dosing distillate samples with Aquasolve™ did not impact the ISO 8217 (Table 1) parameters.

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