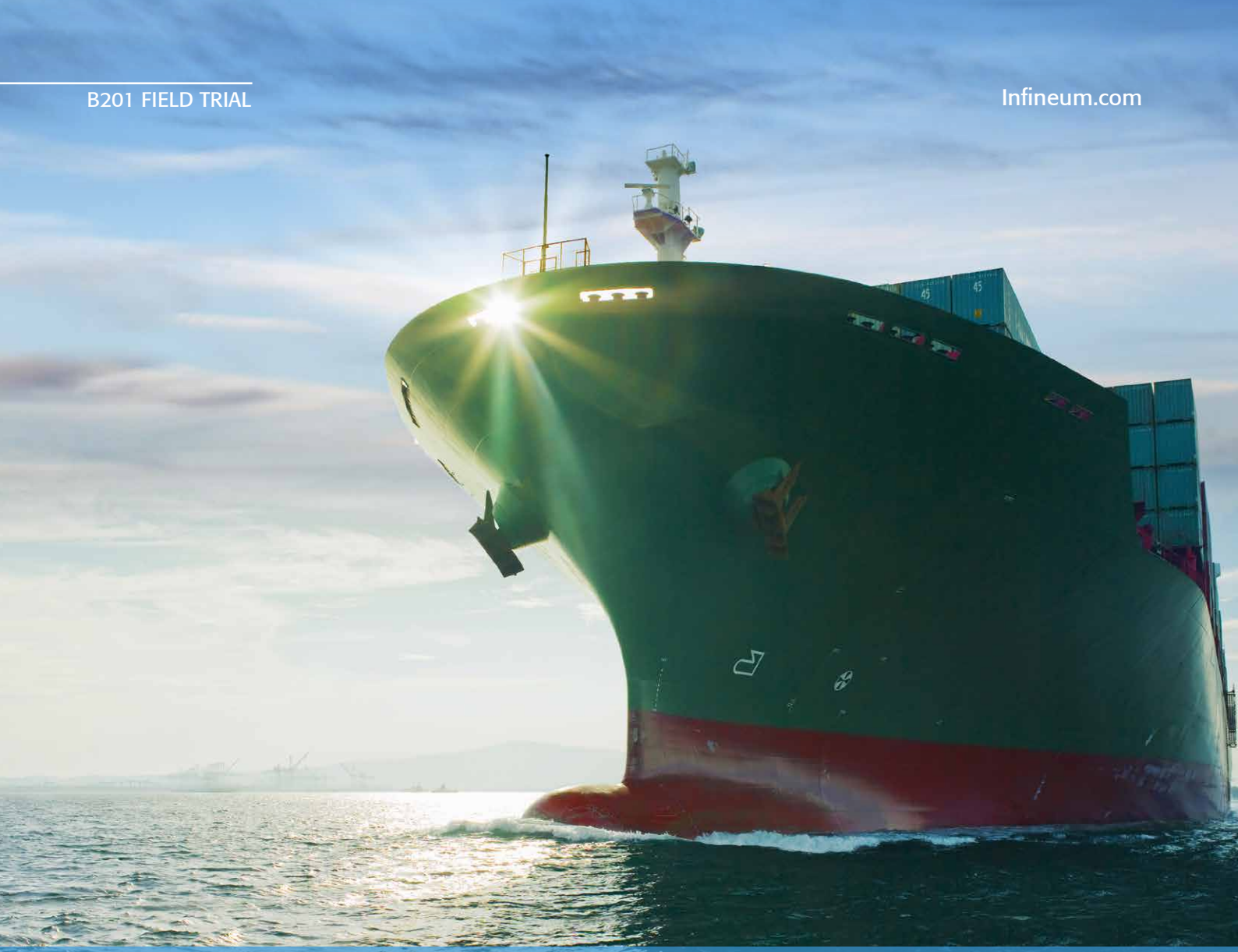

Infineum B201
Demonstrates field-proven performance

Infineum B201 has been formulated to help you meet the IMO 2020 challenge.

This fuels additive package has been developed to provide onboard operating benefits in two critical areas: fuel stability and compatibility. In addition, it also has unrivalled ability to positively influence all the tests mentioned in CIMACs PAS document.

During a recent field trial, Infineum B201 demonstrated a unique ability to stabilise TSP and prevent instability of a very low sulphur fuel oil (VLSFO) blend on board ship (with no harms) as well as broadening the fuel blending window for subsequent stable and compatible VLSFO fuel blends.

Infineum B201 exceeded performance requirements in laboratory tests, but we wanted to demonstrate real-world field-proven performance. Therefore, we partnered with a major international oil company who was testing different ratios of paraffinic/aromatic residual blends to establish their blending window.

One of the major routes for VLSFO production is the blending of high sulphur residual streams (aromatic) with low sulphur distillate streams (paraffinic) to produce compliant fuels. However, this comes with risk – asphaltene-containing aromatic streams tend to be incompatible with paraffinic components and can result in asphaltene drop out which can significantly hinder ship operating conditions, or in severe cases cause engine failure.

Although both blends of unadditised fuel met the TSP specification when loaded onto the ship, both trials failed at various points because of fuel system plugging caused by asphaltene instability. Subsequent laboratory analysis using proprietary Infineum extended TSP analysis demonstrated that fuel stability of both blends (<0.1 mass %) became increasingly worse over a relatively short period of time (days) to the point where the fuel was off specification. An extensive test matrix was conducted by Infineum to determine the cause(s) of the failure and propose a solution. It was discovered that Infineum B201 additive could expand the blend window beyond previous expectations and enhance long term asphaltene stability in several severe blend ratios.

- Unadditised fuel blends were exhibiting TSP of >0.23 consistently
- Additised fuel blends were exhibiting TSP of <0.04 consistently
- During the course of the study Infineum B201 additive was also found to exhibit some supplementary anti-oxidant properties which provided further benefits

As a result of this testing it was decided to conduct a further trial using Infineum B201 in the more severe ship trial blend mentioned above.

- This blend has the most positive economic impact for the Refiner/Producer
- This blend has a known benchmark for a failure/success point

The additised VLSFO trial batch was blended in August with an initial TSP of 0.02 and was loaded onboard the test vessel (Suez Max Vessel, 2-stroke engine) two weeks after blending. The vessel was routed through various ECA waters that prevented a 'block' burn of the fuel. The VLSFO trial batch was burned in segments over an extended 13-week period and resulted in a successful trial with:

- TSP throughout extended fuel retention – 0.03-0.04
- Complete burn of 600mT
- No issues reported by ship engineer throughout any burn regime
- Additised fuel blend was stable for 15 weeks with 13 weeks shipboard. No problems associated with fuel onboard ship and TSP never above 0.04

In 2016, the International Maritime Organization announced (in MARPOL Annex VI, Regulation 14) a marine fuels sulphur reduction program that is expected to have long term implications for the entire marine industry. The change, effective on 01 January 2020, reduced the maximum sulphur content of marine fuels from 3.5% to 0.5%, unless the vessel is either: operating in an Emission Control Area (ECA, where a 0.1% sulphur limit applies), or using an approved exhaust gas cleaning system (commonly referred to as a scrubber). In lieu of using a scrubber, the majority of ships adopted fuel compliance as the route to meet the new regulations. This adoption represented a significant challenge for fuel refiners, traders and blenders to produce sufficient quantities of 'on specification fuel' (as well as to find disposition routes for surplus residual streams). Refinery strategies to meet the demand for new compliant marine fuels will vary, however, in broad terms we can expect two scenarios:

- Simple refineries produce MGO and when they have a VLSFO market, they have switched to processing light, sweet crudes which would allow them to continue shifting their residual streams into marine HFO market. Processing sweet crudes will ultimately lead to the production of more paraffinic fuels and higher costs as sweet crude will be priced at a premium.
- Complex refineries have more flexibility and utilise their conversion units (cokers and hydrocrackers) to produce MGO and VLSFO from heavier, sour crudes. These crudes are discounted heavily relative to light sweet crudes. Broadly speaking we could forecast that the fuels will be more aromatic in nature.

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