

INTERTEK CALEB BRETT HFO Stability Test - March 5, 2019



When regarding the question about the ideal dosing strength for the XBEE Enzyme Fuel Technology to assure adequate defense against the risk of instability caused by age or comingling fuel sources, **Intertek Caleb Brett** laboratories conducted a study for GTR, Inc. to verify that XBEE's standard dose rate used for improving combustion (4,000:1) will be equally effective in improving quality in aged and unstable HFO.

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Intertek Caleb Brett is a worldwide leading laboratory.

Intertek petroleum industry services include laboratory testing, cargo inspection, R&D, materials analysis, asset integrity management, corrosion control, safety, and much more.

In the USA, the XBEE Enzyme Fuel Technology is marketed under the trademark Soltron by GTR, Incorporated <u>www.soltron-gtr.com</u>





Following is a description of the test and the Report of Analysis.

In February 2019, **GTR, Inc.**, the manufacturer of XBEE Enzyme Fuel Technology (marketed in the Americas as "The Original Soltron® Enzyme Fuel Treatment") hired Intertek Caleb Brett, Signal Hill, California, to study the additive's effects on improving stability in unstable HFO. To simulate a realistic shipboard fuel scenario of blended fuels with different ages, five individual 1-Liter and 750-ml laboratory retains from five different bunkering operations were acquired from a California fuel jobber. Fuel certifications (ISO 8217-2017) had been performed between February 2018 and August 2018. The HFO came from a sole source. The refinery and crude oil source is not known.

The five samples were blended together, totaling approximately a gallon (3.78 liters). An additional 6 ounces (180 ml) of an aged IFO 380 sample from a different vendor was added. The total volume was approximately 1.05 gallon, or ~4 liters. The fuel samples were mixed and delivered to **Intertek**.

The Laboratory split the fuel into two equal portions, and additized one sample at 0.5 ml (~4,000:1). The fuel was set aside for one week.

The primary goal of this test was to create a blend of HFO that was unstable due to comingling of different batches of different aged fuels, in order to determine what characteristics XBEE is likely to improve, at the most economical dose rate.

The most remarkable response was the ASTM D 4740 Compatibility rating going from a "5" to a "3". This indicates the blended fuel went from being unsafe to use to being safe to use, but with warnings to not overheat the fuel. Ratings can be subjective, as there are no fractional ratings. The "5" for the neat fuel is obvious. The treated fuel falls in between "2" and "3". As it does lean closer to "3" (not easily visible in the photograph), the rating must go to the higher number (see images, chart, and description next page).

The other notable change was ASTM D 445, which is viscosity. The neat fuel was 374.3 cSt and the treated fuel was 357.7 cSt. This represents a 4.5% reduction in viscosity, with no reduction in fuel density.

Other results of interest include: • ASTM D 664: 12% reduction in acidity • ASTM D 6560: 3% reduction in asphaltenes • ASTM D 482: 45% reduction in ash



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These fuel characteristics are known to contribute to fuel instability, sludge formation, corrosion, and injector fouling or even injector damage. While these are small improvements, collectively they are all contributing factors towards the total improvement of this fuel blend.

CONCLUSION

In this study, even at 4,000:1, the lowest dose rate recommended for enhancing combustion, XBEE greatly improved the compatibility and stability in an unstable HFO blend. For shipboard applications, XBEE can significantly reduce sludge formation due to commingling and aged fuel, and improve fuel system function and engine cleanliness, without having to use the higher factory recommended "recovery" dose rate of 2,000:1.

Following are photographs of the ASTM D 4740 compatibility spot tests, as well as the full **Intertek Caleb Brett** Report of Analysis.

> -- Matt Cohen Clean Fuel Resources Consultant to **GTR, Inc.**



ASTM D 4740 Spot Tests, Results of XBEE treatment compared to neat fuel

The ASTM D 4740 Standard Reference Spot Description

- 1 · Homogeneous spot (no inner ring)
- 2 · Faint or poorly defined inner ring
- 3 · Well-defined thin inner ring, only slightly darker than the background
- 4 · Well-defined inner ring, thicker than the ring in reference spot No. 3 and somewhat darker than the background
- $5\cdot$ Very dark solid or nearly solid area in the center. The central area is much darker than the background.



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Rating ASTM D4740	Reference Spot	Spot Description	Fuel status
1		Homogeneous spot, no inner ring	Compatible / Stable
2	100	Faint or poorly defined inner ring	Will deposit some sludge Handle carefully Consider chemical additives Do not overheat Increase purifier Blow down frequency
3	6	Well-defined inner ring, only slightly darker than the background	As for 2 but increased sludge potential
4	0	Well-defined inner ring, thicker than the ring in reference spot no. 3 and somewhat darker than the background	Incompatible / Unstable
5	6	Very dark solid or nearly solid area in the center, the central area is much darker than the background	Incompatible / Unstable