



Comparison of Biocidal Efficacy of KATHON™ FP 1.5 and Biobor¹ JF in Ultra Low Sulfur Diesel (ULSD) Fuel

Laboratory efficacy tests demonstrate the superior performance of KATHON™ FP 1.5 biocide over Biobor¹ JF in an ULSD Fuel system.

Overview:

The protection of fuels from microbial spoilage is determined by two critical factors: 1) the biocide product to be used for treatment, and 2) the dosage level of the biocide product. The data summarized herein illustrate the importance of selecting a biocide product which demonstrates microbial efficacy in a particular fuel type.

KATHON FP 1.5 is an effective, well-recognized, and trusted product that is used to protect fuel products including diesel, low sulfur diesel (LSD), ultra low sulfur diesel (ULSD), unleaded gasoline, marine, and biodiesel fuels from microbial spoilage. Additionally, KATHON FP 1.5 has a long-standing reputation for providing effective and rapid microbial protection of aviation fuels.

Laboratory study:

A recent study demonstrates the relative performance of KATHON FP 1.5 and Biobor JF biocide products in contaminated ULSD fuel. During this study, ULSD fuel was contaminated with high levels of industrially relevant microbes (5×10^6 colony forming units per milliliter (CFU/mL) of bacteria and 5×10^5 CFU/mL of fungi). Organisms used included the bacterium *Pseudomonas aeruginosa* (ATCC# 33988) and the fungal organisms *Hormoconis resinae* (ATCC# 20495) and *Yarrowia tropicalis* (formerly *Candida tropicalis*) (ATCC# 18138) which are used in the ASTM E1259 method entitled, *Standard Practice for Evaluation of Antimicrobials in Liquid Fuels boiling below 390°C*.

ULSD fuel samples were contaminated with microorganisms on day 0 and then shock dosage levels (as specified by the EPA label) of the biocides KATHON FP 1.5 and Biobor JF were applied to the 50 mL fuel samples (45 mL fuel and 5 mL sterile water). The level of contamination was determined at various time points during the study and scored on a numerical scale of 1 to 4. A score of 2 (which indicated contamination of at least 1×10^2 CFU/mL) and above was considered to be a failing score. Failing scores are shown in red, and passing scores are shown in green. No additional biocides were dosed into the fuel samples after day 0; therefore, biocidal efficacy observed throughout the study is the result of the original biocide dosage on day 0.

Results:

Table 1 shows the results of dosing the ULSD with shock dosage levels of KATHON FP 1.5 (400 ppm of product as supplied) and Biobor JF (270 ppm of product as supplied) in comparison to a no biocide control. As shown in Table 1, KATHON FP 1.5 is rapidly effective (within 24 to 48 hours) for decontamination of the ULSD. Biobor JF failed to decontaminate the fuel at every time point for all three test organisms over 28 days. No significant difference was observed between the efficacy of the Biobor JF product and the no biocide control during this study in ULSD fuel.

¹Biobor is a registered trademark of Hammonds Fuel Additives, Inc. Biobor JF is not registered for use in on-road vehicles.



Table 1. Treatment of heavily contaminated ULSD with shock level dosing of KATHON™ FP 1.5 (400 ppm) and Biobor JF (270 ppm) in comparison to a no biocide control.

Biocide	ppm product	Organism	Challenge (10 ⁶ Bacteria/10 ⁵ Fungi)	Growth Score at Time Point (After Challenge)							
				1 Hour	4 Hours	24 Hours	2 Day	7 Day	14 Day	21 Day	28 Day
KATHON™ FP 1.5	400	Bacteria		4	4	0	0	0	0	0	0
		Yeast		0	0	0	0	0	0	0	0
		Mold		4	2	2	0	0	0	1	0
Biobor JF	270	Bacteria		4	4	4	4	4	4	4	4
		Yeast		4	2	2	2	4	4	4	4
		Mold		4	4	4	4	4	4	4	4
No Biocide Control	0	Bacteria		4	4	4	4	4	4	4	4
		Yeast		4	4	4	4	4	4	4	4
		Mold		4	4	4	4	4	4	4	4

Table 2. Growth scoring scale for efficacy testing results.

Score	# of colonies	Approximate CFU/mL
0	0	<1 x 10 ¹
1	1 to 9	1 x 10 ¹ - 9 x 10 ¹
2	10 to 99	1 x 10 ² - 9.9 x 10 ²
3	100 to 300	1 x 10 ³ - 3 x 10 ³
4	> 300	> 3 x 10 ³

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†except Indonesia and Vietnam

Summary:

When dosed appropriately, the biocide KATHON FP 1.5 is extremely effective for both the decontamination of heavily fouled fuel systems (Table 1) and the prevention of future microbial spoilage. Biocide usage maintains the integrity of fuels at all points during storage, distribution, and usage. The KATHON FP 1.5 product preserves valuable fuel systems to prevent machine malfunction, engine failures, microbially-induced corrosion, and impaired water removal from storage tanks while protecting the fuel performance properties as well as specifications such as color, heat of combustion, pour point, and cloud point.

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