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Product Comparisons: Bell Tank Treatment SDF® vs. The Marketplace

Bell Performance invented the first fuel additive in the year 1909 and has been formulating effective problem-solving fuel treatments ever since. Changes in the composition and chemistries of contemporary fuels have created a burgeoning need for solutions that solve sludge and microbial biomass problems in stored fuels and storage tanks. In response, Bell Performance introduced Bell Tank Treatment SDF® (hereafter sometimes referred to as 'Bell SDF') as a fuel-borne solution for fuel users who store diesel fuel long-term for various applications. In this report, we'll compare the important functions and features of diesel fuel dispersants and see how some of the prominent options in the marketplace compare with Bell Tank Treatment SDF®.

Introduction

Over the last few decades, several notable regulatory and market forces have acted upon the petroleum industry to force substantial changes in fuel composition and chemistry. Market pressures and increased user demand have forced refineries to use cracking processes to increase the yield of high-demand distillate fuels from crude oil. Additional mandated refinery processing to remove sulfur content has also made the resulting ULSD fuels much less able to resist microbial growth. Once microbial growth is established in stored fuels and tanks, the microbes increase sludge production in the fuel and also produce problematic biomass formations. And on top of these changes, today's common practice of incorporating low levels of biodiesel into conventional petro-diesel increase the fuel's propensity for water attraction, which only feeds the microbial problem and makes it worse.

The net result of all these changes is that today's fuel user who stores diesel fuel encounters significantly more serious problems with sludge and biomass development in their storage tanks. Which means they are in greater need for solutions to remediate sludge and biomass than at any point in the past.

Sludge Dispersant Usage

Petroleum fuels have always been susceptible to chemical breakdown and sludge formation as they are exposed to environmental actors. Exposure to oxygen, water, light, heat and catalytic metals will accelerate chemical reactions involving unstable precursors that exist in the fuel from the start of its life. Left unchecked, these reactions will shorten the effective storage life of petroleum fuels and lead to the dropout of asphaltenes and sludge. These unstable components build up in the bottom of storage tanks. This creates the need for stored diesel fuel users for a fuel-borne treatment that can remove this sludge dropout and reclaim it by absorbing it back into the fuel from which it came. The benefits for the user, in this case, come from a couple of considerations: 1) reclaiming the heating value of the sludge that previously would have been lost in the sludge sitting in the bottom of the tank, and 2) keeping the fuel storage tank and delivery system in clean and optimal condition.

The lack of resistance to microbial growth by today's fuels also creates a definite need for an effective solution to the problem of biomass growth. Microbes that become established in fuel storage tanks create growths of biological material that both float in the fuel and adhere to tank surfaces. These biomass growth cause two primary problems – they plug filters and they protect microbes from the action of biocide treatments that might be used to eliminate them.

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Thus, stored fuel users have a need for a fuel-borne dispersant formula that may "break up" and disperse these biomass formations. Without such a solution, it becomes significantly more difficult for stored fuel users to ever get rid of microbial contamination problems in their stored fuel systems.

Beyond these two primary functions, stored fuel users also have a need for corrosion inhibitors and assistance of keeping different fuels together when being mixed in the same storage tank. These are not as pressing as the sludge and biomass dispersal functions, but corrosion issues and fuel homogenization problems can be relatively common in storage tanks. Some sludge dispersant treatments recognize this and provide ingredients to address these secondary considerations while effectively tackling the primary problems.

In response to these needs, dispersant formulations have been developed that effectively address these needs of stored fuel users. While many of them make similar claims, they are not all equal. Some of them are better than others. So it is of value to us to compare some of the dispersant options available in the marketplace to see which options really are the best.

What To Look For In A Dispersant Formula For Diesel Fuel

The best sludge and biomass dispersants for stored fuel should score well on the features listed below. Some of these features relate to active ingredients that accomplish specific functions while others are derived from an assessment of how well the dispersant performs (like treat rate).

Petro-Sludge Dispersant Chemistry

Since this is the primary function of this kind of dispersant, the most effective sludge dispersants will contain some kind of amide or other chemistry that is proven to disperse petroleum sludge and absorb it into the fuel. There are some different options as far as what these effective chemistries are, but at the same time there are some formulations that claim to be sludge dispersants but which do not contain any such chemistries, and thus are not likely to be effective at doing what they claim.

Biomass Dispersant Ability

The ability to break up and disperse the biological excretions from stored fuel microbes is an important secondary value point for dispersant formulations. Having this functionality gives the user flexibility in being able to tackle multiple problems at the same time. And biomass dispersant functionality is also essential to ensuring the effectiveness of any additional biocide use in the fuel tank.

Corrosion Protection

Some dispersant formulations can also provide boundary corrosion protection as an added bonus. They contain amide chemistry that lays down a protective layer on whatever metal surfaces the treated fuel comes in contact with. This layer serves to protect the metal against corrosion that is a pervasive problem with today's stored fuels, especially those in storage tanks with existing microbial presence.

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Fuel Blend Homogenization

With the prevalence of biodiesel fractions in today's fuel supplies, many stored fuel users encounter issues when adding different fuel blends in the same storage tank. Depending on their composition, some of these fuel blends may not mix as well as intended. For these cases, a good dispersant package may also include components that improve the blending and homogenization of different fuels that may be added together in a user's storage tank. This is a useful added benefit for stored fuel users who do not wish to be surprised by such a problem that they really did not expect to have to contend with.

Low Treat Rate

Treat rate matters in two respects. First, it determines the cost to use. Dispersants are used by B2B users who have tight budgets and margins to account for. A good dispersant must be both effective and inexpensive to use. The cost must be kept down so its use does not add excessively to their overhead. And we can infer the likelihood of this happening by considering the dispersant's treat ratio. A dispersant requiring a treat ratio of 1:500 of 1:1000 is going to be multiple times more expensive to use compared to another stabilizer with a treat rate approaching 1:5000 or more, and likely would be cost-prohibitive for most stored fuel users to use.

Treat rate also gives a window in on how effective you might expect the given product to be. By nature, dispersants can be effective at lower treat ratios compared to other fuel additives (like cetane improvers). But there is a limit to this. You need a minimum amount of the different kinds of active ingredients delivered into the fuel for a dispersant to be truly effective, which means it cannot have a treat rate that is excessively low. Ideally, an dispersant can be effective with a treat rate approaching 1:10,000.

Bell Tank Treatment SDF® vs. The Marketplace Competition

Now that we have a clearer picture of what a good sludge and biomass dispersant formulation does compared to a less-satisfactory one, we can compare Bell Tank Treatment SDF® to some of the other popular diesel dispersant products in the marketplace. The comparison products were selected based on consumer familiarity and the market penetration of the brand names.

Of the many dispersant products available, these are some of the more well-known selections.

Technol® 246 Super Sludge Dispersant (Technol Fuel Conditioners, Inc.) – Technol Fuel Conditioners, Inc., based in Eatonville, NJ, markets its own line of proprietary fuel conditioners. This line includes a cold flow improver, corrosion inhibitor product, and a de-icer. Technol® claims to have the world's only patented water-based emulsion stabilizer. Additionally, Technol® is a licensed distributor of Biobor JF® microbicide. For this comparison, Bell Tank Treatment SDF will be compared with Technol®'s 246 Super Sludge Dispersant.

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SBG® Fuel Oil Sludge Remover (FPPF® Chemical Company) –
FPPF Chemical Company is one of the younger companies in the industry, founded in Buffalo, NY in 1975. Their product line started with Fuel Power (a multi-function diesel treatment) and later branched out into home heating oil treatment (though their claim of having the first additive to 'effectively' treat home heating oil is highly suspect). FPPF's current product line is highly diverse, featuring treatments for lubricity, cetane improvement, cold flow, deicing and fuel thawing, biocide and aerosol cleaners. For the purposes of this comparison, Bell Tank Treatment SDF will be compared with FPPF®'s SBG Fuel Oil Sludge Remover.

Clear-Diesel® Fuel and Tank Cleaner *(*Power Service® Products) –
The Power Service® Products company of Weatherford, Texas has specialized in diesel additives since its inception in 1956. Their original formulation was primarily a water dispersant. Today, Power Service offers a broad range of multi-function fuel additive formulations. For the purposes of this comparison, Bell Tank Treatment SDF will be compared to Power Service®'s Clear-Diesel® Fuel and Tank Cleaner product.

Fuel Right® Basic Formula (Fairville Products) – Fuel Right® is the child of former Dupont materials engineer Bob Tatnall. Tatnall's background in anti-corrosion coatings led to his development of the Fuel Right formulation in the early-1990s. Tatnall's current company, Fairville Products, emphasizes the importance of testing standards for his company's formulations, with primary consideration given to a proprietary "quart jar test" developed by Tatnall to evaluate sludge and corrosion control (thought the jar test is not an ASTM-approved protocol). The company's product line includes multiple version of the Fuel Right product treatment, along with winter diesel treatments, cold flow treatment and gelled fuel thaw treatment, and lubricity treatment. For the purposes of this comparison, Bell Tank Treatment SDF will be compared to the Fuel Right® Basic Formula, Fairville's stock fuel treatment chemistry that put the company on the map in 1996.

Comparative Infographic – Bell Tank Treatment SDF® vs. The Marketplace

The features and claims made by each sludge dispersant treatment are summarized in the infographic below. This is followed by a summary description of how each dispersant product performs in each desired area. The goal, in all of this, is to provide a clearer picture of the features and effectiveness of each formulation when viewed in light of the best practice features that the better dispersants should have.

How do these different sludge dispersants compare with respect to their functionality and components?

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Sludge Dispersants Are An Important Tool For The Health Of Your Stored Fuels. Which one is right for you?

When it comes to sludge dispersants for stored fuel, there are lots of choices. Here's how some of the best-known choices compare.

SLUDGE DISPERSANTS FOR STORED FUEL		BELL TANK TREATMENT SDF®	TECHNOL® 246 SUPER SLUDGE DISPERSANT	SBG® FUEL OIL SLUDGE REMOVER	FUEL RIGHT® BASIC FORMULA	CLEAR-DIESEL® FUEL AND TANK CLEANER
	Petro-Sludge Dispersion	✓		✓	✓	✓
	Biomass Dispersion	✓			INCONCLUSIVE	
	Blend Mixing Assistance	✓				
	Corrosion Surface Protection	✓			✓	
	Low treat rate	✓			✓	
		1 oz per 80 gal	1 oz per 31 gal	1 oz per 31 gal	1 oz per 117 gal	1 oz per 3.1 gal

✓ = Good Choice

The choice is clear.

Bell Tank Treatment SDF® from Bell Performance does more - for less - than any of these other popular dispersants. **Bell Tank Treatment SDF®** is the right choice for a stored fuel dispersant.

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Let's compare them in the context of each ideal feature.

Petro-Sludge Dispersion – Four of the five formulations contained ingredients that reasonably can be expected to disperse petroleum sludge and asphaltene dropout to a reasonable extent. It should be noted, however, that there are some asphaltene species that are insoluble in petroleum; thus, no dispersant will remove 100% of a given petroleum sludge layer.

Surprisingly, not all of the formulations were actually effective at accomplishing this primary and essential function. The Technol® 246 Super Sludge Dispersant, per its SDS, only contains two ingredients – kerosene and glycol ether EB. Neither of these is a functional sludge dispersant. Glycol ether is effective at dispersing water, but has no substantive effect on heavy end or asphaltene sludge content. Given that Technol® 246 markets itself on being a "super sludge dispersant", this is a surprising and unsettling conclusion.

Disperses/Removes Petroleum and Asphaltene Sludge Content		
Bell Tank Treatment SDF®	Contains ingredients known to be effective at dispersing petroleum sludge content	
SBG® Fuel Oil Sludge Remover	Contains glycol ether EB and oleic acid. The glycol ether EB has no effect on sludge, but the oleic acid can function as a de-facto emulsifier. While it is less clear that it will function effectively in that manner at its given treat rate, we'll assign it a passing grade.	
Fuel Right® Basic Formula	Contains ingredients known to be effective at dispersing petroleum sludge content	
Clear-Diesel® Fuel and Tank Cleaner	Contains alkyl-substituted hydroxyl-aromatics that function as detergents	
DOES NOT Disperse Sludge Content		
Technol® 246 Super Sludge Dispersant	Contains only kerosene and glycol ether EB, neither of which has any meaningful effect on petroleum sludge content	

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Biomass Dispersion – Only one formulation – Bell Tank Treatment SDF® is clearly able to accomplish the essential function of breaking up and dispersing microbial biomass formations in fuel tanks. Of the four remaining products, three of them (SBG® Fuel Oil Sludge Remover, Clear-Diesel® Fuel and Tank Cleaner, Technol® 246 Super Sludge Dispersant) show no evidence of containing any ingredients known to disperse microbial biomass, nor do they make inferred claims that their formulations will accomplish this. The other formulation, Fuel Right® Basic Formula, markets itself in such a way that it makes strong biocide-related product claims about its functionality. However, one claim it does not make is an explicit claim on biomass dispersal. On this basis, combined with clear information that the formula contains an ingredient to do this, we give it an *inconclusive* grade.

Disperses Microbial Biomass		
Bell Tank Treatment SDF®	Specifically formulated to attack and break up microbial biomass formations	
Does Not Disperse Microbial Biomass		
SBG® Fuel Oil Sludge Remover	No evidence that it contains any ingredients to effectively break up and disperse microbial biomass, nor does it claim to	
Fuel Right® Basic Formula	Makes a number of biocide-related claims while stopping short of explicitly making a functional claim of biomass dispersal	**INCONCLUSIVE**
Clear-Diesel® Fuel and Tank Cleaner	No evidence that it contains any ingredients to effectively breakup and disperse microbial biomass, nor does it claim to	
Technol® 246 Super Sludge Dispersant	No evidence that it contains any ingredients to effectively break up and disperse microbial biomass	

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Corrosion Protection – Two formulations – Bell Tank Treatment SDF® and Fuel Right® Basic Formula are formulated to provide the kind of boundary layer protection that retards corrosion in fuel storage tanks. The remaining products do not make anti-corrosion claims, nor do they show evidence of containing any such effective ingredients in their formulations.

Protects Against Surface Corrosion In Storage Tanks		
Bell Tank Treatment SDF®	Utilizes amide chemistry designed to provide an anti-corrosion protective layer on tank surfaces	
Fuel Right® Basic Formula	Contains amine chemistry to protect against corrosion; make substantive product claims that it will do that	
Does Not Protect Against Corrosion In Storage Tanks		
SBG® Fuel Oil Sludge Remover	No evidence that it contains any ingredients to protect against corrosion	
Clear-Diesel® Fuel and Tank Cleaner	No evidence that it contains any ingredients to protect against corrosion	
Technol® 246 Super Sludge Dispersant	No evidence that it contains any ingredients to protect against corrosion	

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Fuel Blend Homogenization – Only one dispersant formulation, Bell Tank Treatment SDF®, even makes a claim of being able to help keep disparate fuel blends blended together in the same storage tank. None of the other four formulations given any indication or claim that they address this area of need in stored fuels.

Assists In Keeping Different Fuel Blends Together		
Bell Tank Treatment SDF®	Assists in maintain fuel blend stability when different fuel stocks are added together in the same storage tank	
Does Not Help Keep Different Fuel Blends Together		
SBG® Fuel Oil Sludge Remover	No evidence or functional claim to be able to keep different fuel stocks blended together in the same storage tank	
Fuel Right® Basic Formula	No evidence or functional claim to be able to keep different fuel stocks blended together in the same storage tank	
Clear-Diesel® Fuel and Tank Cleaner	No evidence or functional claim to be able to keep different fuel stocks blended together in the same storage tank	
Technol® 246 Super Sludge Dispersant	No evidence or functional claim to be able to keep different fuel stocks blended together in the same storage tank	

Comparisons of Treat Rate Relative To Claimed Benefits

The other side of the coin, no pun intended, is the cost of use for any product, whether it's a dispersant or another kind of treatment. And cost of use is determined by treat ratio. If we examine typical retail pricing for these dispersants, we can see some differences in how much they cost to use. We can then compare this cost to the essential functions and features they actually possess, so we end up with a clearer picture of how these options compare with what they do relative to their retail pricing cost of use (calculated as cost to treat 100 gallons of stored diesel fuel).

To summarize the findings, we've listed all five formulations compared, their total number of benefits, the claimed treat rates recommended to achieve those benefits, and their cost to use per 100 gallons of fuel treated.

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Stabilizer Product	# of Benefits	Actual Product Benefits	Treat Rate
Bell Tank Treatment SDF®	6	Sludge dispersion, Biomass break-up, Corrosion protection, Blend homogenization, Low treat rate, Low cost to use	1 oz: 80 gallons (1:1000)
Fuel Right® Basic Formula	4	Sludge dispersion, Corrosion protection, Low treat rate, Low cost to use	1 oz: 117 gallons (1:15000)
SBG® Fuel Oil Sludge Remover	1	Sludge dispersion	1 oz: 31 gallons (1:4000)
Clear-Diesel® Fuel and Tank Cleaner	1	Sludge dispersion	1 oz: 3.1 gallons (1:400)
Technol® 246 Super Sludge Dispersant	0	NONE	1 oz: 1.5 gallons (1:200)

Summary and Conclusions

Those who store diesel fuel know that sludge and biomass build-up in storage tanks can cause real problems for them. They must treat the fuel with a good dispersant or risk the viability of their investment in the fuel. They have many choices in the marketplace and it may be difficult for them to see meaningful distinctions between those choices.

A more rigorous examination of dispersant candidates helps us to conclude that some dispersants are better than others. Our comparative conclusions the following, listing our conclusions by product in the order of second-best choice to worst choice, by our assessment. The final winner of the comparison will be listed last:

- ***Fuel Right® Basic Formula*** provided the second-best functionality with sludge dispersion and corrosion protection. In fact, it was the only other dispersant beyond the #1 product that did anything else other than simple sludge dispersion. It was also the least expensive dispersant to use at just $2.24 per 100 gallons treated. Its treat rate is also extremely low treat rate, at just 1:15000 or 1 ounce to 117 gallons of fuel.

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- ***SBG® Fuel Oil Sludge Remover*** had no other proven functionality other than its primary function of sludge dispersant. It ranked in the middle in our comparison because its treat rate is also about average.

- ***Clear-Diesel® Fuel and Tank Cleaner*** finishes a poor 4th out of the 5 dispersants. It does have proven sludge dispersion capabilities, so someone choosing to use it will at least be able to do that. But Clear-Diesel®'s treat ratio of 1 ounce to 3 gallons of fuel is very high, which increases its cost-to-use to the point where it is difficult to see how this would be used by any cost-conscious business.

The least recommended stabilizer formulation was:

- ***Technol® 246 Super Sludge Dispersant*** finishes dead last in the comparison for some very good reasons. The only positive thing to say about this dispersant is that it is very inexpensive to use. But this is faint praise indeed because the Technol® 246 dispersant doesn't actually do anything that it claims to do. A user purchasing it to do even just simply sludge dispersion and cleanup will be disappointed because it does not contain any ingredients that disperse sludge. In fact, in the many years of doing business within an additive industry rife with snake oil and empty promises made, the Technol® 246 product is more of the most brazen examples of over-promising and under-delivering that we have yet come across. It is an easy choice for the least recommended dispersant in the comparison.

And finally, after analyzing all essential functionality in conjunction with cost-to-use, it should be fairly clear that Bell Tank Treatment SDF® wins the comparison of functionality combined with low cost.

- ***Bell Tank Treatment SDF®*** clearly does the most of any dispersant in the comparison, and at a very low cost. It was the only dispersant to provide all four important functions – dispersion of petroleum sludge, break-up and dispersion of biomass (the only one to do this), protection against tank corrosion (one of only two to do this) and assistance with blend homogenization of different stored fuels (the only one to do this). It was the clear winner in the stabilizer comparison.