

The “Real” Truth About Fuel Additives

Rebuttal To The August, 2012 Opinions Expressed In The Article Titled “The Truth About Fuel Additives”

To: Sean Kilcarr, Senior Editor

Per our telephone conversation recently and as promised, following is my rebuttal to the opinions in your article.

I must say the title of your August, 2012 article (*The Truth About Fuel Additives*) in Fleet Owner magazine did catch my attention. Unfortunately, as I read your article (three times), I found many **opinions** and very little **real truth** about the subject.

While you did offer quotes from noted industry oil company and engine manufacturer representatives, they too offered little if any in the way of documentation and proof to back up their opinions on the subject.

As a true custom blender and supplier of all types of diesel fuel additives for more than 35 years, my company spends an enormous amount of time, effort and money testing our client's diesel fuels and proving that the additives we sell DO achieve precisely what our clients want for their particular diesel powered equipment applications. And, ALL of the **Amalgamated, Inc** (www.amalgamatedinc.com) products are supported by factual data from reputable laboratories such as Research Laboratories, Inc. – (www.researchlaboratoriesinc.com) and Southwest Research Institute (www.swri.org), that verify and prove for us that the benefits we promote and provided are, in fact, cost effective for our clients.

POINT ONE: The first sentence of Mr. Kilcarr's article incorrectly states that "... sometime you need it (an additive) and sometimes you don't". But, in today's diesel fuel market there are very few times when the diesel fuels being purchased cannot be improved with the right combination of fuel additives.

Lab No.	Date	Location	CFPP (F)	Wax Dispersancy	Cetane Number	Conductivity	Lubricity	Detergency
36353	12/19/11	Pennsylvania	+ 10	poor	-	-	-	*
36354	12/19/12	Minnesota	+ 2	poor	-	-	-	*
36355	12/19/11	New York	+ 12	poor	-	31pS/m	-	*
36406	1/10/12	Indiana	-	poor	43.4	-	-	*
36444	1/23/12	Tennessee	+ 10	poor	-	27pS/m	725 µm	*
36446	1/23/12	Ohio	-	poor	-	-	605 µm	*
36447	1/23/12	North Dakota	+ 4	poor	-	-	-	*
36512	2/03/12	Iowa	-	poor	41.4	-	-	*
36620	2/27/12	Wisconsin	-	poor	-	-	645 µm	*
36627	2/27/12	Massachusetts	+ 12	poor	-	-	-	*
36749	3/12/12	Michigan	-	poor	-	28pS/m	-	*
36750	3/12/12	Illinois	-	poor	-	6pS/m	845 µm	*
36755	3/12/12	Utah	-	poor	-	-	675 µm	*
		ASTM D-975 Spec	-	-	40	25pS/m	520 µm	-

* None Advertised

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The **true fact** is that with today's new high pressure Common Rail Fuel Injection Systems being supplied on nearly all new diesel engines, they **will require** the use of extra diesel fuel IDID Detergents, Stabilizers, Corrosion Inhibitors, Deposit Modifiers and Lubricity Agents in order to protect the fine tolerances and insure the integrity of their design and performance.

And, no petroleum refiner in America today is "premixing" all of these chemical components in their diesel fuels in the required quantities to achieve the necessary protection. **In fact**, most fuel producers and fuel marketers add little, if any, of these chemistries to the diesel fuels they sell. They contend that the fuels supplied are fungible products and when it meets the loose ASTM diesel fuel specification, it is adequate for legal sale.

The task of upgrading or improving the quality of the diesel fuel for better, more efficient performance is left to the diesel fuel purchaser and the fuel consumer.

POINT TWO: The **real truth** about "winter diesel blend" fuels (No.2-D fuels blended with ultra-low sulfur kerosene) is that these ubiquitously brewed and distributed fuels:

- (a) Contain a lower BTU Content which yields significantly less power production and substantially reduced fuel economy (which costs the fuel user more money) AND
- (b) Cost much more compared to No. 2-D diesel fuels properly treated with the right cold flow improver winterization additives.

Lab No.	Date	Location	% K-1	Additive	Cloud Point (°F)	Pour Point (°F)	CFPP (°F)*	Density	BTU Content (per Gallon)
36462	1/25/12	Iowa	0	none	+ 14	- 6	+ 14	0.8408	137,856
			0	treated	+ 13.8	- 50	- 23	0.8408	137,856
			10%	0	+ 9.4	- 12	+ 7	0.8352	137,187
			20%	0	+ 9.3	- 18	+ 7	0.8313	136,716
			30%	0	+ 3.3	- 22	+ 4	0.8272	136,220

* Cold Filter Plugging Point Temperature

The **real fact** is a 30 percent kerosene blend will cost 15 to 20 cents per gallon more during the winter time and only deliver about 10 degrees F drop in the CFPP (Cold Filter Plugging Point) - the “winter operability” temperature reduction.

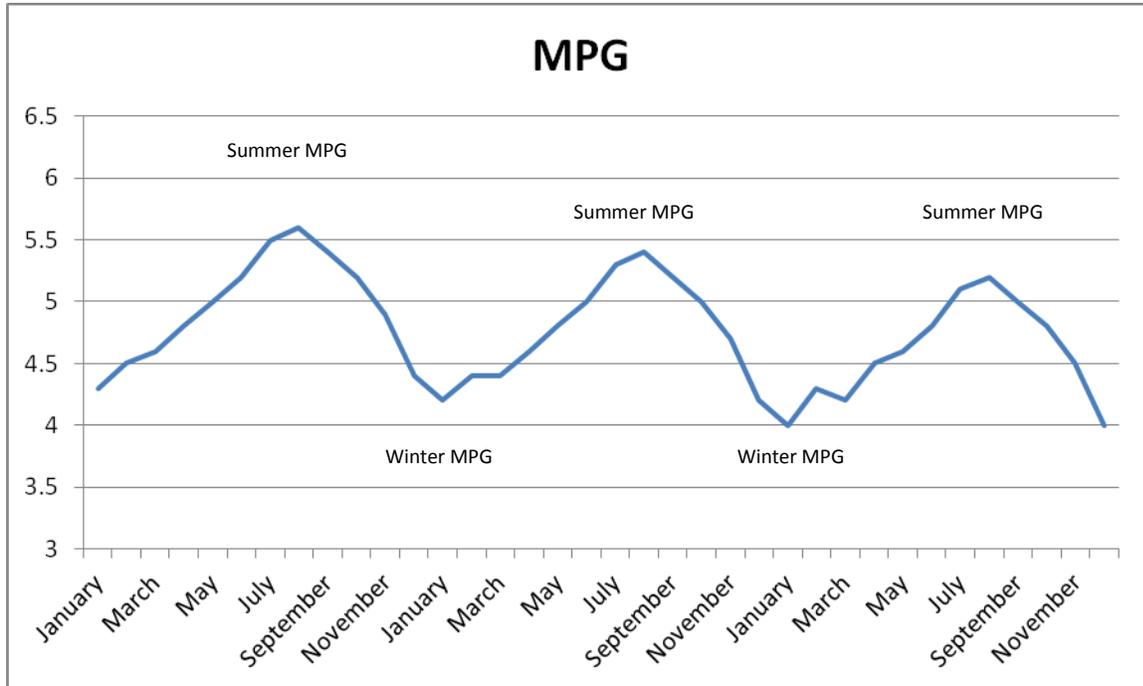
The correct fuel additives can achieve a better result for a cost of about 2 cents per gallon.

In fact, most diesel fuels must be blended with 50 percent OR more kerosene (at a cost of 25 to 35 cents per gallon) to achieve a 20 to 25 degrees F CFPP drop (winter operability protection). And, this amount of kerosene blending will reduce fuel economy by more than 25 percent in all diesel engines using such blended fuels.

Comparison lab testing of the right chemical additive product can easily prove a better winterization can be achieved (than blending 50 percent kerosene in the diesel fuel) for only about 5 cents per gallon treatment cost versus the 25 to 35 cents per gallon for blended fuel.

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A plot of yearly diesel fuel economy (mpg) will almost always yield a ‘sine curve’ indicating the mpg is much better in the summer months compared to the winter months of any given year.



This **fact** is nearly always the result of refiners and fuel suppliers ‘premixing’ (blending) kerosene and light distillates into the “winterized” diesel fuels (reducing the fuel's energy content).

But, fleets do not have to use blended diesel fuel in the winter time and diesel fuel economy does not have to drop so dramatically during the cold months of the year. **Research Laboratories, Inc** has CFPP testing capability and a unique one-of-kind ‘in-house’ Cold Room facility where winter diesel fuels and additive treated diesel fuels can be tested for winterization and operability performance versus the protection claims.



10' x 10' Computer Controlled Cold Room Facility



OEM Fuel Pumps & OEM Filters Used

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This Cold Room testing facility allows diesel fuels (without and with winterization additives) to be analyzed by flowing diesel fuels through OEM (Original Equipment Manufacturer) fuel filters using OEM fuel pumps at temperatures down to -28 degrees F to determine precisely when a diesel fuel will fail under 'real-world' cold temperature operability parameters.

Historically, **Amalgamated, Inc's** expertise is in supplying winterization chemical additives to the diesel fuel markets easily lowering the cold weather operability temperatures of diesel engines in any climate by more than 30 degrees F without the use of any kerosene blending. And, it extensively uses the “real world” Cold Room Test Method to verify the winterization additive protection it sells compared to the performance claims of competitor products.

Unfortunately, again, the *task of proving the true cause of poor winter mpg with blended diesel fuels versus finding better mpg with winterization additives is left to the diesel fuel purchaser and the fuel consumer.*

POINT THREE: A Fuel Lubricity requirement was added to the ASTM D-975 Diesel Fuel Specification in 2006, but not all diesel fuel producers or suppliers add an adequate amount of fuel Lubricity chemistry to actually achieve the required specification. This was verified in diesel fuels recently tested by **Research Laboratories, Inc** that were sourced from various North American diesel fuel sources, including Shell Oil.

<u>Fuel Number</u>	<u>Location</u>	<u>HFRR Result</u>
36351	South Bend, IN	590 µm
36444	Knoxville, TN	725 µm
36445	Cadillac, MI	535 µm
36620	Tomah, WI	645 µm
36750	Riverton, IL	845 µm
36755	Salt Lake City, UT	675 µm
36973	Des Moines, IA	700 µm
36975	Warren, OH	605 µm
	ASTM D-975 Spec	520 µm

The **real fact** is that for less than a half cent per gallon the diesel fuel Lubricity can easily be improved at the fuel production source or at the distribution point of sale. But, the diesel fuel must be laboratory tested before and after treatment on a frequent basis to determine if the additive used actually did or did not correct the fuel's deficiency on a consistent basis.

And, very few (if any) diesel fuel producers and diesel fuel suppliers actually test their diesel fuels' Lubricity on a continual basis to verify the constancy of the diesel fuels' Lubricity delivered to the market. *That task is usually left to the diesel fuel purchaser or the consumer.*

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POINT FOUR: Totally misleading and unwarranted are the ‘scare tactics’ used by Mack Truck's Mr. McKenna and Shell Global Solutions' Mr. Cherrillo to lead diesel equipment operators away from diesel fuel additives because of the "... ultra-sensitive..." nature of today's diesel engines and the potential "... side effects..." from using diesel fuel additives.

The **true fact** is that the fuel additive manufacturers themselves test and retest their product qualities and performance to verify that they **in fact** DO NOT harm the diesel engines or the fuel delivery systems used by the engine OEMs.

Additionally, the **true fact** is ASTM D-975 Diesel Fuel Specification is a very broad specification and as such all diesel fuels from different producers are not the same. Quality and chemical makeup of diesel fuels from different producers vary significantly due to a variety of crude oil sources and often much more compared to the changes imparted from diesel fuel additives treated into finished diesel fuels. *(This fact is even more important today with the influx of various tar sand, shale oil and other heavier crude oils being refined.)*

Independent Lab Analyses of Delivered Diesel Fuels

Lab No.	Date	Location	Sulfur Content	Carbon Residue	Cetane Index	Viscosity	API Gravity	Distillation (F)				Density
								10%	50%	90%	EP	
36239	11/15/11	Connecticut	13.91	0.014	48.20	36.93	35.3	355	515	614	665	0.8468
36215	11/14/11	Ohio	10.02	0.011	44.40	36.52	33.5	367	510	596	641	0.8561
36532	2/08/12	Indiana	8.71	0.038	45.10	35.69	35.1	340	496	590	648	0.8478
36347	12/19/11	Wisconsin	9.01	0.010	42.70	37.03	32.0	345	518	630	683	0.8639
36349	12/19/11	Ohio	8.06	0.010	41.00	35.37	32.7	338	498	580	636	0.8602
36350	12/19/11	Michigan	9.52	0.040	42.30	35.83	32.9	348	505	611	671	0.8592
36352	12/19/11	Utah	4.72	0.010	40.60	34.42	37.7	339	494	584	622	0.8348
36356	12/19/11	Iowa	3.83	0.002	45.80	36.83	34.3	335	512	634	692	0.8519
36410	1/10/12	Pennsylvania	9.06	0.023	44.96	35.04	34.8	332	505	583	610	0.8494
36514	2/03/12	Ontario Can	6.87	0.009	45.60	34.32	38.1	333	458	570	625	0.8328
36622	2/27/12	Pennsylvania	10.47	0.028	43.90	34.39	34.9	296	498	566	602	0.8489
36625	2/27/12	Illinois	10.75	0.010	43.80	36.86	33.4	341	511	621	677	0.8566
36748	3/12/12	Kansas	9.56	0.007	47.40	35.04	36.6	345	489	600	668	0.8403
36751	3/12/12	Tennessee	9.39	0.020	46.20	35.90	35.0	347	505	616	670	0.8483
36757	3/12/12	Indiana	10.36	0.023	43.40	36.45	32.9	348	513	619	677	0.8592
36977	5/15/12	Minnesota	9.60	0.002	44.80	36.70	33.1	360	520	625	675	0.8581

Regarding the improvement in fuel economy with diesel fuel additives, we have numerous reports from actual diesel fuel users who have confirmed mpg improvements directly related to the use of our additives in their diesel fuels.

These are not test programs from some unnamed "...reputable laboratory..." or a so called "... reputable laboratory..." operated by an oil company or an engine manufacturer. These are actual real time customer field tests conducted without and with additives in their diesel fuels over long periods of time. And, these many diesel fuel additive users who have tested the additives before buying them cannot all be wrong.

However, ultimately the *task to determine the diesel fuel quality purchased and the performance of additives in those diesel fuels should be left to the diesel fuel purchaser or the consumer.*

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POINT FIVE: The **real truth** is the Environmental Protection Agency (EPA) does NOT test diesel fuel additives before adding them to the “registered” list. The EPA only does a ‘review’ of the proposed additive formulation to determine that the additive contains only those chemistry components the EPA knows will not create harmful emissions when burned. The EPA does NOT approve additives based on their effects on the diesel engine or any engine components.

And, for Chevron Oronite's Mr. Parsons to suggest that the diesel fuel refineries add all of the necessary additives “... right at the start...” and infer that the additives must only be added by the refineries “... to insure they are properly blended in at the correct amount...” **is untrue and completely ridiculous.**

Plus, the ASTM D-975 Specification for diesel fuels does NOT **require** the petroleum refiner to add any diesel fuel additives. Since the specification is so very broad, the petroleum refineries need only to ‘tweak’ their production cut points and “perhaps” add a small amount of specific chemicals to allow nearly all refinery diesel fuels produced to fit within the specification.

ASTM D-975 Requirements For Diesel Fuels Oils (Diesel Fuels)

<u>Property</u>	<u>Test Method</u>	<u>No. 1-D (S15) *</u>	<u>No. 2-D (S15) *</u>
Flash Point (min °C)	D-93	38	52
Water & Sediment (max % Vol)	D-2709 / D-1796	0.05	0.05
Distillation Temperatures (°C Vol Recovered)	D-86		
Min		-	282
Max		-	338
Kinematic Viscosity (mm ² /S at 40 °C)	D-445		
Min		1.3	1.9
Max		2.4	4.1
Ash (Max % mass)	D-482	0.01	0.01
Sulfur (Max ppm µg/g)	D-5453	15	15
% Max Mass	D-2622	-	-
% Max Mass	D 129	-	-
Copper Strip Corrosion Rating (Max) (3 Hours @ minimum temperature of 50 C)	D130	No. 3	No. 3
Cetane Engine Number (Min)	D-613	40	40
One of the following properties must be met			
(a) Cetane Index (Min)	D-976-80	40	40
(b) Aromaticity (Max % Vol)	D-1319	35	35
Ramsbottom Carbon Residue on 10% Distillation Residue (Max % Mass)	D-524	0.15	0.35
Lubricity (HFRR @ 60 °C Micron, Max)	D-6079 / D-7688	520 µm	520 µm
Conductivity (pS/m) or Conductivity Units (Min)	D-2624 / D-4308	25	25

*** NOTE: There are other circumstances that allow these numbers to be somewhat different (ref. to ASTM D-975)**

The only major point in question for the refiner is diesel fuel winterization and that part of the specification also is extremely broad and variable depending on the region of the country and the time of the year.

Consequently, the **real truth** is that most diesel fuel winterization is left to be defined and dealt with at the final point of sale (distribution) usually by the diesel fuel terminals or the actual fuel suppliers. And, these companies infrequently test the fuels they source and they infrequently test the actual finished fuels they supply to their customers.

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And, to say that “Since many (diesel fuel) locations in northern climates switch over to winter diesel blends during the colder months, a fleet operating in those areas doesn’t need to treat its fuels with an aftermarket cold-flow inhibitor ...” is again misleading and totally untrue.

(P.S. There is no such term as “cold-flow inhibitor” – one can improve the cold-flow properties of a diesel fuel, but one cannot inhibit cold-flow of a diesel fuel.)

The **real fact** is the diesel fuels actually supplied to fuel users don’t always meet even the most minimum winterization requirements in the region the diesel fuels will be used. **Amalgamated, Inc** collects hundreds of diesel fuel samples from its customers throughout North America every winter and has independent laboratories analyze the cold flow properties of these delivered diesel fuel samples.

These lab reports verify that nearly all delivered fuels sampled need some level of added winterization and/or upgrade chemical protection to insure adequate operability for the fuel use applications as noted below:

<u>Lab No.</u>	<u>Date</u>	<u>Location</u>	<u>CP</u>	<u>PP</u>	<u>CFPP</u>	<u>Wax Dispersancy</u>
36157	10/21/11	Colorado	+ 5	- 8	- 4	Poor
36188	11/03/11	Indiana	- 1.6	- 16	- 2	Poor
36215	11/14/11	Ohio	- 1.2	- 36	- 2	Poor
36230	11/10/11	Michigan	+ 2.5	- 24	0	Poor
36239	11/15/11	New Hampshire	+ 14.7	- 2	+ 8	Poor
36308	12/06/11	Indiana	+ 6.3	- 38	- 2	Poor
36344	12/19/11	Wisconsin	- 0.6	- 28	- 1	Poor
36345	12/19/11	Illinois	+ 4.4	- 10	+ 4	Poor
36346	12/19/11	Tennessee	+ 12.9	- 14	+ 11	Poor
36354	12/19/11	Minnesota	+ 8.7	- 20	+ 2	Poor
36364	12/21/11	Indiana	+ 5.0	- 14	+ 4	Poor
36405	1/10/12	Iowa	+ 5.0	- 16	+ 5	Poor
36443	1/23/12	Pennsylvania	+ 10.6	- 16	+ 7	Poor

Again, the ***task of testing the diesel fuels to determine the expected winterization parameters and the application of cold-flow improver additives to the diesel fuels falls squarely on the diesel fuel purchaser and the consumer.***

POINT SIX: Mr. Kilcarr, why did you include three paragraphs of totally unrelated comments from Mr. Parsons (Chevron Global Solutions) about lubricating oils and additional quotes from a lubricant additive maker (Mr. Mark Nyholm, Amsoil) in an article you authored and titled “The Truth About Fuel Additives”?

The **real truth** is there is little if any correlation between the benefits imparted to lubricating oils from lubricating oil additives and performance benefits achievable in diesel fuels from diesel fuel additives. The **real fact** is that lubricant oil additive companies also market diesel fuel additives and the majority of their net profits come from lubricating oil additives – not diesel fuel additives. This **fact** does not necessarily make them an expert in treating diesel fuels.

The “Real” Truth About Fuel Additives

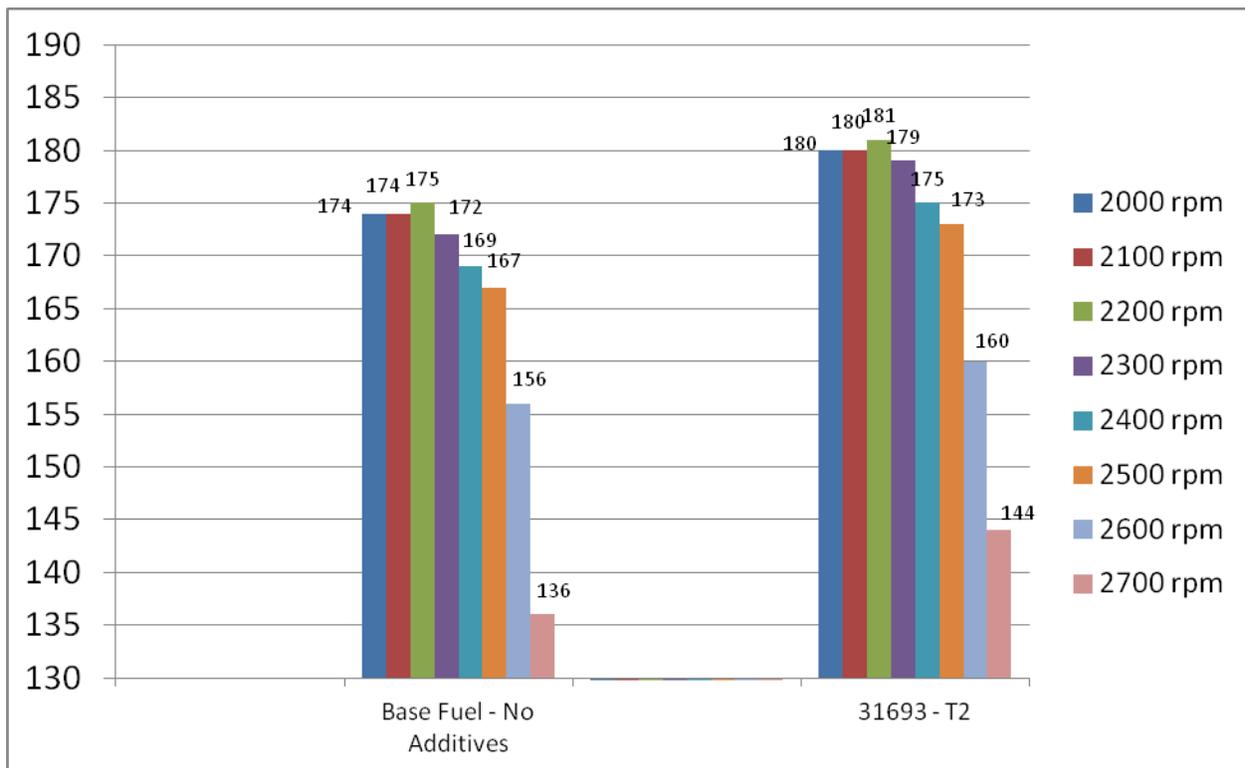
POINT SEVEN: As a diesel fuel additive supplier, **Amalgamated, Inc** agrees completely with the need for Deposit Control Additives (Detergents) in all diesel fuels. This is especially true when considering the new Common Rail Fuel Injector (CRFI) engines being manufactured today.

But, it is misleading to infer that these additives will ever be utilized and added by the petroleum refineries (especially at the required high IDID dosage rates for CRFI engines) or any intermediate terminal operators. Because the major pipeline operators controlling fuel distributions throughout the United States and North America are so concerned with carryover contamination to jet fuel deliveries, they do not allow diesel fuels with such chemistries to be put in their pipelines. And, there is no indication that says this position will change anytime soon.

Accordingly, the **real truth** is diesel fuel Deposit Control Additives (Detergents) will have to be added very close to the point of sale if not at the point of fuel consumption and *most likely this task will need to be taken on by the ultimate diesel fuel user.*

POINT EIGHT: The **real truth** is the ASTM D-975 Diesel Fuel Specification only *requires* a minimum 40 Cetane Engine Number. Better combustion efficiency of the diesel fuel and increased Brake Horse Power (BHP) in an engine can be achieved by significantly raising the diesel fuel Cetane Engine Number with Cetane Improver Additive which will increase mpg.

Independent Engine Dyno Testing Without and With Diesel Fuel Additive



Brake Horsepower Increases at Various Engine RPM with Amalgamated, Inc Cetane Enhanced Additive

The “Real” Truth About Fuel Additives

The above engine Dyno Test was conducted by an independent engine test laboratory operated by the same technician on the same day using the same commercially available No. 2-D summer grade diesel fuel with a 46 Cetane Engine Number.

The diesel fuel was treated with an **Amalgamated, Inc** additive (**#31693-T2**) to enhance the Cetane Engine Number to 54 during the additive treated test run. Three test runs were conducted without and with the additive and the average data of each set are shown in the graph above.

(Horsepower was improved at all engine RPM when the same diesel fuel was treated with performance improving additive.)

But, the petroleum refineries *generally* add only enough Cetane Improver Additive to insure their finished diesel fuel products meet the minimum requirement. And, they do not *generally* add Cetane Improver Additive to raise the Cetane Engine Number anywhere near 50 and above. So, the *task of enhancing the Cetane Engine Number is left to the diesel fuel purchaser and user.*

Also, with better combustion of the diesel fuel, NOx (nitrogen oxide) emissions may be slightly higher. But, Mack Truck's Mr. McKenna's suggestion that Cetane Improver Additive should not be used to raise the Cetane Engine Number (combustibility) of the diesel fuel because of increased cost of DEF (Diesel Exhaust Fluid) is again totally misleading and mathematically incorrect.

Example: DEF costs about \$2.74 per gallon and is used at an injection rate of approximately 2% per gallon of diesel fuel consumed. Diesel fuel typically costs about \$4.00 per gallon.

If a diesel vehicle gets 6 mpg, then the cost per mile to operate the vehicle (including the DEF) would be: \$0.6667 for diesel fuel + \$0.0548 for DEF = \$0.7215 per mile.

If Cetane Improver Additive is added to the diesel fuel to increase combustibility of the diesel fuel which improves the fuel economy (mpg) by just 5% (to 6.30 mpg) and the DEF usage was increased from 2% of diesel fuel consumed to 3% (a 50% increase; this amount is much more than will likely be needed), the fuel cost per mile would be: \$0.6349 for diesel fuel + \$0.0822 for DEF = \$0.7171 per mile.

The cost per mile even with the grossly exaggerated extra DEF usage would be less with the better combustibility. And, if the mpg actually increases by 10% with the use of this amount of Cetane Improver Additive, the fuel cost per mile would be: \$0.6061 for diesel fuel + \$0.0822 for DEF = \$0.6883 per mile.

The **real truth** is the increase in DEF usage can be more than offset by the reduction in fuel cost per mile from improved combustibility when adding Cetane Improver Additive to a diesel fuel. But, again *the task of proving this is the responsibility of the individual fleet owner.*

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POINT NINE: If the lubricant additive supplier, Amsoil's Mr. Nyholm, is correct in his stated opinion that: “You don’t gain any additional performance benefit once the Cetane rating of the fuel exceeds 52”, then why is the current European specification of 51 slated to be raised to a minimum of 55?

And, since most diesel fuel in America is manufactured and delivered to the market with typical Cetane Engine Numbers of 43 to 46, how are the European diesel engines being imported into the USA markets (requiring 50+ Cetane Engine Numbers) expected to operate properly?

Obviously, Cetane Improver Additive will need to be added to diesel fuels for these European engines and for the advanced performance of American made engines. In **fact**, “off-the-record”, various diesel equipment manufacturers have voiced their a strong desire to see the American Cetane Engine Number standard increased from the current minimum 40 to a minimum 50.

But, since the petroleum refiners will not want to increase the cost of their fungible diesel fuel products, *to accomplish this task, the diesel engine fleet owners will need to press the issue at ASTM.*

POINT TEN: Finally, the **true fact** about diesel fuel additives is that petroleum refiners manufacture diesel fuels to the *required* ASTM specifications for legal sale and these specifications do not require the refiners to add diesel fuel additives. And, the petroleum refineries are not inclined to add diesel fuel additives unless they are *required* to do so to meet a *required* specification.

Additionally, the diesel fuel marketers and suppliers also are not required to add performance enhancing diesel fuel additives to the products they sell. The diesel fuel marketers and suppliers consider diesel fuel chemical additives only as marketing tools for selling their particular diesel fuels.

While some diesel fuel additives may be added at the terminal/distribution or point of sale as an inducement for making the sale, there is no guarantee the chemicals added are the right additive(s) to accomplish the desired results of the fuel user. Too often the amounts of diesel fuel additives they choose to include are minimal at best because of the competition down the street who has chosen not to add any chemicals to the diesel fuel sold.

The **real truth** is no diesel fuel sold is perfect. And, every diesel fuel manufactured will not provide the same performance in every engine operating today. Some diesel fuels may need only a small amount of improvement depending on their base crude source and the refinery processes used to make the fuel. And, some diesel fuels may need a great deal of improvement in order to provide the fuel user with the best possible performance in his diesel engine.

The **real truth about fuel additives** is that they do have an application in nearly every diesel fuel produced today and they can definitely improve the performance of nearly every diesel fuel supplied in the market.

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But, *the diesel fuel purchaser/user ultimately must take up the task of proving the claims made by the diesel fuel supplier as well as the diesel fuel additive seller. Currently, determining the performance improvements in any vehicle or fleet is the sole responsibility of the diesel fuel purchaser and the diesel fuel user.*

Gary Pipenger
President
AMALGAMATED, INC.
6211 Discount Drive
Fort Wayne, Indiana 46898
260-489-2549
www.amalgamatedinc.com

P.S. The data and statistics presented herein are only a representative sample of the multitude of lab and field testing that Amalgamated, Inc has undertaken over the past 35+ years to document and verify the validity and performance of the diesel fuel additive products it sells. Amalgamated, Inc encourages all fleet owners and diesel fuel users to test and verify the performance and compare the cost effectiveness of diesel fuel additive products BEFORE they purchase any product.