EVALUATING AFTERMARKET DIESEL FUEL ADDITIVE PACKAGES

1) Will the product measurably affect the cetane number of fuel? (Reduced cetane may cause starting difficulties, especially in cold weather, and can cause knocking and rough engine operation from ignition delay.)

- FPPF provides many products with cetane improvers. Our 8+ Cetane product is the most potent product on the market today. Our Total Power, Lubricity plus Fuel Power, Agri-Fuel, Liquid Muscle, Auto Truck and our custom formulas all contain cetane improvers. Further the use of all our other products maintain cetane levels and will not reduce cetane ratings as some other additives can.

2) Will product measurably increase the ash content of the fuel? If yes, what is the ash increase in parts per million in the fuel when the additive is blended at the maximum of 0.01 percent ash by weight which may approximate to 100 ppm. High ash levels in the fuel can cause higher rates of ring and piston groove wear that may need to be evaluated by fleets using high ash fuels. High ash can also increase the level of particulate emissions from diesel engines and may need to be evaluated to determine the impact, if any, on emissions requirements that the equipment user is required to meet. High-ash fuel may also reduce the number of miles/hours between service intervals on certain types of after treatment. On other types of after treatment, high ash fuels might reduce the life of after treatment components. Thus, before an additive is used, the impact on after treatment devices should be evaluated.

- All FPPF fuel additives will not contribute to increased ash content in fuel. Since several of our products actually enhance the combustion efficiencies of the fuel they would potentially reduce the fuel ash content.

3) Does the product contain any metallic compounds or any other elements other than hydrogen, carbon, nitrogen, or oxygen? If yes, specify compound and amount. Also, is the product EPA registered? All gasoline and diesel motor vehicle fuel additives are required to be registered in accordance with the regulations at 40 CFR 79. Lists of registered gasoline and diesel additives are available at http://www.epa.gov/otaq/fuels/index.htm (Some metallic trace elements can be beneficial as combustion catalysts and/or smoke suppressors in low concentration of just a few parts per million when blended in the fuel; any greater concentration will measurably increase total ash content as per (2) above. Some metals can destabilize fuel in storage, from particularly abrasive ash, or produce very toxic exhaust emissions; it is recommended that independent specialist advice be sought before using any additive package containing metallic compounds. Halogenated compounds (e.g. containing chlorine, fluorine and/or bromine) and sulfur compounds form highly corrosive acids at the combustion stage. These acids, when introduced into the crankcase through downward blow-by, rapidly delete the lubricating oil additive package to form sludge in addition to their corrosive effect on all metallic engine components.)
- FPPF diesel fuel and heating oil additives contain no heavy metals or metallic compounds that could potentially be harmful to engines or burners. FPPF’s gasoline additive products: Ethanol Gas Treatment and Marine Ethanol Gas, both contain a permitted amount of the only approved non-alcohol based octane booster in the United States: MMT. MMT does contain some Manganese, but the levels are well below permitted levels for both engine and environmental criteria.

4) **Will the product measurably increase the vapor pressure and/or reduce the flash point of the fuel? (If yes, this may cause an explosive safety hazard and may also be illegal.)**

- None of our fuel additives will reduce the flash point or increase the vapor pressure of the fuel significantly. Almost all our products contain high flash active ingredients and carrier solvents that do not vary significantly from pure #2 diesel fuel or heating oil. The only product that has some lower flash components is FPPF Melt Down. This is not a problem since when used as directed it will not change the overall fuel vapor pressure or flash point significantly. One interesting point, FPPF’s Melt Down actually modifies the flash and vapor pressures of the fuel significantly less than competing de-gelling products on the market today. When originally formulating Melt Down, FPPF Chemists utilized only active ingredients that minimize any potential negative effects to the fuel and engine components yet provide excellent performance.

5) **Will the product significantly change the viscosity of the fuel? (Increased viscosity may lead to incomplete combustion. Reduced viscosity may accelerate fuel pump and injector wear rates from lowering of the inherent lubricity of the fuel) See ASTM D975.**

- Viscosity is unaffected by the use of all FPPF fuel additives. Remember the treat ratio of most of our additives is 1:1000 or greater. Further our hydrocarbon based fuel additives have viscosities very close to #2 Diesel Fuel and heating oil.

6) **Will the product complex with sediment or water, either suspended in the fuel or settled in fuel tanks, to form sludge suspensions capable of plugging fuel filters and/or injectors?**

- All FPPF additives help to eliminate both water, sediment, or sludge in fuel. Further, one of the primary benefits of FPPF products is their ability to chemically breakdown complex oil based polymers formed in the fuel aging process. This slows down the oxidation of the fuel.

7) **Will the product remain indefinitely blended the fuel, or will it settle out during fuel storage?**

- All FPPF fuel additives remain in complete solution with the fuel and will not separate over time.

8) **Does the product contain gasoline or other solvent hydrocarbons that may cause detrimental side effects on equipment and may be potential safety hazards?**

- There are no gasoline or potentially harmful components in any of the FPPF diesel fuel and heating oil additives.
9) Will the product change the cold weather performance characteristics of the fuel (i.e., cloud point, LTFT, CFPP, and/or pour point)? Aftermarket additives in low dose concentrations typically do not measurably reduce the cloud point of the fuel. Cloud point additives are typically added at the refinery and not as aftermarket products. Aftermarket additives may not affect each of the remaining properties. See TMC RP 356, Cold Flow Operability of Diesel Fuel.

- FPPF winter additives are second to none for reducing the LTFT, CFPP, and Pour Point of diesel fuel and heating oil. FPPF Polar Power, Total Power, Biodiesel Winter, Fleet Formula Winter, Auto Truck Formula and HOT 4in1 additives all contain a strong antigel active component that significantly reduces the temperature at which diesel fuel and heating oil will thicken and eventually solidify.

10) Does the additive have any sensitivity to over-treat? If so, what are the consequences?

- Over treating is not a problem for FPPF additives. Generally the flash point and the viscosities of our products are very similar to diesel fuel and heating oil. The combustibility of each is also similar, and so even if ten times or more, the recommended treatment quantities were used, no ill effects should manifest.

11) Does the additive clearly state that it meets all federal and state regulations for ultra low-sulfur diesel (ULSD)? Sulfur content of ULSD is limited to less than 15 ppm by law for use in diesel motor vehicles. Improper use of an additive with greater than 15 ppm sulfur content may result in a non-complying diesel fuel.

- Yes, all FPPF additives meet the requires 15 PPM maximum with only one exception our fuel biocide; Killem. Killem is a EPA registered fuel biocide that can be used in all hydrocarbon based fuels including diesel fuel, heating oil, gasoline, bunker fuels and more. The treat ratios are extremely low and are specified on all containers as required. The PPM of sulfur in Killem is greater than 15. Conversely due to its extremely low treat ratio requirement, Killem will only augment fuel sulfur content less than one PPM. If you have any questions on this, please contact us.

12) Does the product contain a lubricity additive and if so, is it compatible with the engine oil and will the additive measurably improve the HFRR lubricity performance of the fuel? See ASTM D 6079, High Frequency Reciprocating Rig (HFRR) Test. (See Table 1.)

- Several of the FPPF fuel additives contain lubricity improvers. Lubricity plus Fuel Power, Fuel Power, Lubricity 100%, Total Power, Polar Power, Agri-fuel, Auto Truck and Liquid Muscle all contain varying amounts of lubricity additive. FPPF primarily uses a complex synthetic lubricity enhancer that provides the most effective lubricity enhancement with a minimal chance of filter plugging or sludge formation.
13) Does the additive contain antioxidants and a stability additive? These will help stabilize the fuel, prevent fuel degradation and prevent peroxide build up in ULSD and Biodiesel. ULSD is relatively stable, but peroxide formation may occur and cause embrittlement of elastomers and rubber seals. Additives that contain antioxidants can prevent peroxide build up. Refer to ASTM D 975 and ASTM D7467.

- FPPF fuel additives contain stabilizers that help to keep fuel fresh over time. One of the most important features of a sound fuel stabilizing package is the inclusion of powerful anti-oxidation chemistry. FPPF’s premier stabilizer product is our Super Fuel Stabilizer that contains a metal deactivator, oxygen and thermal breakdown blockers and chemical cuppling agents. Other FPPF products with stability enhancers include Fuel Power, Total Power, Lubricity Plus Fuel Power, Agri-Fuel Treatment, Marine Diesel, Liquid Muscle and others.

14) Does the product contain sufficient corrosion inhibitor? As fuels are more severely hydro-treated, they tend to become more corrosive. Fuels have less corrosion protection as they move downstream through pipelines. The use of a corrosion inhibitor should be considered if issues have been identified.

- Some corrosion inhibitors are put in diesel fuel at the refiner. Additionally Fuel Power acts as a corrosion inhibitor. Since it is included in formulation of several of our other products (Fuel Power, Polar Power, Total Power, Lubricity Plus Fuel Power, HOT 4in1, and others) they have an added benefit of reducing potential corrosion. FPPF's Super Fuel Stabilizer and Custom Formulas, Fleet Formula and Total Power, also contain added corrosion inhibiting chemistry.

15) Is the additive compatible with biodiesel blends of fuel? For what percentage of biodiesel (B2, B5 or greater) is the product rated?

- All FPPF products can be used effectively with biodiesel and biodiesel/diesel fuel blends. Further we have two products formulated specifically to improve biodiesel fuels: FPPF Biodiesel Fuel Power and Biodiesel Winter Formula. Both products contain biodiesel stabilizers and the winter product contains biodiesel anti-gel. These products also provide all the benefits of our non biodiesel specific products.

16) Does the additive affect the verification of any device, retrofit or original equipment, by any governmental regulatory body?

- A simple no on all counts here. Our products have no effect on verification equipment.

17) Does the additive affect warranty? Does the amount of water @ 200 ppm affect warranty? Check with engine manufacturer for water contamination allowances.

- None of the FPPF products violate engine warranties, they only improve the fuel.
18) What is the treat ratio? Does the label clearly state the correct amount of treatment needed per gallon?

- Yes all FPPF product labels clearly note the recommended treat ratio and all options for enhanced fuel treatment.

19) Does the additive emulsify or demulsify? It may suppress water to the bottom, to the fuel/water separator or through the fuel filter.

- This question is product specific. FPPF products containing Fuel Power encapsulate water, but technically are not true emulsifiers (Please refer to our “Water Elimination Technology in Fuel” bulletin (11/15/15) For more details, call us and we will send you a copy.
- Fuel Power and all products containing Fuel Power work effectively with all engines and are compatible with the latest technologies including DPF and Reger Technology. They actually enhance the operation of both, (see our tech memo on this Subject dated 4/15/16) FPPF does produce products that could be classified as de-emulsifiers. This list includes Liquid Muscle, Diesel Injector Cleaner, 8+ Cetane and Lubricity 100%.

In summary, if you have questions regarding the functionality of any FPPF products, please call us at 1-800-735-3773 or look us up on the web.