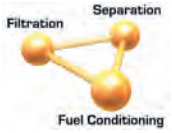
TABLE OF CONTENTS

AFC-705
Fuel Catalyst



AFC-705 Fuel Catalyst is a unique and powerful, broad-spectrum fuel additive concentrate for use in Diesel, Biofuels, Gasoline, Kerosene and HFO. Including AFC-705 as part of a preventative fuel maintenance program, in combination with good housekeeping, will stabilize your fuel, prevent sludge build-up and eliminate the need for expensive and toxic biocides. Regular use of AFC-705 Fuel Catalyst will help guarantee **Optimal Fuel Quality at All Times**.

AFC-705 features:

- Cleans Fuel, Storage Tanks & Injection systems
- Improves Combustion, Lowers Emissions & Fuel Consumption
- Removes & Prevents Carbon Build Up and Corrosion
- Adds Lubricity and Inhibits Corrosion
- Extends Lube Oil & Equipment Life
- Optimizes Engine, Generator & Boiler Efficiencies
- Reduces Harmful Emissions, Soot & Particulates (CO, HCs, NOX, SOX, VOCs, Carbonyls, PAH)

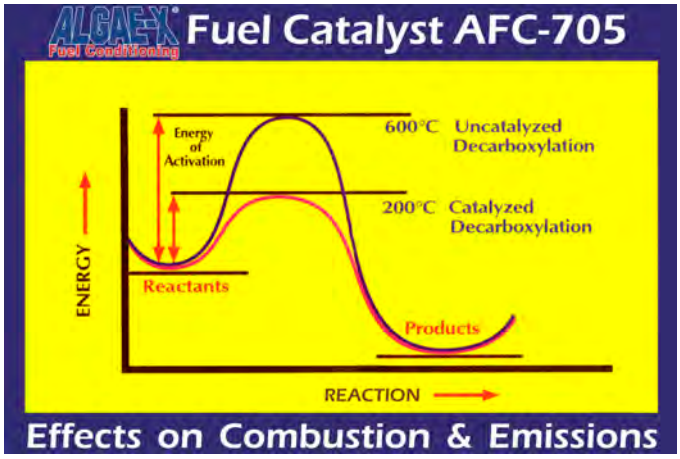
Using AFC-705 accelerates tank cleaning and fuel restoration processes. It enhances the breakdown and removal of sludge, slime and bio-fouling from tank walls and baffles that are difficult to access. AFC-705 effectively decontaminates and cleans the entire fuel and injection system and continues to work in storage tanks, cleaning and stabilizing fuel for 6 months or longer

AFC-705 SPECIFICATIONS

Active Ingredients	Combustion Catalyst, Surfactant, Dispersant, Corrosion Inhibitor, Lubricity Enhancer
Treatment Ratio	1:5000
8 oz. Bottle	320 Gallons
1 Gallon Jug	5,000 Gallons
5 Gallon Jug	25,000 Gallons
55 Gallon Drum	275,000 Gallons

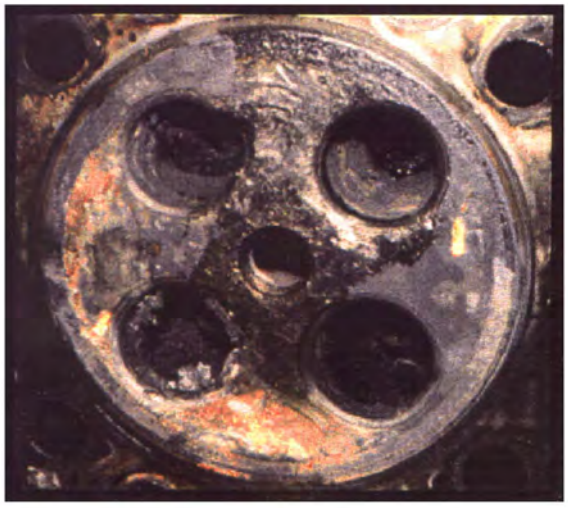
Wherever fuel is being used or stored

AFC-705 MONEY SAVING TECHNOLOGY

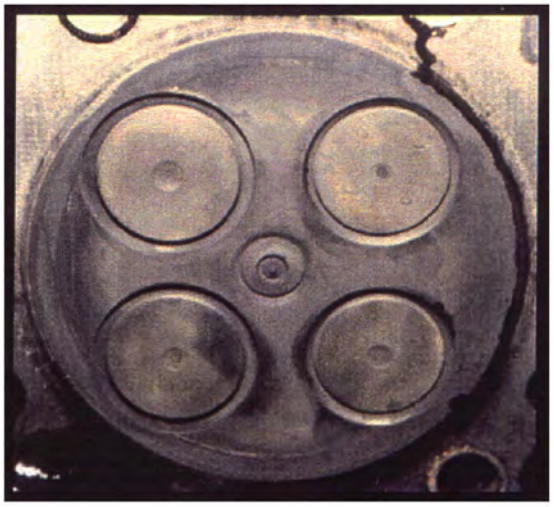


Clean Engines Save $$

Combustion chamber deposits are rapidly modified and removed during operation with AFC 705 treated fuel. Deposits removal reduces fuel consumption, oil consumption, emissions and maintenance costs.



Caterpillar D348 777 diesel engine head after 13,260 hours of continuous operation with **untreated** Fuel



Caterpillar 3408 diesel engine head after 13,788 hours of continuous operation with **AFC 705 treated** Fuel

INTRODUCTION

AFC-705 is a **High Performance, Full Spectrum Additive Package Concentrate**.
It combines combustion surface modifiers with lubricity enhancers, corrosion inhibitors, surfactants and dispersants. This unique formulation removes and prevents carbon-based deposits in the combustion chamber, eliminates microbial contamination, clogged filters, and the build up of sludge in fuel storage and delivery systems.

The **immediate results** of using **AFC-705** are:

1. Cleaning and decontaminating the entire fuel system.
2. Lowering fuel consumption by 5 to 10%.
3. Reducing harmful exhaust emission.
4. Engines run better and smoke less.

The **AFC-705** surfactant and dispersant components **break down and dissolve sludge and organic debris** in fuel tanks and filter systems. A very small dosage of AFC-705 decontaminates the entire system, restores fuel quality, and eliminates the need for costly tank cleaning procedures and disposal fees.

The use of AFC provides Optimal Fuel Quality, clean tanks and filter elements.
It reduces operating cost, maintenance and downtime while extending equipment life.

The **AFC-705** combustion catalyst promotes the **removal of carbon deposits** in the combustion chamber. AFC treated fuel burns cleaner, more completely and will prevent the formation of new deposits. New engines stay clean while older engines become clean.

The complete elimination of deposits in the combustion chamber can **more than double engine life**. There is less wear on the engine parts and oil stays clean much longer. During inspection disassembly, a simple wipe down with a shop cloth shows that engine parts still look brand new. Machining marks and serial numbers are often clearly visible.

AFC-705 is **extremely cost effective** technology. It is designed to decontaminate the total fuel system, enhance combustion and fuel economy, while reducing harmful emissions, without spending a dime on redesigning engines or retrofitting refineries.

AFC-705 extends the life and performance of all equipment, such as, Engines, Turbines, Boilers, etc. using hydrocarbon based fuels like **diesel, gasoline, bio-diesel, HFO, hydraulic oil, turbine and kerosene fuels.**

THE BENEFITS OF AFC-705

The benefits of using **AFC-705 Fuel Catalyst** are derived from its unique formulation of dispersants, surfactants, combustion enhancers and deposit surface modifiers, targeting problems of contaminated fuel systems in storage tanks and deposits in engines, turbines and burners.

Remove engine deposits. AFC-705 combustion catalyst removes deposits by interacting with the surface of the deposit, lowering the energy of activation of its chemical bonds.
This allows the release of carbon in the form of $C0_2$ at the lower temperatures.

Prevent deposit formation. The **AFC-705** catalytic components inhibit the agglomeration process from forming heavy deposits. The agglomeration process is stopped at the primary and secondary particle formation phase, which results in smaller, lighter particles.

Reduce fuel consumption. Deposits in the combustion chamber absorb and protect the fuel from complete combustion. AFC-705 catalyses the combustion process. It destroys and removes deposits, which leads to the more efficient conversion of the fuel to $C0_2$. The surfactant component in AFC reduces the fuel droplet size, which enhances the combustion process, burning a higher percentage of the fuel before the exhaust valve opens. AFC treated fuel immediately reduces fuel consumption by 5 to 10 %.

Reduce Emissions. As deposits are removed, the emissions of CO, NO_x, SO_x, HC and particulates are drastically reduced.

Reduce carbon content of ash. The catalyst interferes with the agglomeration of combustion by-products by enhancing $C0_2$ production. With less carbon available to end up in the ash complex, the amounts of ash or soot will be significantly reduced.

Cooler Exhaust, Lower NOx. Fuel has a limited amount of energy that becomes available during combustion through the production of $C0_2$. The catalytic components in **AFC-705** enhance the combustion process. When more of the fuels' energy is released during the combustion phase, less energy will be available to be released during the exhaust phase. The difference in energy release correlates to a temperature difference. Higher energy release in the combustion chamber means lower energy release during the exhaust phase which results in lower production of NO_x.

Extend lube oil life. AFC-705 treated fuel produces smaller and less abrasive particles, which in connection with the removal of deposits, result in cleaner, longer lasting lubrication oil, and leads to reduced engine wear, less maintenance and down time, lowering operating cost.

Extend Equipment life. Engine life can be more **than doubled** as the result of complete deposit removal, cleaner oil and reduced friction. Injectors, valves, rings and other associated parts show little sign of wear, even after extended use.

Enhance fuel lubricity with the **AFC-705's** Lubricity Enhancers.

Inhibit corrosion with the AFC-705 Corrosion Inhibitor.

TANK CLEANING WITH AFC-705

AFC-705 . . . it comes in a bottle and cleans your tank

One gallon of AFC-705 completely cleans a full 5000 gallon fuel tank. This full spectrum additive package cleans the entire fuel system, restores fuel quality and provides Optimal Fuel Quality for engines and storage tanks, improving fuel economy, reducing emissions and lowering operating cost, maintenance and down time.

We all agree that most engine failures originate in the fuel tank. Frequent filter changes, fuel dialysis and tank cleaning are generally viewed as good house keeping, and have become accepted as standard periodic maintenance.

The normal aging process of the fuel is often accelerated by microbial contamination, chemical incompatibility and condensation of water in the system. Oxidation, polymerization and stratification will lead to darkening of the fuel, the build up of tank sludge, filter plugging, corrosion, and fuel breakdown. We will see a slimy, jelly like layer develop in the water fuel interface, while a bio film is growing on the bottom, walls and baffles of service and storage tanks, inside fuel lines and delivery systems.

The process of fuel breakdown is most severe in the bottom of our tanks. Every time we fill our tanks, we mix and contaminate the fresh fuel with our residual fuel, and add new oxygen, which accelerates the problem. Because we primarily use the higher and therefore dryer layers of the fuel, it is easy to overlook the symptoms of this continuous process of fuel breakdown.

Suddenly we get a wake up call, and experience some or all of these symptoms:
-- clogged filters -- fouled and corroded injectors -- smoking engines -- loss of power and RPMs -- fuel pump problems -- and, ultimately complete engine failure. All of this can be **prevented by** simply monitoring fuel quality, and using the available **ALGAE-X technology.**

The surfactants and dispersants in AFC-705 break down and dissolve the tank sludge and bio-film. It eliminates clogged filter elements and recovers the BTU value that would otherwise be lost.

Traditionally tank cleaning meant filtering the fuel in the tank, or removing the fuel for filtration, or complete fuel disposal often in conjunction with opening the tank and physically removing tank sludge and bio-film. All these techniques are time consuming, costly and only partially effective in particular when we realize that filtration will only remove the suspended debris and has no effect on the bio-film growing on tank walls, bottom and baffles, or on the process of fuel break down. **At best we can expect only temporary relief at an extremely high price.**
ALGAE-X International provides Complete Solutions for Optimal Fuel Quality.

1. LG-X Inline Magnetic Fuel Conditioner
2. AFC-705 Algae-X Fuel Catalyst

We recommend the use of AFC-705 to completely decontaminate and clean the entire fuel system, with the simultaneous installation of an inline ALGAE-X Fuel Conditioner to insure continuous Optimal Fuel Quality, enhanced combustion, and reduced emissions.

The AFC catalyst enhances and complements the effects of the ALGAE-X inline magnetic fuel conditioner, and reduces fuel consumption by at least an extra five to ten percent.

When fuel economy is of primary importance the continued use of AFC-705 is strongly recommended in conjunction with the installation of an Algae-X inline magnetic fuel conditioner, LG-X or FC Series device.

LUBRICITY ENHANCER & CORROSION INHIBITOR

In low sulfur fuel, many of the fuel components that contribute to the lubricating properties of the fuel have been removed. The components used to formulate the lubricity enhancers in **AFC-705** work to offset these lower lubricating properties in two different ways, and over two different temperature ranges.

A. The **first component** works by **coating the surfaces with a protective lubricating film**. This film also acts as a **corrosion inhibitor**, which keeps the parts clean and free of pits. The film works best at lower temperatures up to about 300^{O}C, and is constantly being replenished as it is broken down by friction and heat.

B. The **second component** breaks down **large abrasive particles into smaller smoother particles**. This component works at temperatures higher than 200^{O}C, and continues to work in conjunction with the combustion catalysts once it enters the combustion chamber.

The two components together address corrosion, lubrication and friction problems over the entire engine operating temperature range, and inhibit the formation of acids. **AFC-705** lubricity enhancers will not change the fuel specifications in any way. The sulfur content, BTU value and other specifications will remain unchanged.

The principle benefit of **AFC-705** lubricity enhancers is the **extended life of engine parts that rely on the fuel for lubrication**. Keeping these parts operating normally, solves many of the problems related to switching from a regular to a low sulfur diesel fuel. A small increase in available power will be noticeable, due to lower friction.

Engine parts will be more resistant to **acid corrosion** and will show less wear due to carbon grit. As a result, engine lubricating oil will stay cleaner much longer. The mineral content, carbon grit, and acid forming compounds in the oil will be much lower. **AFC-705** lubricity enhancers will not interfere with crankcase oil additives. Instead, they may actually help them to do a better job.

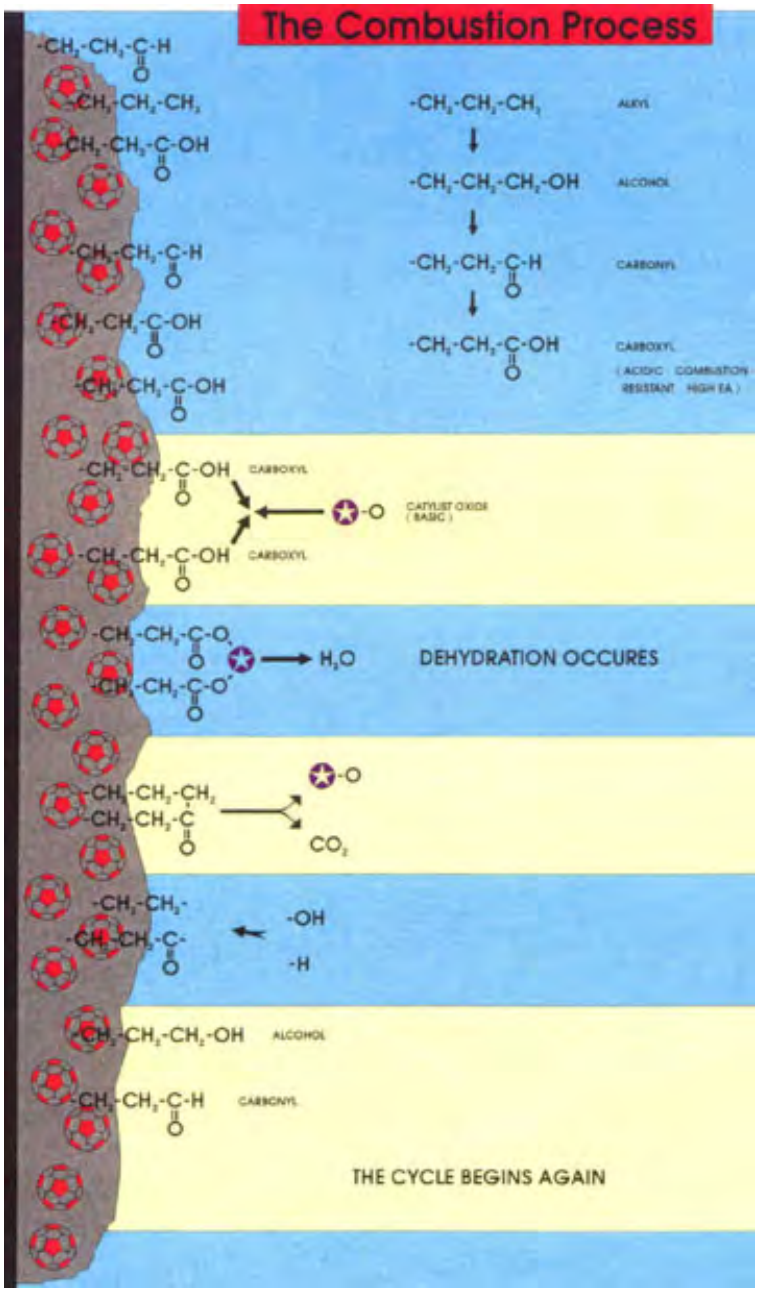
As in any maintenance situation, the effectiveness of **AFC-705** lubricity enhancers does not replace good maintenance practices. However, its use will significantly reduce maintenance requirements and down time, while extending equipment life.

The use of **AFC-705** is highly recommended, in particular in situations with low sulfur, or low lubricity fuel. The lubricity enhancer, and corrosion inhibitor package in the catalyst are designed, to improve engine performance, and increase the life of key engine parts, while saving in fuel and reducing harmful emissions.

EFFECTS OF AFC-705 ON COMBUSTION PROCESS

The ALGAE-X® catalyst complex interacts with the heavier, long chain, combustion resistant elements of the fuel, and existing carbon deposits. This interaction allows these deposits to break down and burn. The "molecular atomization" of the fuel, and the destruction and burning of the surface deposits produce the following positive effects on the combustion process:

Quicker, more complete combustion.
Optimal use of available oxygen.
Lower excess air requirements.
Removal of existing deposits
Better heat transfer.
Lower fuel consumption.
Increased overall efficiency.



EFFECTS ON COMBUSTION BYPRODUCTS

AFC 705 enhances the combustion process, which leads to the following positive effects on combustion byproducts:

Inhibition	of new deposit formation
Removal	of old carbon deposits
Prevention	of new deposit formation
Decrease	- fuel consumption
	- particulate, smoke and soot
	- NOX, SOX, CO, and VOC emissions
	- Carbon content in the ash
	- fouling and corrosion due to decrease V205 activity
	- cold-end corrosion due to decreased SO3 formation

These effects lead to a significant increase in energy output by burning a larger portion of the Carbon available in fuel, and an important reduction in corrosion due to much lower formation of SO_3, which increases the amount of SO_2, harmlessly captured in ash.

HOW AFC-705 WORKS ON DEPOSITS

The Deposit Removal Mechanism

Combustion Deposits are mostly carbon and aromatic compounds in a highly combustion resistant state. These deposits are the source of many engine problems, such as higher than normal fuel consumption, excessive harmful exhaust, and costly maintenance. Fuel problems and incomplete combustion ultimately cause complete engine failure.

Deposit formation begins with spherical molecules called primary particles and branched aromatic chains, both of which are produced in the early stages of combustion. The chain branches consist of alkyl, alcohol, carbonyl and carboxyl compounds. The alkyls oxidize to alcohol, oxidizing to carbonyl, oxidizing to carboxyl. The oxidation process stops with the carboxyl compounds, which are acidic and highly combustion resistant with a **high energy of activation**.

The various branch compounds are attracted to the primary particles, which spin at extremely high velocities. When a branch becomes attached to a primary particle, the entire chain structure is quickly wrapped around the primary particle forming a secondary particle. These secondary particles agglomerate and form a tertiary particles. This can happen when several primary particles become attached to the same chain on different branches, and then simultaneously become secondary and tertiary particle, as they wrap up the chain.

Tertiary particles agglomerating on a surface will become further coated to form quaternary particle. **The coated quaternary particles make up deposits**. The chain structures coating the surface of deposits leave exposed branches. It is at these branches where **AFC-705** catalyst begins to break down and destroy the deposits as it modifies the surfaces.

The carboxyl branches are **acidic**, and attract the **AFC-705** catalyst oxide which is **basic**. When the two combine a process called dehydration occurs and a water molecule is produced. What remains is a compound with a low **energy of activation**, which readily breaks down at high temperatures, releasing a CO2 molecule and the catalyst oxide.

Upon releasing the CO_2 and the catalyst oxide, the end of the chain re-oxidizes to an alkyl, alcohol or carbonyl compound and finally to a carboxyl compound. When the end of the chain reaches this state, the catalyst oxide once again combines with the carboxyl, and starts the break down cycle again. Over time, the deposits are removed by being converted to CO_2 and water.

AFC-705 inhibits the formation of new deposits in much the same way as it destroys existing deposits. It interacts with the ends of the aromatic chains and the attachment sites on the primary particles. This interaction keeps the primary particles from wrapping up full chains, by blocking or destroying the attachment sites, and/or breaking the chains.

This interference stops the deposit agglomeration process at the primary and/or secondary particle agglomeration state. This results in much lighter and smaller particles that don't stick together and are more easily oxidized. The result of this interference is a lower mass of particulate emissions, and instead an increased energy output, and increased production of CO_2 and water, which are the desirable end products of the combustion cycle.

Deposits are the major source of emissions. Eliminating deposits lowers the production of soot and smoke. The use of AFC-705 enhances energy output and optimizes the production of CO_2 and water during the entire combustion process, which significantly lowers the output of both regulated and unregulated emissions.

ELIMINATING COMBUSTION DEPOSITS

AFC-705 technology is based on the catalytic effects of organo-metalics. The main active ingredients are synergistic, multifunctional combustion catalysts containing combustion surface modifiers and deposit surface modifiers. AFC-705 can be used with any liquid hydrocarbon fuel such as gasoline, diesel, residual fuel and HFO.

In an **AFC-705** treated environment, the surfaces of the fuel particles and deposits are modified such that the catalyst lowers the **energy of activation** of the deposit surfaces. The modified surface deposits can then burn up at a much lower temperature.

A typical engine develops a temperature gradient ranging from 200°C at the combustion chamber wall, to 1200°C in the combustion center. Many of the fuel components require a higher temperature than 600°C to combust. It is not possible to completely burn heavy fuel components in temperatures ranging from 200° – 600°C. Incomplete combustion forms the deposits, harmful emissions, and the consequential mechanical problems.

Combustion chamber deposit surfaces and fuel particles treated with **AFC-705** begin to combust at temperatures as low as 200°C and then burn over the entire temperature range. This results in complete combustion and eventually in the total removal of all engine deposits, while at the same time preventing new deposit buildup. Complete combustion leads to better performance, lower fuel consumption, lower emissions (CO, SO_x, NO_x, HC's and PM-10), lowering operating cost, maintenance and downtime.

The process of deposit removal begins immediately, and can take up to 600 hours or 4,000 miles. The actual time needed depends on operation, history, and age of the equipment. **AFC-705** treated fuel completely removes the deposits from fuel injectors, intake and exhaust valves, and other exposed combustion chamber parts of dirty engines, while preventing deposits in new engines.

In older engines the use of **AFC-705** treated fuel is even more pronounced than the new ones. The performance of new engines will not degrade and maintenance will remain at a minimum. A gasoline engine will not experience an octane requirement increase.

Fuel treated with **AFC-705 Combustion Catalyst** burns completely so that new engines stay clean, and older, dirty engines become clean. **AFC-705** is the most cost effective way to conserve energy and protect the environment while enhancing performance and engine life.

AFC-705 is available in 8oz bottles, 1 gallon containers, 55 gallon drums or by various sizes of tank trucks and rail cars.

AFC-705 treatment ratio is 1:5,000.

THE EFFECTS OF AFC-705 ON SO_X

The treatment of carbon based fuels with AFC-705 has a significant effect on trace sulfur combustion chemistry. In diesel engines, gasoline engines and open flame applications (boilers) the use of AFC-705 treated fuel will significantly reduce sulfur oxide (SO_X) emissions, and related sulfur acid corrosion problems.

AFC-705 does not react with the sulfur in the fuel nor does AFC-705 have any effect on the sulfur content of the fuel. AFC-705 does not effect fuel specifications at recommended treatment levels. Fuel containing one percent sulfur prior to AFC-705 treatment will still contain one percent sulfur after AFC-705 treatment. However, the use of AFC-705 will determine where the sulfur ends up and what its chemical state will be after combustion.

The combustion of sulfur in fuels invariably leads to the formation of sulfur dioxide $S + O_2 \rightarrow SO_2$ (1) and sometimes sulfur trioxide $2SO_2 + O_2 \rightarrow 2SO_3$ (2). Sulfur trioxide formation is catalyzed by vanadium pentoxide (V^{5+}). This is the most stable oxidation product of vanadium, when vanadium containing fuels are burned in air $4V + 5O_2 \rightarrow 2V_2O_5$ (3). The catalytic effect is thought to relate to the reversible dissociation $2V_2O_5 \rightarrow 2V_2O_4 + O_2$ (4) at temperatures between 700^O-1125^O C. The sulfur trioxide reacts with water vapor to form sulfuric acid $SO_3 + H_2O \rightarrow H_2SO_4$ (5) which is primarily responsible for acid corrosion problems in combustion equipment.

AFC-705 affects the production of gaseous SO_X emissions. It enhances the formation of CO_2 during the combustion phase thus limiting the amount of SO_X produced during the exhaust phase. The increased production of CO_2 reduces the amount of excess O_2 available for other reactions. The difference in the amount of CO_2 produced during the combustion and the exhaust phases correlates to a temperature differential. This temperature differential results in lower exhaust temperatures and shorter heat transfer times.

Minerals contained in fuel are generally oxidized to metal oxides during the combustion process. When vanadium is oxidized to V^{5+} the production of sulfur trioxide increases due to reversible dissociation, and sulfuric acid is ultimately formed. The use of AFC-705 inhibits the formation and reversible dissociation of V^{5+} during the exhaust phase by limiting the available O_2, high temperatures, and time periods needed for these reactions to occur.

This greatly reduces the catalytic effect V^{5+} has on the formation of Sulfur trioxide and thus the formation of sulfuric acid. By reducing the catalytic effect of vanadium, AFC-705 promotes the combination of SO_X compounds with other minerals in the fuel such as Na and Ni. This leads to the formation of stable mineral salts and mixed mineral sulfates found in the clinker or fly ash.

In this manner, **AFC-705 decreases the gaseous sulfur emissions** by increasing the particulate portion of the combustion residue products. AFC-705 treated fuels will therefore show slightly higher sulfate content in the ash than untreated fuel.

THE EFFECTS OF AFC-705 ON NOX

The **formation of NOX** takes place when combustion **temperatures reach above 2500 °F** and **pressures are the highest**. This especially occurs when the engine is under high load or wide open throttle. NO_X formation is influenced by available **excess oxygen**, **time**, and **deposit buildup**.

AFC-705 significantly **lowers the amount of NOX** production in internal combustion engines and open flame boilers.

This reduction correlates with **combustion deposit removal**. Carbon deposit build up in the combustion chamber causes higher compression. This directly affects the factors responsible for the formation of NO_X supports a direct connection between NO_X emissions and deposits. This connection is supported by the fact that clean engines using AFC-705 treated fuel produce lower amounts of NO_X. The process by which AFC-705 inhibits the formation of NO_X is a direct result of the process by which it removes existing and prevents the formation of new deposits, namely through the promotion of CO_2 production.

AFC-705 affects the three main factors enhancing the formation of NO_X. Fuel has a finite amount of energy, which is released through the production of CO_2. AFC-705 promotes the formation of CO_2 during the combustion phase. If more CO_2 or energy is produced during the combustion phase then less is available to be released during the exhaust phase. The difference in the amount of energy released during the two phases correlates to a temperature differential. This temperature differential, its magnitude and cause are important for three reasons.

Lower exhaust temperature. If the temperature of the combustion phase rises due to increased CO_2 production then the temperature of the exhaust phase will go down. This denies the nitrogen molecules the high temperatures needed to form NO_X compounds. Lower temperatures slow down the production of NO_X by requiring more time for the reactions to take place. The greater the amount energy released during the combustion phase and the associated lower exhaust gas temperature the lower the rate of NO_X production will be.

Shorter heat transfer time. The greater the magnitude of the temperature difference, the shorter the heat transfer time becomes. Increase in heat transfer to the surrounding engine components during combustion will decrease exhaust temperature and time for the conversion of nitrogen to NO_X compounds. The shorter the heat transfer time the lower the NO_X emissions.

Oxygen depletion. Increasing the production of CO_2 uses up more of the available oxygen. AFC-705 promotes the production of CO_2 during the combustion phase, lowering oxygen availability for NO_X reactions during the exhaust phase. Less available oxygen results in lower NO_X emissions

The combination of lower exhaust temperatures, shorter heat transfer time, less available oxygen, and the complete removal of carbon deposits cause a very significant reduction of NO_X emissions.

THE EFFECTS OF AFC-705 ON LOW SULFUR FUELS

In the past few years, the sulfur content of diesel fuel has become a major concern due to its contribution to SO_X emissions, especially SO_3, which combined with water forms acid. This has led to legislation requiring the removal of all but .05% of the sulfur in all diesel fuel used in over the road applications as of October 1, 1993. And new regulations will lower allowable sulfur content even more.

Although sulfur itself does not contribute to the performance of a fuel, the fuel components removed together with the sulfur to produce a low sulfur fuel did. These other fuel components have a BTU value, and give the fuel its lubricating properties. The latter is important since many engine manufacturers use the fuel itself to lubricate the fuel pump and other engine parts that come in contact with the fuel. These same components also provide an important portion of the total energy content of the fuel.

Low sulfur fuels have a lower BTU value, a lower lubricity factor and present significant problems for fuel producers and users alike. In the refining process, considerable amounts of extra work are required to remove the sulfur. The process may require extensive re-tooling of the refinery, which translates into a significant cost increase for the end user. The result is a lower energy yielding fuel at a higher cost.

Cost increase is not the only problem the end user will experience. There will be an immediate drop in fuel economy of about 3 to 7%, and a considerable loss of power resulting from the lower BTU value. Because of the reduced lubricating properties of the fuel vital engine parts will wear out more quickly, this can be noticeable in as little as one or two months. The reduction in lubricity will also contribute to a loss in usable power due to the increased friction the engine will have to overcome. Even a perfectly tuned engine will experience a noticeable drop in efficiency.

The traditional solution has been to add lubricity and anti-wear additive packages to the fuel. AFC-705 contains a premium lubricity and anti-wear additive package correcting the friction and wear problems.

New legislation offers another alternative. If it can be shown that a higher sulfur content fuel (.1-.2% sulfur content) can meet the emission standards of a lower sulfur fuel, being mandated for use in a particular area, then a waiver can be received for the use of that fuel. The benefits are that higher sulfur fuel will be easier to manufacture, less expensive to buy, and offer better fuel economy than the low sulfur fuel.

One may qualify to obtain a waiver by treating the higher sulfur fuel with AFC-705 Fuel Catalyst. AFC-705 will decrease the emissions of SO_X by catalyzing reactions between the sulfur and minerals in the fuel thus converting the combustion products of sulfur to harmless solid sulfur salts found in common soil and rock. A higher concentration of sulfur may therefore be present in the fuel while resulting in constant or lower SO_X emissions when compared to a reference low sulfur fuel.

AFC-705 also increases fuel economy of engines, turbines and burners. Lower fuel consumption to obtain the same energy output, immediately translates into lower overall emissions.

AFC-705 keeps the engine clean and free of deposits, which lowers maintenance and operating cost. The lubrication oil of engines using AFC-705 stays significantly cleaner and last much longer. Regardless of the type of fuel used, AFC-705 treated fuel will perform better than non-treated fuel. The results will always be immediately evident.

The cost of AFC treated fuel will always be significantly less than the cost of using low sulfur fuel.

In all applications, AFC-705 more than pays for itself. It saves money, and enhances your bottom line.

AFC 705 IN FUELS CONTAINING VANADIUM AND SULFUR

Crude oils from Alberta, Canada and from Venezuela contain considerable amounts of dissolved vanadium oxides. Normal refinery practice does not provide for the removal of these vanadium oxides. In fact, a major source of commercial vanadium is derived from the fly ash from burning Canadian crude.

In an engine where there is no catalysis for the fuel combustion, unused oxygen can cause the vanadium (oxidation state of three) to be oxidized to vanadium pentoxide, V_2O_5. This V_2O_5 can be a problem in itself because it deposits as a hard coating on the surface on the combustion chamber walls. Under many circumstances it has to be manually chiseled off.

If an engine is already damaged by vanadium deposits (V_2O_5) it is unlikely that AFC 705 can burn off these deposits. Whereas, if the deposits were carbon, adding AFC 705 to the fuel will definitely burn off these carbon deposits.

In addition, the presence of V_2O_5 can catalyze the transformation of sulfur dioxide, SO_2, to form sulfur trioxide, SO_3. This is important because sulfur trioxide (SO_3) and water gives the highly corrosive sulfuric acid.

Since water is one of the products of hydrocarbon combustion, much damage occurs to all metal parts of the combustion chamber and the exhaust system, resulting from the acid that is produced when vanadium is in the fuel.

The use of AFC 705 results in the complete use of the oxygen present in combustion, leaving little or no oxygen to oxidize the mixed vanadium oxides to the V_2O_5. By using up all the available oxygen to burn the fuel completely, there is little or no oxygen left over to oxidize the SO_2 to SO_3 whether V_2O_5 is present or not.

In new engines and boilers, the use of AFC 705, will significantly diminish the formation and deposits of V_2O_5, and therefore prevent production of SO_3 and the resultant acids. This clearly and significantly diminishes engine damage caused by acidic corrosion.

As a result, engine life and overhaul cycles will be dramatically extended, while engine maintenance, down time, and overall cost of operations will be significantly reduced. The cost of ALGAE-X AFC 705 is more than justified on the basis of its effect on preventing the oxidation of the vanadium oxides and sulfur which are very difficult to remove from fuels.

THE EFFECT OF AFC-705 ON FUEL SPECIFICATIONS

Data from independent testing laboratories using ASTM procedures demonstrate that AFC-705 fuel treatment does not significantly change any of the commonly accepted fuel specifications. The data shown below are representative of AFC-705 at the recommended 1:5,000 treatment ratio in a baseline #2 diesel fuel. The data in this report is within the limits of uncertainty as specified in the reference methods.

The data in the following table confirms that AFC-705 fuel treatment does not cause any fuel instability nor are there any significant changes in fuel specifications, which would cause the fuel to be harmful to an internal combustion engine or any other combustion equipment. The use of AFC-705 treated fuels will not void equipment warranties.

TEST DESCRIPTION	FINAL RESULT - BASELINE	FINAL RESULT – TREATED	LIMITS/* DILUTION	UNITS OF MEASURE	TEST METHOD	DATE
ASTM D-86 DISTILLATION			*1		ASTM D-86	10/06/93
Initial Boiling Point	340	344	1	Deg. F	ASTM D-86	
05% Evaporated Temperature	424	420	1	Deg. F	ASTM D-86	
10% Evaporated Temperature	453	452	1	Deg. F	ASTM D-86	
15% Evaporated Temperature	471	469	1	Deg. F	ASTM D-86	
20% Evaporated Temperature	485	483	1	Deg. F	ASTM D-86	
30% Evaporated Temperature	509	509	1	Deg. F	ASTM D-86	
40% Evaporated Temperature	528	528	1	Deg. F	ASTM D-86	
50% Evaporated Temperature	548	548	1	Deg. F	ASTM D-86	
60% Evaporated Temperature	565	565	1	Deg. F	ASTM D-86	
70% Evaporated Temperature	584	582	1	Deg. F	ASTM D-86	
80% Evaporated Temperature	606	604	1	Deg. F	ASTM D-86	
90% Evaporated Temperature	633	631	1	Deg. F	ASTM D-86	
95% Evaporated Temperature	659	656	1	Deg. F	ASTM D-86	
End Point	673	672	1	Deg. F	ASTM D-86	
% Recovery	97.9	97.9	0.1	Vol. %	ASTM D-86	
% Residue	1.6	1.5	0.1	Vol. %	ASTM D-86	
% Loss	0.5	0.6	0	Vol. %	ASTM D-86	

TEST DESCRIPTION	FINAL RESULT – BASELINE	FINAL RESULT – TREATED	LIMITS/* DILUTION	UNITS OF MEASURE	TEST METHOD	DATE	TECH.
Acid Number	0.002	0.002	0.002	mg KOH/g	ASTM D-664	10/06/93	DD
Ash Content, Routine	<0.001	<0.001	0.001	Wt%	ASTM D-482	10/07/93	DD
Gross Heating Value	19201	19110	1	BTU/lb	ASTM D-240	10/04/93	QE
Sulfur by X-Ray Spectro-photometry	0.039	0.039	0.005	Wt%	ASTM D-4294	10/05/93	PCW
Pour Point	15	20	-60	Deg. F	ASTM D-97	10/07/93	MQ
Cloud Point	14	18	-40	Deg. F	ASTM D-2500	10/07/93	MQ
Gravity, API @ 60 Deg F	31.9	31.9	-20	Deg. API	ASTM D-287	10/04/93	PCW
Conradson Carbon	0.04	0.04	0.01	Wt%	ASTM D-189	10/02/93	QE
Copper Strip Corrosion	1a	1a			ASTM D-130	10/02/93	PCW
Flash Point, PMCC	142	142	70	Deg. F	ASTM D-93	10/05/93	QEW
Cetane Number, Neat	43.6	44.3	20	Cetane #'s	ASTM D-613	10/31/93	FB
Water, Karl Fischer	65	49	1	Ppm	ASTM D-1744	10/08/93	DD
Accelerated Stability	0.54	0.54		mg/100ml	ASTM D-2274	10/08/93	DD
Particulate Contaminants	6.9	5.7	0.1	mg/l	ASTM D-2276	10/08/93	D
Viscosity @ 100 Deg F	3.7	3.70	0.01	CSt	ASTM D-445	10/07/93	DE

The enclosed tables describing the Effect of AFC-705 on Fuel Specifications are within the limits of uncertainty as specified in the reference methods. There is no significant change in fuel specifications. The differences in the test values will not affect fuel performance in the field to any noticeable degree.

POUR POINT AND CLOUD POINT

POUR POINT

The pour point is the lowest temperature at which a petroleum product will begin to flow. Pour point is measured at intervals of 5^{O} F. This interval gives a range in which to account for error inherent in the measuring procedure. A sample with a pour point of 10.5^{O} F and a sample with a pour point of 14.5^{O} F would be labeled as having a pour point of 15^{O} F. Even with the 4^{O} difference they would be considered the same. However, a sample with a pour point of 15.5^{O} F would be labeled as having a pour point of 20^{O} F even though it is only 1^{O} higher than the 14.5^{O} F sample mentioned before. Due to experimental and operator error, sample variations of one interval are not considered significant. Since the measured values for the two samples are only one interval apart the difference is not significant.

CLOUD POINT

The cloud point is the temperature at which wax crystals begin to form in a petroleum product as it is cooled. Cloud point is measured at intervals of 2^{O} F. An example similar to the one used illustrating the pour point procedure applies here. Differences of one interval are not considered significant. Wax crystals depend on nucleation sites to initiate growth. The difference in the cloud points of the two samples is explained by the fact that any fuel additive will increase the number of nucleation sites, which initiate clouding. A change in temperature at which clouding starts to occur is therefore expected upon addition of any additive. The difference between the cloud point values for the two samples is not abnormal and is not significant.

COMBUSTION CATALYST TREATMENT RATIOS

The AFC-705 combustion catalyst compound is the deposit control and combustion surface modifier, which acts as a catalyst breaking down carbon deposits. The deposits are reduced through a process called de-carboxylation, the release of a carbon atom in the form of $C0_2$.

The relatively cool surface temperature of the deposit layer restricts de-carboxylation from happening naturally in an internal combustion engine. The catalyst reduces the temperature needed for de-carboxylation from about 600^{O}C to about 200^{O}C. It enables the chemical reaction to occur on the cooler surface of the deposits.

The interaction of the catalyst with the exposed surface of the deposits causes the release of a water molecule and a carbon molecule in the form of CO_2. The deposit surface re-oxidizes to a carboxyl state and continues interacting with the catalyst molecules.

The effectiveness of AFC-705 in removing carbon deposits is related to the surface area and mass of the deposits, the amount of new deposit material being formed during combustion and the amount of catalyst present. Results will be different for each combustion chamber because of its unique history of deposit buildup. However, due to the similarity in basic chemical reactions the end result will be the same in spite of all the differences.

Once an old engine is clean, the minimum amount of catalyst needed is the amount required to inhibit new deposit formation. A new engine needs only this minimum amount to remain clean, and a dirty engine will not get any worse. The exact amount in each case depends on the size of the combustion chamber and the fuel being used. The concentration of AFC-705 catalyst in treated fuel is higher than the necessary minimum requirement. It ensures zero new deposit formation, and the complete removal of all old deposits.

The optimum amount to use in a dirty engine is the amount necessary to inhibit new deposit formation plus completely saturate all exposed surfaces of existing deposits. Excess amounts of catalyst beyond the surface saturation point, will not speed up the deposit removal process.

The concentration of the active ingredient has been calculated such that the majority of the dirty engines in operation will receive a sufficient amount of combustion catalyst required for total deposit surface saturation.

The recommended treatment ratio for **AFC-705 is 1:5000**. Concentrations higher than 1:2500 are not recommended. Concentrations of 1:100 may begin to produce perceptible changes in fuel specifications.

1 oz of AFC-705 treats 40 Gallons of fuel.
1 gallon treats 5000 gallons.

AFC-705 AN ALTERNATIVE TECHNOLOGY

An average reduction of five (5) to ten (10) percent in the consumption of petroleum based fuels and a very significant reduction of emissions is possible without spending a dime redesigning combustion engines, turbines and burners, or retrofitting refineries. All we need to do is treat our fuel with AFC-705.

AFC-705 contains a multi component combustion catalyst, which promotes the removal of engine deposits especially those in the combustion chamber. While removing deposits, AFC-705 treated fuel burns cleaner and more completely, thus eliminating the formation of new deposits. New engines stay clean and older engines become clean. Initially the use AFC-705 treated fuel will often show reductions in fuel consumption far greater than the average five (5) to ten (10) percent. The reduction of emission will increase with the removal of the existing deposits.

In addition, the use of AFC treated fuel will significantly lower equipment operating and maintenance costs, while engine life can be more than doubled. There is less wear on the engine parts and engine oil stays cleaner much longer. When disassembling an engine, a simple wipe down with a shop cloth will show that the parts look as good as new, often with all the serial numbers clearly readable and machining marks still clearly visible.

AFC-705 is extremely cost effective technology. This complete additive package improves fuel consumption and reduces emissions. It extends engine life, decontaminates and cleans the total fuel system, dissolves tank sludge, lowers operating and maintenance cost, while enhancing your bottom line. The AFC additive package perfectly complements magnetic fuel conditioning.

WARRANTY

The manufacturer guarantees that the use of AFC-705 treated fuel will in no way damage or void the warrantees of engines burning that fuel. Engine warranty is based in part on the condition that only a fuel meeting certain specifications can be used in the engine. The proper addition of AFC-705 to a fuel will not change that fuels specifications and therefore will not void the warranty.

Since the product was first introduced in 1989 there has never been an incident where the use of AFC-705 has caused engine damage. However, should a problem occur, the manufacturer will take full responsibility for any unusual engine damage not due to normal engine wear that is proven to be caused by the proper use of AFC-705.

ALGAE-X® International
5400-1 Division Drive, Fort Myers, FL 33905 ▪ 877-425-4239 ▪ Fax: 239-690-1195
Internet: www.algae-x.net ▪ Email: algae-x@algae-x.net

AXI
(239) 690-9589
5400 Division Drive Ste.1
Fort Myers, Florida 33905

JULY 27, 2010

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MATERIAL SAFETY DATA SHEET

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SECTION 1 - PRODUCT / CHEMICAL IDENTIFICATION

PRODUCT NAME **AFC- 705**

SECTION 2 - PRODUCT INFORMATION / COMPOSITION

MATERIAL	CAS NUMBER	%
PROPRIETARY ADDITIVE PACKAGE	*	>75
C9-C11 Aromatic Hydrocarbons	**70693-06-0**	<25

* TRADE SECRET CLAIM GRANTED ON JULY 27, 2004 WITH HMIRC REGISTRATION NUMBER 5507

SECTION 3 - HAZARD IDENTIFICATION

APPEARANCE: Amber
PHYSICAL FORM: Liquid

EMERGENCY OVERVIEW

WARNING!
HEALTH HAZARDS
ASPIRATION HAZARD IF SWALLOWED-CAN ENTER LUNGS AND CAUSE DAMAGE MAY CAUSE CARDIAC SENSITIZATION
OVEREXPOSURE MAY CAUSE CNS DEPRESSION MAY BE IRRITATING TO THE SKIN, EYES AND RESPIRATORY TRACT
SEE "TOXICOLOGICAL INFORMATION" (SECTION 11) FOR MORE INFORMATION FLAMMABILITY HAZARDS
COMBUSTIBLE LIQUID AND VAPOR
PER CANADIAN CPR SECTION 38
REACTIVITY HAZARDS
STABLE

POTENTIAL HEALTH EFFECTS, SKIN

SLIGHTLY IRRITATING. Contact may cause reddening and pain or burning sensation.
Defatting agent. Repeated or prolonged contact may result in drying, reddening, itching, pain, inflammation, cracking and possible secondary infection with tissue damage. .
No significant effects are expected to occur following short term exposure. Repeated or prolonged contact with large amounts of this material may result in absorption through the skin to produce toxic effects.

POTENTIAL HEALTH EFFECTS, EYE

May cause slight transient irritation, lacrimation (tears) and a burning sensation in the eyes.
Exposure to vapors, fumes or mists may cause irritation.
Prolonged or repeated exposure may cause irritation and conjunctivitis.

POTENTIAL HEALTH EFFECTS, INHALATION

Breathing of the mists, vapors or fumes may irritate the nose, throat and lungs. Symptoms may include sore throat coughing, labored breathing, sneezing and burning sensation, depending on the concentration and duration of exposure.
May cause central nervous system depression or effects. Symptoms may include headache, excitation, euphoria, dizziness, in-coordination, drowsiness, light-headedness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death, depending on the concentration and duration of exposure. May cause cardiac sensitization, including arrhythmia (irregular heart beat) and death due to cardiac arrest. Overexposure to this material may cause systemic damage including target organ effects listed under "Toxicological Information" (Section 11). Other specific symptoms of exposure are listed under "Toxicological information" (Section 11).

POTENTIAL HEALTH EFFECTS, INGESTION

May cause irritation of the mouth, throat and gastrointestinal tract. Symptoms may include salivation, pain, nausea, vomiting and diarrhea. Aspiration into lungs may cause chemical pneumonia and lung damage. Exposure may also cause central nervous system symptoms similar to those listed under "Inhalation" (see Inhalation section).
Overexposure to this material may cause systemic damage including target organ effects listed under "Toxicological Information" (Section 11).
Other specific symptoms of exposure are listed under "Toxicological Information" (Section 11).

SECTION 4 - FIRST AID MEASURES

SKIN

Immediately wash skin with plenty of soap and water while removing contaminated clothing and shoes. Get medical attention if irritation develops or persists. -
Place contaminated clothing in closed container for storage until laundered or discarded. If clothing is to be laundered, inform person performing operation of contaminant's hazardous properties. Discard contaminated leather goods. '

EYE

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

INHALATION
Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear and give oxygen.
Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

INGESTION
Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips to prevent aspiration and monitor for breathing difficulty. Gastric lavage should be performed only by qualified medical personnel. Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

NOTES TO PHYSICIAN
Gastric lavage may be indicated if ingested. If spontaneous vomiting has occurred after ingestion, the patient should be monitored for difficult breathing, as adverse effects of aspiration into the lungs may be delayed up to 48 hours. In cases of acute poisoning, artificial respiration with administration of oxygen may be useful for support. DO NOT GIVE EPINEPHRINE, EPHEDRINE OR SIMILAR ADRENERGIC DRUGS. THEY MAY INDUCE FATAL VENTRICULAR FIBRILLATION. Electrocardiograph monitoring should be carried out with severely ill patients to anticipate possible cardiac arrest.

SECTION 5 - FIRE FIGHTING MEASURES AND EXPLOSION DATA
HAZARDOUS COMBUSTION PRODUCTS
Combustion may produce hazardous combustion products such as COx and irritating vapors.

EXTINGUISHING MEDIA
Use water spray, dry chemical, carbon dioxide or fire-fighting foam for Class B fires to extinguish fire.

BASIC FIRE FIGHTING PROCEDURES
Evacuate area and fight fire from a safe distance.
If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak. Use water spray to cool adjacent structures and to protect personnel. Shut off source of flow if possible. Stay away from storage tank ends. Withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire.
Firefighters must wear NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

UNUSUAL FIRE & EXPLOSION HAZARDS
Vapors may form explosive mixture with air. Vapors can travel to a source of ignition and flash back.
Explosion hazard if exposed to extreme heat or to thermal shock.

Flash Point Greater than 158°F or (70°C) TAG CLOSED CUP (ASTM D56)

Auto ignition Temperature	720 - 835°F or (382 - 446°C)
Flammability Limits in Air, Lower, % by Volume	Not disclosed or Not applicable
Flammability Limits in Air, Upper, % by Volume	Not disclosed or Not applicable

SECTION 6 - ACCIDENTAL SPILL OR LEAK PROCEDURES
EMERGENCY ACTION
Eliminate and/or shut off ignition sources and keep ignition sources out of the area. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind. Isolate for 800 meters (1/2 mile) in all directions if tank, rail car or tank truck is involved in fire. Evacuate area endangered by release as required. (See Exposure Controls/Personal Protection, Section 8.)

ENVIRONMENTAL PRECAUTIONS
Eliminate all sources of ignition. Isolate hazard area and deny entry. If material is released to the environment, take immediate steps to stop and contain release. Caution should be exercised regarding personnel safety and exposure to the released material. Notify local, provincial and/or federal authorities, if required.

SPILL OR LEAK PROCEDURE
Keep unnecessary people away. Isolate area for at least 50 meters (150 feet) to preserve public safety. For large spills, consider initial evacuation for at least 300 meters (1000 feet). Keep ignition sources out of area and shut off all ignition sources. Absorb spill with inert material (e. g. dry sand or earth) then place in a chemical waste container. Large Spills: Dike far ahead of liquid spill for later disposal.
Use a vapor suppressing foam to reduce vapors. Stop leak when safe to do so.
See Exposure Controls/Personal Protection (Section 8).

SECTION 7 - PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE
HANDLING
Ground lines and equipment used during transfer to reduce the possibility of static spark-initiated fire or explosion.
Use non-sparking tools. Do not cut, grind, drill, weld or reuse containers unless adequate precautions are taken against these hazards.
Do not eat, drink or smoke in areas of use or storage.

STORAGE
Store in tightly closed containers in a cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles. Avoid contact with strong oxidizers.
Empty containers may contain material residue. Do not reuse without adequate precautions.
Do not eat, drink or smoke in areas of use or storage.

AXI
(239) 690-9589
5400 Division Drive Ste.1
Fort Myers, Florida 33905

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(202) 483-7616 (collect) -- INTERNATIONAL

MATERIAL SAFETY DATA SHEET

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SECTION 8 - EXPOSURE CONTROL / PERSONAL PROTECTION

ENGINEERING CONTROLS

General or local exhaust ventilation and other forms of engineering controls are the preferred means for controlling exposures.

EYE PROTECTION: PERSONAL PROTECTION EQUIPMENT (PPE)

Keep away *from* eyes. Eye contact can be avoided by using chemical safety glasses, goggles, and/or *face* shield.
Have eye-washing facilities readily available where eye contact can occur.

SKIN PROTECTION: PERSONAL PROTECTION EQUIPMENT (PPE)

Avoid skin contact with this material. Use appropriate chemical protective gloves when handling. Protective glove materials include, but are not limited to Viton, Silver Shield/4H (PE/EVAL/PE). Additional protective clothing may be necessary.
Good personal hygiene practices such as properly handling contaminated clothing, using wash facilities before entering public areas and restricting eating, drinking and smoking to designated areas are essential for preventing personal chemical contamination.

RESPIRATORY PROTECTION: PERSONAL PROTECTION EQUIPMENT (PPE)

A NIOSH approved air-purifying respirator with an appropriate cartridge or canister, such as an organic vapor cartridge, may be used in circumstances where airborne concentrations may exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled /release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

ODOR AND APPEARANCE

AMBER LIQUID WITH A HYDROCARBON ODOR

Boiling Point	Greater than 212°F
Flash Point	**Greater than 158°F of (70°C) TAG CLOSED CUP (ASTM D56)**
Specific Gravity	0.87-93 at 24°C
Melting Point	Not disclosed or not applicable
Percent Volatile	Not disclosed or not applicable
Vapor Pressure	0.5 psi
Vapor Density	Not disclosed or not applicable
Bulk Density	Not disclosed or not applicable
Solubility in Water	Not disclosed or not applicable
Octanol/Water Partn	3.30 - 4.50 @ *25°C*
Volatile Organic	Not disclosed or not applicable
pH Value	ESSENTIALLY NEUTRAL
Freezing Point	Not disclosed or not applicable
Evaporation Rate	VERY SLOW
Molecular Weight	Not disclosed or not applicable
Chemical Family	HYDROCARBON MIXTURE
Odor Threshold	Not disclosed or not applicable

SECTION 10 - STABILITY AND REACTIVITY DATA

STABILITY/INCOMPATIBILITY

Incompatible with oxidizing agents. See precautions under Handling & Storage (Section 7).

HAZARDOUS REACTIONS/DECOMPOSITION PRODUCTS

Combustion may produce COx and irritating vapors.

SECTION 11 - TOXICOLOGICAL INFORMATION

ROUTES OF EXPOSURE

Inhalation, ingestion, skin and eye contact.

LD50

LD50: 6-7 g/kg (rat, oral)
LD50: >2 g/kg (rat, dermal)

LC50

LC50: >4688 mg/m3 (rat, 4 hr) - maximum achievable saturated vapor concentration.

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TOXICOLOGICAL DATA
Acute or chronic overexposure to this material or its components may cause systemic toxicity, including adverse effects to the following: skin, liver, kidney, cardiovascular and nervous system. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage (sometimes referred to as solvent or painter's syndrome). Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal. This material contains benzene. Acute benzene poisoning causes central nervous system depression. Chronic exposure affects the hematopoietic system causing blood disorders including anemia and pancytopenia.

CARCINOGENICITY
This material contains benzene. Benzene is carcinogenic to laboratory animals when given by intubation or by inhalation. There is an association between occupational exposure to benzene and human leukemia. Carcinogenic determinations: IARC human positive and animal suspected carcinogen (IARC Class 1); NTP known carcinogen; ACGIH suspected carcinogen; OSHA carcinogen.

TERATOGENICITY, MUTAGENICITY, OTHER REPRODUCTIVE EFFECTS
This material contains benzene. Mutagenic and clastogenic in mammalian and non-mammalian test systems.

Reproductive or developmental toxicant only at doses that are maternally toxic, based on tests with animals.
Pregnant women may be at an increased risk from exposure. Consumption of alcoholic beverages may enhance toxic effects.

PRE-EXISTING CONDITIONS AGGRAVATED BY EXPOSURE
Pre-existing medical conditions which may be aggravated by exposure include disorders of the skin, liver, kidney, respiratory, cardiovascular and nervous system.

SECTION 12 - ECOLOGICAL INFORMATION
ECO-TOXICOLIGICAL INFORMATION
Available data indicate similar materials (C10-C14 aromatic hydrocarbons) are toxic to aquatic organisms.
96-hour LL50, rainbow trout = 3 *mg/L*
96-hour LL50, daphnia magna = 1.1 *mg/L*
72-hour EL50, algae (Selenastrum capricornutum) = 1-3 *mg/L*
CHEMICAL FATE INFORMATION
Available data indicate similar materials (C10-C12 aromatic hydrocarbons) biodegrade in soil, readily degrade in the atmosphere, and may partition into air, soil and to a lesser extent, water.
Biodegradation in soil (OECD 301 F) = 60.7% in 28 days
Indirect Atmospheric Photo-degradation: T (half-life) = 3.7 to 29.2 hours

SECTION 13 - DISPOSAL PROCEDURES
WASTE DISPOSAL
This material, as supplied, when discarded or disposed of, is a characteristic hazardous waste according to Federal regulations (Subpart C of 40 CFR 261) due to its benzene content. Under the Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user of the material to determine, at the time of disposal, whether the material is a hazardous waste subject to RCRA.

The transportation, storage, treatment and disposal of RCRA waste material must be conducted in compliance with 40 CFR 262, 263, 264, 268 and 270. Disposal can occur only in properly permitted facilities. Check state and local regulations *for* any additional requirements as these may be more restrictive than federal laws and regulations. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Disposal of this material must be conducted in compliance with all federal, state and local regulations.
In Canada, wastes should be disposed of according to federal, state, provincial and local regulations.

SECTION 14 - TRANSPORTATION INFORMATION
BILL OF LADING-BULK (U. S. DOT)
Combustible Liquid, N.O.S., Solution, NA1993, PG III

BILL OF LADING - NON-BULK (U. S. DOT)
Non-Regulated

MATERIAL SAFETY DATA SHEET

U. S. Department *of* Transportation (DOT) Requirements
General Transportation Information *for* Bulk Shipments

Proper Shipping Name	Combustible Liquid, N.O.S., Mixture		
Hazard Class		Combustible Liquid	UN/NA Code NA1993
Packaging Group		PG III	
Labels Required		None	
Placards Required	Combustible, NA1993		
Reportable Quantity	See Regulatory Information (Section 15)		

International Transportation

IATA See DOT requirements

IMDG See DOT requirements

COMMENTS: See Bill of Lading *for* proper shipping description, or consult 49 CFR 100-185 *for* specific shipping information.

SECTION 15 - REGULATORY INFORMATION

FEDERAL REGULATIONS

All ingredients are on the TSCA inventory, or are not required to be listed on the TSCA inventory.
This material may be subject to export notification under TSCA section 12(b); contains: Naphthalene, CAS# 91-20-3, Effective Date 5/26/04. Consult OSHA's Benzene standard 29 CFR 1910.1028 for provisions on air monitoring, employee training, medical monitoring, etc. A release of this material, as supplied, may be exempt from reporting under the Comprehensive Environmental
Response Compensation and Liability Act(CERCLA-40 CFR 302) by the petroleum exclusion. Releases may be reportable to the National Response Center (800-424-8802)under the Clean WaterAct,33 U.S.C. 1321(b)(3) and (5)
This material does not contain toxic chemicals (in excess of the applicable de minimis concentration) that are subject to the annual toxic chemical release reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) Section 313 (40 CFR 372).
This material contains one or more substances listed as hazardous air pollutants under Section 112 of the Clean Air Act. This material contains up to 100% volatile organic compounds (VOCs) per 40 CFR Part 51.100. This material contains less than 1% hazardous air pollutants (HAPs) per Section 112 Clean Air Act Amendments of 1990.
Check local, regional or state/provincial regulations for any additional requirements as these may be more restrictive than federal laws and regulations. Failure to report may result in substantial civil and criminal penalties.

STATE REGULATIONS

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

INTERNATIONAL REGULATIONS

This material has been classified in accordance with the hazard criteria of the Hazardous Products Act and the Controlled Products Regulations (CPR) and this MSDS contains all the information required by the CPR.
WHMIS Classification: B3, D2B
INVENTORIES:
EU INVENTORY (EINECS): 274-759-3
KOREA INVENTORY (ECI): KE-01915
US INVENTORY (TSCA): 70693-06-0

SARA 311/312HAZARDCATEGORIES

Immediate Hazard:	X	Delayed Hazard:	X	Fire Hazard:	X	Pressure Hazard:	
Reactivity Hazard:	-						

NFPA RATINGS

Health		1	Flammability		2	Reactivity 0	Special Hazards

HMIS RATINGS

Health	1*	Flammability		2	Reactivity	0

WHMIS RATINGS

Compressed Gas		Flammable/Combustible		Oxidizer	Acutely Toxic
Other Toxic Effects	x	Bio Hazardous			Corrosive	Dangerously Reactive

SECTION 16 - ADDITIONAL COMMENTS AND INFORMATION

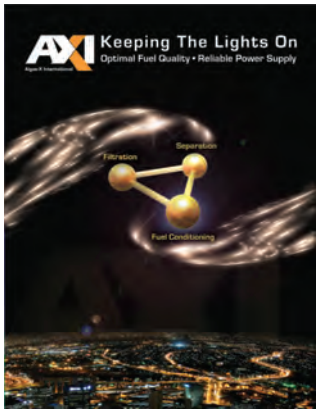
DISCLAIMER

NOTICE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However, an MSDS may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, expressed or implied, is made as to the accuracy or comprehensiveness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the material.

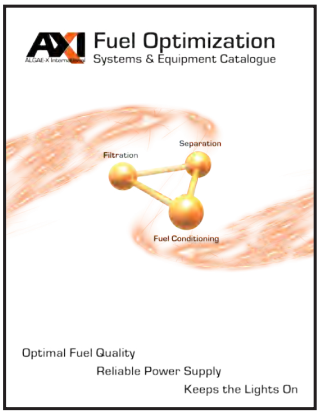
AXI designs and manufactures standardized and custom-engineered Automated Fuel Conditioning, Fuel Polishing and Transfer Systems, Tank Cleaning Equipment, Fuel Additives and In-line Fuel Conditioners to ensure optimal fuel quality at all times.

Our scope of expertise covers fuel storage and fuel supply systems from single engine installations to power plants. AXI is your single source for all fuel conditioning related equipment and support available world-wide.

- Peak Engine Performance
- Reliable Power Supply
- Lower Maintenance Costs
- Lower Exhaust Emissions



Read about the secret life of fuel and find solutions in the AXI Brochure, available at www.AXIFuelConditioning.net.



See the full product line in the AXI Systems and Equipment Catalogue, available at www.AXIFuelConditioning.net.

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