



## What is the SpiritPFC Fuel Purifier?



**SpiritPFC "Power Stick"**

The SpiritPFC Fuel Purifier is a patented fuel enhancement product that is placed into an engine's fuel system, fuel can, or storage system, treating and removing undesirable elements from Gasoline and Diesel Fuels.

**How does it work?** The concept is roughly based on the well known metal plating process which has been used around the world for over one hundred years, to place a thin coating of a metal onto another metal surface.

## Metal Plating Basics

The theory of electroplating is based on a positive charge, conductivity and reactions of the plating metals and electrons. The process of electroplating is made of four important parts:

- *Cathode* – negatively charged electrode in electrolysis, where negative electrons are created and positive ions are discharged, it is the object that is going to be plated.
- *Anode* – positively charged electrode in the electrolysis, where negative ions are discharged and positive ions are created, it is of the same material as the plating metal.
- *Electrolyte* - conducting medium that where the flow of current is with the movement of matter. Most of the time done in aqueous solutions such as acids, bases and salts.
- *Direct Current* - electricity that passes from the anode to the cathode through the electrolyte.

As the direct current passes from the anode through the electrolyte, it brings positive ions of the plating metal to the cathode. It is then joined with negative electrons created by the cathode and transforms into the metal coating. The metal coating bonds to the cathode and thus the electroplating process is complete.

Since most fuels have varying amounts of metals dissolved in them which detract from proper combustion, we have created a method similar to electroplating to remove them.

In the case of the SpiritPFC Fuel Purifier, we use the basic electroplating principle outlined above to improve fuel purity.

To explain how our products work you must first understand a bit about metals in regard to the electrical properties.

Every metal has a standard reduction potential or a voltage. Here are a few values for some common metals:

Aluminum	-1.66 Volts
Zinc	-0.76 Volts
Iron	-0.44 Volts
Nickel	-0.25 Volts
Tin	-0.14 Volts
Lead	-0.13 Volts
Copper	+0.34 Volts
Silver	+0.80 Volts

Table 1

Since every metal has as specific potential or charge, you can now see how using the right combination of metal alloys, say Silver and Aluminum separated by an insulator will create a voltage or charge between them such as in this example. Thus, +0.80 and -1.66 give a difference or charge of 2.46 volts between them.

With this in mind, look at the basic construction of the SpiritPFC Fuel Purifier below.

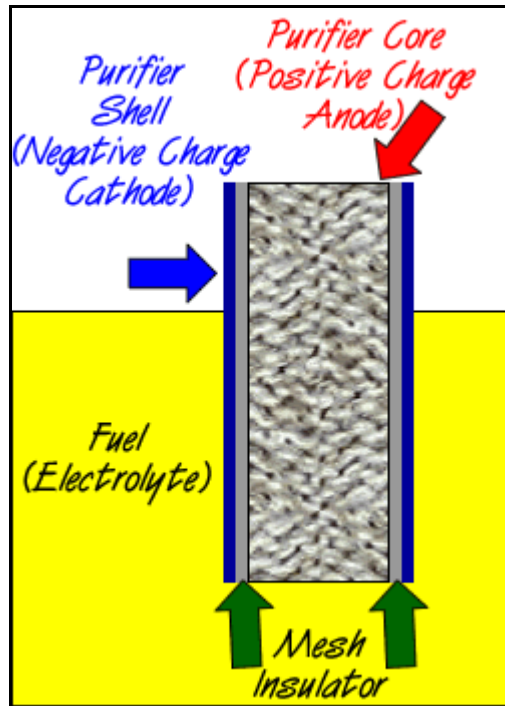


Figure 1

### Basic Purifier Construction

As seen in the drawing [Figure 1](#), the SpiritPFC Fuel Purifier is constructed using three basic components.

An inner core which is the positive or anode, a shell or negative cathode, and an insulating material which separates the two. Since all three of these components allow fuel to freely flow freely throughout the purifier, the fuel then becomes the electrolyte.

Within these inner and outer components of the purifier, the fuel or electrolyte containing dissolved metals now flows freely. These dissolved elements contained in the fuel are attracted and attach themselves to the core or shell (anode or cathode) and therefore are removed from the fuel. Since these products would normally inhibit proper fuel combustion, removing them **prior** to entering your engine will greatly improve the fuel's ability to combust enhancing the performance of the fuel.

**Note:** In our process a separate DC current is not necessary to move the dissolved metals from the liquid because the small voltage difference between the anode and cathode materials does it for you.

It is also important to realize that the small electrical potential or voltage is created using the fuel as the electrolyte and the extremely small amount of current flows through the fuel only when immersed. Since the current is so small and disappears when the purifier is removed from the fuel, there is no danger or fire hazard!

Two examples proving the process are seen below. First is a simple test we performed and below that are actual results from a Certified EPA Laboratory.

### Removal of Elements Test

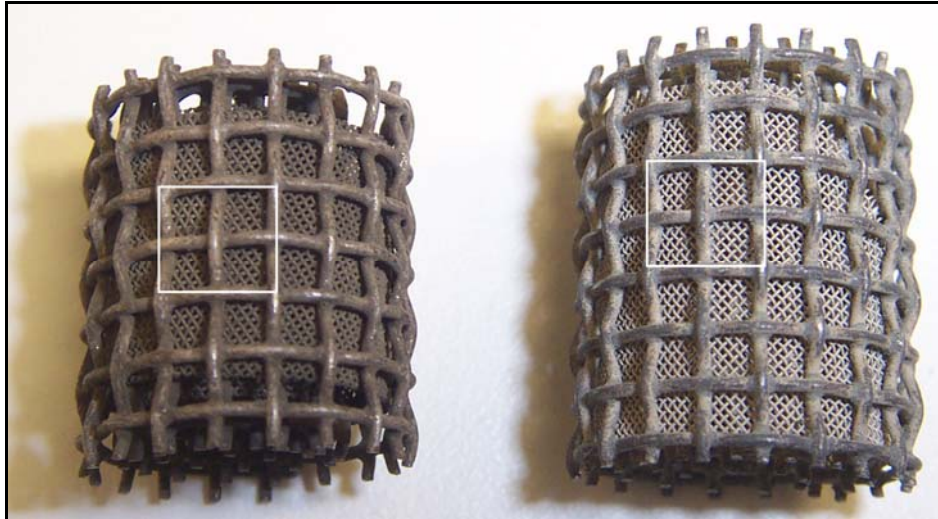


Figure 2

Above in [Figure 2](#) you see (2) 1-inch purifier coils used in this demonstration

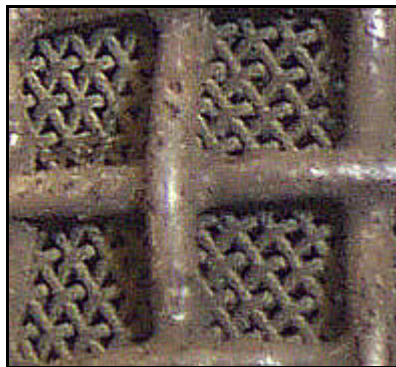


Figure 3

**Purifier after 3 days use**

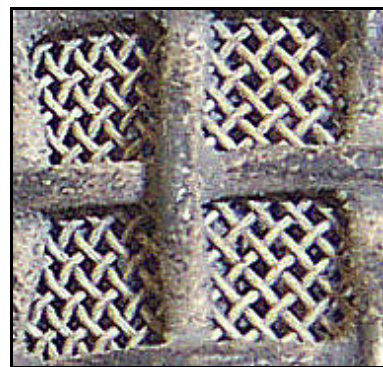


Figure 4

**New unused purifier element**

As seen in the above [Figure 3](#), you see a close-up of the SpiritPFC catalyst after being immersed in gasoline for three days. On the right [Figure 4](#) is a new unused coil.

**Notice the build-up of the elements that have been removed from the fuel!**

If these elements are allowed into an engine, they will NOT allow the fuel to combust properly and would become what many refer to as "Carbon Deposits". These so called "Carbon Deposits" are actually several different combinations of element deposits that solidify in the combustion chamber. They cause incomplete combustion, fouled spark plugs, clogged injectors, the clogging of the exhaust catalytic converter, and will steadily degrade your engine's performance!

Results of the SpiritPFC "Removal of Elements" is also reflected in the table below that was constructed from the EPA-6020 test performed by KLA Environmental Consulting Laboratories, a EPA certified Laboratory.

**KLA Environmental Consulting  
 Certified Environmental Laboratory  
 EPA #: NV-905/CA I-2386  
 (Date: 1/17/2001)**

**Type of Test: I.C.P for removal of metals from Diesel Fuel  
 (EPA 6020)**

**Amounts in PPM (part per million), ND=None Detected**

<b>Material Detected</b>	<b>Untreated Fuel</b>	<b>SpiritPFC Treated Fuel</b>	<b>% of Removal</b>
<b>Lead</b>	96	ND	<b>100%</b>
<b>Copper</b>	37	1	<b>98%</b>
<b>Iron</b>	240	ND	<b>100%</b>
<b>Aluminum</b>	96	ND	<b>100%</b>
<b>Zinc</b>	150	1	<b>99%</b>
<b>Silica</b>	5	3	<b>40%</b>
<b>Magnesium</b>	98	4	<b>96%</b>
<b>Calcium</b>	341	9	<b>74%</b>
<b>Potassium</b>	91	2	<b>97%</b>
<b>Sulfur</b>	340	18	<b>94%</b>

Table 2

**Removing elements that interfere with combustion improves performance!**

If the internal combustion engine burned 100% efficient and burned at the stoichiometric (perfect combustion) value, all that would remain from the combustion process would be Carbon Dioxide and Water. Unfortunately the combustion is never that efficient because several conditions cause the fuel's ability to combust to be less than perfect.

The complete emissions test we performed on a simple Honda GC135 air-cooled gas engine is attached. It shows how the improved fuel purity produces cleaner combustion, which leads to better engine performance and power.

**Improve Fuel Storage Stability!** When the crude oil is first removed from the earth, it contains many elements not useful in internal combustion products. This is

why crude oil must be separated or refined into products that include gasoline and diesel fuel.

Even after the refining process, petroleum fuels still contain a certain amount of dissolved metals or "organo-metals". They include things like Lead, Sulfur, Copper, Aluminum, etc. These elements also are introduced into the fuel as it makes its way to the pump. The fuel companies would also rather that consumers do not know that much of the fuel we buy at the pump can be considered somewhat of a "garbage dump" of byproducts left over in the refining process.

When fuel destabilizes it is usually due to a reaction called "Oxidation". Fuel Oxidation is caused by reactions between chemicals and elements such as copper present within the fuel itself. Destabilization produces a gummy substance that will deposit in everything from the fuel tank to your exhaust system.

Here are excerpts from one of the largest petroleum companies ([Chevron Corporation](#)) website, explaining how fuels destabilize and the result...

**"The gum formed by oxidation is usually soluble in gasoline. However, it remains behind as a sticky residue when the gasoline evaporates. Since gasoline begins to evaporate in the carburetor of a carbureted engine or in the injector of a fuel-injected engine, a gasoline containing soluble gum may leave a deposit on these parts and on the intake valves. These deposits will be in addition to the deposits normally formed by a gum-free gasoline — a formation triggered by the elevated engine temperatures.**

**Modern engines are designed to run best when vital engine parts are clean. Carburetor and fuel injector deposits can cause hesitation and stumbling on acceleration, lower fuel economy, lower power output, and higher emissions of hydrocarbons and carbon monoxide. Excessive intake valve deposits can cause many of the same performance problems, plus higher emissions of hydrocarbons, carbon monoxide, and nitrogen oxides.**

**For the most part, instability involves the chemical conversion of precursors to species of higher molecular weight with limited fuel solubility. The precursors are certain nitrogen and/or sulfur containing compounds, organic acids, and reactive olefins. The conversion process often involves oxidation of the precursors. [Certain dissolved metals, especially copper, contribute by functioning as oxidation catalysts](#)". (Source, Chevron Corporation)**

As you can see, the reactions between elements such as copper in the fuel contribute to oxidation that will quickly degrade the fuel's properties reducing its combustion performance. Knowing this you can see that removing these elements from the fuel before combustion will improve the fuel's quality!

SpiritPFC Fuel Products remove these elements from the fuel system, therefore reducing the oxidation process and improving the fuel quality and performance!

**Conclusion:** It can now be understood that using a proven method to remove dissolved metals from liquid such as gasoline or diesel fuel, will ultimately improve the purity and performance of that fuel!