"Diesel starts to deteriorate and form solids within 60-90 days after refining. As this change occurs, particulates increase in size & mass. You will notice heavy deposits in filtration equipment, sludge forming in tanks and other fuel system components requiring increased maintenance." -- http://www.algae-x.net

"I stopped at my dealer yesterday to have my oil changed, lubed and the fuel filter changed. He dropped my fuel filter and showed me that there was "algae" and some rust in it. The technician told me I should have my fuel tank dropped, drained and cleaned out or this algae and sediment that's in my tank would eventually burn out my injectors."

"I personally wouldn't want to run algae contaminated fuel. The main thing I think you're going to go through will be filters. But some could slip thru & plug an injector."

"It can be very nasty stuff. Use a good quality treatment in your tank. Because of the warm climate, it does not get killed over the winter. I had heard of it in fuel from Mexico. Make sure that you keep good fuel in the tank and change your filter regularly. I would check into maybe a Racor or a filter similar."

"Frequent diesel fuel filter changes and cleaning diesel fuel tanks have become acceptable periodic maintenance instead of a warning signal for diesel engine failure. Diesel fuel filter elements should last a thousand hours or more, and injectors some 15,000 hours. However, since diesel fuel is inherently unstable, solids begin to form and the accumulating tank sludge will eventually clog your fuel filters, ruin your injectors and cause engines to smoke.

Symptoms...
- Clogged and slimy filters
- Dark, hazy fuel
- Sludge build up in tanks
- Loss of power and RPM
- Excess smoke
- Corroded, pitted injectors
- Foul odor

The solids that form as the result of the inherent instability of the diesel fuel and the natural process of degradation will accumulate in the bottom of your tank. The sludge will form a coating or bio-film on the walls and baffles of the tank, plug your filters and impact combustion efficiency. Eventually it will clog fuel lines and ruin your equipment.

Filter plugging can have several causes and often critical consequences. For example, low temperatures can cause wax crystallization, which can lead to filter plugging. An example would be using summer diesel in cold weather. Wax or paraffin is part of the diesel fuel.

Contaminant build up resulting from excessive microbial growth and bio-degradation of diesel fuel can cause filter plugging. Micro-organisms, bacteria and enzyme activity, fungus, yeast and mold cause fuel degradation and the formation of waste products. The

process is similar to milk turning into cottage cheese, a different form of milk. Of all the microbial debris and waste products in the diesel fuel tank only about .01% is bugs. Even though microbes may be the root-cause of certain bio-film, and cause and accelerate the process of fuel degradation, it should be clear that the waste products clogging your filter are not the microbes but degraded components of the fuel which have formed solids and the bio-film.

Frequently, the application of a biocide aggravates the situation and turns bio-film into solids, creating a real fuel filter nightmare. Repeated use of biocides in the same fuel makes matters worse. Bio film develops throughout the entire diesel fuel system. It grows in the water fuel interface and on the walls, baffles and bottoms of storage tanks. An unlucky end user may be filling up his tank and getting this debris delivered as a part of his fuel, for the same price as the fuel.

Chemical incompatibility may cause dramatic filter plugging. This may happen when fuels with incompatible additive packages are mixed.

A diesel engine uses only some of the fuel it pulls from the tank. All of that fuel goes to the high-pressure fuel pump and to the injectors operating under enormous pressure and high temperatures. The surplus fuel that the engine is not using goes back to the tank. This fuel is continuously re-circulated and exposed to extreme pressure and heat, which results in the agglomeration of asphaltenes, the high carbon content, heavy end fuel molecules. It leads to the formation of larger and larger clusters and solids, which are very difficult to completely combust. These solids may grow so large that they will not pass through the filter element and become part of the polymer and sludge build up plugging the filter.

More than 90% of the debris on filter elements and the sludge in our tanks is organic material, fuel and oil breakdown residue. In most cases, this debris is acidic and not good for your engine. It causes corrosion in injectors, pumps and storage tanks.

In addition, the hot fuel coming back to the tank will raise the fuel temperature in the tank, cause condensation and contribute to microbial contamination, fuel break down, bio fouling and the build up of sludge and acid.

Large fuel droplets and high asphaltene concentrations require more time, more energy and higher temperatures to combust than is available in engines during the combustion cycle and before the exhaust valve opens. Any device in the fuel system exposing the fuel to stress (heat and pressure) such as pumps, heaters, or centrifuges will increase the formation of asphaltenes and negatively impact combustion.

The diesel fuel of today is not the same as what was available years ago. Up until about 15-20 years ago, refineries used only about 50% of a barrel of crude oil to make distillates such as gasoline, jet fuel and diesel fuel. The remainder of the barrel of crude oil went to "residual oil" such as lubricating oils and heavy oils. Today, as a result of

different refining techniques and additive packages, the refinery uses 85% or more of the same barrel of crude, which clearly has consequences for fuel stability.

Poor thermal fuel stability can plug filters. Fuel will form particulates (solids) when exposed to pumps and the hot surfaces and pressure of the fuel injection system. This will result in an increase in asphaltene agglomerations, polymerization and a dramatic loss of combustion efficiency.

Fuel systems, in general, are designed to return a significant proportion of the fuel not used for combustion back to the tank. This return fuel is very hot and will promote polymerization and fuel breakdown. Eventually, more and more solids from the tank will reach the filter and over time, plug the filter. These problems continuously occur in commercially operated engines, such as trucks, heavy equipment, shipping, and power generation, but will also appear in recreational boats, RV's and all types of fuel storage tanks.

Truck engines are used continuously and, in most cases, the tanks "appear to be clean". However, a 2-micron filter element does not last very long, in general 15,000 miles or less. It should be 30,000 miles or more. In the marine industry, 400 hours is, in many instances, standard operating procedure, while filters should easily last 1,000 hours or more.

Short filter life is quite remarkable realizing how "thin" diesel fuel actually is and knowing how clean the tanks on most trucks "appear" to be.

Short filter life is symptomatic of polymerization, increase in the size of the fuel droplet, agglomeration of asphaltenes and the formation of solids in fuel systems. The consequences are carbon build up in engines and exhaust systems, higher fuel consumption and excessive smoke.

The stuff that clogs your filters is actually fuel in some way, shape or form. In excess of 90% of this organic debris are fuel breakdown products. It is not sand, dust, stones, rust or inorganic matter that blocks your filter.

The inorganic material like sand, dust and other particles will not cause your filters to clog. In fact, a lot of sand in a fuel filter would act as extra filtration. The pores between the sand particles are much larger than the pores in a standard fuel filter element. Sand filters are commonly used to filter water. A hair is approximately 40 micron and fuel filter elements range all the way from 30 micron for a pre-filter to 2 micron in a fine filter.

Fuel stability is a serious concern for the diesel fuel user.

The chemistry of diesel fuel instability involves the chemical conversion of precursors to species of higher molecular weight with limited solubility. The conversion process often involves oxidation of the precursors. Fuel solvency plays a role since the development of

insolubles is always a function of both the presence of higher molecular weight species and the fuel capacity to dissolve them.

Fuel is an unstable, organic liquid that goes "bad". Your vendor will always sell you the highest fuel quality possible. However, due to a variety of circumstances, fuel may have "aged", oxidized and/or may contain water. It may have been contaminated before it was delivered to you or to your vendor.

Fuel has to travel from the refinery to the end user destination. It is pumped through pipelines, barged, trucked and stored in tank farms. Changes in temperature throughout any given day and exposure to the atmosphere will cause condensation and water in storage systems. As a result, your fuel quality diminishes.

When your fuel is finally used, it is exposed to the heat and pressure of engine injection systems, centrifuges, pumps and heaters, causing an increase in asphaltene agglomerations, which negatively impacts combustion efficiency and emissions.

Fuel is made to certain ASTM specifications and diesel engines are designed and built to operate on fuels that consistently meet these specifications. When it does not meet these specifications, we could refer to it as "bad fuel". However, we tend to refer to fuel as "bad fuel" when we see symptoms such as: •dark hazy fuel, •filter plugging, •sludge build up in tanks, •poor engine performance, •excessive smoke & •emissions, •etc. We refer to fuel as "good fuel", when it is clear and bright. Or, rather in that case, no reference is made at all to our fuel. We simply use it and take fuel quality and peak engine performance for granted.

Dark fuel is symptomatic of poor quality and even though, in most cases, it can be used, fuel in this condition will provide poor combustion and filtration problems.

"Dark fuel" is, in general, indicative of oxidation and that the process of fuel degradation is in a far advanced stage. Hazy fuel is indicative of water emulsified in the fuel. In general, dark, hazy fuel will not damage your engine. It indicates however, poor fuel quality, which will definitely not provide you with peak engine performance.

As long as fuel meets the (ASTM) specifications, it will perform in your engine. Using less than optimal fuel quality negatively impacts engine efficiency and accelerates the process that makes new engines old.

Diesel fuel can range from colorless to amber or light brown in color depending on the crude oil and the refinery process used to produce it. In addition, dyes may be added to change the fuel color for tax identification purposes.

In time, stored fuel will darken due to oxidation, repolymerization and agglomeration of certain components. The darkening is accompanied by the formation of sediment that plugs filters and causes poor combustion. Fuel & Oil vendors suggest that, if diesel fuel is

stored for emergency use, it should be replaced with fresh fuel within a year, unless special precautions or remedial actions are taken.

The University of Idaho conducted tests on the life expectancy of fuels to determine the time line on degradation of stored #2 diesel fuel. The results indicated 26% degradation after 28 days of storage." -- from http://www.diesel-fuels.com/bad-diesel-fuel.html