Website: The truth about Diesel Fuel:

The first thing that must be understood is that Diesel Fuel is a complex organic substance and just like any other organic substance will begin to deteriorate as soon as it is made. Plants, trees, animals, and human beings are all organic and have a life span and Diesel Fuel is no different. Studies at the University of Idaho suggest that Diesel Fuel can deteriorate or degrade as much as 26% in the first 28 days and that Diesel Fuel has a usable life-span of about 1-2 years.

The refining process has changed greatly in the past few years. Back as far as the 1970s, fuels for use in vehicles was refined from crude oil in a distillation process and refiners were realizing a yield of about 50% from a barrel of oil. As the need for greater amounts of fuel were desired and to help in reducing our country's dependence on foreign oil, refiners developed new methods, such as "fracking" to produce yields of up to 90%. While these new methods of refining have resulted in higher yields, the result is fuel that is less stable than in the past, thus life span of the fuels have reduced. Yes, the fuel must meet the American Society for Testing and Materials (ASTM) standards, but only at the time it leaves the refinery. By the time you pump the fuel into your vehicles or standby generator, the aging process has already started and it is more than likely "out-of-specs".

Not only is the fuel itself in a constant state of degradation just by the nature of its composition and newer refining methods, it gets exposed to air and water on a constant basis. Every time the fuel is transferred from a storage facility, to a transporter (truck or ship), and finally to the pump at the service station, the fuel has had an opportunity to be exposed to air and water. The air and water combined with an organic compound – such as Diesel Fuel, makes prime conditions for microbial growth – bacteria, mold, and yeast. These microbes flourish in this type of environment and can multiply and grow at incredible rates.

The microbial growth causes two problems. The first issue is that they cause the fuel to become acidic thus accelerating the degradation process. Secondly, the microbes, while individually are microscopic, begin to form colonies and develop as sediment in the bottom of the tank – right near the pick-up tube for the fuel. Yes, even though these organisms are microscopic, they are still large enough to clog filters, especially as the colonies grow in numbers and size! They may start out as organisms not visible to the naked eye to large masses of slime and sediment on the bottom of the tank! Remember that a strand of human hair is between 40 and 80 microns in diameter, and the filters, especially on the newer generation diesel engines, are in the 2-10 micron range. So it does not take too much of this stuff to clog up a filter and starve the engine of fuel – and of course it will happen in the midst of a crisis or extended power outage.

Yes, there are additives (biocides) that can be purchased for the purposes of killing the microbial growth, but lets discuss some of the fallacies associated with additives. First, just simply pouring the additive in the fuel tank does little to circulate the biocides where they will, or have a chance, to actually come in contact with the microbes and kill them. Second, even if you were able to adequately circulate the additive, the microbes that are killed just simply do not disappear. They may be dead, but they fall

to the bottom of the tanks and add to the sediment. The biocides do not dissolve or make the cell walls and membranes of the biological material disappear.

And what is the other key ingredient to microbial growth – water! Water sometimes can get into the fuel tank through leaks or maybe the rain cap on the main vent tube is missing. The other and most prevalent source of water in a fuel tank is through condensation on the interior walls of the tank. The atmosphere in south Florida is very humid and that humidity turns into a perfect source for water. As the temperature changes through out the day, the condensation forms and collects at the bottom. The surface between the fuel and the water, the fuel/water interface, is where the microbial growth starts! Just remember what the windshield of your car looked like this morning and imagine that the same thing happens each morning on the inside of your fuel tank.

Now let's talk about the new Ultra Low Sulfur Diesel (ULSD) and what that has done to the industry. Sulfur was one of diesel fuel's natural preservatives. Sulfur has been used as an antibiotic for many years, and with the limitations of Sulfur going from 225 ppm to 15 ppm in 2007, the chance for microbial growth has risen in diesel fuel. The new refining processes to remove sulfur from diesel fuel has caused the price to rise sharply which means it is even more critical to do everything you can to keep your diesel fuel **fresh** and not have it carted away by an environmental contractor.

OK, so what else can go wrong inside the fuel tank? What about the fuel that gets re-circulated back into the tank from the engine? More fuel is drawn into the injector rack than is actually used. It is returned back to the fuel tank, but has now been heated and that heated fuel can become acidic and accelerate the degradation process. There are additives to assist in slowing the degradation process by keeping the fuel from becoming too acidic and the formation of asphaltines, (paraffin and varnishes) but just as the biocides, it does not get circulated very well. Additives are beneficial if, and only if, the organization is disciplined enough to ensure that is added to the fuel at regular intervals. Accurate record keeping and maintenance schedules are a must. Most often, the additives get treated like the filter in your home air-conditioner. There are a select few that may actually change filters at monthly intervals like the manufacturers recommend, but in reality it only happens when you think about it or when the technician changes it during an annual service – if that even happens.

Also, as diesel fuel degrades, the asphaltines come out of solution and the particles get lodged in the filters and the larger particles add to the sediment in the bottom of the tank. The newer generation engines have very little tolerance for particles in the fuel and the filters on those engines can be as small as 2-10 microns. In other words, it will not take very long for the filter to become clogged, and the engine shutting down.

Additives are beneficial, but should in no way be considered the end-all. Personnel responsible for the operation of an emergency power supply system that are depending on those additives alone for dependable service will sooner or later be facing the question **"Why did the generator fail during the crisis?"**

So what can you have done to prevent answering the embarrassing question – and the answer will be broadcast on the television and circulated through social media faster than you can update your resume':

- Have your fuel analyzed by a certified petroleum laboratory – visual examinations or quick and easy field tests are minimal at best at determining if your fuel is **fresh**. Deal with the issue based on facts!
- Check the condition of your tank – visible leaks and missing rain caps are an easy route for water intrusion in addition to the condensation issue
- Have your tank cleaned if visible sediment is present and your fuel polished to remove water and particles
- Change filters on generator engines, engines in vehicles, and filters on fuel pumps frequently
- Use additives at the specified intervals, but do not rely on these alone to prevent a failure
- Refer to the technical data and instructions from the engine's manufacturer with regards to fuel supply – not the generator's manufacturer; the **engine's** manufacturer
- If you have fuel in a generator that is still in good condition, consider moving it into a high-use source such as a fleet fueling site and replace the fuel in your generator with **fresh** diesel fuel. Make sure that you are not putting fuel that exceeds the sulfur standards in the fleet tanks if you have any new generation diesel engines as they will not tolerate the increase in sulfur.
- If your system supplies powers for a fire sprinkler system or you are a health care facility, please ensure that you are following National Fire Protection Association (NFPA) 110 – Standard for Emergency and Standby Power Systems. If you have claimed accreditation by the Joint Commission of Accreditation of HealthCare Organizations (JCAHO), you are required to comply with NFPA 110.
- Have Southworth Fuel Solutions develop a comprehensive fuel management program for your organization!