

Case Study

A group of trawler owners in the US conducted their own test and discussion recently.

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A Little History

This concept is not that new to trawler operators. I saw such a system on two different Marine Traders we looked at while boat shopping. I was told that the complete schematic and "how to" instructions are in the MTOA "Technical Tips" newsletter. This system has no debugger (easy to add) but serves as a bypass, recirculation, transfer and back up fuel pump system (especially for the single engine vessels that often came with no primary filter).

I have gathered most of the parts needed for the system described by Captain Wil in his January and February posts. I had to double some of the parts to apply it to our twin tank/engine system with Racor 900s. I added a magnetic debugger(s) later on. My main goal is cleaning the fuel and tanks and recirculating it with my own system for less than what I would pay a contractor for one visit. I will keep records of what I encounter (not as any formal test and not as meticulous or scientific as Captain Wil) so, when I add the debugger(s) later, I may detect some further difference in the end state of the fuel. I and others theorize that the major value of the debugger is in the "polishing mode" which keeps already cleaned fuel from getting too dirty.

The magnetic concept of bacteria control and the invention of the magnetic device was done by Mr. Colin Wickham of Auckland, New Zealand. After the invention, Mr. Wickham began the marketing process world-wide. In the early stages, the device was known in the US as De-Bug.

At the time of the parting of the ways, Mr. Wickham had refined his original design and the new design was marketed in the US under the name of "Algae-X." I am informed that through out the rest of the world, this new device was marketed under the name of "FuelMag."

What Colin Wickham Claims

The claim of Colin Wickham at the beginning and still today is that the magnetic unit will destroy the bacteria in the fuel which passes through the unit and doing that will improve the performance of the engine, reduce operating cost, and increase the life of the diesel engine associated with the system.

All of the other claims and statements about this process are from other sources and are classified as anecdotal evidence. The dictionary gives one definition of anecdotal as: "based on or consisting of reports or observations of usually unscientific observers anecdotal evidence."

Why Bother With It All?

The only reason to pursue this subject is because of its possible impact on our successful use of our boats in the conditions we use them in. It should be obvious that the single most common reason for a marine diesel engine to stop is because of clogged fuel filters. Because of the low hours normally put on pleasure trawlers, low fuel consumption of pleasure trawlers, and relatively large fuel capacities of pleasure trawlers, we are very prone to the problems of dirty, contaminated fuel and clogged filters.

We are not alone. The literature is full of many kinds of commercial vessels which report severe problems with dirty fuel. These vessels include Tug Boats, Pilot Boats, Coast Guard and Navy vessels. These vessels operate frequently, for long periods, and burn large amounts of fuel. Their problems indicate that we are just part of a large fraternity who need a better solution to keeping our fuel clean.

Captain Wil's Anecdotal Evidence

A polishing system was installed on AfterSail which pumps 45 gph thru a magnetic unit and 2-micron Racor filter. The fuel capacity is about 700 gals. and was dirty at the start. After 167 hours of operation, the vacuum drop across the 2-micron Racor dropped to 0-inches and has remained at that level.

There are now 1250 hours of polishing system pumping on one Racor element as well as 250 hours of engine time on this engine. That's over 58,500 GALLONS OF DIESEL FUEL THRU THE FILTER ELEMENT AND THE PRESSURE DROP ACROSS THE FILTER IS 0.0 INCHES. Analysis shows no bacteria of any kind in the fuel. These facts are in agreement with the claims.

What is in addition to the claims is the fact that the fuel which was black is now perfectly unclouded red. It is in the same condition it was when first put in the tank. The crud at the bottom of the tank has disappeared, the water at the bottom of the tank has disappeared, the engine runs quieter, the engine idles smoothly at lower RPM, and the soot on the transom is reduced. This, by the way, is Captain Wil's anecdotal evidence.

Who Got What From Whom?

After more than six months of testing and observing my system, I am convinced of the marvelous results when using this system. I am most interested in just what is going on and hoped that the inventor could help me understand what magic is really happening. I asked for any lab. results he had. There is only one extensive lab report which verifies the claim that the magnetic unit reduces the bacteria which passes thru it. That report does not explain all of the other things which are going on. While I was glad to see some professional verification about the bacteria claims, I was disappointed that NO ONE seems to know, for sure, just why all the other benefits are occurring.

While I was interested in their tests, they were equally interested in my tests. While they have many reports of the same kind of results I have seen, no one else, it seems, except Captain Wil, has gone to the trouble to make weekly observations, verify flow rates, record pressure drops across the filter on a regular basis, etc. Others just rejoice in the results.

It is interesting that they are not surprised by my results, but do not make any claim that the black will go away, the crud from the tank bottom and water will disappear.

Beyond the Claims

To gain the benefits which are possible beyond the verified claim of destroying bacteria, evidence from other experiences is necessary and this report is really about that. The following is a brief distillation from my experience.

- Great circulation is necessary to obtain the best results. For most installations in pleasure trawlers this means installing a bypass polishing system. Few, if any, diesels in our range return enough fuel to the tank to get the job done.
- The circulation rate should turn the fuel over three or four times per week. I pump a total of 48 hours at 45 gph per week.
- The fuel tanks should be kept as full as possible. No chemicals of any kind should be added to the fuel.
- A vacuum gauge should be installed on the leaving side of the Racor to monitor the pressure drop across the element. The element should be changed when the vacuum drop exceeds 5-inches.

What's Going On?

I really don't know. It's something like electricity, we don't know what it is, but we use it. This system will clean up your fuel and regular use will keep it clean.

Who's Doing it?

I have seen letters from, Virginia Pilot Association, Bay Gulf Trading Company (tug fleet), and US Department of Transportation giving testimonials to FuelMag. I have seen a list of six Coast Guard and one Navy vessel on which the FuelMag unit has been installed.

Finally

I am more than pleased with my system.

Questions

I do not know what type of algae grows in diesel. However, the term algae >is often applied to what were known as blue-green algae. BG algae are >actually bacteria and now go by the name cyanobacteria. Eukaryotic algae, >common algae, have large cells and would likely be caught on a filter. >Since many cyanobacteria are as small as bacteria, removing them by filtering may be a problem.

I think that you are right. A 2-3 micron filter will not take them out, but a 0.1-0.2 micron filter will. This is something I learned just today, by calling up some friends in the fuel filtering business. I am not a microbiologist that I would be able to speak with authority on these things; but I have heard many people refer to them as bacteria. I was under the impression that algae needed light to grow, which would rule them out in most cases in dark fuel tanks.

I've also called around a bit today to see who is using these magnetic devices. It seems as if a number of credible folks are buying them as a result of having run their own tests. One local fuel supplier is even installing a custom made one on a twelve inch fuel line. Right now, I'm to the point where I am no longer calling them snake oil--even though, like Captain Wil, I'm not sure how they work. I've just had a sufficient number of credible people tell me that they do work

The following is a quote from a part of a F X McGreecham article

to the Proceedings of the Marine Safety Council (July-September 96):

"Microorganisms are single-celled organisms surrounded by a phospholipids membrane. The purpose of the membrane is 2-fold. First, it physically contains the cell's organilles and the other cellular machinery (proteins) needed for survival. Second, it maintains a separation between the intracellular and extracellular salt solutions in which the cell exists.

This separation of the ions across the bacterial cell wall and the maintenance of the impermeable phospholipids membrane is essential for cell life. The bacteria cell membrane contains protein channels that transport different ions across the membrane to control both electrical and chemical potential that exist across it. When microorganisms are subjected to a strong magnetic flux field, the ability of the protein channels to maintain the electrical and chemical potential across the cell's membrane is greatly affected. In brief, the membrane is drastically torn apart and the microorganism is destroyed."

Further Responses

A few opening remarks, then answers to some detailed questions.

1. I have nothing to sell or prove. The only reason for the work was to keep MY FUEL TANK CLEAN AND MY ENGINE RUNNING. I reported the results for information only.
2. My experience leads me to believe that a 2-micron Racor filter will never clean up the tank. My experience is that the filters just keep getting clogged up. I accept that condition as a fact and not theory.

Several possibilities present themselves for seeing results after fitting a debugger.

1. *Your original black fuel was full of bacteria which the magnetic unit killed.*
2. *Your original black fuel had no bacteria to start with. Your increased >engine efficiency is attributed to a reduction of dirt, water, and algae in the fuel caused by the Racor.*
3. *Your original black fuel had bacteria which was caught by the 2-micron filter rather than being killed by the magnetic unit. The bacteria may or may not have caused the black discoloration, which may have been caused by dirt or algae in the fuel.*

Do you have any ability to eliminate any of these possibilities? My recollection is that you had to change Racors many times before the fuel was clean, is that right?

I'll not go into the possibilities. The facts are that the tank and fuel did clean up. I am on the THIRD 2-micron, size 500 Racor element after the start of this system. More than 65,000 gallons of diesel have been pumped through those three elements and over 57,000 gfallons through the last element. I'll change it at the end of the year whether it needs it or not.

The first two elements were changed during the first 167 hours when they developed a pressure drop of 2.5-inches of vacuum. The third element vacuum increased to 5.5-inches and then slowly decreased to 0.

HAVE YOU EVER HEARD OF ANYONE PUMPING 57,000 GALLONS OF DIESEL THROUGH ONE 2-MICRON, SIZE 500 FILTER?

HAVE YOU EVER KNOWN A CASE WHERE THE PRESSURE DROP ACROSS A FILTER ELEMENT DECREASED IN SERVICE?

To me, this is more than anecdotal evidence.

I remain skeptical about the ability of magnets to kill bacteria, although >it offhand seems likely that bacteria would be more affected by a magnetic field than a plant. On the other

hand if live bacteria can pass through a 2 micron filter I fail to see how it could affect engine performance. Isn't that too small to clog an injector?

If we assume for the moment that the magnetic unit kills bacteria, and that it is beneficial to do so, we are presented with two possibilities. Either the now-dead bacteria is still in your tank, or a 2-micron Racor will trap dead bacteria but not live bacteria. Is there a possibility I haven't thought of?

All I can say is look to the evidence. If it walks like a duck, quacks like a duck, it must be a duck. You're trying to use logic on a process which isn't fully understood yet. Have you tried to explain electricity?

On the Magnetic Fuel Conditioning I have a nagging doubt. I wonder if you would have achieved exactly the same results (clear, red, uncontaminated fuel, no water, etc.) by doing everything you did and do now, but w/o the magnetic gizmos. Is the "black" colored diesel that you started out with the sign of bacterial contamination? Would the 2 micron Racors remove that w/o the help of the magnetic gizmos? Is there anything you can suggest that definitively points to the FuelMag as the contributing factor?

I spoke at great lengths on this subject during the first seven posts. In a nut shell, the quantity of fuel pumped tells the story. If the results of seven months of observation don't do the trick, I don't know what will.

The other doubt I have is this:

It would seem to me that were I to be making and promoting these devices, it would be very simple to set up a test rig to demonstrate their effectiveness. Just take some bacterially contaminated diesel, circulate it past a FuelMag for X hours and "voila", uncontaminated fuel. But as you allude to, everything I read about these things is vague and anecdotal. The question is why. If it's all true, I would think that it would be very easy to create lots of unequivocal lab results to use in the promotion of the product. Do you agree??

I doubt it is easy to make a first class lab. test to demonstrate all we want to know, but I have asked them why not do it. My sense is that such a test is not coming. Among the reasons is that after the great expense of a quality test, someone would want one done another way. But I really can't (and don't want to) speak for them.

If you don't have a fuel problem, or if you believe some other method is superior to this, don't consider this process. My only intent is to share my experience. You must be comfortable with how you manage your boat.

Captain Wil's report

http://www.guangmingdaily.com.cn/technique/fuel_dispenser_t20060330.html