



Photo courtesy Mahina Expeditions

By Ed Stott

**M**y wife called while sailing for a week on a Blue Water Sailing Club women's cruise. She had been sailing on a Dehler 41 Deck Saloon and having cocktails on a Hylas 49. I recall her saying something about running the genset, probably to chill the refrigeration to make more ice cubes for cocktails, while I'm down below on our vintage Swan 44, sweating on a 90-degree day while cleaning diesel fuel tanks.

**WHY DIESELS STOP RUNNING**

As an offshore delivery skipper

on numerous yachts to and from the Caribbean and invariably, in the Gulf Stream when the weather is rough or just sailing in the usual offshore gales, I have seen the "sludge" or "algae" that has accumulated in the diesel fuel tanks over the years begin to show itself. The fuel filters become clogged; the engine is starved of fuel, it runs erratic and quickly comes to a halt. If the boat is equipped with dual primary fuel filters, you can switch to the alternate filter and keep the diesel running for a while, while you change the filter element in the first filter.

If you have only one primary fuel filter and the conditions are rough or

A clean fuel system will ensure that your engine will run when you need it most

you're making the passage through Town Cut in St. George's Bermuda and the engine stops due to a clogged primary filter, you now have a new problem on hand. Having a fuel filter that has a clear sediment bowl with a drain in the bottom for purging water is preferred and a vacuum gauge installed on the primary filter provides a good indication as to when it's time to change filters. The three things that are paramount to keeping a diesel engine running are clean fuel, clean fuel and more clean fuel.

**HOW DIESEL SLUDGE FORMS**

It's important to understand how "sludge" or microbial contamination becomes present in your fuel tank. Water can become present in your fuel tank through condensation, water intrusion at

# Keep Your Diesel Running

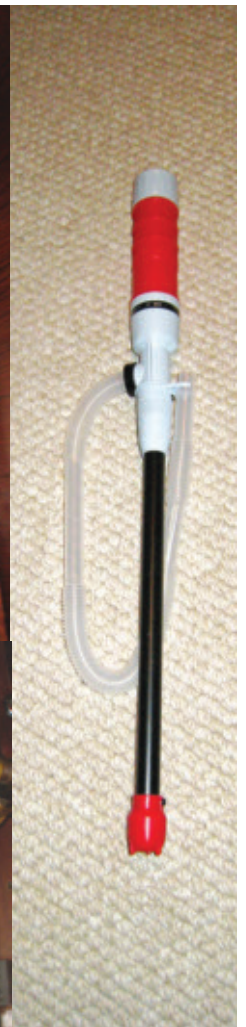
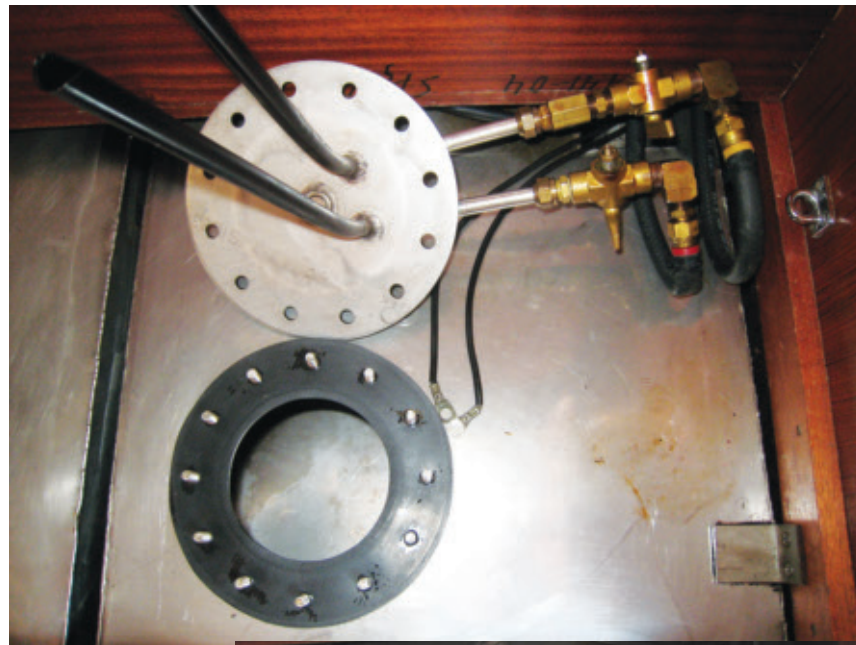
The diesel supply and return lines are connected to the inspection plate in this diesel tank, right, making it easy to inspect the lines. A handheld pump, far right, makes it easy to vacuum out some of the sludge

the deck fill, a vent, or from the source where the fuel was purchased. In all water intrusion cases algae or bacteria will eventually grow. Water is heavier than diesel fuel and will accumulate at the bottom of the tank. The algae or bacteria thrive when water and oxygen are present in the fuel tank. The bacteria lives, multiplies and eventually dies in the area between the water and the diesel fuel creating diesel sludge. Water and microbial contamination are then transferred to your fuel filter through the supply tube, which in most fuel tanks extends almost to the bottom of the tank where water and sludge is present.

Large fuel tanks are built with baffles inside to minimize the sloshing effect when the boat is leaping off waves. Water can accumulate in pockets around the baffles and the bacteria will grow on the walls and floor of the tank and can be impossible to get to. If the tank is heavily contaminated, it is advisable to manually clean these areas. If access to the entire tank is not possible, cutting access holes and installing inspection ports between baffles is advisable. Also the use of a biocide a few days before cleaning the tank loosens the bacteria from the tank walls, and a lot of the bacteria will be picked up during the fuel polishing process.

## TANK CLEANING

You need to get to the root of the problem by cleaning the tank. Only having the fuel polished and not cleaning the tank is just treating the symptom and not treating the problem. The “sludge” or bacteria and any water present in the tank must be



evacuated from the fuel tank. This is not a fun project or one that can be done in a hurry, but once completed, you will have a new found confidence in the quality of the diesel fuel being delivered to your engine. Polishing the contaminated fuel once the fuel tank has been cleaned is recommended.

The do-it-yourself method is possible if you're at all handy with the tools in your toolbox. Set aside a day to clean the tanks without interruption. The job can be completed while the boat is on the hard, tied to the dock or on a mooring.

The tank shown has diesel supply and return lines connected to the inspection plate. On the underside of the inspection plate are supply and return tubes that extend into the tank and terminate about a quarter-inch from the bottom of the tank.

If the supply and return lines are equipped with shut-off valves, turn the supply and return valves to the off position to minimize any excess fuel from spilling and carefully remove the nuts to the inspection port. If the supply and return lines are a part of the inspection port, expect some diesel fuel to run out of the tubes that otherwise are inside the tank. This is a good time to carefully inspect the supply tube for pinholes, a bad weld or connections that could draw air into the system shutting down your engine.

Assuming your primary tank is not full to the top so it won't spill over when the inspection port is opened, begin by evacuating the fuel in the first fuel tank to another fuel



tank on board or to jerry jugs. There are many reasonably priced, portable 12-volt vane pumps available for fuel transfer. I have also used an inexpensive diesel fuel transfer pump that runs on D-cell batteries and will fill a five-gallon jerry jug in a matter of minutes.

Once all the fuel has been removed from the tank, you're now ready to inspect the fuel tank for "sludge." You may see a black film on

the bottom of the fuel tank and in the crevices and corners of the tank, or you may find a lot of sludge. It's very important to clean the tank to the best of your ability. If you're using a 12-volt fuel pump with a hose or a PVC wand, you may be able to "vacuum" some of the sludge from the corners and around the tank baffles but don't count on this method to really clean your tank as evidenced by the photo above.

You'll need a pair of Rubbermaid dishwashing gloves, oil absorbent rags to clean the sludge and a receptacle to put the used absorbent rags in. Check with your local municipal-

ity regarding the proper disposal of the rags. Try not to use rags that will leave lint or paper towel remnants that may later get drawn into the fuel supply tube and create a block-

as many angles inside the fuel tank as possible. Even if you can see the seams and welds yourself, your digital camera will allow you to zoom in on the photo for a close-up inspection

while the photo is still in the camera. Once you upload the photos to your computer you may inspect the welds and seams up close.

The two photos to the right are of the same seam. The close up shot gives a good view of a weld that appears to be opening up. I'll take the



A pump may be able to get out the worst of the sludge, above, but you will still need to wipe down the tank. A weld/seam inspection, right, is an important step. Mmmm...sludge, opposite right

age in a fuel line elbow.

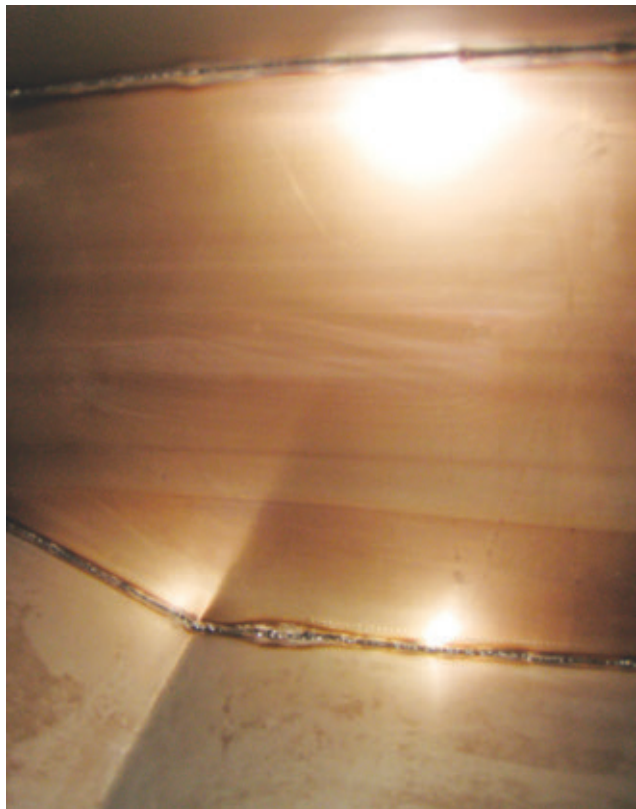
### TANK CONDITION INSPECTION

Now the tank is clean, and we're feeling pretty good about our accomplishment but the job isn't complete yet. The next step is equally as important as the cleaning. The tools you'll want to have at hand are a flashlight or droplight, mirror and a digital camera. Using your light and mirror, carefully go over every possible inch of the inside of the fuel tank, paying particular attention to the seams or welds if the tank is aluminum or stainless steel. Use your digital camera to take photos of

prudent approach and pull the tank out of the boat and have it looked at by a welder rather than chance a bilge full of diesel fuel.

### FUEL POLISHING

Once the fuel tank is clean and thoroughly inspected, you're ready to have the dirty fuel polished and reinstalled in your fuel tank for many trouble-free miles. Fuel polishing is the continuous cycling of fuel through an independent filtration system other than the engine's primary filtration system. Boats with large fuel capacities may consider installing an independent



onboard fuel polishing system. I use a portable fuel polishing systems that runs on 12 volts and cycle all the fuel six to 10 times to remove suspended contaminants. The fuel polishing system is also used as my fuel transfer pump.

### USE THE AVAILABLE FUEL

On boats that are equipped with multiple fuel tanks, skippers often seem to have a “favorite” fuel tank. They draw down on one particular fuel tank and refill it instead of drawing down on the other tanks. Although you want to keep your fuel tanks as full as possible to reduce condensation in the tank, don’t neglect using the fuel in the other tanks. If fuel in the alternate tanks becomes unused and old, it may become unstable and already have water and sludge accumulating in

the tank, making it unreliable when you need it most. Get in the habit of turning the fuel over by using most of the fuel in every tank before refueling again.

I consider tank cleaning a must for all boats, particularly those headed offshore or any boat that is coastal sailing in an area where the “sludge” in your tank may get stirred up, especially if the fuel tanks haven’t been cleaned in years. A coastal example would be an area where a robust breeze opposes the

current causing square waves that pitch the boat up and down sufficiently enough to stir up the sludge, ultimately clogging your fuel filter and starving the engine.

You may want to put tank cleaning and fuel polishing on your preventative maintenance schedule rather than waiting until the diesel coughs and spits and tells you it doesn’t like the fuel you’re feeding it. If you’re heading south to the islands this fall, fuel tank cleaning and fuel polishing should be at the top of your to-do list

