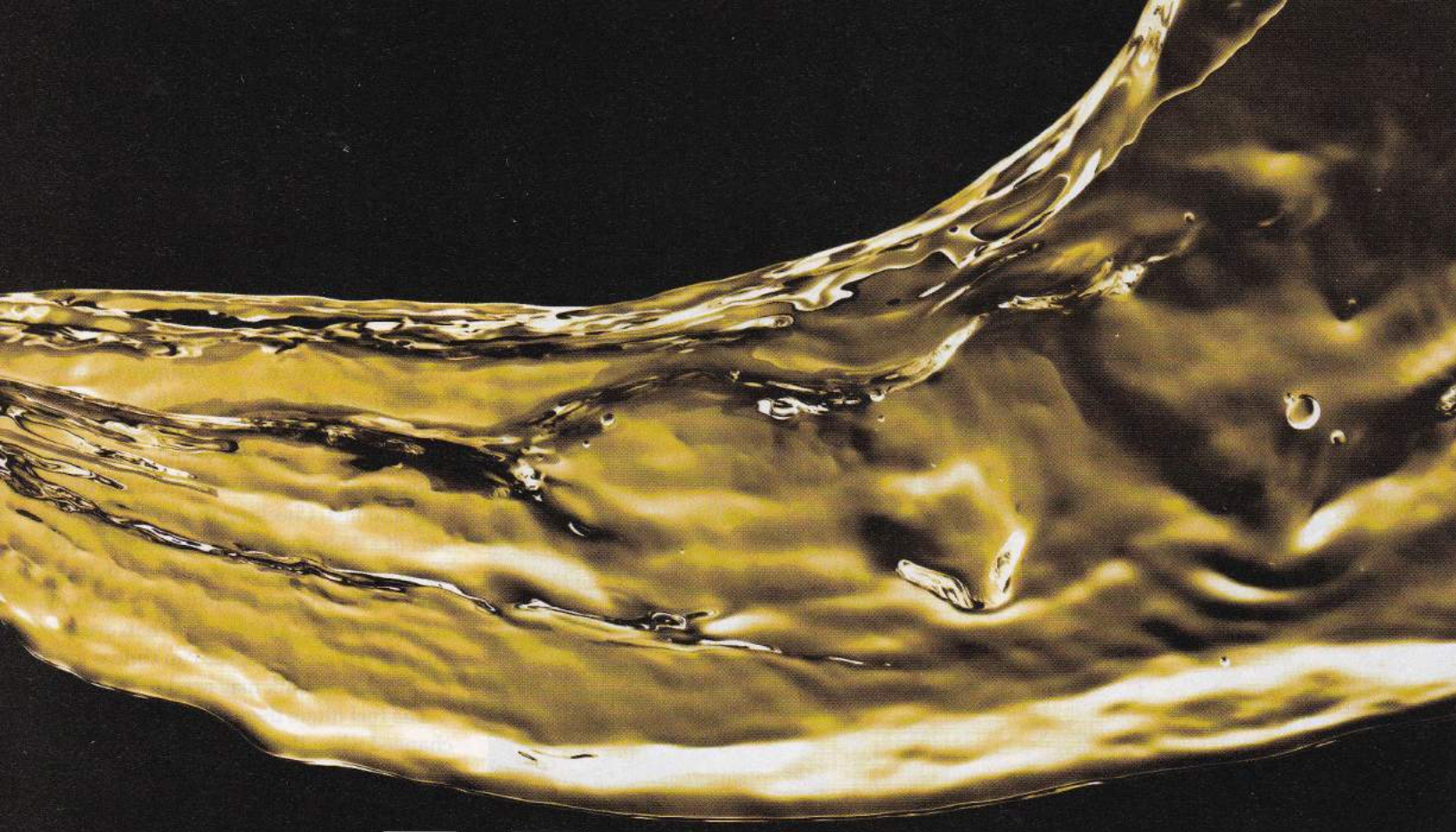
CLEAN FUEL, HAPPY BOAT

Diesel engines are tireless workhorses, but they're finicky about their fuel, so do what's necessary to keep things clean and dry.

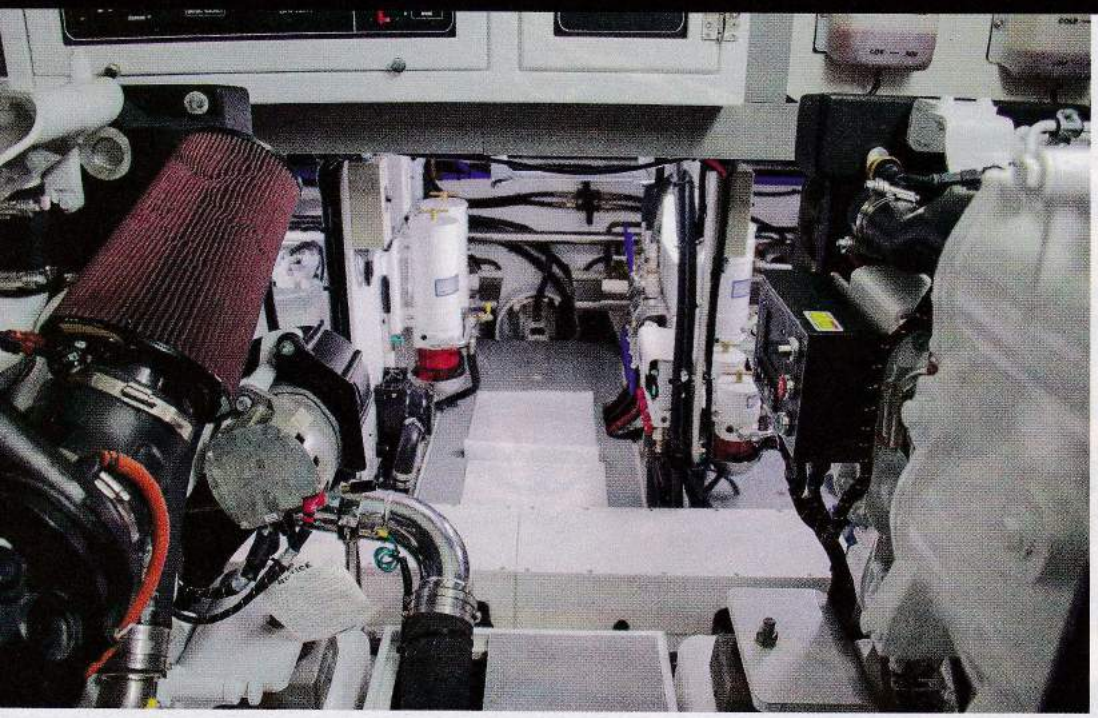


Most boat owners have heard a self-professed dock guru at their marina quote an old saw: "All a diesel engine needs to run forever is clean fuel and air." Strangely enough — unlike his advice about using Freon to clear a clogged head — this adage actually has merit. According to national repair statistics, nine out of the 10 most likely diesel engine problems will be the result of contaminated fuel. Learn how to keep your fuel system in top condition — and yourself from becoming a statistic.

DIESEL FUEL & SO MUCH MORE!

One of the major differences between gasoline and diesel engines is the way they use fuel. Gasoline is simply a fuel that's burned to produce heat and power, but diesel fuel does much more, which is why keeping it clean is so critical. In addition to producing power, it acts as a lubricant, which is why it feels oily. Diesel engines circulate more fuel than is needed to produce power, and the extra fuel not only helps lubricate the engine but also carries away excess heat.

Like the self-professed dock guru says, the key to keeping your diesel engine happy is clean fuel. While gasoline engines may shake and sputter a bit while doing so, they can normally burn through a little water in the fuel. Not diesels. They may be more robust, but they have a zero-tolerance policy when it comes to water or other particulates. The reason for the clean fuel hubbub has to do with a diesel engine's injectors. Fuel injectors are precision-tuned components that deliver a precise, ultra-fine mist into the combustion chamber. They don't like contaminants one bit, and even microscopic specks of dirt or water can wreak havoc on the combustion process (as well as your injectors and, consequently, junior's college fund).



FILTERS: FIRST LINE OF DEFENSE

While you, of course, want to avoid taking on fuel from a questionable source, it's best to assume that even the fuel at the best marinas will contain at least some traces of dirt and water, which is why having and maintaining a proper onboard filtration system is so critical.

Most diesel fuel systems will contain a large primary filter mounted near the engine, perhaps on a bulkhead, and a smaller secondary filter mounted on the engine itself. The primary filter does the lion's share of fuel filtration, while the finer mesh secondary unit does the cleanup work by filtering out any microscopic particles of grit and water that sneak past the primary.

Most larger diesels will have a second primary filter plumbed into the fuel system, via a manifold or crossover switch, which allows a clogged filter to be changed underway. It's an excellent setup for any diesel. Just be sure to carry plenty of extra primary and secondary filter elements. And it would help to know how to replace them out on the water and how to bleed the engine's fuel system — a common requirement whenever you change a filter.

Primary filters should have a clear sediment bowl, to make visual checks for evidence of water or sediment in the fuel easy and fast. Checking the bowl should be part of a daily routine while cruising, and if you spot water or contaminants in the bowl, drain it using the plug at the bottom. Having to drain a filter more than every 80 to 100 hours of engine run time is an indication the tank may need to be cleaned.

The fuel filters themselves should be changed when they're dirty, but definitely prior to affecting engine performance. One way to stave off trouble is to replace the filters at regular intervals based on the engine manufacturer's recommendations (e.g., a given amount of hours or annually). A more accurate way to monitor filter performance is to install a vacuum gauge at the primary filter. The gauge provides a visual representation of fuel flow restriction through the primary filter or, conversely, how hard it is for the engine to suck fuel through it. The higher the gauge pressure, the more clogged the filter is and the more immediate the need for replacement.

ESSENTIALS

To help ensure a safe and uninterrupted passage, be sure to carry spare components, which can include (from left to right) a fuel filter water separator, other appropriate filters — e.g. from Volvo (cutaway) or an H2Out (blue) — and a funnel filter.

Diesel engines don't like contaminants one bit.

Filtration systems are the first line of defense against fuel contamination

As the primary filter captures the majority of contaminants, the generally accepted rule is that the secondary filter need only be changed at every other primary filter change.

To help keep bad fuel from entering your tank in the first place, use a multistage fuel filter funnel when taking on fuel. Popular examples include the Racor Fuel Filter Funnel or Mr. Funnel.

One final note on fueling. Even if you use a fancy new filter funnel and take other such precautions, the best option is to always purchase the cleanest fuel possible. Select marinas that have a high rate of fuel sales, which means a high rate of fuel turnover. For example, the best marina I know in this regard is located beside a major highway and also serves as a truck stop.

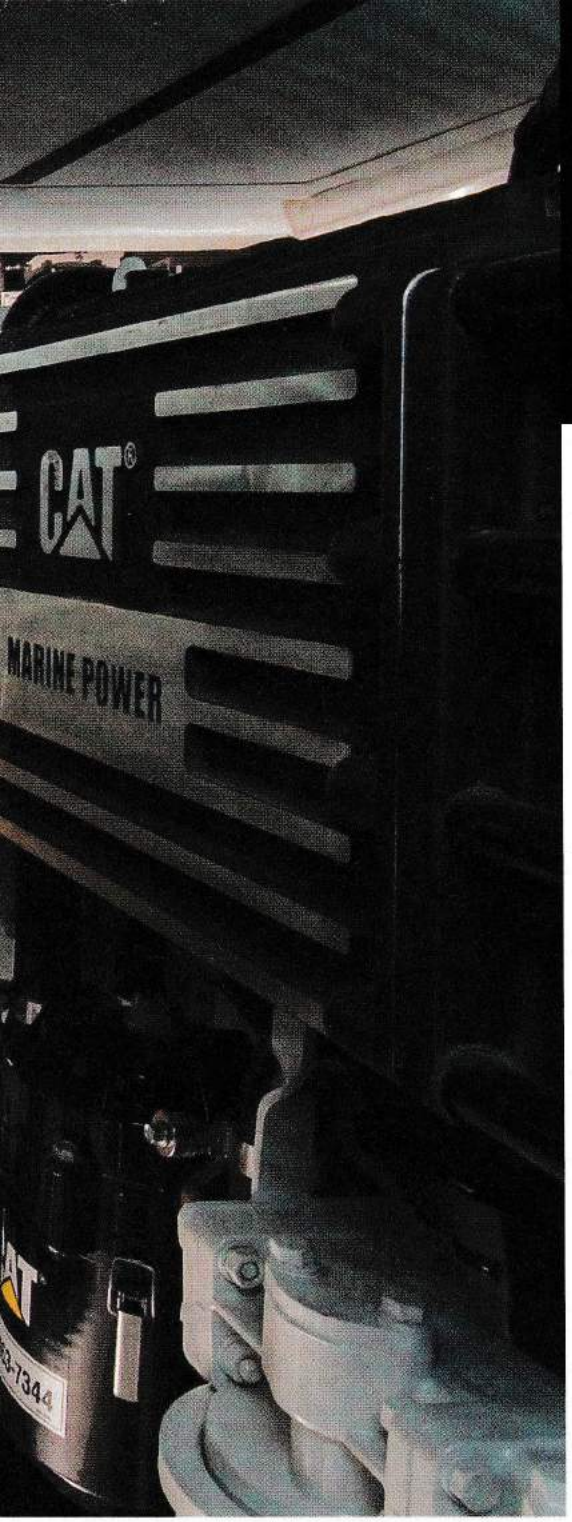
If you have any doubts about the cleanliness of the fuel down at the Oyster Shack Restaurant & Marina, pump some into a clean glass jar before fueling and let it sit for a few minutes, during which time water and dirt will settle to the bottom. If you see either, buy your fuel somewhere else.

FUEL POLISHING

FUEL POLISHING IS SIMPLY cleaning the fuel inside your tank by cycling it through a filtering system and returning it to the tank. Fuel polishing systems are typically separate from the engine fuel supply, although in some cases they can be plumbed to utilize the engine's primary fuel filter. They can be operated 24/7 if necessary (depending on design) and do not require the engine to be running.

When designing or installing a polishing system, fuel should be drawn from the bottom of the fuel tank. The fuel pickup for the engine typically stops an inch or so from the bottom of the tank, to reduce the chances of sucking up contaminants — the very stuff you want to reach when polishing.

The time required to cycle through all of the fuel in your tank will depend on the polishing system components; however, three to four hours is a reasonable goal to shoot for when you're designing and shopping for a system. The system should also be designed to allow easy access to inspect and replace filters. As with your primary fuel system, it's recommended to install a vacuum gauge to monitor filter condition.



The fuel tank deck fill is a common point of ingress for water, so do everything possible to keep it sealed.

David J. Shuler

CLEAN FUEL ONLY HALF THE BATTLE

So, you went the extra mile and made sure the fuel you took on is clean. A commendable first strike in the war against fuel problems, but it's only the first skirmish. Two of the biggest enemies in the battle for clean fuel are water contamination and long-term storage.

First up is water, which loves nothing more than penetrating your defenses and getting at all that dry, clean fuel you just bought. Diesel engines use pressure to generate combustion, and when water enters the engine it turns to steam, which can literally blow your injectors to pieces. Water also mixes with the sulfur in your fuel to create sulfuric acid (sort of like the blood of those critters in the "Alien" movies), which can cause internal engine parts to corrode.

The best strategy, particularly for long-term storage, is to treat clean fuel with stabilizers and biocides before a bug issue occurs.

What are some of the ways insidious water gets into fuel tanks? One is through the tank's vent system. Unlike the closed fuel system in your car, a boat's tank is vented, and an open system lets moisture in, where it can condense on the inside walls of a tank due to daily heating and cooling cycles. The more air in the tank, the more moisture and potential condensation. To combat potential trouble, it's recommended to keep your fuel tank fully topped off (up to 95 percent), particularly during long-term storage.

Another common point of entry is the fuel tank deck fill, due to factors such as missing O-rings and deteriorated gaskets. Fuel fills on sidedecks are especially vulnerable in this regard, particularly on sailboats, because they can ship a lot of water during rough passages, heavy rains or washdowns.

As water enters a fuel tank, it eventually separates and settles to the bottom — a common problem with long-term stored fuel. That's when it gets buggy. Microbes thrive in such water, and their only goal in life is to eat and multiply. Sure, you can add biocides after the fact and kill the little SOBs, but as any good hitman knows, killing is the easy part. The problem is disposing of the bodies. In the case of dead microbes, they'll lie in wait at the bottom of a tank until a rough passage and then rise up — zombie-like from the dead — to clog filters and wreak vengeance on the fuel system or, worse still, the engine.

The best strategy, particularly for long-term storage, is to treat clean fuel with stabilizers and biocides before a bug issue occurs and prevent water from entering the tank in the first place. No water, no critters.