

Screen Test

Today's marine fuel filters do a good job of screening contaminants. But which one works best?

Story and Photos by Bill Grannis

There's an old adage about oil and water not mixing, but it is even more true of gasoline and water. Water in a boat's fuel tank can cause a world of problems. It will almost certainly hurt performance, and can strand you with a dead engine that's in need of major repairs. And if your boat has twin engines — whether they're outboards or stern-drives — you're at twice the risk, particularly if both engines draw from the same tank.

Water can creep into your fuel tank in many ways. Alcohol in today's gasoline attracts moisture, which migrates to the bottom of the tank. Not topping off after each fishing trip allows condensation to form due to temperature changes, especially in humid environments. A bad O-ring around a fill-cap or an unshielded vent fitting will also allow water or debris to enter your fuel supply. Of course, contaminated fuel from a gas dock is always a possibility.

A water-separating fuel filter (or spin-on fuel filter) can help screen out water and other contaminants, ensuring that your engine gets the pure fuel it needs. But not all fuel filters are equal. Just as costs vary (from \$7 to \$22), so does quality. What do you get for your money? To find which brands offer the best elements, largest filtering areas and greatest contaminate capacities, we tested a wide range of filters for gasoline engines. Here's what we learned:

FILTER ELEMENTS

A marine spin-on fuel filter resembles an automotive oil filter, and consists of a metal canister that's crimped to a round "head." The head is a thick steel disk containing an O-ring, six to eight inlet holes, and a threaded hole in its center. A

spring inside the canister holds a filter element tightly against the head. The filter is screwed onto a mounting bracket, measures approximately 3/4 inches in diameter, and ranges from 3/8 to 7/8 inches in length. One brand, Racor, offers filters with reusable plastic or metal bowls equipped with a petcock to drain trapped water.

Gasoline entering through the inlet fitting travels into the filter assembly, and any water settles to the bottom of the canister (since water is heavier than gasoline). Fuel passes through the element, removing any minute particles. The clean fuel exits through the center hole to the outlet fitting.

For our testing and comparison purposes, specifications concerning micron rating and filter area were obtained from the manufacturers when possible. A micron is 1/1000 of a millimeter or 0.00003937 of an inch. Filters with a 28-micron rating will trap particles of about 1/1000 of an inch.

The Mercury and MerCruiser filter style, with its 1/8-inch threaded hole and a 2 1/4-inch seal ring, is an industry standard used by Yamaha and aftermarket suppliers. For years, this was a full-size canister (Mercury/Quicksilver Part No. 35-60494), although it's since been replaced with a short canister (Part No. 35-807172).

By comparison, Bombardier (formerly OMC) filters designed for Evinrude and Johnson outboards have a 1-inch thread with a 2 1/4-inch seal ring.

Worth noting is that some engines — such as Evinrude's Ficht Ram and Mercury's Opti-Max outboards, as well as late model Volvo Penta sterndrives — use proprietary filter systems that we didn't test. This story concentrates on filters and mounts suited for non-proprietary applications; in other words, cartridges and brackets that are suited for aftermarket installations.

Racor makes filters to fit either Mercury or Bombardier



■ The basic components of a spin-on fuel filter help protect your engine from contaminants. The gray inside the canister is epoxy coating for rust resistance.

(formerly OMC) mounting brackets, and also offers a proprietary bracket and filter with a 1-inch thread and a 3/8-inch seal. It's important to note, however, that a Racor bracket handles only Racor elements (more on this in a bit). Other aftermarket companies make both Bombardier- and Mercury-style filters. Sierra and Aqua Power, brands now owned by Teleflex, produce identical filters. The Marine Power filter comes in a Marpac box, but is also sold in its own packaging.

TESTING PROCEDURES

Owing to its widespread use, we used the Mercury-type bracket and filter styles for testing, except for the Bombardier element that requires an OMC bracket. On a workbench, we mounted a filter bracket, an electric fuel pump and a Dwyer differential-pressure gauge. The gauge measures the input and output pressures at the filter and displays the difference. This provides the true flow resistance of a filter assembly. Mid-grade gasoline, mixed at 50:1 fuel to oil, was drawn through each filter at approximately 24 gallons per hour, roughly duplicating the fuel consumption of a large V-6 outboard at high-speed.

We then introduced water through the fuel-intake hose un-

Fires, Filters, Feds

Because gasoline is extremely flammable and explosive, inboard and sterndrive fuel systems have to comply with federal regulations concerning installation, materials and fire-resistance. Fuel-system components have to withstand a 2 1/2-minute direct flame to meet the U.S. Coast Guard safety requirements mandated in Title 33, Part 183.590 in the Code of Federal Regulations.

Because of the law, Racor's see-through plastic bowl and outboard fuel filter can neither be used legally nor safely in enclosed compartments on inboard or sterndrive boats. Racor makes a metal bowl and a heavier-gauge filter housing for these applications. Read all the instructions and labels carefully. Approved filters have a "UL" suffix on the part number (e.g., S3232-UL for inboards and S3232 for outboards). The filter canisters are labeled "Outboard Only" or "Inboard and Outboard" depending on the model.

— Bill Grannis

til it was seen in the clear line attached to the outlet fitting and recorded any increase in vacuum. At this point, we removed the filter canister and measured how much water it retained. With the Racor's petcock, we drained the water without removing the canister.

(Incidentally, manufacturers do not recommend re-installing a used filter after draining because of the chance for fuel or air leaks.)

FLOW RESTRICTION

Vacuum is commonly



■ The Mercury/Quicksilver-style mounting bracket has four 1/4-inch NPT fittings. On the right, a Bombardier bracket uses two 3/8-inch NPT fittings.

Screen Test

measured in inches of mercury (Hg), but smaller pressures are measured in inches of water — the force required to lift a column of water 1 inch. An inch of mercury equals 13.6 inches of water. Most of the filters needed only 7 inches of water (about ½-inch Hg) vacuum to pull the fuel through the filtering element — about the same force needed to sip water through a 7-inch straw.

■ This Racor filter and bowl measures 7½ inches in length — more than 3 inches longer than other canisters.



The Marpac/Marine Power needed only 5 inches, possibly due to its thinner and coarser filter paper. Mercury/Quicksilver and the Sierra/Aqua Power assemblies needed 8 inches, and the GLM required 9 inches.

When the filters started to pass water, vacuum rose an additional 3 to 4 inches — except for the Racor, which doubled to 14 inches. After draining the water via the petcock, we retested the Racor with fresh fuel and found that resistance had increased from 7 to 12 inches.

WHAT WE LEARNED

Our physical inspections showed that the Yamaha, Mercury/Quicksilver, Bombardier (formerly OMC), and Sierra/Aqua Power elements had the heaviest steel canisters with an internal epoxy sealer for rust protection. That's a plus in the saltwater environment, especially when the filter is mounted in an exposed location. Mercury/Quicksilver, though, was the smallest of the group.

Imported filters had little or no visible rust-prevention coatings,

and internal parts were not as substantial as in the domestic brands. Light could be seen through the Marpac/Marine Power filter paper because it was so thin.

The Racor is the most versatile filter, owing to its drain valve and see-through bowl, but needs additional vertical clearance to install. Its advantages are a large filter area, a fine micron rating, and its ability to trap large quantities of water. The clear-plastic bowl cannot legally be used in enclosed spaces with inboard or sterndrive gasoline engines, however, due to federal safety regulations concerning fuel systems

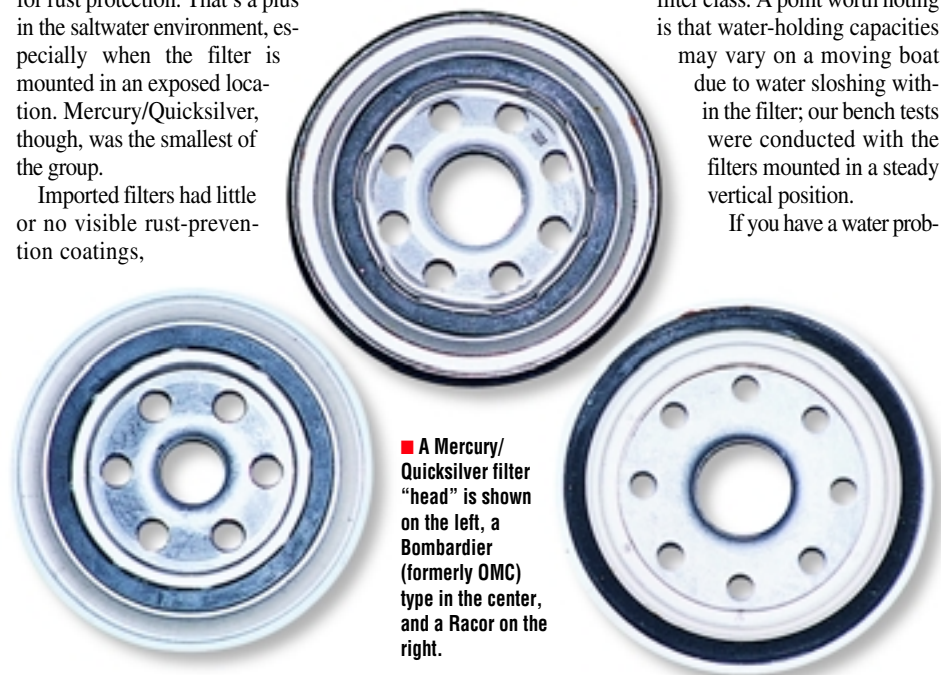
and fires. You must utilize Racor's metal bowl and UL Series filters to be in compliance.

OUR RECOMMENDATIONS

None of the filters tested will stop water from entering your engine once the canister is full, but each can trap at least 1½ cups of water before allowing any to pass into your engine.

The largest and most expensive filter tested, Racor, won easily due to its water capacity and filtering area. The Mercury/Quicksilver, GLM and the MarPac/Marine Power filters held the least amount, at 13 ounces, while the Tempo, with its 18-ounce capacity, held the most water in the standard-sized filter class. A point worth noting is that water-holding capacities may vary on a moving boat due to water sloshing within the filter; our bench tests were conducted with the filters mounted in a steady vertical position.

If you have a water prob-



■ A Mercury/Quicksilver filter "head" is shown on the left, a Bombardier (formerly OMC) type in the center, and a Racor on the right.

lem, a Racor is the only way to go. For the best in versatility and economy, we recommend the purchase of a Bombardier- or Mercury-style filter bracket. That way, you can use the proper Racor replacement filter and bowl to capture large amounts of water, and drain it as necessary. When your fuel contamination problem is resolved, you



can switch to less expensive filters. If you choose a Racor bracket, however, you are limit-

ed to using the expensive Racor filter every time.

The best buy in a filter is the

Tempo. It can hold 18 ounces of water and has the same fine micron rating as a Racor.

Yet, no matter which brand you choose, a water-separating fuel filter is vital equipment for any gasoline-powered boat. You may

love the water, but you don't want it in your engine, and a spin-on fuel filter is the best way of screening it out. ⚙️

WATER-SEPARATING FUEL FILTER COMPARISON

Manufacturer	Retail Cost	Length (inches)	Metal Thickness (inches)	Filter (square inches)	Water (ounces)	Micron Rating	Interior Coating	Origin
Aqua Power/Sierra <small>Teleflex, Dept. TBM, No. 1 Sierra Place, Litchville, IL 62056; 800/648-3976; aqua-power.com; sierramarine.com</small>	\$8.70	4 3/8	0.022	N/A	15	28.0	Epoxy	USA
Bombardier (formerly OMC) <small>Bombardier (Evinrude/Johnson), Dept. TBM, 200 Seahorse Drive, Waukegan, IL 60085; 847/689-7090; bombardier.com; evinrude.com; johnsonoutboards.com</small>	\$9.45	4 3/8	0.022	149	17	28.5	Epoxy	USA
GLM Products <small>GLM Products, Dept. TBM, 705 Los Angeles Ave., Monrovia, CA 91016; 636/357-0077; glm-marine.com</small>	\$8.70	4 3/8	0.021	327	13	28.0	Oxidation treatment	China
Marpac/Marine Power <small>Marine Power, Dept. TBM, 17506 Marine Power Industrial Park, Ponchatoula, LA 70454; 504/386-2081; marinepowerusa.com</small>	\$7.00	3 7/8	0.020	N/A	13	N/A	None	Taiwan
Mercury/Quicksilver <small>Mercury Marine, Dept. TBM, P.O. Box 1939, Fond du Lac, WI 54936; 920/929-5040; mercurymarine.com</small>	\$7.10	3 7/8	0.022	149	13	28.5	Epoxy	USA
Racor <small>Racor Div./Parker-Hannifin Corp., Dept. TBM, P.O. Box 3208, Modesto, CA 95353; 209/521-7860; parker.com/racor</small>	\$22.00	7 1/2	0.016*	360	21	10.0	Anti-rust coating	USA
Tempo <small>Tempo Products, Dept. TBM, P.O. Box 39126, Cleveland, OH 44139; 440/248-1450; tempoproducts.com</small>	\$8.00	4 7/16	0.018	N/A	18	10.0	Epoxy	USA
Wix <small>Wix Filtration, Dept. TBM, P.O. Box 1967, Gastonia, NC 28053-1967; 704/864-6748; wixfilters.com</small>	\$8.00	4 3/8	0.016	203	16	12.0	Epoxy	USA
Yamaha <small>Yamaha Motor Corp., Dept. TBM, 1270 Chastain Road, Kenneshaw, GA 30144; 800/526-6650; yamaha-motor.com</small>	\$11.00	4 7/16	0.021	N/A	15	N/A	Epoxy	USA

*All specifications are nominal.
N/A — Unable to obtain information from manufacturer.
* Denotes outboard-style filter. UL-approved inboard filter measures .018.*