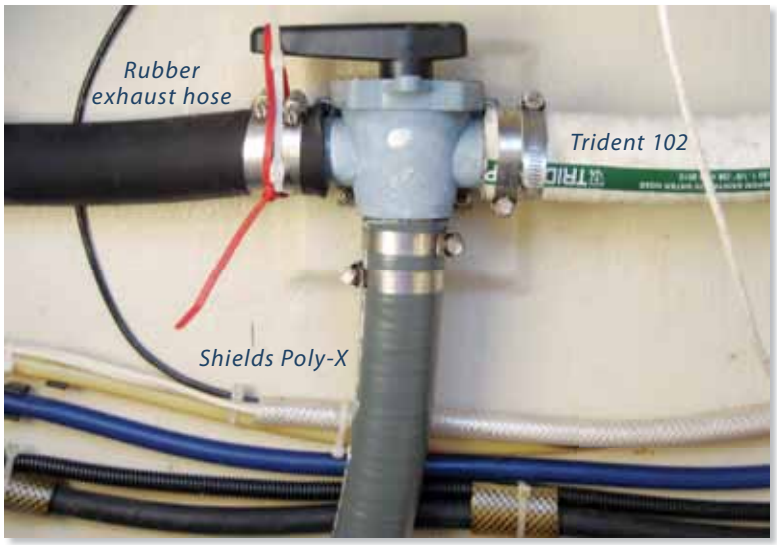


After 30 months of testing, the bulk carbon in the Big Orange holding-tank vent filter (above left) was still going strong. This report offers PS's findings after 2½ years of testing vent filters and sanitation hoses in controlled tests and aboard a test boat (above right).

War Against Head Odors Part 2

A look at hoses and tank vent filters after 30 months of testing.

A few years ago, we launched a series of product tests aimed at ridding a boat of head odors, including evaluations of holding-tank vent filters (PS, March 2012) and sanitation hoses (PS, April 2012). Both of those tests centered around the backyard "bench" testing of multiple miniature holding tanks and ocean testing aboard a PDQ 32 catamaran. After 30 months of testing, we've reached some solid conclusions on the hoses and vent filters—and we're pleased to say that the test boat is still head-odor free. Here's the latest on both tests.

WHAT WE TESTED

Both tests featured a cross-section of popular marine brands, and the holding-tank vent filter review also included a homemade system.

The sanitation hoses we tested were Trident Marine's 101/102 EPDM hose; SeaLand's OdorSafe Plus, a PVC and acrylonitrile butadiene rubber hose; Raritan Engineering's butyl rubber Sani/Flex Odor Shield; and Shields Marine's Poly-X polyurethane sanitation hose. We added schedule 40 PVC sanitation pipe and clear vinyl hose (Trident) to the mix for comparison. PVC pipe is known to resist permeation indefinitely, but we expected the clear vinyl hose to fail in short order. We included it because it's occasionally found in marine sanitations systems, always with disappointing results.

The holding-tank vent filter test field comprised our homemade system and three commercially available products: the SeaLand SaniGard from global marine sanitation manufacturer Dometic; the 5/8-inch filter from Canadian manufacturer Big Orange; and the No-Smell NSF16 from Maryland-based Vetus. All of the products use activated carbon and are intended to be installed in a 5/8-inch-diameter hose.

After our test began in 2011, Big Orange introduced a vent filter that is a drop-in replacement for SeaLand-style OEM filters. We have not tested this model.

SANITATION HOSES

Proper sanitation hoses are specifically designed to contain odorous gases. They are made of very different materials than similar-looking hoses that are used for fuel, coolant, and tap water, and are not interchangeable with these.

The one-year update on our sanitation hose test offered preliminary results for which hoses were easiest to install, which resisted permeation in the near term, and some ins-and-outs of installation. In the 18 months since that report, we've learned a few more things from the head-to-head mini-tank testing and from our test boat, which has been sailing with its odd assortment of hoses, wracking up real-world miles and exposure. For details on our test protocol, see "How We Tested."

We can report that at 30 months, all of the premium marine test hoses (Trident 102, Raritan Odor Shield, Shields 148, Shields Poly-X, and OdorSafe Plus) are performing perfectly, without permeation, fittings leaks, or hose kinks.

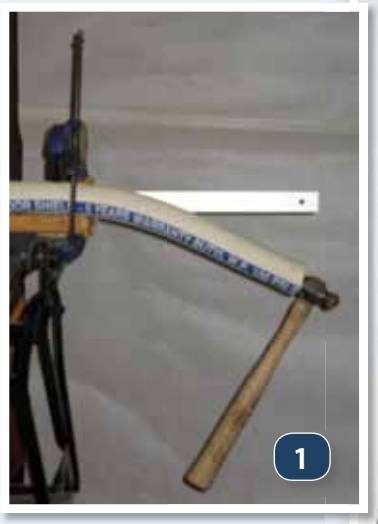
Predictably, the clear vinyl hose is gradually turning yellow and stinking more and more. The standard white sanitation hose (Shields 148) test sample may be permeating a tiny bit; testers' opinions were mixed during the string of observation tests. (See "How We Tested.")

SHIELDS 148

The Shields 148 is standard, white, flexible PVC sanitation hose. It's easy enough to

Photos by Drew Frye and courtesy of manufacturers

Tiny Tanks Simulate Stinky Marine Heads



1. *Testers used a 1-pound ball-peen hammer to weight down the hoses during the hose-flexibility test.* ***2.*** *We installed a homemade, PVC vent filter on the PDQ test boat.* ***3.*** *Five-gallon buckets with tight lids were fitted with sanitation hoses and tank vent filters to create mini holding tanks for this test.*

For real-world field testing, we installed a rainbow of sanitation hoses and a homemade holding-tank vent filter aboard a test boat. The test boat is cruised three weeks per year and sailed or over-nighted most weekends year-round.

For bench testing, we built six miniature holding tanks to simulate real-world conditions. The mini tanks—5-gallon buckets with lids, filled with a mixture of iguana poop, sea water, and fresh water—were fitted with the holding-tank vent filters we were testing, along with the sanitation hoses being tested. During the first few months, we also used the mini tanks to test a variety of holding tank chemicals (*PS*, February and December 2012); once that was over, we flushed clean all the tests tanks and filled them with matching waste.

Each test holding tank was fitted with a 4-inch PVC filling standpipe with a valve so testers could fill each tank with 1 gallon of sewage every five days (effluent plus seawater; the buckets were dumped each time they reached 80-percent capacity).

To maximize hose-permeation test results, the bottom of each tank was fitted with a sanitation hose, so that they were continuously filled with sewage. Having hoses fully submerged in sewage goes against hose makers' installation advice, but manufacturers agreed that the test method was a good way to force failure.

The hoses also were tested for flexibility and odor control. To measure stiffness, we clamped a 1-foot section of each hose to the edge of a workbench, suspended a 1-pound weight from its end, and measured the vertical deflection after 10 seconds. To measure bend radius, we took a length of test hose and pressed it until it showed signs of buckling.

The real test of any sanitation hose is whether it allows sewage odors to escape. To determine the stink factor of the test hoses, we conducted a sniff test and used a hydrogen sulfide monitor to support our results. At regular intervals, the hoses were wrapped in aluminum foil and left sealed for one week. This was followed by a sniff test and monitor reading. Afterward, each hose was wiped with a damp cloth and the cloth sniffed; this is also a good way to troubleshoot your own system.

In evaluating the holding-tank vent filters, there was really only one question to answer: Does the vent stink when the head is flushed? Testers conducted sniff tests and also used a gas-reading meter to measure effectiveness.

Testers have now wrapped up the years-long mini-tank testing, but we'll continue the onboard testing for a while. (Look for updates in upcoming issues.)

For more specifics on the test protocols and products, check out the launch articles for the sanitation hose test (*PS*, April 2012) and vent filter evaluation (*PS*, March 2012).

clean, but you'll need a brush and some effort to get the grooves clean. It's very stiff, often requiring hot water to make it pliable enough to slide onto fittings.

Testers noted no permeation at 24 months, but possible permeation at 30 months.

Bottom line: This is a common and inexpensive option ($4.90 per foot, the cheapest tested), but there are better products out there. The Shields 148 is widely available in smaller sizes that other hoses are not, making it useful for vent lines. However, even with the 148, our opinion holds true for common white sanitation hoses: not recommended.

SEALAND ODORSAFE PLUS

An upgraded white sanitation hose with different polymer chemistry, Sea-Land's OdorSafe Plus is well respected and had no signs of permeation at 30 months. It also has done well in previous *Practical Sailor* testing (*PS*, September 2000).

One drawback is that it's very stiff, often requiring hot water to soften before sliding onto fittings. It's reasonably easy to clean, except the grooves, which require a brush and some elbow grease.

Bottom line: Priced in the middle of the pack at $8.69 per foot, OdorSafe Plus earned testers' Recommendation.

TRIDENT MARINE 101/102

Trident Marine's premium 101/102 hose is a little stiff and a bear to clean—our

VALUE GUIDE SANITATION HOSES AT 30 MONTHS

MANUFACTURER	RARITAN	SEALAND	SHIELDS		TRIDENT	
NAME	Sani/Flex Odor Shield ✓	OdorSafe Plus ✓	Poly-X ★	148 white	101/102 $	Clear vinyl**
PRICE / FOOT*	$10.50	$8.69	$19.62	$4.90	$7.99	$5.99
MATERIAL	Butyl rubber	PVC and acrylonitrile butadiene rubber	Polyurethane	PVC hose	EPDM	PVC
TYPE	Sanitation hose	Sanitation hose	Sanitation hose	Sanitation hose	Sanitation hose	Potable water hose
SIZE TESTED	1½-inch ID	1½-inch ID	1½-inch ID	1½-inch ID	1½-inch ID	1½-inch ID
COMMENTS	Can kink if forced because it is so flexible.	Very stiff; smooth surface; easy to clean	Smooth surface; easiest to clean	Heating may be needed for fitting	Distinctive rubber smell; stains easily	Becomes yellow when permeation is severe
TEST RESULTS						
PERMEATION @ 6 MONTHS	None	None	None	None	None	Minor
PERMEATION @ 12 MONTHS	None	None	None	None	None	Major
PERMEATION @ 18 MONTHS	None	None	None	None	None	Major
PERMEATION @ 24 MONTHS	None	None	None	Very slight	None	Major
STIFFNESS (DEFLECTION @ 65 DEGREES)	4.25 inches	0.21 inches	0.56 inches	.30 inches	1.25 inches	Not measured; limp
EASE OF CLEANING	Fair	Good	Excellent	Good	Poor	Fair
REMOVABILITY	Excellent	Poor	Poor	Good	Good	Excellent
U-TURN RADIUS (@ 65 DEGREES)	7 inches	20 inches	12 inches	16 inches	11 inches	Not measured; kinks easily

★ Best Choice $ Budget Buy ✓ Recommended

*Prices may vary, depending on retailer. ** Only tested as reference.

test sample had stubborn stains that would not come off—but it's a very dependable product, and despite its stiffness, testers found it easy to fit during install.

There were no permeation failures at 30 months. Priced at $7.99 per foot, the 101/102 offers the longest service life per dollar.

Bottom line: A very close second pick, Trident's 101/102 is a better value than Shields Poly-X, and it is a good choice if ease of cleaning is not your top priority. It earns the Budget Buy pick.

Big Orange carbon refill

Vetus impregnated foam refill

Three of the vent filters we tested, including the Big Orange, use bulk carbon. The Vetus No-Smell was the only that used a carbon-foam adsorbent pack.

SHIELDS MARINE POLY-X

Shields Marine Poly-X is another hose with a flawless track record. It showed no permeation at 30 months, and it comes with a lifetime warranty against permeation.

Only the vinyl hose was stiffer than the Poly-X, but testers noted that the Poly-X was not difficult to push onto fittings. Testers also noted that cleaning it was a breeze; it resisted mildew to an amazing extent and was cleaned with a quick wipe of a cloth without any need for soap.

At $19.62 per foot, Poly-X was the most expensive hose tested, but sometimes, you get what you pay for.

Bottom line: The high-quality Marine Poly-X is the Best Choice among the sanitation hoses we tested.

RARITAN SANI/FLEX ODOR SHIELD

Raritan's Sani/Flex Odor Shield, permeation-free at 30 months, was the hands-down easiest hose to work with. The very flexible, butyl rubber hose was much easier to fit than any other tested hose. We're looking forward to gaining more field time with this product as it is certain-

PS VALUE GUIDE	WASTE VENT FILTERS			
MANUFACTURER	DOMETIC ✓	BIG ORANGE ★	VETUS	HOME BUILT $
NAME	SeaLand SaniGard (309310002)	5/8-inch Big Orange	No-Smell (NSF16)	N/A
MODEL / SIZE	5/8-inch	5/8-inch	5/8-inch	5/8-inch
PRICE	$85	$145	$120	$16
REFILL COST	$71	$25	$16	$5.75
MAKER RECOMMENDED REPLACEMENT PERIOD	1-2 years	Annually	Annually	2 years
MATERIAL	PVC	PE	PE and PET	PVC
DIMENSIONS (W x D x H)	18 x 3.5 x 3 in.	7.5 x 6.5 x 10.75 in.	5.75 x 6 x 6 in.	18 x 3.5 x 3 in.
HOSE SIZES AVAILABLE	5/8; 3/4; 1; 1½ in.	5/8; 1½ in.	5/8; 3/4; 1; 1½ in.	Any size
CARBON TYPE	Flat granular bulk	Bulk	Impregnated foam	Bulk
CARBON CAPACITY	620 milliliters	878 milliliters	323 milliliters	620 milliliters
TEST RESULTS				
4 MONTHS	Pass	Pass	Failed (after 6 weeks)	Pass
30 MONTHS	Pass	Pass	NA	Pass

★ Best Choice $ Budget Buy ✓ Recommended

ly the most user-friendly in tight spaces.

Cleaning ease was average: It took some effort, but no stains remained.

Bottom line: Priced at $10.50 per foot, Odor Shield is a Recommended product.

TRIDENT CLEAR VINYL

Trident Marine does not recommended using its clear vinyl hose for this application, but we included it in the test to show why clear vinyl hose is a bad choice for sanitation systems.

Testers noted that it is very prone to kinking—even when it's bent on a long radius—making it unsuitable for use in vent lines. The clear vinyl hose section installed on the test boat became badly permeated, with odor becoming quite noticeable after about 18 months. The hose had also kinked and collapsed, so testers replaced all clear vent lines with Shields 148 sanitation hose.

PVC sanitation hose or rubber exhaust hose is a better choice than clear vinyl hose. We recommend all vent hoses be sanitation hose; generally only 148-series white vinyl hose is available in the small sizes required.

Bottom line: Clear, soft vinyl tubing—by any brand—has no place in sanitary plumbing.

CONCLUSION

After 2½ years of mini-holding-tank testing and onboard use, no premium sanitation hose has shown any permeation. The long-term, on-boat observations will continue.

Our recommendations at the 30-month mark mirror those we made in the one-year test update. The Shields Poly-X, a standout thanks to its ease of cleaning, held on to its spot as Best Choice, and the Trident 101/102, which is preforming predictably well, is still the Budget Buy. Testers Recommend the SeaLand OdorSafe Plus and the flexible Raritan Sani/Flex Odor Shield, which we will be monitoring to see how it does in the longer term on the test boat.

VENT FILTERS

While proper ventilation and chemical treatments are the most common approaches to curing holding-tank odor, some boats require a more direct approach. Adding a holding-tank vent filter filled with activated carbon to a sanitation system can stop even the foulest stench. The downside is that they can become clogged if not installed properly or if the holding tank is overfilled; this can lead to a ruptured holding tank—a stinky prospect for sure.

After two Chesapeake Bay summers and 30 months of testing, the lone failure among the holding-tank vent filters we tested was the Vetus No-Smell. As we reported in the March 2012 issue, the Vetus NSF16 uses a carbon foam adsorbent pack that failed after six weeks of testing. Interestingly, after each failure, the No-Smell recovered during the cooler weather of the off-season—when reduced biological activity minimized the load on the filter—but it would again fail when temperatures rose.

Following this test, *PS* filled the Vetus No-Smell NSF16 with bulk silica gel for our fuel-tank vent test (*PS*, January 2013). *PS*'s retrofit was successful in fuel-tank venting; however, we did not try it with holding tanks. In the wake of the fuel-vent test, Vetus is coming out with a new vent filter, the No-Smell NSFCAN, in January. According to Vetus, the NSFCAN solves the problems we had with the NSF16 because it uses a combination of activated bulk carbon and bulk silica gel as the adsorbent media. We plan to test the new Vetus filter once it is released.

DOMETIC SEALAND SANIGARD

The 5/8-inch SeaLand SaniGard is a simple but effective vent filter that uses bulk carbon. A 12-inch length of 2-inch PVC pipe with custom end fittings, the SaniGard comes with minimal mounting hardware. One drawback testers noted was that when it's time for a refill, you have to replace the entire canister, which costs 85 percent of the price of an $85 new unit.

Based on its own lab studies, the maker claims its carbon is far more effective than competing filters; industry practice confirms that certain types of carbon are more suited to odor removal than others.

Bottom line: The Dometic/SeaLand is comparatively expensive to refill, but

Dometic/SeaLand SaniGard

The Results of our Mini Test Tank Autopsies

When we wrapped up the testing of the miniature holding tanks after 30 months, we were tempted to just pitch the whole lot in the dumpster after draining their contents, but we thought taking the faux holding tanks apart and examining the components up close might yield some interesting findings. (The things we do in the name of product testing—yuck!) Here's a breakdown of testers' observations.

HOSE REMOVAL

Disassembling the test holding tanks allowed testers to gauge how easily the sanitation hoses could be removed from the barbed fittings. Not surprisingly, the result varied depending on hose stiffness.

The Trident clear vinyl hose was easy to remove. The Raritan Sani/Flex Odor Shield required a little nudging with a screwdriver, while the Trident 101/102 and Shields Poly-X hoses required more vigor but came off within a minute or two. These hoses were not damaged in the process and could have been reattached without leaks. The white Shields 148 and SeaLand OdorSafe Plus hoses, however, could not be removed without damage and would require either a razor knife, hack saw, or heat to get off.

The Shields Poly-X hose was the easiest to clean, while the Trident 102 was stained. Here are the hoses post-cleaning.

No hose showed any internal evidence of deterioration (blistering, checking, severe staining). None of the nylon or Marlon through-hull fittings showed any damage, and none were significantly weakened—testers intentionally broke a few during our experiment.

SEALANTS

To seal the plumbing fittings on the tanks, we tested 3M Marine Silicone, 3M 5200, and butyl rubber tape. None leaked, but the silicone showed some evidence of peeling and blistering, and the 3M 5200 blistered in a few places. The butyl rubber looked the same as the day we assembled the test rigs, tightly adhering to all surfaces and stretching as they parted. This wasn't surprising, given that neither silicone nor urethane are rated for hydrogen sulfide and urine/uric acid, but butyl is.

EASE OF CLEANING

There are major differences in how easy the hoses are to clean. Some wipe off as easily as a kitchen countertop, while others require heavy scrubbing and bleach to attain even so-so results. With a brush and Spray Nine multi-purpose cleaner, we were able to sufficiently clean the white PVC products and the Raritan Sani/Flex. The Trident 101/102 did not come clean.

Remarkably, the Shields Poly-X hose was wiped clean of accumulated dirt and mildew with only a damp cloth. (Since our test setting was a shaded, leaf-covered backyard through two humid summers, the mildew conditions were severe.)

it uses good-quality carbon and was still performing well after 30 months. It gets our Recommendation.

VETUS NO-SMELL

The 5/8-inch Vetus No-Smell NSF16 vent filter was the only product tested that uses a carbon-impregnated filter media rather than bulk carbon. Because the filter is marketed for use as both a holding-tank filter (NSF16) and a diesel fuel-tank vent filter (NSF16DS), we also included it in our fuel vent test (*PS*, January 2013).

Vetus No-Smell

The Vetus No-Smell's packaging and mounting hardware are both top quality, and the media is easily replaced, but the filter's performance was disappointing in this test. The media contains far less carbon per unit volume than bulk carbon, and the No-Smell's volume is insufficient for most holding-tank jobs. At $120, it was the second most expensive filter tested. We look forward to testing Vetus's new filter this winter.

Bottom line: We do not recommend the Vetus NSF16 for holding-tank use.

BIG ORANGE

The largest vent filter tested, the Big Orange is the only unit on the market that includes a vacuum break valve, which is essential to protecting the holding tank in the event of filter plugging. The only flaw we noted in the design is that it is made to mount on the top of the holding tank. We feel bulkhead mounting is a better option, but a simple cleat or bracket would solve this.

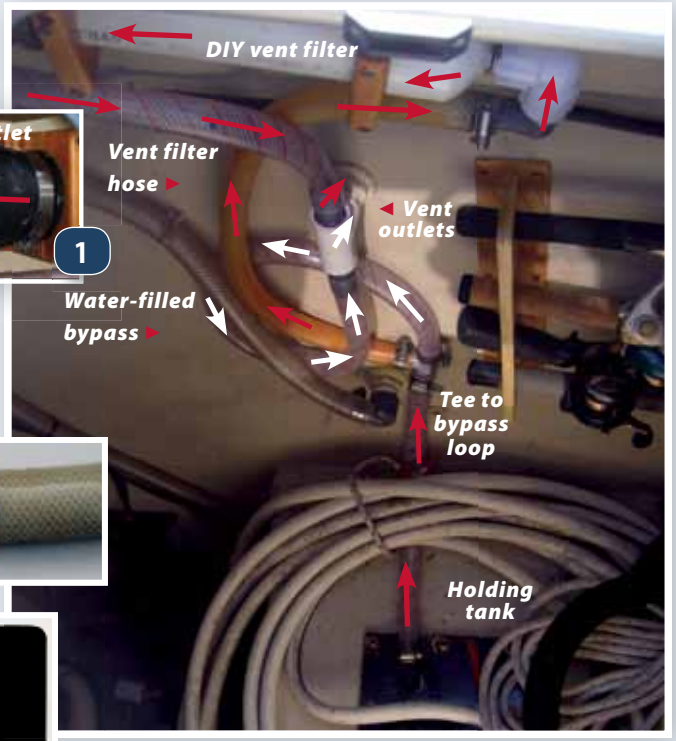
Big Orange refills are either bulk carbon from the manufacturer ($25), or you can find your own local bulk-carbon source; many pet and aquarium stores carry it. Changing the carbon couldn't be easier: Pull out the carbon tray, dump the old carbon, and fill with new carbon.

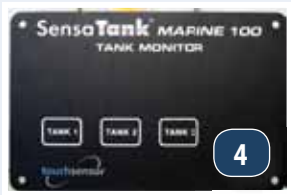
After 30 months in a tough test environment, the carbon tray slid right out with the gaskets in good shape, and we refilled it without spills in just minutes.

Big Orange now makes a smaller in-

Patchwork and Geysers

Practical Sailor product evaluations often result in a spinoff test or two, or lead to some interesting findings not specific to the test products. Such was the case this go around. Here's brief rundown of what we came across.





1. *The test system aboard tester Drew Frye's PDQ features a home-built, PVC vent filter and the requisite bypass loop; inset is the filter outlet.*
2. *Aluminum tape proved to be an effective hose-patching material.*
3. & 4. *The top picks in our external holding-tank sensor test were the Scad Solo Profile Series (3) single-tank sensor and the SensaTank Marine 100 (4) multi-tank sensor.*

HOSE PATCHING OPTIONS

When stinky sanitation hose becomes a problem, totally replacing the hoses is often the only real cure. Because such work is never convenient, we sought a temporary hose-patching method that actually worked. In conjunction with our sanitation hose evaluation, we tested reader suggestions for hose-patching methods, including wrapping the offending hose with either aluminum tape or Saran Wrap plastic wrap.

To test aluminum tape, we wrapped our failed clear vinyl tube with a single wrap of Nashua 324A duct tape with a half-inch overlap. After 18 months outdoors in the sun and rain, the tape actually looked quite good, with no evidence of lifting or failure, and no odor permeation.

While it certainly looks like a patch and won't address problems around fittings, duct tape certainly seems to be a valid emergency fix, and we recommended it as a temporary patch to delay hose replacement until seasonal maintenance.

The Saran Wrap patch was not as successful, but perhaps our test was unfair since it was outdoors rather than in the bowels of a boat. Even in heavy shade, the UV did a number on the clear Saran Wrap within weeks. We found the cling wrap annoying to work with, prone to coming loose, and impossible to clean. Perhaps it would be helpful when troubleshooting odors—it did reduce the odor for a short time—but otherwise, it was scarcely worth the effort.

SOLIDS BUILD-UP

When our holding-tank vent filter test began, some predicted that the amount of solids build-up in the tanks would be proportional to filter size, i.e. tanks with larger vents would have fewer solids. We found no such correlation.

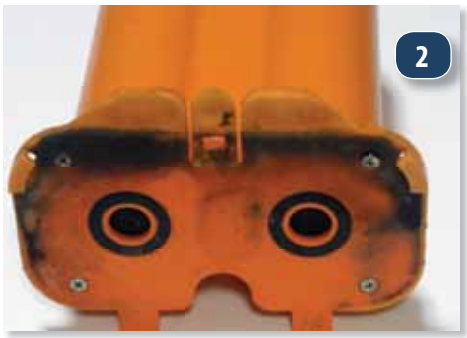
Some also thought that the use of holding-tank treatments would dramatically reduce solids. We saw some evidence that the more effective chemicals reduced solids, but it was not a definitive finding. After 30 months of testing, the only factor that strongly correlated with solids was the use of vegetable oil or mineral oil (both were similar) for lubricating the head. The effect was dramatic, and some of the deposits would not come off, even with a directed hose blast. We dosed 1 tablespoon for each 5-gallon tank filling cycle; perhaps with lower use, the effect would be less noticeable. Be sure to lubricate the head per manufacturer instructions; this often requires disassembly.

VENT FILTERS

We've all heard stories of pumping problems and ruptured holding tanks resulting from clogged holding-tank vent filters. If the holding tank is overfilled, sewage can plug the filter and the force of the head pump is more than enough to rupture weak tanks, causing pump-out geysers.

In one story we recently heard, the boat owner relied on a tank-level sensor to warn of a high black-water level, and the sensor became clogged. Clearly, a non-contact sensor installed on the exterior of the tank is a better answer. The Scad Solo and SensaTank 100 were the top picks in our February 2008 test of external tank sensors.

In other cases, heeling caused sewage to enter the vent filter before the tank was even full. In the March 2012 vent filter report, we described a proper vent installation method that featured both a high location and a bypass loop. (See photo above and the online version of this article.) If you can't provide these, perhaps a vent filter is not a good idea for your boat. Instead, consider one of the enhanced ventilation options with an effective treatment chemical.



1. *After testing, we cut open the homemade tank vent filter; there was no evidence of clogging or contamination of the carbon. There had been some concern that catalytic oxidation of the carbon would lead to sulfur deposits, but there was no sign of this.* ***2.*** *The Big Orange's slide-out filter unit shows that the gaskets were still good after 30 months of testing.* ***3.*** *Further disassembly showed that all parts of the Big Orange filter were still in good shape.*

line vent filter that is a drop-in replacement for SeaLand-style OEM filters. Unlike the SeaLand-style filters, the Big Orange OEM replacement ($115) has the same features testers liked in the original Big Orange. The OEM replacement also has a built-in, vacuum-break valve that prevents holding tank pump-out difficulties and collapse concerns, in the event the filter become plugged, and it is easy to refill.

Big Orange

Bottom line: The most expensive filter we tested ($145), the Big Orange also offers top features and a lower long-term operating cost than some of the other test products. The recipient of *PS*'s Editor's Choice title in 2012, the Big Orange filter holds on to its Best Choice pick and will be installed on the test boat for extended testing.

HOMEMADE VENT FILTER

Dimensionally identical to the SaniGard, the vent filter we built was also based on 12 inches of 2-inch PVC pipe. We tapped NPT-to-garden hose adapters into the PVC end caps, but hardware-store bushings could also be used.

The DIY filter used in the mini-tank testing was not designed for refill; however, we built a second filter of similar design for the test boat, and it was refillable. The refillable filter has one end cap held in place with a 2-inch no-hub connector—a simple hose with two clamps available in any hardware store—instead of being glued on. We mounted it in a wooden saddle, but two 2-inch PVC conduit clamps would make a simple, durable, and inexpensive bracket.

After 30 months, the homemade vent filter on the test boat is still going strong and is more than 90-percent effective, reducing head odors well below the point of offence.

Bottom line: If you're at all handy, there's no reason you can't fabricate a durable, economical, refillable filter with common tools. This option is our Budget Buy.

Our homemade vent filter comprised 12 inches of 2-inch PVC pipe with NPT-to-garden hose adapters tapped into PVC endcaps.

CONCLUSION

After 30 months of testing the holding-tank vent filters, there are no odor or hardware problems to report. The expensive but effective Big Orange filter is still our Best Choice, and we Recommend the SaniGard filter, or building your own vent filter.

We have confirmed that manufacturers' single-season replacement advice is *very* conservative, and that an average sailor can expect much more service life from a single fill-up—perhaps the three to five years generally reported from the field. At that rate, vent filters become a simple and economical approach to controlling head odors, especially when compared to regular chemical treatments (*PS*, February 2012 and December 2012). Plan to replace filter media every year or two, but be sure to inspect the vents more frequently to ensure there are no system clogs. The vents will last longer if they are protected from salt water and holding tank overflow.

CONTACTS

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