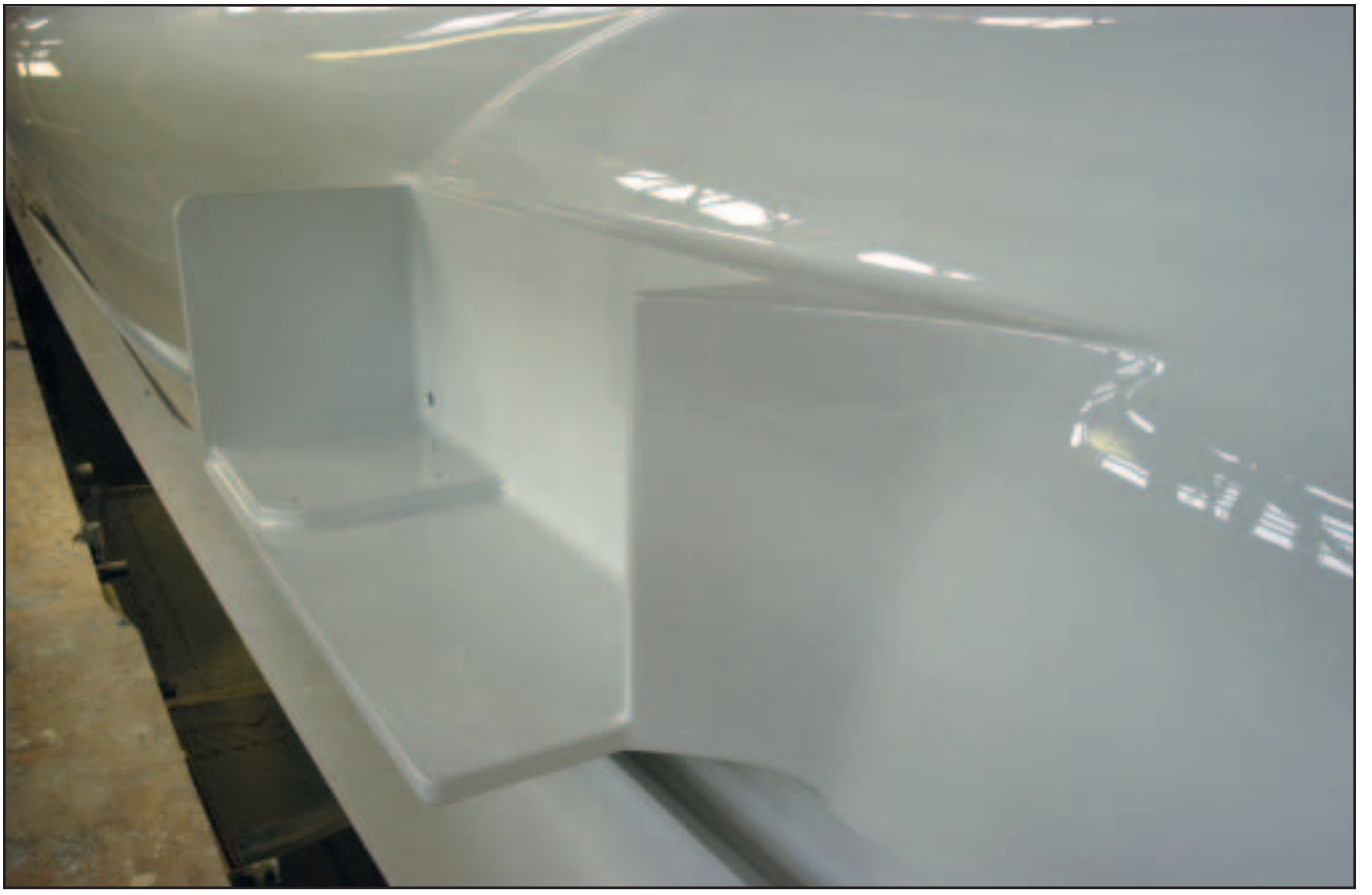


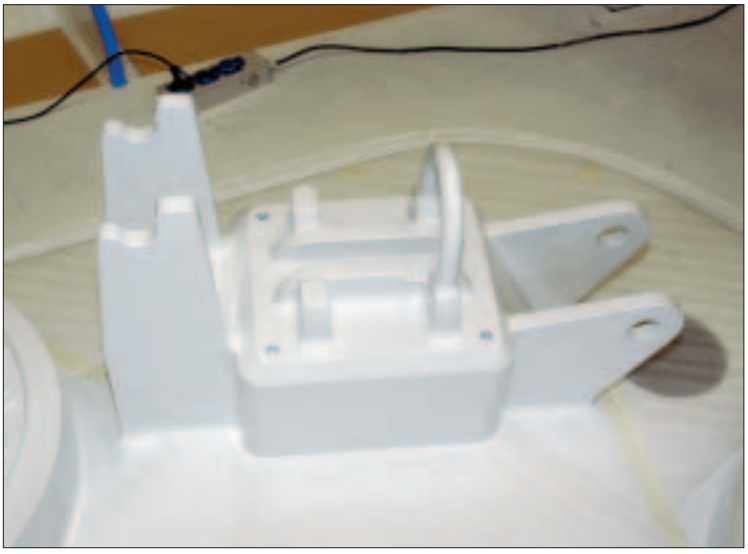
Fairing a Megayacht

At the Netherlands' De Vries Scheepsbouw, a Feadship yard, controlled application of precisely metered and mixed fairing material, coupled with a minimum of sanding and longboarding, produces beautifully fair surfaces.

Text and photos by Bruce Pfund

Hans Devilee heads the paint and fairing department at De Vries Scheepsbouw (Aalsmeer, Netherlands), one of two yacht yards and a naval architecture firm that make up the Feadship organization. He and his crew are responsible for fairing the huge flat and curved panels on the steel hulls and aluminum superstructures of the 120′ to 295′ (37m to 90m) megayachts De Vries builds. On these vessels, there are simply no places to hide surface imperfections and the jagged reflections they cast. During one of my recent trips to the yard, Devilee said to me, "You can't make a surface straight or curved by sanding off the fairing. You must put the fairing on that way." This sensible statement sums up the De Vries approach to fairing: apply it in such a way as to minimize the time spent sanding it off. The results speak for themselves.

A few years ago, I wrote an article in this magazine titled "Brush-Painting a Megayacht" (PBB No. 77, page 52), about De Vries' unusual painting practices. Here, I'll look at how the yard does the fairing work in preparation for paint. (For an in-depth profile of the De Vries yard, see PBB No. 77, page 70. And for more on fairing, see my article "Avoiding Fairing Problems," PBB No. 67, page 49.)

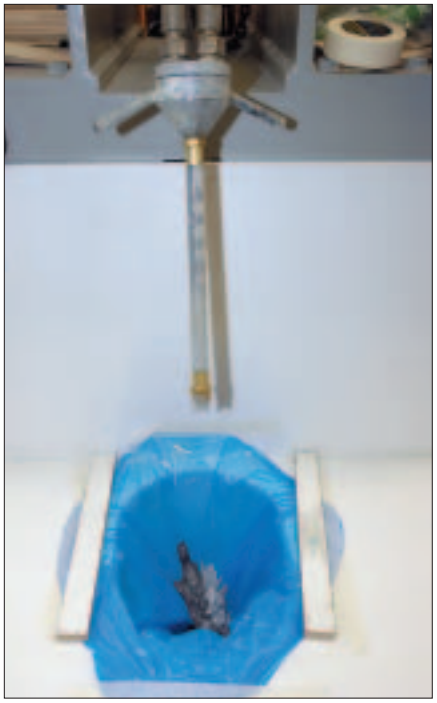


Facing page—*The reflections on these complex curves and inside and outside corners show no jagged edges—a sign of a high-quality fairing job underneath carefully sanded primer and topcoat layers.* ***Above—****This equipment foundation receives the same methodical fairing, priming, sanding, and topcoating steps as a hull's panels and topsides.* ***Right—****Sighting underneath an aluminum straightedge during a "dry run"—that is, without putty—allows the fairing crew to spot high and low locations before they apply any more material. Notice the matte and shiny surface bands left behind by a brief longboarding that takes down only the high spots. The efficient time to sand off the high spots is at the gray fairing stage, shown here.*

Achieving perfect cosmetics is only part of the challenge of running the fairing and painting operations on a huge vessel that takes more than two years to complete. Aside from application considerations is the challenge of managing a yacht-scale fairing project. Fairing is a strategic chokepoint in the manufacturing process—especially if the yard waits until late in the project's build cycle to start. Fairing time becomes even more compressed if other parts of the project's schedule slip, and fairing is a process that cannot be rushed. Paint-system topcoats on rushed projects often suffer too, due to solvent entrapment and incomplete crosslinking of the pastes and coatings that lie underneath. As Devilee told me, starting early and taking sufficient time keep the fairing crew out of trouble.

The superb metalworking skills of the De Vries yard and its various subcontractors produce hulls and superstructures with very true surfaces. The flats are flat, without the "hungry horse" look, and the compound-curved sections are remarkably fair. Consequently, less fairing is required to produce a flawless surface. When the hulls and superstructures arrive at Aalsmeer from the subcontractor, the exteriors are ground and sanded to bright metal and then electrostatically primed with corrosion-resistant paint. Once the primers have cured, the fairing crews have basically inherited whatever bumps and hollows the steel and aluminum fabricators have produced. Can a good crew apply lots of fairing to hide a bumpy hull or

This complex section of the upper-deck bulwarks houses two life-raft canisters. Fair and true surfaces with straight facets and diligently ground welds will require less fairing, which translates to reduced weight and labor costs.

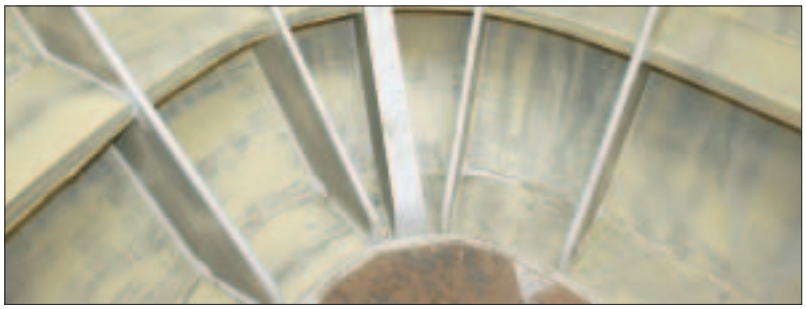


Left—*A big static mixer, approximately 1" (25mm) bore, is attached to the discharge head once the system has been purged. It ensures that the accurately proportioned materials forced from the drums are thoroughly mixed. Note how the dark-gray and white components at the head of the mixer tube become a uniform light gray as they approach the end of the mixer's convolutions.* ***Right—****The shop's 2002-vintage coarse-fairing-putty dispensing equipment has two massive hydraulic rams to force-prime two gear-pumps with high-viscosity putty out of two matched metal drums. This is an impressively powerful dispensing machine, with a big hydraulic power supply, yet the controls are sensitive enough to allow workers to get just a few ounces (1 oz=28.35 grams) of material for small spot work. The mix ratio of the two different-colored materials is 1:1 by volume, produced by having each hydraulic cylinder extend the same amount. At the start of each shift, the system is purged to ensure correct proportioning. The putty components collected during setup are mixed so they will cure, and then they are discarded.*

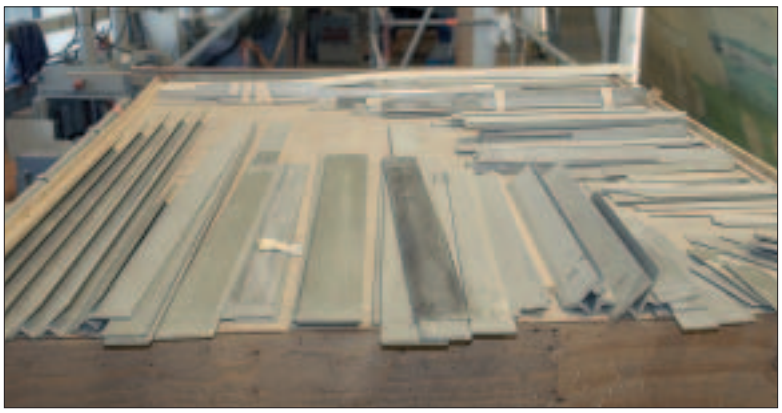
house? Of course, but at a significant weight penalty, and a cascade of consequences for the operators follows, from reduced seakeeping to increased fuel consumption. Excess fairing is bad for the builder's bottom line, too. Runaway fairing projects where both materials and labor costs go off the charts are not uncommon. The consequences for the vessel's delivery date—and the business health of the yard—are predictably bad.

Poorly mixed materials—*even at the correct ratios*—are the source of many fairing system problems. Fairing putties, especially the viscous gray coarse-grade products, are difficult to mix. De Vries has invested heavily in specialized meter/mix/dispense equipment (shown in the photos at left) to give the crew accurately proportioned and thoroughly mixed fairing putties. Coarse and fine fairing putties are supplied by Sikkens.

Key to the yard's successful fairing are metal "drawdown" blades—rigid and flat bars or beams, or more-flexible metal battens that maintain fair curved shapes when bent. Every application of paste or putty gets bladed—a sign of a shop that knows how to save sanding time by improving application techniques. Rubber squeegees are too flexible, and the widest single-handed putty knives far too narrow to apply a fair coating layer.



Left—*Each layer of fairing is carefully vacuumed, not blown down with compressed air. Dust-contaminated surfaces don't bond well to subsequent layers, so this is an important step. All flat and curved surfaces are established in the coarse gray fairing compound shown here. The surface roughness and hollows will be filled with less-viscous fine fairing material.* ***Above—****No excess fairing putty is to be found in any of these small and highly contoured areas. The crew applied the yellow paste to the inner surfaces of the hull with stiff, radiused steel blades. For blending the hull-shell interior's fairing surfaces together at each vertical rib and horizontal frame, they used specially shaped, more-flexible steel blades with radiused inside-corner noses. The bands of gray showing through on the hull-shell panels indicate that the yellow fairing has been dragged over the gray layer beneath, to fill its hollows but not accumulate on high spots.*



Left—*Shown here is about one-quarter of the shop's short- and medium-length drawdown-blade inventory. The De Vries crew chooses the longest blades practical for each surface, allowing for generous overlaps onto adjacent cured sections. This technique produces fair surfaces without the faceting that can result from shorter tools that don't span enough of the part's surface.* ***Right****—This photo was taken after the first pass with a radiused drawdown blade around the perimeter of a deck overhang. The low spots will be filled on the next pass.*

Devilee walked me into the shops and showed me three hulls in various stages of painting and fairing. Some surfaces had already been primed with spray-applied high-build material, while others were still in the gray coarse fairing stage. He told me that his crew uses long aluminum bar stock and angle-iron blades to fair the coarse putty as much as possible before it sets. We looked down the unsanded side of one of the superstructure levels; it was dead straight. There are both in-house and subcontracted fairing teams working in the yard. "A new crew came in recently that was unfamiliar with our methods," said Devilee. "They preferred to apply more, but came around to our way when they realized how much less sanding we have to do."

Devilee is very cautious in using fairing "ramps"—narrow bands of fairing developed under battens curved

Left—*Note the faint patches of gray coarse fairing on the right, showing through the second application of yellow fairing paste that is sanded to a flat finish. Rough layout of the paste is done with broad metal trowels and putty knives. It's applied with up-and-down strokes, and then leveled by more side-to-side passes with the trowel.* ***Right—****A rigid aluminum bar is the drawdown blade here. Notice how hard the crew is pressing on the blade, forcing it to register against the gray substrate's high spots, and leaving behind the minimum amount of material to fill the lows. Excess putty that accumulates on the blade on this pass will be scraped off and applied to the next section of the hull side below the one shown. The crew will jog down one level lower in the staging to complete a full-height drag. The process will then hopscotch farther along the hull.*

Left—*Compound curves such as this one, at the aft weather-deck stairs to the swim platform, are especially challenging to fair. The accurately curved aluminum substrate, fabricated by subcontractor Akerboom, makes life a lot easier for the crew. Note the bend in the flexible steel blade the two workers are using to fair the yellow paste. Note, too, that the upper worker's right hand is almost a foot ahead of the top of the blade, twisting it to match the corner's compound curve. The blade is also pitched sharply forward, holding the fairing paste that's been scraped off. The older crew member first took the younger one through two or three dry runs, without fairing paste, to demonstrate how the blade had to be deflected to match the section's curvature.* ***Above—****Hard metal drawdown patterns are used on all outside corners too small to match the maximum deflection of a straight blade.*

When it's not convenient to use a straightedge or batten, the De Vries crew checks all curves for fairness with metal or wooden patterns, as with the curve shown here, hidden inside the detail recess.

to the desired surface contours—because they can print-through. The De Vries crew places ramps where they will either be completely hidden or next to impossible to detect.

All the blades the crews use to spread coarse and fine fairing putties, as well as some of the abrasive tools, are as long as practical for the job. In deck overhead, for example, a full-height blade would be registered on the top and bottom ramps and dragged horizontally to fair the passageway sidewall. Some of the yard's sanding longboards take three to five men to operate. The crew that applies the fairing also longboards the surfaces; that way, they're more conscientious in applying putty. One rule I learned in the boatyard as a kid was "He who applies, removes." I quickly

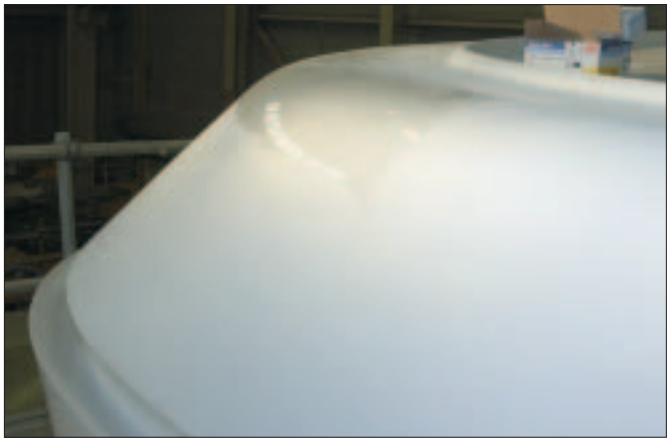
Some might consider sanding multiple high-build and topcoat layers to be part of the painting process. At De Vries, though, sanding paint is part of fairing. A flawless and fisheye-free layer of paint can show wiggly reflections and wandering edges that are dead giveaways of unfair surfaces. The slightest errors in finish sanding—especially at edges and corners—are all it takes to create these problems. That's why the paint sanding at De Vries is done as rigorously as the fairing.

learned how to be neat and tidy. The De Vries fairing crews I saw at work were wearing rubber gloves, although they rarely needed them.

What is particularly impressive about De Vries' method is that the crew can finish-sand much earlier in the process than in the "slather it on and then straighten it out with long-boards" approach. By the time the second application of fine yellow paste goes on, the panels are basically flat, or correctly curved. The sanding longboards are retired, and the crew switches to double-acting 8" (20cm) disc sanders and 15" (38cm) air files.

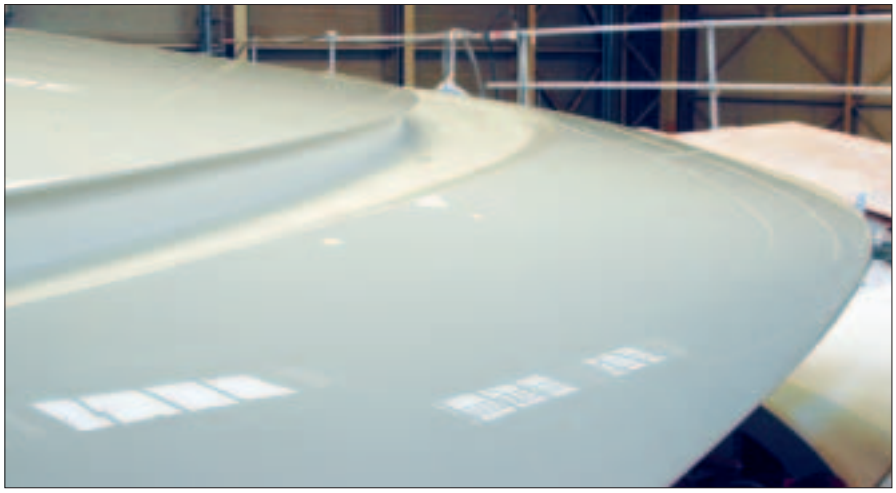
"We are very careful," said Devilee, "to do as much of the fairing as possible in the troweled-on fairing putty, rather than by sanding the paint system's sprayable primers—of which we use a minimum. It's helpful that we build approximately two boats a year, because we figure it takes six to eight months for the coarse fairing to cure and degas thoroughly. Undercure or small residual amounts of solvents are enough to ruin an otherwise excellent paint job.

Left—*Surface coloring is particularly important to this member of the crew—the detail sander. Note that he is working only on the radiused panels, sharp edges, and inside corners in the life-raft-canister storage section of the bulwarks. The flat-panel sections ahead and aft of this spot are left to someone else.* ***Above, right—****Coloring the matte finish of each but the last top-coat layer's surface allows the sanding crew to spot high and low areas and confirm 100% sanding coverage of each area. Sanding strokes are on the diagonal, lower right to upper left, followed by a similar number from upper right to lower left.* ***Above—****Because both coarse and fine fairing materials are applied with a blade, critical edge details such as the overhang shown here will need only minor sanding.*



Left—*This crew member has a foam-rubber-backed "soft-pad" to sand only the very lower edge of the tinted house side panel, where it meets a detail recess. By sighting down the shiny tinted surface ahead of him, he can spot slight irregularities in the upper hard edge at the recess, and even them out by varying the sanding pad's pressure. Note the helpful reflections of the fluorescent lights in the tinted panel, and, in the distant background, the next fellow coming along the hull, bar-sanding out the flats.* ***Right—****The shop's clerestory windows are reflected in the unsanded band on this superstructure corner. Once the shiny paint is sanded, the reflection will disappear. A hard and flat sanding bar was used to de-gloss the flat and single-plane-curvature surfaces, to ensure maximum flatness and fairness without wiggles from excess finger or hand pressure on the abrasives. Only the compound-curved surfaces left shiny will be hand-sanded with a soft backing pad.*

"Thick layers of topcoat-system primers applied to fairing can cause solvent entrapment problems," he continued, "and the unevenness of the primer thickness that occurs when it is faired can cause ghosting and other cosmetic problems in the finish topcoats. Our goal is to have a uniform-thickness, uninterrupted layer of primer over the fairing layers before the topcoats are applied. Surfaces that are nearly perfectly fair before the



Late in the afternoon, after the shop-floor crew has left and the big overhead lights have been turned off, is an excellent time to check fairing and topcoating quality. Most of the overlapping reflection sources are gone; there's no welding flash in the background; and it's easier to check surfaces by using single reflections that have straight lines in them, such as these reflected skylights. The slightest jog in a reflection that should be dead-straight indicates local unfairness, and if you look closely, there is a little one visible, in one of the window's vertical bars. This is only the second of five brush-applied topcoat layers, each one but the last carefully sanded. That little jog will be gone, turned to sanding dust in the next few days. The thousands of kilograms of fairing materials—along with the thousands of man-hours to apply them—will have disappeared completely under many layers of surfacing primers and topcoats before the yacht leaves.

paint is applied are critical to meeting our standards."

De Vries' paint topcoats are exceptionally thick—up to 100 mils (2.54mm), according to Devilee. As a result, the multiple sanding steps between the first four topcoats (the last is not sanded) can either jeopardize or enhance the fairing work that precedes the topcoat application.

I noted that much of the finish-sanding of the topcoat layers was done by hand. Hand-sanding fair surfaces is unlikely to compromise them. The peril with powered sanders is that they continue removing material when the operator stops moving them. This is especially dangerous to the surface's fairness at sharp edges and compound outside curves. PBB

About the Author: *As "Bruce Pfund/ Special Projects LLC," Bruce consults on composite processes and inspects marine composite structures. He is the technical editor of* Professional BoatBuilder. *This article is adapted from a forthcoming book by the author on the De Vries yard.*