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Sometimes you feel like a nut…

By Tom Pawlak

Some years ago I had the curious idea of cutting a dried black walnut in half on a band saw. That first look at the exposed insides grabbed me as very unusual, even surreal and not at all what I expected. I decided to seal the cut surfaces in epoxy which made them look even more unusual. I've made many since and love to see the reaction from people looking at them for the first time. I've been told they look like brain scans, polished geodes and ink blots.

Now I keep my eyes open when I walk in the woods in search of different types of nuts. Like that first one, I bring them home, dry them, and carefully cut them on my band saw to reveal the secrets hidden within. I've found that I get a different look depending on if my cut is made parallel to the length of the nut or perpendicular to the length. I've even cut some on the diagonal.

A cross-section of a pinecone cast in black epoxy.

This pinecone was cast in epoxy and then sliced on an angle leaving some of the scales free floating in the casting half on the right.

Cover Photo: A collection of nuts cast in epoxy and sliced into veneers

Sometimes I'll drill a small hole at one end then inject epoxy into the nut to fill it before cutting it on my saw. That way, I can slice the nut into 1/8" thick "veneers" without the nut meat falling out in pieces. More often, I cut them in half, set the uncut end onto a bit of putty or modeling clay to keep the cut surface level, and fill the half nut with epoxy. Once the epoxy cures, I can cut them into veneers before sealing the faces with a generous coat of epoxy.

After years of experimenting by cutting nuts on different angles and using different types of nuts, I'm still having fun. Because of the unique images and the instant reactions people have at seeing them, I realize they have great potential for use in jewelry and art.

I've discovered a variety of walnuts, pecans and hickory nuts that range in size from 5/8" in diameter (think earrings) to others just over 2" in diameter (think pendant). Black walnuts have a fragile thick outer shell that can add greatly to the overall appearance if you can keep it intact while cutting the nut in half. You can see from the pictures how unusual they are but there is no substitute for holding one in your hand.

I've always preferred using WEST SYSTEM 105 Resin with 207 Special Clear Hardener for filling and sealing the ends but on occasion I use G-5 Five-Minute Adhesive to seal the cut surfaces if I am working with children. That way they can take their "treasures" with them when they go back home.

Sweetgum seed ball and its cross-sections.

Pine cone being cast in the neck of a bottle.

A walnut nut shell, cut in half, with putty underneath to hold it upright while filling the cavity with epoxy.

Recently I've been casting pinecones, spruce cones and Sweetgum seed balls into epoxy, letting them cure then cutting them into veneers. To avoid wasting epoxy, I use the narrow end of a plastic bottle and cast them into that. It allows the pinecone or Sweetgum seed to fit snugly in the neck of the bottle. I carefully pour epoxy over the item to ¼" to ⅜" depths then set the container on a vibrator table for several minutes to help the air bubbles rise to the surface and escape. After an hour or two, I pour again repeating the process until it's filled.

Once they've cured, I cut them into veneers that are then sealed with 105/207 to produce a rounded lens. The surface tension on the liquid epoxy applied to the cut surface allows it to "dome" a bit giving it a nice finished look after it cures. I use all of the tricks for breaking up air bubbles, including misting the uncured epoxy with denatured alcohol sprayed from a fine misting spray bottle, documented in "Bubble-Free Coating" (*Epoxyworks 34*) and "Bubble-Free Casting in Knotholes and Cracks" (*Epoxyworks 45*).

The photos show the fun I've been having. I hope the pictures inspire you to try making something similar for yourself.

COMPOSITES SCHOLARSHIP AWARDED TO ENGINEERING STUDENT

Winona, Minnesota—Benjamin Wooden of Edina, Minn. was named the first recipient of the Michael A. Barnard Memorial Scholarship at Winona State University (WSU). The scholarship, established by the Gougeon Employees Foundation, is designed to benefit Winona State University students majoring in Composites Materials Engineering. It emphasizes community involvement and leadership rather than grade point average.

According to his scholarship essay, Wooden chose to pursue an education in composites engineering at Winona State because it fit nicely with his areas of interest. "I have a love of engineering that started when I was young," Wooden said. "I spent countless hours of my childhood building and designing with [LEGO® bricks]. As I grew older I enjoyed studying math, physics and chemistry. I love problem solving and thinking creatively. I've also been enthralled with flight since a young age. I love airplanes. I love rockets. I love pretty much anything that flies through the air."

As for his goals, Wooden said, "I aspire to land a job where a combined background in aviation and composites engineering will allow me to excel." He is currently paying his way through college as well as taking flying lessons.

In addition to serving as a residence hall assistant at WSU, Wooden is an active volunteer in service to the poor and hungry.

The scholarship was established as a tribute to Winona graduate and Gougeon Technical Advisor Michael A. Barnard, who passed away unexpectedly on July 28, 2017. The Gougeon Employee Foundation endowed the scholarship with $30,000 in Barnard's name in order to support students who can continue his legacy of advancing the use of composite materials. Scholarship applications are accepted through WSU, with finalists forwarded to the Gougeon Employees Foundation and winners announced by the Foundation in May.

Wooden's award will be approximately $1,000 to be used toward his education, and will be presented at an awards ceremony at WSU in September, 2018.

Mini Skeeter

By Randy Rogoski

Citronella set up at Hartshorn Marina, February 22, 2018.

There is only one solution that comes from the ache of seeing iceboats ripping around on Mona Lake all your life: give in and buy one. If the thrill doesn't quite meet expectations, build one that will be faster.

Pat Filius has lived 20 years on a now-flooded celery flat fed by Black Creek, the main tributary of Mona Lake in Norton, Michigan. In 2014 he bought his first iceboat for $400. Sailing it just once was enough to convince him that he wanted a faster boat.

He found a website for the Mini Skeeter, a small craft that John Enslore designed to be sailed over land or ice. He didn't know any ice boaters at the time, but found his way into a new group of friends at WMIYC.org. 45-year-old Filius went "All in!" as they say in Texas Hold 'Em poker. So far, he has spent $8,000: half on components, boat building materials, and supplies, and half on a trailer to haul it. He also spent $50 to buy plans.

Filius bought the spars, a sail, and wheels. He recycled scrap redwood and bought a walnut board and milled strips. He used 1.5 gallons of WEST SYSTEM Epoxy Resin and hardeners in addition to fillers, and S-glass fiberglass cloth. While the plans called for marine plywood for the sides and bottom, he prefers stripper construction. "Strips are pretty," he said.

An access hatch for a beer trunk was a needed deviation from the plans. He'd previously cold molded two wood-strip paddleboards and a kayak with WEST SYSTEM Epoxy. The experienced boat builder and building contractor of new homes knew exactly what he was getting into. "I had fun building it," he said.

Inside a new double-bottomed 7'x7'x14'-cargo trailer, he built a workbench that can be utilized as a bar. He also has 150 lbs of iceboat gear, another plank, and wheels for the land sailing configuration inside this 2,200 lb trailer. To make space in his shed, he mounted the land and ice sailing apparatus on a wall. This leaves room to spare for his ice fishing gear, as well as warm weather gear. The land sailor wheels double as a dolly to portage his Mini Skeeter. It only takes ten minutes from the time he drops the tailgate until he's ready to shove off. He packs it up just as fast.

Filius has an understanding and cooperative family. His wife of more than 25 years, Gerri, would prefer to park her summer convertible in the garage, but accepts that it will always be Pat's workshop. His daughter, Lyndi, named the boat *Citronella*, like the mosquito repellent because she thought it would be a cool name for a Skeeter iceboat.

Always hitched and ready to roll, he sails every chance he can. His GPS logged 480 sailing miles this season. "It's so much fun it's ridiculous!" Filius said.

When he began the project, Filius had no idea that long-time WMIYC club member Marty Fredericksen had already built a Mini Skeeter. Noticing that he was slow, Fredericksen invited him over to his workshop to adjust runner alignment. Getting the runners parallel boosted his speed. They agree the Mini Skeeter is comfortable to sail, and fast. Fredericksen had his boat up to 56 mph. "But it doesn't point," Fredericksen said. The boat has a self-supporting carbon fiber mast.

During the off season he plans to build tooling for molding a stiffer mast that will have better upwind performance. The Mini Skeeter is about the same amount of work to build as a DN iceboat, Fredericksen said.

WELCOME.

2018 has been a year of growth and change here at Gougeon Brothers. Our Technical Department welcomes three new staff members.

Rachael Geerts

Composite Materials Engineer

Rachael recently graduated from Winona State University in Minnesota with a Bachelor's in Composite Materials Engineering and a minor in Polymer Chemistry. As one of four girls, Rachael grew up in the twin cities and attended Catholic school through high school. She started at Winona State in the fall of 2014 after graduating high school. Rachael joined InterVarsity Christian Fellowship, a campus ministry, her freshmen year and was on the leadership team her sophomore and junior years. Starting at the end of her sophomore year, she was a student intern for COMTEC, a materials testing company in Winona. Rachael completed her final year at Winona State as a student representative on the College of Science and Engineering Council and was on the academic dean's list during her last semester.

Rachael is excited about moving to Michigan and starting her career at Gougeon Brothers, Inc. She has had a good amount of experience working with different materials in her labs during college but is excited to get more hands-on experience with more industry relevant projects. Rachael is also eager to apply the things she learned during her four years at Winona State at work.

Terry Monville

Technical Advisor

Terry started in the marine business more than 30 years ago in a small fiberglass repair shop. Over the years, he worked at a couple different repair facilities including one of his own and another he managed. Also, as we like to say around here, *back in the day*, he helped build G32 catamarans and some wind blades at the Gougeon Manufacturing facility in Pinconning, Michigan.

For the past 20 years, Terry managed the local West Marine store where he helped guide countless customers through their WEST SYSTEM Epoxy projects, from fixing a gouge to core and transom replacement.

When not at work, Terry likes like to spend time with his family. He feels fortunate to live in Michigan and near Lake Huron, where he gets to do a lot of outdoor activities including sailing his family's Pearson 28, racing J-22s with friends in the summer, and downhill skiing in the winter.

Victoria Hankins

Laboratory Technician

Victoria has an Associates degrees from Delta College in Mechanical Engineering Technology, Fine Arts, Liberal Arts, as well as certificates in CNC and CAD. During her schooling she was the lead lab tech at Delta College for the photography and ceramics labs, then later worked at Aptar as an Elastomeric Flow Control Expert Center intern.

Victoria is excited to be a part of the Gougeon Brothers, Inc. team and can't wait to learn more about epoxy and apply that knowledge to future projects. In her free time, she is most likely to be found adventuring with her German Shorthaired Pointer puppy. She loves traveling, photography, music, building custom pieces and experiencing all that the world has to offer including any physical outdoor recreation sports having to do with water, riding something with wheels and/or a board.

Triple Threat— 38 years old and counting

Bruce races Triple Threat weekly in a Wednesday night series on the Saginaw Bay.

A case study of gelcoat blister remediation

By Bruce Niederer

My father, rest his soul, and I bought Triple Threat together sometime in the mid-'80s. We raced our '81 Pearson Flyer hard together for the next 15 or so years, including 12 Port Huron to Mac races. The purchase date is lost to history, but the details surrounding how many times the boat needed a new bottom—meaning a new epoxy barrier coat—are forever etched in my psyche. It's all the sanding that accompanies blister jobs that has addled my IPA soaked cranium. One just doesn't forget those seemingly endless hours of self-imposed torture.

The story begins before we launched the boat and long before I even started my career at Gougeon Brothers, Inc. Because I'd been racing sailboats since the late '70s, I was friends with many of the guys who worked for GBI at the time—J.R. Watson and Joe Parker not to mention Meade and Jan Gougeon—and they had already converted me to the virtues of WEST SYSTEM Epoxy.

Even though the Flyer had only 200 hours of use when we bought it, it had been stored indoors at the marina for a number of years, and showed absolutely no signs of blistering, I knew I should apply a barrier coat before it ever hit the water. Boats built in the era when mine was built tended to blister much more than more "modern" boats, that is, production boats generally built after 2000. This is mostly due to changes in building techniques and materials. Many, but not all, production boats built today apply a vinylester barrier coat at the factory under the gelcoat to prevent the blisters that plagued many earlier production fiberglass boats.

Around '85 or '86 we long-boarded the gelcoat, exposing nearly all of the laminate, and then rolled and tipped six coats of 105 Resin/206 Slow Hardener. We started on the starboard bow with one of us rolling and tipping and the other mixing the epoxy and 422 Barrier Coat Additive to keep the supply in the rolling pan fresh. We traded places when the arms of whoever was applying the epoxy couldn't take it anymore. It was about 80°F and sunny, which allowed for six trips around the hull and keel non-stop. In the time

it took to get back to where we'd started on the starboard bow, the epoxy was tacky and ready for recoating. I won't kid you, it was a long day. But it was only one long day and we only had to sand the hull once to prep for the bottom paint. If we had to stop for any reason before all six coats were applied, we would've had to sand before completing the application and still sand again to prep for painting.

The initial barrier coat applied to the dry hull in 1986 lasted about 8 to 10 years before a growing number of small, pencil-eraser sized blisters appeared when I hauled out, and under the pads after a winter on the hard. Actually, getting 8 to 10 years life from a barrier coat in the Great Lakes is phenomenal! Most yards up and down the three coasts (that's right Fifi—Michigan has more coastline than either the East or West coast) offer a two-year warranty on workmanship only, meaning if the whole barrier comes off in sheets or the bottom paint doesn't stick to the new bottom, they'll fix it. I've heard some offer a warranty as long as five years.

Warranties generally cover the repair of isolated blisters if they show up during the warranty period, but if you can get them to apply a new barrier coat, you're a better man than I. Most people in the repair industry do not expect a barrier coat on an old boat to last more than a couple years without some blisters reappearing. I have answered a number of calls over the years when a customer learns about the reality that blister jobs are not permanent. They are a bit freaked out that a yard might charge several thousand dollars for work with a two-year stated life expectancy. While epoxy has proven to be the best moisture barrier available, it is not moisture-proof. Moisture will eventually work its way through. For this reason, and for the best long-lasting results, it's important that your hull laminate is dry and structurally sound.

As you might have guessed, sometime around '96 or '97 I began to see the return of isolated areas of small blisters in the bow area and in the stern. I learned an important lesson from Joe Parker around this time: blister formation can be augmented by moisture that originated from inside the boat. The bow is where my sail lockers/bins are and they sit against the hull holding in moisture that then gets forced through the laminate. In the stern, where the engine is mounted, there are a few decade's worth of engine oils and grime coating the inside laminate surface, again working to force any moisture that may have seeped into the laminate through osmosis towards the outer surface and causing blisters.

Having taken a patchwork approach to blister remediation for a few years, my father and I again tackled the project of sanding off every last bit of bottom paint with 60- to 80-grit paper, applying six more coats of 105/206, re-sanding for fairness with long boards, and applying new anti-fouling paint. Just like the first time.

I'm not suggesting that all the returning and isolated blisters were due to moisture from the inside. I mention it because it's something to consider in the maintenance and care of your boat. When using a moisture meter to assess, measure, and track moisture in your hull from the outside, remember that a high moisture reading may not even be in the laminate but from inside the boat: water tanks, standing water in the bilge, holding tanks, or possibly wet cushions up against the inner hull. My point is, be aware of these sort of situations that may yield false or skewed data when tracking hull laminate moisture with a meter. (ref. *002-550 Fiberglass Boat Repair & Maintenance*, pg. 69 sec 11.1.1)

Triple Threat in front of the Gougeon Brothers boat shop ready for a great season of sailing.

Now here we are in 2018, twenty years since my last barrier coat. I've been taking that patchwork approach I mentioned for three or four years…or more. I arranged to go in the GBI boat shop for a couple months around the first of the year and apply THE LAST BARRIER COAT I'LL EVER PUT ON TRIPLE THREAT! EVER. EVER.

My Dad is long gone now, but I have a talented and energetic crew that helped me get this project done. My 65th birthday fast approaches in September, as does my retirement, and I've learned a very, very important lesson…

I'm getting too old for all this… *manual labor, crawling in and out of the cradle, up and down ladders, and sanding upside down until every bone in my body aches*!…nonsense.

I'm going to want beer—and lots of it!

The picket fence happens to be the backdrop for a lot of childhood photos. Here's my daughter playing in the pool back in 2008.

A Pine and Epoxy Fence, Age 20

By Grace Ombry

We bought our home, a 1904 stucco American Foursquare, in November 1997. The following spring we decided to fence in the backyard. White PVC picket fences were all the rage in the late 1990s, and while we liked the clean, bright, classic style of a traditional looking fence and felt that was in keeping with the style of our home, we observed that PVC fences tended to blow over in high winds. Considering Michigan's frequently rough weather, we knew we wanted something sturdier.

We decided a custom wooden picket fence would fit the bill. This was easy enough to design with classic 2"x2" pickets set one picket-width apart. We incorporated some ideas to make the fence longer lasting: cutting the tops of the pickets to pyramid points to discourage kids from climbing over it or sitting on it as well as to prevent the pickets from collecting/absorbing snow and rain; and most importantly, pre-treating certain parts of the fence with coatings of WEST SYSTEM Epoxy.

The posts, as the most important and hardest to replace structural components, were fully encapsulated with epoxy. We leaned the posts upright against sawhorses and coated them about halfway down with a couple of coats of 105 Resin/206 Slow Hardener, waiting until one coat had reached the tacky "green" stage before

The base of the posts were encapsulated with epoxy and placed against sawhorses to cure.

A picture taken this summer. After 20 years, it's due for a fresh coat of paint.

The pickets were cut with a pyramid point on top to minimize the absorption of moisture.

adding the next. Once these coats of epoxy cured, we flipped the posts over and coated the remaining halves.

We epoxy coated the end grain of the 2"x4" stringers and 10" to 12" inside the end of each stringer. Each picket was coated on the bottom and about 6" up. All of this was also done before assembly, again using sawhorses.

Because it would have been both time consuming and expensive, we elected not to fully encapsulate the stringers and pickets with epoxy. We simply cut a few extra pine pickets to have on hand in the event that any got damaged. As a matter of practicality, the investment in epoxy and the labor of fully coating each fence component seemed like overkill.

Coating the end grain helps the fence maintain moisture stability, reducing seasonal swelling and shrinking so that it hangs onto its exterior-grade latex paint longer.

Prior to erecting the fence, we painted the pickets in assembly line fashion on sawhorses. This ensured they were each fully coated with paint, and saved us untold hours of the back-aching labor associated with painting an erected fence.

Assembly began with renting a post hole digger, digging the holes, and putting gravel in them for drainage. We then mixed and poured Quikrete® and set each epoxy-encapsulated post in an annulus of concrete. Next, we used a laser level to accurately site the posts, then cut them to the proper height so that the topline of the entire fence would appear even despite variations in grade across our backyard. We always meant to put those fancy copper caps on the post tops, but 20 years later still haven't gotten around to it.

Rather than nails, we used screws to attach the stringers to the posts, then painted the posts and stringers before screwing the painted pickets into place. While they are a little more work to install, screws are much more effective fasteners

The epoxy-encapsulated posts were set in concrete and tied together with stringers.

The fence approaching completion in 1998.

than nails for holding a fence together long-term. It was easy enough to get perfect picket-width spacing by using, you guessed it, a picket.

When we first installed the fence we were often asked if it was PVC. And while it's not quite that perfect looking anymore, our pine and epoxy fence has held up beautifully for the last two decades and has never been repainted. It has withstood rambunctious kids, dogs, countless fox squirrels, and blizzards. Most of the spare pickets we cut remain in limbo in the rafters of our garage, with only a couple pressed into service over the years.

While our 20-year-old the fence is admittedly in need of repainting now, it's every bit as sturdy as the day we finished it.

Over the past few years I've been cultivating an increasingly larger vegetable garden. Last year was my first attempt at growing cucumbers but by mid-summer they had climbed halfway up the screens on my sun-porch windows. That's when I decided I needed a trellis.

Because my trellis would be located right in front of my sun-porch windows, I wanted something with a little more personality than the standard lattice pattern. It also needed to be low enough to allow light to shine through.

The trellis I designed had free floating zig-zag rails. This was a bit of an engineering challenge because the rails needed to be strong enough to support fruit- and veggie-laden plants while spanning a five foot section unsupported. I knew fillets would be a necessity and hoped they would make it strong enough.

I cut my trellis pieces and attached everything together with finishing nails to hold it in place. On the inside corner of all the joints, I created fillets with 105/205 thickened with 406 Colloidal Silica to a peanut butter consistency.

The rounded end of an 808 Mixing Stick was the perfect radius for my fillets.

After the initial application cured, I filled any remaining gaps with thickened epoxy for added strength and to make it more aesthetically pleasing. I wanted to minimize the visibility of the joints after the trellis was painted.

Pleased with how solid the fillets made the trellis, I applied a couple coats of neat epoxy to the entire thing. I paid close attention to the end grain of the posts that would be embedded in the soil, and areas that were likely to see standing water. After a couple coats of spray paint, the trellis was ready to be installed.

My cucumbers and pole beans seem to really be enjoying the trellis. As am I.

- Jenessa Hilger

Adagio at the start of the 2018 Bayview to Mackinac Race.

Aged Epoxy Boats Still WINNING BIG

By Grace Ombry

A pair of multihulls built by Gougeon Brothers with WEST SYSTEM Epoxy decades ago won important races on the Pacific Ocean and Great Lakes in 2018.

Incognito is a G32 catamaran, vacuum bagged composite construction, by Gougeon Manufacturing in 1990. Russell Brown of PT Watercraft in Port Townsend, Washington raced the 28-year-old vessel singlehandedly in the grueling R2AK (Race to Alaska). In the qualifying leg from Port Townsend, WA to Victoria, BC he finished 40 minutes ahead of the rest of the fleet. He then led the race for three days until fatigue set in, requiring him to put finishing safely first. Still, he was the first solo finisher for the second year in a row and knocked more than 24 hours off his record-breaking 2017 win, also aboard *Incognito*.

"It's totally on fire now," he said of his updated G32, "the boat just rips."

Brown's approach attests to his own grit and determination, as well as the durability of his epoxy-built multihull. Solo sailing to Alaska required Brown to dock the boat in order to rest while boats crewed by more sailors passed him in the night. During the day he'd pass those boats. While team Sail Like A Girl took first place overall, Brown was the first solo finisher and came in well ahead of much of the pack regardless of crew size.

A few weeks later, *Adagio* took first place in Division III (multihulls) of the 2018 Bell's Beer Bayview Port Huron to Mackinac race sailing the Cove Island course. This 35' trimaran was built by the Gougeon Brothers in 1971 and is widely considered to be the first all-epoxy-bonded wooden boat ever built. That it is still competing today speaks to the longevity of the cold-molded epoxy construction methods pioneered by the Gougeon Brothers in the 1970s.

Adagio is owned by Alan Gurski and Ben Gougeon of Bay City, Mich. and skippered by Matt Scharl of Lawrence, Mich. Gurski and Gougeon crewed.

"At 47 years old, *Adagio* is still an incredibly fast boat," Gougeon said. "Even by today's standards, using modern building methods, it's difficult to build a lighter, stiffer boat. The secret to her longevity and success is quite simple. Keep her sealed up tight with WEST SYSTEM Epoxy and constantly look for ways to add a couple of tenths of boat speed. Between our ongoing maintenance program and the awesome sails our friend Magnus Doole at North Sails, NZ designed for us, *Adagio* has taken first in her division on three consecutive PH-Mac races. The scary part is at almost 50 years she's still getting faster!"

Incognito, a Gougeon built 32' catamaran.

ITALMAS

By Ben Van Dam

CAD rendering of the finished design

Italmas, a one-of-a-kind build underway at Van Dam Custom Boats, in Boyne City, Michigan, is a world-class cruising vessel designed by Stephens Waring Yacht Design. She has been shaped and appointed for her owner to easily enjoy daysailing as well as cruising on the Great Lakes. Distinction and grace have been combined in a traditional manner and squarely pay homage to yachts of the '40s and '50s. The yacht exudes *classic*.

- LOA: 44'
- Beam: 12' 6"
- Draft: 6' 6"
- Sail Area: 1,072 sq. ft.
- Displacement: 23,500 lbs
- Fuel Tank: 60 gal.
- Power: Yanmar SD/53hp

She is largely constructed of hand-selected mahogany, carefully sorted and chosen for characteristics that will best suit each construction application. Ben Van Dam, the president of Van Dam Custom Boats, together with his seasoned craftsmen, ensure there is a solid plan in place for success. Their onsite, four year apprentice program is shaping future boat builders and all are well instructed before the sawdust flies. Amazingly, as it has always been, planes and chisels are still at the top of the list when the crew reaches for the tools of the trade. Traditional design styling of the past meets old-world craftsmanship. A marriage made of timelessness. Let us be clear however that *Italmas* does not lack for modern innovation. At Van Dam, old and new have learned to coexist very, very well.

In the words of the designers at Stephens Waring, they offer these insights about *Italmas* when asked about her unique and innovative elements (visit stephenswaring.com/spirit-of-tradition-in-italmas/ for more):

- She'll crush the competition to windward. She sports a super-efficient keel and rudder with a modern, low-wetted surface hull. She was engineered to be strong and light. The Van Dam skill with wood will ensure this is the outcome.
- Idiot-proof water ballasting: *Italmas* was so light that we found a ton of spare space between the lead at the bottom of the bulb keel and the bottom of the hull. So much so, that we could

Cabin top planking epoxied in place.

The 60-gallon fuel tank mounted on top of the bulb keel.

Top left: Custom cut and polished metal parts manufactured on site.

Top right: A few of the cabinets going in the galley.

engineer a 60-gallon fuel tank right there in the keel. *Italmas* will feature an everyman's water-ballasting option: Rough day? Top off the fuel tank for more windward punch. Want to strip down for lighter days? Run the tank closer to empty. She'll move right along.

- She'll be roomier below: *Italmas* will be open and airy with large forward spaces and plenty of room for guests and gear. A fair amount of privacy ensures a week at sea will not leave people wishing for alone time.
- She'll be easy to sail: *Italmas* will be lighter, stiffer, and roomier than you would expect. Consequently, we paired her with a custom engineered, modern wood spar that utilizes advanced materials where appropriate. Her taller rig and lighter overall weight will provide enough sailing horsepower for some serious "get up and go" when the seas will allow it.

At Van Dam, *Italmas* will be shaped using the process of cold molding. Room-temperature cured epoxy adhesive is used to laminate many thin layers of wood creating the large structural members of the hull, as well as the hull itself.

Taking advantage of the benefits of epoxy adhesives and the natural strength of wood, the crew at Van Dam meticulously forms and assembles all the structural members, joints and skins to create a wooden boat that is strong, durable, and stable. The boats are not built as they were before epoxies and then epoxy is simply added. That wouldn't be an effective use of epoxy, and can result in myriad future problems–and an unsatisfied customer.

When done well, custom wooden boats are by nature a unique level of luxury as compared to similar watercraft constructed from production fiberglass. Furthermore, the cold molded process of wooden boat building, as done by the craftsmen of Van Dam Custom Boats, affords clients a lightweight, resilient vessel impervious to the traditional challenges of water meeting wood; swelling, cracking and rot are non-existent in these builds as long as the boat is properly cared for. Van Dam's lifetime guarantee supports that fact.

Italmas will be more seaworthy in foreboding weather, a quicker sail to her destination—home or open water—and easier to captain than most any other boat of comparable appearance and styling. Stephens Waring Yacht Design put forth the dream. Van Dam Custom Boats is bringing that dream to life.

Online Forums are the Bane of my Existence—An Epic Rant

My humorous take on the Social Media disasters called Technical Forums

By Bruce Niederer, Senior Technical Advisor/Chemist

I've answered a lot of phone calls and e-mails in my 23 years here at Gougeon Brothers, Inc. Many of the questions are repetitive—that's the nature of helping customers both new and old to be successful. Some are interesting—a few are downright fascinating. But I know it's gonna be one of *those* calls when the first thing I hear is "I was reading in this forum last night about…"

DOH! (I try not to slap my forehead loud enough to be heard on my headset.)

Let me treat you to you a couple typical and oft repeated exchanges. The names are changed to protect the innocent and the dull. The names of the forums don't matter—the following exchange could appear in any one of them.

Frankie

I have an old wooden canoe that I just stripped of varnish. I'm thinking of using a penetrating epoxy before reapplying varnish. Any opinions?

Seriously? Any opinions? I think there might be a comment or 10!

Johnny

Penetrating epoxies are great as a primer—I use one often. My theory is that once the solvents have all evaporated, the epoxy that's left is microporous. The finish, especially if worked into the surface (meaning lots of brushing) forms a mechanical bond as well as an adhesive bond to the epoxy, and the epoxy forms a better mechanical and adhesive bond to the substrate than the finish alone would.

Oh Johnny (sigh) you started out so well, sharing correctly that highly solvent filled epoxies are not good moisture barriers (see my article "Penetrating Epoxy: Legend or Myth?" in *Epoxyworks 45*). But then you drive off a cliff with theories of mechanical and adhesive bonding. Like all forums, there will be someone calling out any holes in your post—what I call "the slap down."

Stagger Lee

Wouldn't a "mechanical bond" and an "adhesive bond" be basically the same thing? I've heard of mechanical bonds and chemical bonds, but I'm left wondering what an adhesive bond would be. The whole idea of hot-coating (meaning applying a topcoat over an uncured, solvented system) always presents a few questions in that the evaporating (and quite strong) solvents may be incompatible with the topcoat being applied over them. I admit I'm not a fan of highly solvented epoxies and think a fair bit of the marketing hype is distorted B.S.. But there are instances where I could see it as a viable primer for paint or varnish. However, if it was my boat, I'd absolutely wait for the solvents to evaporate completely before applying a dissimilar material over it. The manufacturer of your paint or varnish certainly wasn't expecting you to apply it over something which was still leaching strong solvents. It is probably worth noting that priming with any diluted epoxy product most likely increase your potential for UV problems. It's also likely to make the eventual job of stripping the boat down to clean, bare wood for future refinishing a lot more difficult.

Stagger Lee I love ya! You asked exactly what I would ask and it sounds like you know your stuff.

You picked up on his adhesion confusion. As you said, there are two types of bonding. Primary bonding (a chemical bond) is when the adhesive, in this case epoxy, chemically bonds to a previous, uncured layer of epoxy and cures together creating a single fused layer. A secondary bond (mechanical bond) relies on mechanical adhesion, or the ability to key into the substrate. Except for bonding to uncured or partially cured epoxy surfaces, all epoxy bonds are secondary bonds.

I'm not sure what you mean by saying that priming with diluted or solvented epoxy will likely increase the potential for UV problems, but everything else is correct and I'm good with it. But will Frankie and Johnnie recognize this or will someone else throw another monkey wrench into the fray?

Billy DeLyon

Actually, penetrating epoxies form a moisture barrier on wood. If they're used as a primer and you poke something through the varnish topcoat and penetrating primer, water will get behind them. This will cause dark stains that are impossible to remove unless the coated surfaces are completely stripped beyond the epoxy-sealed wood. This is quite difficult as chemical strippers will not dissolve the epoxy barrier. Dry scraping is the only alternative as heat will not soften the epoxy either! I prefer to lay down a thinned coat of varnish as a primer and hot coat over it when it is dry enough to do so. Clear/white shellac can also be used as a primer and will dry enough to be varnished over in just a few minutes.

Billy, Billy, Billy, Billy. This reply is an exercise in contradictions. First thing ol' Bill claims is that solvent-filled epoxy forms a moisture barrier on wood. Um…no! Didn't Johnny already establish that it is not a good moisture barrier? Next Billy D. correctly states if water gets into the wood behind these coatings, the wood will get stained—which is actually the beginning of rot spores expressing themselves. Rot spores are always present in wood but they need sufficient moisture and air to start eating your wood.

Next, he says chemical strippers will not dissolve epoxy—correct. Then goes on to say heat will not soften epoxy—incorrect. Heat does indeed soften epoxy, but the epoxy portion of a highly solvented penetrating system is not on the surface of the wood, rather, it's just beneath the surface of the wood.

Johnny

The mechanical bond I refer to is one where the paint works its way into the pores in the cured penetrating epoxy surface, then hardens. Some, if not most, of those holes will be bigger on the inside than on the outside so the paint will be mechanically locked in place.

That this is actually happening is just a theory I came up with to explain why the varnish did not peel as soon as it surely would have otherwise.

Adhesion is the molecular force of attraction in the area of contact between unlike bodies that acts to hold them together. This is not a chemical or mechanical bond, the two surfaces do not chemically or mechanically combine. Paint adheres to glass without any chemical reaction between the two, and unless the glass is sandblasted or chemically etched there will be no mechanical bond.

Paint/varnish can and does form a mechanical bond as well as an adhesive bond when it soaks into new wood, but the bonds formed between epoxy and wood are even more durable. That's why we glue with epoxy rather than paint or varnish.

Anyway, it worked for me, and in my experience repairs always show as a different color, penetrating epoxy or not.

Finally, I'm not one to argue with success, as my old pal Tom Pawlak was fond of saying. That said, I have not heard of anyone successfully hot coating varnish over varnish or varnish over shellac on boats. That's an old technique I've heard furniture builders use, but they rub it on like stain.

But wait, Johnny feels the need to defend his first statement against Stagger Lee's slap down.

Huh??? Clearly Johnny has a poor understanding of chemical, mechanical, and adhesive bonding. His idea that paint can work its way into the micro-porosity left by the escaping solvents and key in is just not possible. But Johnny is nobody's fool—he's concludes with the universal cover story in case someone actually calls BS on the BS he's just been flinging: "Anyway it worked for me…"

Good one Johnny. Good one.

But Stagger Lee senses he has Johnny on the ropes so he starts working on the body.

Stagger Lee

I would certainly love to see some actual scientific tests/proof that this is even possible. Surface tension alone of something as thick as paint or varnish would keep it from "working its way" into nearly invisible small solvent pores.

Oh my. Stagger Lee delivers a—pun intended—staggering blow to Johnny's mid-section. From where I sit, Johnny's knees are getting wobbly.

Johnny

I did say to rub it in with a brush you know, and if it were thinned it would work even better. I'd like to see that theory tested too, but I'm willing to accept my own experience as sufficient.

You've got heart kid, I'll give ya that. But your theory is still wrong.

Stagger Lee

You really think you can rub paint into pores which are too small to even see in any meaningful way? Personally, I don't, but whatever floats your boat.

Wham, Bam Thank You Ma'am! A stunning TKO victory for Stagger Lee!

That's my take on this exchange. In fact there is a lot of misinformation in this thread and who knows what Frankie will take away from it? Another thing to consider is that Frankie originally asked about re-varnishing an old canoe and didn't provide any more detail than that. It doesn't sound like the canoe in question is a modern stripper built with epoxy and glass and with few, if any, frames. More likely, it's an older canoe built with copper fasteners and lots of frames. Would it hurt if he were to use a penetrating epoxy as a primer, assuming he let it cure for a good 72 hours to make sure all the solvents evaporated, then sanded the surface before applying varnish?

No, probably not. My point is that forums are so often filled with any number of misconceptions, bad information and outright lies one must remain skeptical about what is said, and by whom.

Here's one more quick exchange that expresses and repeats a long held and widely believed misconception regarding gelcoat over epoxy—an oldie but goodie!

Marco

Just a quick question. I was thinking about taking off the rails that go around the bow. That's going to leave a lot of screw holes that will be an eyesore, lol. What could I use to fill in those holes to make it not look so bad?

That seems to be a reasonable question. Let's see what the forum world has to say.

Polo

3M™ 5200.

Yikes! Why would anyone want to use a soft urethane sealant material to fill visible holes in a deck?

Let's just ignore this yahoo and move on.

Ferdinand

In addition to 3M 5200, you could use a 2-part epoxy (e.g, PC-11, Marine R/X) or you could fill them with some sort of thickened polyester resin followed by a top coat of gelcoat. The easiest would be 5200 or epoxy. Resin/gelcoat would give you the option of trying to color-match the boat so the repairs are less obvious.

Holy Bat Guano Batman! Two of them in the same thread! Marine R/X over 5200? That's some particularly bad advice right there. It's just…stunningly wrong! Is there any hope for this thread?

Magellan

If you are concerned about appearance, I would fill with epoxy to just slightly below the surface and top coat it with matching gelcoat.

Now you're just showing off Magellan! First you organize the whole first circumnavigation of the world—and now this. You hit the nail on the head in one simple sentence that actually helps Marco. Sweet!

Marco

I was under the impression that generally, gelcoat doesn't adhere very well to epoxy.

Marco. Hey, all my props to ya brother. Exploring China and bringing it to the world through your writing…nothing but respect. Seriously. And you're a lot of fun in the pool too. But let's be honest, Magellan did the whole around-the-planet thing. I would advise you to concede this one to Magellan.

All kidding aside, we get this *I know gelcoat won't stick to epoxy* comment often. So here's the real answer concerning gelcoat over epoxy—there are three conditions that must be met to successfully apply gelcoat over epoxy:

First, the epoxy resin and hardener must be mixed at the correct ratio.

Second, it must be completely cured. If the epoxy is applied at low temperatures it may need to cure for a few days. 48 hours at 72°F is the standard to aim for.

Third, blush must be removed if using 205, 206, or 209 hardeners. 207 is a blush-free hardener.

If you meet these three conditions, you can successfully apply gelcoat over epoxy.

In fact, there is a WEST SYSTEM video showing how to properly apply gelcoat over an epoxy repair. It features Joe Parker, a (now retired) employee here at GBI, rockin' his '80s hair cut.

Creativity is Contagious, Pass It On…

By Tom Pawlak

My career at Gougeon Brothers is coming to an end. By the time you read this article, I will have moved on to new things, the things that retired people do such as travel, kayak, volunteer, read books, and tinker creatively in my shop.

There is a place inside each of us where creativity bubbles freely. Creativity is a gift that needs to be tapped into and shared with others to fully blossom into something beautiful. Tinkering has always been a creative outlet for me. I wonder why many of us seldom tap into it. Possibly we were embarrassed as a child after showing someone our creations. The emotional wounds we suffered early in life may cause us to stop sharing ideas and creating things.

Tapping into creativity has produced a number of highlights in my life. Many of them involve my work at Gougeon Brothers, Inc. Brothers Jan and Meade Gougeon were creative geniuses. People flocked to them because they were innovators who were fun to be around. They made their employees and co-workers proud to be part of an organization that helped inspire the next generation of innovators.

Creativity would seem to be the spark of life that is trying to be expressed and created in the world.

When faced with a challenging situation at work that did not require immediate action, I often took a walk. I found this best done outdoors where distractions are limited and not at all bothersome if they occur. The walk often got me out of my thinking mind just long enough for my brain to steer out of the neural grooves that had me struggling at a dead end.

Years ago, when Gougeon Brothers was known as the best wind turbine blade manufacturer in the world, I was a crew leader responsible for fabricating prototype tooling for making the blades. I was often faced with the creative task of figuring out ways to guide a saw, router or drilling device, clamp things in place or align tooling so the wind blades were in perfect alignment for the next step in the manufacturing process. If my crew and I struggled to come up with a good approach to accomplish the needed step, I would take a walk to an old hardware store located a couple blocks from our Pinconning, Michigan plant. It was the type of hardware store that had lots of old, tarnished, dust covered tools and clamping devises from decades prior, like was found in many small towns prior to the big box building store era. Within 15 minutes of my arrival, an object on the shelf would catch my eye, a lightbulb would go off in my head and my challenging problem was solved. Often, I just needed a concept. The tool on the shelf might be oversized or undersized for my project so I often came back to the shop where the crew and I fabricated our own using the borrowed concept.

One of my favorite quotes, often attributed to Albert Einstein, is "Creativity is contagious, pass it on." The wisdom of this quote surely rings true at Gougeon Brothers; the place where two amazing brothers, along with their childhood friend James R. Watson, and several others came together to build race-winning boats that moved effortlessly across water and ice.

Their success spawned lots of curiosity. People stopped by the Gougeon brothers' boat shop to see their methods and materials. They witnessed a new epoxy that could glue wood together without need for fasteners or high clamping pressure. They discovered that this same epoxy glue could also be used to seal wooden structures, stabilizing the moisture content so the wood stayed dry. This was the birth of WEST SYSTEM Epoxy.

The brothers exemplified the quote "Creativity is Contagious" in willingly passing along their creativity to others. They wrote *The Gougeon Brothers on Boat Construction*, a book that spawned a grass roots phenomenon of wood and epoxy boat building. They sometimes spent more time on the phone helping others be successful than they spent on building their boats in the shop. This set up a remarkable business model of technical service that to this day is unmatched in the boat building and composites industry.

Today though, I reminisce about the amazing people that I've worked with and learned from in my Gougeon family over the past 37 years and I am grateful for the experience. I'm remembering too the creative conversations on the phone with many of you, helping you out of a jam or being a sounding board for your creative juices. It has been a privilege to have participated in your creative process. I will miss you.

I have benefited from that spark of creativity and I'm genuinely grateful for having had the opportunity to work for such an amazing company.

300 Mini Pumps. To buy or not to buy?

By Terry Monville

Selling WEST SYSTEM Epoxy in a retail environment for more than 20 years, these were the three most common questions I received.

1. Do I really need the Mini Pumps?
2. If it's a two-part epoxy, why are there three pumps in the package?
3. The pumps look the wrong size to fit my cans. Are you sure these are the right ones?

These are valid questions. We've all been in a situation where the salesperson is trying to up sell us or has no clue what we really need. In the case of Mini Pumps, however, the salesperson is trying to do you a favor. You really do need Mini Pumps unless you already have a set of them, or you plan on using a scale, graduated cups, or have one of our larger pumping systems in your shop.

Why Use Pumps?

WEST SYSTEM Resin and Hardener—like any epoxy—must be mixed at the correct ratio to cure properly and with the published physical properties. Too much or too little hardener will not change the speed in which it cures but instead will prevent it from properly curing. Too much hardener means once all the resin has reacted with the hardener, the extra hardener has nowhere to go. This extra hardener in the mix results in softer epoxy, or what the industry calls a "plasticizing cure."

We formulate the ratio for 105 Resin and our 200-series hardeners to have a "fudge factor" but get outside of that forgiving stoichiometric range and problems will occur. Mixing on ratio is always ideal, but with WEST SYSTEM products, hardener lean is better than hardener rich. This is why you really want to buy a set of calibrated 300 Mini Pumps. One full pump stroke of resin to one full

pump stroke of hardener will yield the proper volume of each.

WEST SYSTEM is based on the 105 Resin and four 200 series hardeners (205 Fast, 206 Slow, 207 Special Clear, and 209 Extra Slow). When installing the pumps, put the resin pump on first. It's the largest pump and has Resin printed on top. You are now left with two pumps with Hardener printed on the top. The larger diameter screw-on cap will fit the 205 and 206 hardeners and the one with the smaller diameter screw-on cap fits the 207 and 209 hardeners.

The pumps come set up to fit the "B" size group (gallon of 105 Resin) of epoxy. Shorter extension tubes are packaged with the pumps to fit the "A" size group (quart of 105 Resin). Before fitting pumps into your A-size resin and hardener cans, remove the extension tube from the bottom of the pumps and replace with the smaller extensions. If you plan on using the pumps on a "C" size of WEST SYSTEM Epoxy, you'll find those larger extensions packaged in the box containing your "C" group resin and hardener.

Getting the most out of Mini Pumps

Now that you made the right decision and bought the pumps, here's how to make the most of your purchase.

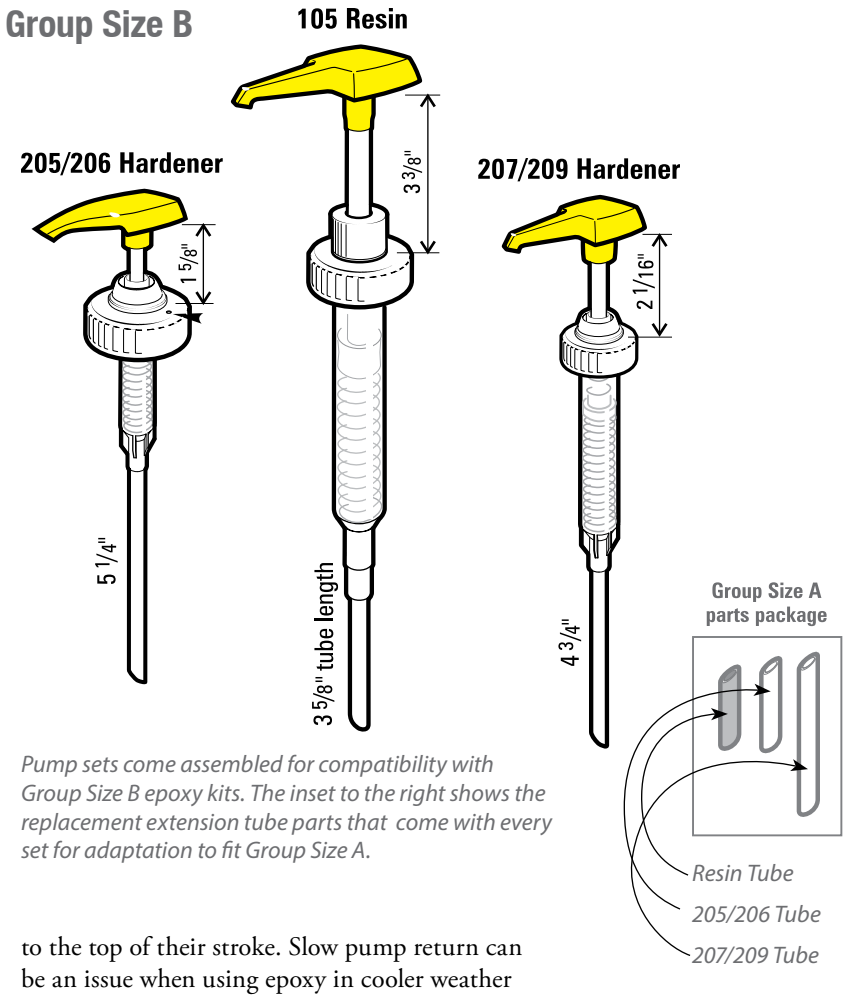
When you first install the pumps, check to make sure the resin pump is ready to use. Hold the white cap that screws onto the can and the clear plastic pump barrel and make sure they are screwed together snugly. You will also want to check on this from time to time.

Priming the pumps before the first use is simple but important; the instructions in the package explain how to do this. You will want to check the prime if the pumps been sitting for a long time, or when changing cans.

That's right, when changing cans. No need to buy new pumps every time you buy new cans of epoxy. Store the pumps right on the cans and when you run out of WEST SYSTEM Epoxy you can move your pumps to the new cans of resin and hardener.

If the pumps have been sitting on the cans for a while they may develop a crust on the end of the spout. Hardener pumps particularly seem to do this. The crust is easily cleaned away: just break it off and wipe the spout. You can use warm water to clean the hardener pumps and acetone or denatured alcohol for the resin pump, if needed.

Use only full pump strokes and do not pull up on them, let them return on their own. Alternating one stroke of resin and one stroke of hardener eliminates the need to count strokes and reduces the time spent waiting for the pumps to return to the top of their stroke. Slow pump return can be an issue when using epoxy in cooler weather when the epoxy becomes "thicker" (actually, more viscous as our chemists would say). Try to keep your resin and hardener warm even if what you're working on isn't. Mix your epoxy indoors if you're working at low temperatures in the garage. In the boatyard, an empty cooler and a shop light with an incandescent 15-watt bulb will keep your resin and hardener nice and warm.



Pump sets come assembled for compatibility with Group Size B epoxy kits. The inset to the right shows the replacement extension tube parts that come with every set for adaptation to fit Group Size A.

Remember, warm epoxy will cure faster until it hits the cool/cold surface. Call and talk to one of our Technical Advisors about cold temperature bonding applications, or check our *User Manual & Product Guide*, visit westsystem.com, or see "Cold Weather Bonding" by Don Gutzmer in *Epoxyworks 43*.

Lastly, long-time WEST SYSTEM users may still have pumps with white tops (which we stopped selling back in 2002). The white-top pumps and the newer yellow top pumps are not compatible and should not be combined. But as long as your old white-top pumps are still delivering resin and hardener on ratio (verified by a simple pot-life test), they're good. See, we told you Mini Pumps were reusable.

The completed repair

Fiberglass Repair on a Yamaha WaveRunner

By Jordan Teddleton

I wanted to purchase a personal watercraft so I'd be able to join my friends at the local lake for some fun in the sun this summer. Like most people on a budget, I searched Craigslist for the best deal. I needed something low maintenance, so a WaveRunner™ felt like a good fit. After a week of looking, I found a 2004 Yamaha GP1300r that appeared to be in decent shape; however, a strangely placed sticker on the top port side turned out to be covering a painful past.

I quickly learned something about fiberglass; a simple crack on the surface can be misleading as to the extent of the damage. Removing the sticker uncovered what I thought was a little crack that would be quick and easy to fix. I had no previous knowledge of fiberglass or epoxy, thus I was rather naive. I did not realize that a simple crack on the surface could result in delamination of the surrounding material.

Based on the helpful advice of Technical Advisor Don Gutzmer and the WEST SYSTEM *Fiberglass Boat Repair & Maintenance* manual, I had to remove all the damaged material to give my repair something strong to adhere to. This part of the process was very uncomfortable; I would remove a little material and find that the damage propagated deeper into the surrounding material, prompting further cutting. When I finally worked my way back to solid laminate I had a fairly large hole to repair.

After nervously cutting away all of the damaged material it was time to prep the area for the repair. As a general rule, the diameter of the bonding area of a repair patch should be 12 times the thickness of the damaged skin. The WaveRunner's skin measured 0.165" thick, requiring a bevel length of roughly two inches to ensure my repair had enough bonding area. I did my best to follow this rule, but the complicated geometry of my repair area made this difficult to maintain in some locations.

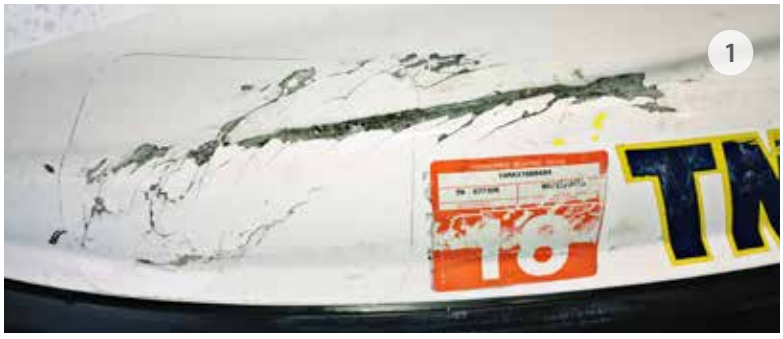
The *Fiberglass Boat Repair & Maintenance* manual recommends using a backing to support the wet-out fabric patch if the hole is larger than 1". My hole was obviously much larger than 1". Due to the lack of access to the hole from the backside, a support backing method was not so obvious. I turned to Don Gutzmer for advice and we decided expandable foam would be the best option. I purchased a can of Dow® Great Stuff™ from the hardware store and started filling the hole. After filling and shaping it a few times I ended up with a backing that followed the bodylines fairly well.

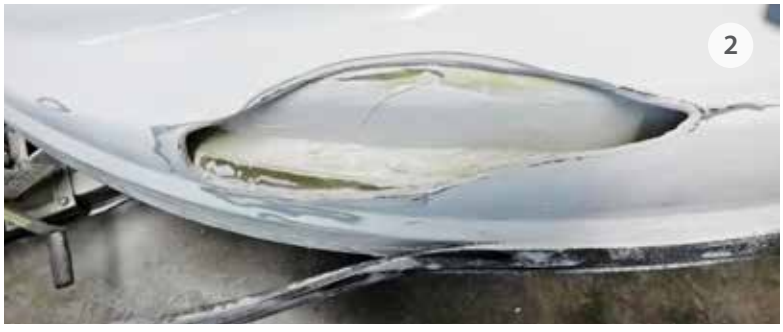
With the bevel and support backing steps complete, it was time to start cutting out my repair patch from some 10 oz. woven cloth.

The repair skin must be laminated to the same thickness as the surrounding laminate. The first layer of cloth should fit to the edge of the bevel and each layer thereafter should be incrementally smaller with the last layer matching the dimensions of the hole. Though it may require more work, using multiple layers of a lighter weight cloth will result in a stronger repair.

Based on the thickness of my 10 oz. fabric, I needed 14 layers to measure 0.15" thick. To cut out the layers, I traced the hole with some transparent plastic and used it as a template to cut out first and last layer. I then test fitted these layers, made any needed modifications, and used the layers and my micrometers to incrementally cut the middle 12 layers, small to large. This was a tedious process that was further complicated by the irregular shape of the hole, so I took my time.

At this point, it was time to lay some glass, wet it out, and repeat. I chose WEST SYSTEM G/Flex 650 for this process because it bonds well to the Waverunner's SMC laminate. To prep the repair area before the first layer, I coated it with a layer of epoxy to fill any voids. After that, I strategically placed each layer in a large-to-small piece sequence followed by thoroughly wetting it out and using a grooved roller to remove any trapped bubbles





1. The initial damage to the side of the WaveRunner.

2. The damaged had propagated into the surrounding fiberglass. All the damaged material needed to be removed so the repair attached to solid laminate.

3. To recreate the original shape of the nose, the void behind the laminate needed to be filled. Great Stuff was used to fill the void and was then sanded to the proper shape.

4. Transparent plastic was used to create a template of the hole. This was then used to cut the layers of fiberglass for the repair.

5. The layers of fiberglass stacked in the correct order and orientation make application easier.

6. The layers of fiberglass have been applied (largest to smallest).

7. 407 Low Density filler mixed with G/flex was applied to fair the surface.

8. The final surface painted. The transition is seamless between the original surface and the repair area.

in-between each layer. For the final step in this process, I placed a sheet of WEST SYSTEM's 879 Release Fabric over the repair to give it a textured surface for the next step. The foam backing supported all the layers during the curing process and gave it a shape to start with.

I allowed the fiberglass repair patch a few days to completely cure. Then, I sanded the edges smooth for a seamless transition. When I was satisfied with the surface of my patch I began the fairing process. This was difficult due to the complex geometry of the nose of the WaveRunner.

I purchased batten material from the hardware store to capture the highs and lows. I also used the batten to trace out some bodylines for reference. I repeated this step many times between layers of filler.

For filler, I mixed some WEST SYSTEM 407 Low Density filler with my G/flex epoxy mixture. I had to play with the filler-to-epoxy ratio to attain the consistency I needed. A plastic spreader was used to apply my fairing mixture. Most of my repair was on a vertical surface so required a thicker mix. This part of the repair calls for artistic ability and patience. If the fairing mixture is applied too thickly it will sag and could fall off the surface.

I am sure there are other repair methods and tricks I could have used, but I take pride in my repair given my lack of foundational knowledge going into this. Gougeon's technical support and their *Fiberglass Boat Repair & Maintenance* manual were my most valuable assets throughout the process.

I am a mechanical engineer in a high-pressure die casting foundry and the mechanical properties of different materials intrigue me. Fiberglass is an amazing material with its high strength, low thermal expansion, and highly versatile workability.

I humbly admit that a repair of this size was a challenge for me. The advice from Gougeon Brothers, Inc. helped a lot on the repair.

Besides the large crack on the side of the nose, there was a smaller crack on the front of the nose. The smaller repair was used for practice before attempting the larger repair.

For information about WEST SYSTEM® products or technical information for a building or repair project, Gougeon Brothers offers a range of detailed publications that can help you get started. These publications are available at your local WEST SYSTEM dealer or by contacting Gougeon Brothers. They are also available as **free downloadable PDFs at westsystem.com.**

Free literature (US and Canada only)

Visit westsystem.com to order online or call 866-937-8797 for the WEST SYSTEM free literature pack. It includes:

002-950 **WEST SYSTEM User Manual & Product Guide**—The primary guide to safety, handling and the basic techniques of epoxy use. Includes a complete description of all WEST SYSTEM products.

000-425 **Other Uses–Suggestions for Household Repair**—Repairs and restoration in an architectural environment. Many useful tips for solving problems around your house and shop with epoxy.

Also included are the current price list and stocking dealer directory.

How-to publications

For sale at WEST SYSTEM dealers, free downloadable pdfs on westsystem.com or by calling our order department, 866-937-8797.

002 **The Gougeon Brothers on Boat Construction**—A must for anyone building a wooden boat or working with wood and WEST SYSTEM Epoxy. Fully illustrated composite construction techniques, materials, lofting, safety and tools. 5th Edition, revised in 2005.

002-970 **Wooden Boat Restoration & Repair**—Illustrated guide to restore the structure, improve the appearance, reduce the maintenance and prolong the life of wooden boats with WEST SYSTEM Epoxy. Includes dry rot repair, structural framework repair, hull and deck planking repair, and hardware installation with epoxy.

002-550 **Fiberglass Boat Repair & Maintenance**—Illustrated guide to repair fiberglass boats with WEST SYSTEM Epoxy. Procedures for structural reinforcement, deck and hull repair, hardware installation, keel repair and teak deck installation. Also, procedures for gelcoat blister diagnosis, prevention and repair and final fairing and finishing.

002-898 **WEST SYSTEM Epoxy How-To DVD**—Basic epoxy application techniques, fiberglass boat repair and gelcoat blister repair in one DVD.

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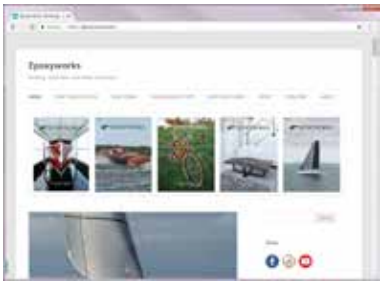

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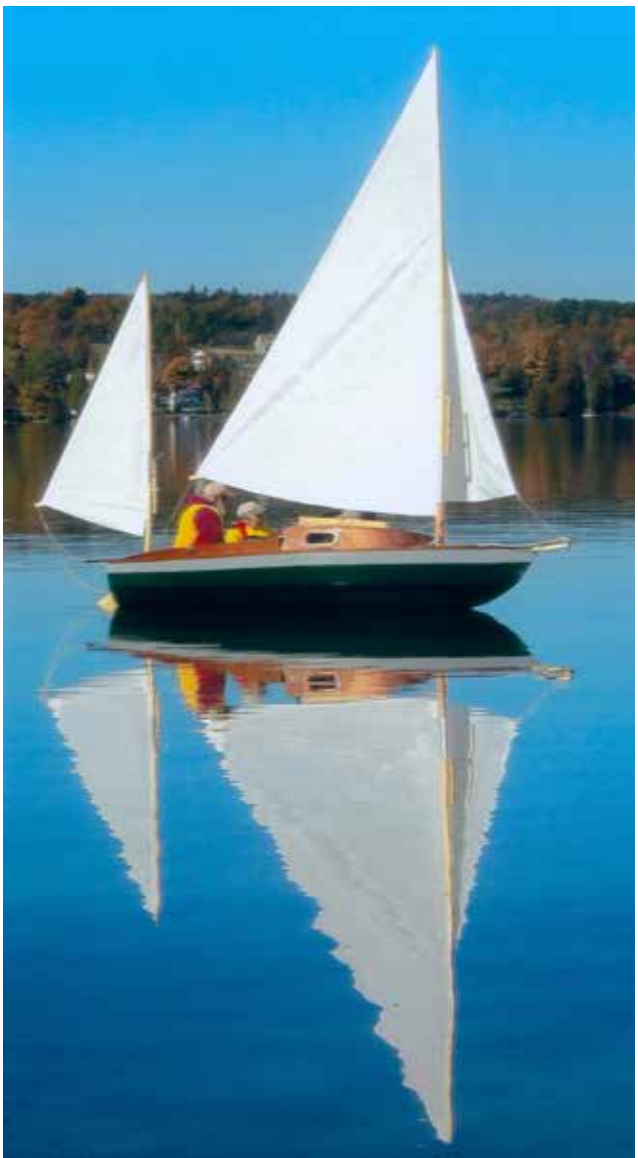
Readers' projects

Below: Long time reader Phil Pike built this beautiful little Swifty 13. The lapstrake sailboat has a dark green hull and bright mahogany topsides.



Above: Suresh Kalavala of Galloway, Ohio built this waterproof Carrom game board. The frame is walnut, the corners are quilted maple and the game surface is Baltic birch plywood laser printed with a wide-format UV LED printer. He coated the surface with 8 coats to 105 Resin/207 Special Clear Hardener to protect the design. The resulting finish was actually too smooth and hard for optimum playing (the game involves flicking game pieces into the corner pockets), so he sanded it and added a layer of polyurethane to provide the correct texture.

Above: A collection of live-edge tables and wall art from Ohio based craftsman George Zilich. He uses colored pigments and clear coating in his custom pieces.