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ACCELERATIONS, Part 1



KKMI: The Business of Clean

In its two successful service yards on San Francisco Bay, a company meets the challenging standards of California's tough regulatory climate.

Text and photographs by Aaron Porter

Above—To meet KKMI's strict environmental protocols, old paint must be removed from a boat's bottom with vacuum sanders in a temporary shelter, and when applying new paint (shown here) crew are required to wear a respirator and a full Tyvek suit.

Increasingly strict environmental and safety regulations come close behind fires, hurricanes, and luxury taxes in the list of worries that keep boat builders and yard operators up at night—and for good reason. In the last three decades, amended air-quality regulations in most North American and European jurisdictions have required fundamental changes to construction methods and shop practices for builders in materials from wood or

steel to advanced composites, and have limited the options for boat propulsion in some places. During the same period, rules to safeguard water quality have reduced the active ingredients in antifouling paint, restricted the areas black and gray water may be discharged, and demanded containment and treatment of yard runoff from pressure washing and rain. More relaxed environmental and safety standards in developing countries are



Due in part to the 25' (7.6m) dredged depth along much of KKMI's Point Richmond waterfront, the company got an early reputation as a service yard for large racing sailboats and other deep-draft vessels when the facility opened in 1996.

cited as determining factors in the relocation of some large boat manufacturers to South Africa and China, or the out-sourcing of construction and maintenance to yards in Central and South America.

Boatbuilders and materials suppliers in the U.S. complain that pending regulatory actions at state and federal levels leave them uncertain what standards they will have to meet in just a few years. They tend to look to California as the best indicator of the future regulatory landscape, and more often than not, they don't like what they see.

In 1988, California was the first state to impose tighter air-quality regulations (see *Professional BoatBuilder* No. 25, page 8) with Rule 1162, which drove composite boatbuilders in many states to explore low-styrene resins, elimination of acetone as a solvent, limited spraying, and adoption of closed-molding techniques. More recently, service yards and paint manufacturers everywhere have been scrambling for alternatives as they face the threat of a ban on copper antifouling paint in California waters that is bound to be copied in other jurisdictions (Washington State is already pursuing similar legislation). Other concerns about water quality include meeting regulations by various state and regional Water Resource Control Boards over storm-water runoff, as well as satisfying hazardous-waste-disposal requirements and strict workplace health and safety standards. The practicality and efficacy of specific regulations aside, accepted industry wisdom says you don't want to have to do business

under California rules.

Contrary to that attitude, Keefe Kaplan Maritime Inc. (KKMI) studied the state's regulatory climate, embraced it, and became a thriving San Francisco Bay Area business. In May 2012, I visited its service yards in Sausalito and Point Richmond to take a closer look.

KKMI's yards seemed familiar enough: Travelifts, building sheds, shrouded paint bays, old engines, rigs, keels, a crane, jackstands, metal shop, wood shop, office, crew bustling about on myriad jobs. But I saw something that's not common. Workers stopped often to pluck things from the ground—old tie wraps, cotter pins, bits of tape and plastic, all the detritus of repairwork—and they dropped them in the many waste barrels on-site. Picking up litter might not seem like a major breakthrough in running a clean boatyard, but I'd never seen it done so naturally and universally in any other yard I've visited, and it's just one of many measures, small and large, KKMI has taken to meet the letter and spirit of federal and state environmental regulations since opening the 6-acre (2.4-hectare) Point Richmond yard in May 1996.

Translucent walls and roof allow natural light in this paint room, where spars from the 1920s-vintage Bird Boat-class sloop Kookaburra are being varnished.





Proper disposal of all materials and recycling where possible are standard practices at KKMI. **Left**—Paint cans and lids are allowed to dry before being compacted and sent for recycling. **Right**—Plastic buckets in the yard store collect the spent batteries that workers come in to replace. Just inside the doors, also note the binders of MSDS (material safety data sheets) for all potentially harmful substances stocked in the store.

Creating KKMI

"I always thought I was going to be involved in marine sciences," said co-owner Paul Kaplan as we toured the Point Richmond facility. He recalled sailing to the Galápagos with *Sail and Inc.* magazine founder Bernie Goldhirsh, who told the young Kaplan a career in marine biology would mean living "grant to grant." After a detour into yacht brokerage in the early '70s (KKMI still represents Nautor's Swan on the West Coast) and

a lucrative business career in San Francisco, he has returned to his undergraduate interests, except now his water- and air-quality studies are good business as well as good science.

While reviewing the bafflingly complex regulations for boatyards, Kaplan realized the risk that noncompliance posed to any marine business. He also saw how easy it would be to think you were operating in compliance with provisions of, say, the Federal Clean Water Act, but in the absence of adequate inspectors to monitor all the permits in the bay, to find yourself subject to crippling fines and corrective actions if a violation were discovered. And discovery is becoming more likely.

"We were such a small industry that no one was worried about

us. Now, 40 years after the Clean Water Act we are being subjected to what other businesses were decades ago," Kaplan said. In light of that history, KKMI's policy is that the company is ultimately responsible for ensuring compliance with all regulations, and it is bad business to do otherwise.

Kaplan and business partner Ken Keefe, an accomplished sailor and yacht broker, were looking for a yard in the mid-1990s when the Point Richmond property became available. It was home to the smaller Sanford-Wood boatyard then. They were relieved to find no legacy of a toxic late-Victorian industry, since the industrial site had been around only since WWII—when the Santa Fe Channel was dredged out to 25' (7.6m) to accommodate the victory ships built in the Kaiser Shipyards.

The dredged water depth quickly pigeonholed the yard as a big-boat facility. When it hosted five maxis during the September 1996 big-boat race series on San Francisco Bay, the reputation became even more ingrained. More big-boat action came as Oracle Racing ramped up its Golden Gate Yacht Club-based challenge for the 2002 *America's Cup*, and in 2003 the yard hosted *USA 76* (see the sidebar on page 22) and *Alinghi* (winner of the 2002 cup) when they sailed a series on the bay. Kaplan said it's nice to be known as a yard respected by some of the world's most serious sailors, but the size association isn't always useful. They have



Due to limitations on new buildings built within 100' (30.4m) of the high-water mark, many of KKMI's shelters for larger boats are temporary fabric-covered structures such as this one for a 1970s motor-yacht in for core repairs and a paint job.

DIY Waning

Traditionally, Keefe Kaplan Maritime (KKMI) has allowed owners to do some work on their own boats in its Point Richmond, California, yard. It was such an important part of its core business that the company hosted a series of technical seminars on engines, marine electrical systems, and rigging for DIY clients. But the yard's new environmental protocols make the practice a less comfortable fit, because DIY owners need to adhere to the same practices as the yard crew.

"Someone just coming in to work on their bottom doesn't want to invest the 5 to 20 hours needed to get up to speed," co-owner Paul Kaplan said.

In the smaller Sausalito yard, there's very little DIY work permitted. Ken Keefe said you can wax your hull in the yard, and there's one client who varnishes his transom, but that's it. The liability of a DIY owner being injured in a fall or violating environmental laws is just too much to overlook, he said with regret. "Liability is a big part of the business that wasn't as prominent 10 to 20 years ago."

As much as he'd like to continue to offer the opportunity, Kaplan said the risks are growing too large and that DIY at the yard may become a thing of the past.

—Aaron Porter

to work to attract smaller-boat clients.

The average boat length at KKMI is 42' (12.8m) and increasing. With an eye on the business and market demographics, KKMI can only get so big, because the bay is pretty small for anything larger than 80' (24.4m) and boats large enough to head offshore tend to be serviced in Mexico or Seattle at rates KKMI can't easily match. This leaves the roughly 20,000 boats berthed in the bay, half of them at municipal marinas, which means slip fees at private marinas can't rise much higher than their municipal competition. (Much of KKMI's limited slip space is tailored to the deep-draft boats other marinas can't accommodate.)

Regardless of boat sizes, the fleet is aging, Kaplan said, and "the service needs for those boats is only going to get greater and greater." Betting on that trend, KKMI opened a second, smaller yard on a 68,000-sq-ft (6,317m²) property leased from Clipper Yacht Harbor in nearby Sausalito. Before choosing the Point Richmond site, the partners had looked at the property back in 1994. When the service yard there didn't renew its lease in 2009, KKMI jumped at the opportunity. "If someone had said the economy is going to go upside down, we'd still have done it," Kaplan said.

The Sausalito yard is on a nice yacht harbor just 10 minutes from the St. Francis Yacht Club and closer to San Francisco proper, but it was built

on infill in the 1940s. Since then, Kaplan said, the site has been steadily sinking, now at a rate of about ½" (12.7mm) per year. As we walked the approach to the yard, Kaplan explained that the entire area floods on an extreme tide. True, a permitted yard had been operating there, but the case was an example of Kaplan's rule that just because a facility is operating with permits doesn't mean it couldn't be found in violation. KKMI's interpretation of the relevant standards as they had come to understand them from operations in Point Richmond revealed that the company could be held responsible for managing any runoff during a flood. In addition, the Sausalito site is in a microclimate with about twice the annual rainfall of Point Richmond.

The plan to address rain and flood-water runoff, as well as processing

water from pressure washing and other yard operations, started with regrading, and surfacing the entire site with concrete surrounded by 4' (1.2m) reinforced-concrete walls on deep footings. The gated openings that allow traffic access are fitted for heavy drop boards, or flood gates, that stop water at the same height as the walls. On top of the wall a chain-link fence with curtains keeps yard dust from blowing into neighboring sites.

From outside, the yard looks moderately fortified. From inside, it appears that the crew of 16 is operating in an expansive empty wading pool. Nothing, Kaplan assured me, drains off this site directly to the bay or the sewer. "If you don't sweep it up, it's going to go somewhere. It used to go into the bay; now it goes in our filter system, and you have to shovel it out later [for disposal]," said Keefe, who oversees the Sausalito yard. "Everybody's shocked, because we have this closed system, how much stuff used to go into the bay. As they see it, it just becomes common sense, second nature to pick things up."

If a truck drips oil in the Sausalito yard, someone dumps sawdust on it, and the absorbed oil gets shoveled into hazardous-materials disposal.

Before any of the protocols and cultural changes I saw could come about, Kaplan and Keefe had to conceive of a facility that would take into account all the environmental limitations and still serve as a fully functioning boatyard, which includes noise, dust, oil, solvents, resins, machined metal, biological waste, and toxic materials such as antifouling paint. "There are a lot of things we've done that we just couldn't go to a book and look up. We had to innovate," Kaplan said.

From the outside, KKMI's Sausalito yard appears moderately fortified. The 4' (1.2m) concrete walls are designed to keep storm surge out so the company can control the water quality of any runoff from its site. At the gate, slots in the concrete accommodate drop boards when flood conditions threaten.



Treating Water Two Ways

Processed water and storm water are subject to two different regulations. "We needed to come up with a way that we would not commingle the two [waters]," Kaplan said. It's done by maintaining a designated concrete pad for pressure-washing that's pitched toward a settling weir—a series of three chambers where smaller suspended solids are allowed to settle out—and a drain that feeds the waste wash water into an electro-coagulation system acquired from OilTrap Environmental (Tumwater, Washington). In the event of rain or flood, the drain for the pad will be switched so runoff water is directed to a separate storm-water-filtering system that accommodates runoff from the entire yard.

KKMI has learned to keep as many solids or contaminants as possible out

of the wash water before it heads down the drain. A length of loose chain on the pad just upstream of the weir catches some of the larger chunks of biological fouling knocked off by pressure-washing. Next, a grate keeps large materials out of the weir. Crews shovel accumulated solids from the chain and the weir to the hazardous-materials bin at the back of the pad. On the advice of a regulator, an oil-absorptive pad is now hung in the weir to remove some petroleum contaminants before they can get to the actual treatment system.

After the weir, the water runs



Pressure-washing boats is always done on the bespoke concrete pad that drains all water and suspended solids to this three-chamber settling weir. Most larger solids, such as marine growth, are caught in the chain (usually arrayed on the concrete to the left of the grate) or in the grate proper. Smaller solids settle out in the weir before wastewater is run through an electro-coagulation treatment system.

through an underground pipe to the electro-coagulation treatment system housed in a shipping container on

USA 76 Repurposed

In keeping with KKMI's reputation as a service yard that can accommodate the needs of large racing yachts, I found the 84' (25.6m), 2001-vintage *America's Cup* boat *USA 76* on the hard at the company's Point Richmond, California, yard. According to her owner and Oracle Racing bowman Brad Webb, she was in for a hull repair and bottom painting before she resumed day-chartering on San Francisco Bay. No stranger to the yard, she was based there as part of a special race series against Cup winner *Alinghi* in 2003, and during a two-month conversion from raceboat to workboat in 2011 after Webb had her shipped back to the yard from Spain, where she'd been in storage since her last test-boat duties for Oracle in 2005. He'd been in Valencia for sailing trials on new multihulls for Oracle in 2010 when he saw the boat. "I said, 'Good luck to whoever buys that,'" he recalled. Upon reflection he saw the potential for a business carrying passengers in San Francisco, especially with interest growing in the 2013 *America's Cup* challenge there.

Webb consulted with KKMI owners Ken Keefe and Paul Kaplan, and before *USA 76* was even on the ship, the complex plan for converting the raceboat into a safe day-charter vessel was well along. First, Webb, a professional sailor, wanted sailing the boat to feel as close as possible to racing in real competition. "We didn't want people to think they were on a Disneyland ride.... We've tried not to dumb it down too much," he said. Second and antithetically, installation of five watertight bulkheads, an engine, and electrical system, and adjustments to the keel were needed to meet requirements for U.S. Coast Guard certification. And there were other practical changes to allow the boat to sail comfortably with a crew of four.



Crews tape the waterline of *USA 76* in KKMI's Point Richmond yard. In 2011 the yard converted the 2001 *America's Cup* boat for day-charter service.

"We do not pretend to be structural engineers, or chemists, or laminate specialists," Kaplan explained. So, as with any major repair job, Webb engaged outside engineering expertise, in this case, Paul Bieker of Bieker Boats (Seattle, Washington). "Paul was involved with the original design and engineering of the boat, so he had the advantage of knowing exactly what we were working with," Kaplan said. Bieker had the lines of the boat on file, which meant the tricky work of locating the new engine, fuel tank, and bulkheads within the existing structure could be finished before the boat arrived at the yard. For a project with a tight budget, that sort of preparation allowed the yard crew to work efficiently. "Within a day of arriving, we had two bulkheads in," Webb recalled.

When *USA 76* was built, of carbon fiber skins over an aluminum honeycomb core, the order of the day was strong and light regardless of the cost. The conversion

the other side of the yard. In the so-called ElectroPulse system, pH-adjusted wastewater passes between electrically charged plates in a series of 4"-diameter (102mm) tubes; the polarity of any suspended solids, heavy metals, and oils is altered, breaking them out of an emulsified state and making them cluster together. The electrical charge helps oxidize any metals, rendering them inert, and releases micro-bubbles in the water that help float the coagulants to the surface, where they are skimmed off in a separation tank. The resulting waste can usually be disposed of in a municipal landfill, while the water can be sent to the municipal sewer or be reused in a gray-water system.

The accumulated storm water from

Solids, chiefly copper antifouling paint and biological growth, are removed from the weir and placed in a hazardous-waste bin for approved disposal.



the yard is treated by a separate Aquip system from StormwaterRx (Portland, Oregon). First, water runs through a weir system and then into a 1,000-gallon (3,785-l) settling tank, which is pumped by any of three pumps (redundancy is important, because this system cannot fail) to the rooftop Aquip container that

houses a filter bed of gravel, alumina, charcoal, fine and coarse sand, and filter fabric. Water enters high in the tank, spills over a baffle, floods the surface of the filter bed, and



Changes to USA 76 included, from left to right: an electrical system complete with panel; a Yanmar auxiliary engine with attendant fuel tank, fire-suppression systems, and ventilation; and five watertight bulkheads, one shown here with a watertight penetration open.

was different. The new bulkheads were plywood sheathed with epoxy and fiberglass material. Kaplan said his crew installed carbon fiber hat sections as stringers to support the Yanmar diesel auxiliary, but other than that, the composites were more workboat than raceboat.

The engine required an electrical system the boat had never had before. Webb had hoped for a very simple system just serving the engine, but the Coast Guard required more to power essentials such as navigation lights. Kaplan said an elaborate ventilation system was necessary to draw air to the engine room, and an even more complex fire-suppression system, including remote ventilation-shutoff. The engine exhaust is a complex split system with outlets to port and starboard. In cutting holes for those and other through-hull fittings, KKMI crews were dealing with a core material they'd never seen before (aluminum honeycomb). Before approving the finished alteration, Kaplan said, the protocol was to have crews cut a hole and clean up around it, but do no more until he and Webb had a chance to see exactly what they had in fact uncovered. In this case, part of quality control included affirming what they *thought* was there. Webb noted that they backfilled liberally around the cutouts for all new installations.

The 115' (35m) rig with steel rod rigging remains the same, but the maststep is now locked; originally it was adjustable through onboard hydraulics. Likewise, a trim tab along the trailing edge of the fin keel has been locked. Webb said the keel on the passenger-carrying USA 76 was one of a few that came with the boat, but that it's larger than the model she was raced with. He noted that with the additional gear, structures, and systems in the hull, he had to adjust the weight by removing a comparable amount from the ballast bulb in the keel; that affects the calculated stability and required that she carry less sail than she otherwise might. "We've done all we can to unload the boat while keeping the experience," Webb said. "We're sailing with 30% less sail area."

Despite the changes, the boat sails only about 1 knot off her competition speeds, and still handles like a racing boat. Webb reported that the boat is still very close to the real thing, still "waiting for you to let go of the wheel, waiting to bite you in the ass."

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—A.P.

settles down through it. The upper layers filter out particulate contaminants while microbes in the bed break down organic pollutants. Lower down, dissolved pollutants are removed. KKMI's model can filter 6,600 gallons (24,983 l) per hour, or 110 gallons (416.4 l) per minute, which keeps up with most flows during rainstorms. The largest backup pump can actually exceed that rate during the heaviest theoretical downpours. But by the time such flows bypass the treatment system, the volume of rain already filling the treatment tank will likely have scoured the entire yard, leaving little in the way of residual particles behind. Kaplan said the treated water meets EPA benchmark toxin levels, although they have



The ElectroPulse system from OilTrap Environmental (Tumwater, Washington) is wired to a central control panel (left). It adjusts the pH of the wastewater before sending it through a series of 4"-diameter (102mm) tubes fitted with electrically charged plates (right) that change the polarity of any suspended solids, causing them to cluster and float, and rendering any metals inert through oxidization.

difficulty hitting the conductivity benchmark, because seawater intrudes into the system through an underground

pipe. Occasional maintenance is required to remove accumulated solids from the surface of the Aquip

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Left—Storm water from the entire 68,000-sq-ft (6,317m²) Sausalito yard ends up in this 1,000-gallon (3,785-l) settling tank, affectionately referred to as “the wishing well.” From there, three pumps of varying capacities pump it up to a rooftop AQUIP system from StormwaterRX (Portland, Oregon), capable of filtering 110 gal (416.4 l) per minute. **Right**—Samples of treated and untreated water and the five filter media in the AQUIP filter tank. Treated stormwater can be discharged directly into the bay.

tank, and the filter-bed material must be replaced annually. Storm water from the AQUIP system is clean enough to be discharged into the bay.

To reuse some of the processed water, the Sausalito yard is plumbed with a gray-water system so water cleaned by the ElectroPulse system can be employed for yard tasks not

requiring potable water. “I’m really hoping we’re going to get to the point that eight months of the year our only water from the water district is final boat rinse and the toilets,” Keefe said.

Affording Compliance

AQUIP and ElectroPulse systems cost about \$125,000 apiece plus at

least \$125,000 for associated plumbing and external tanks. And that does not include the cost of the floodwater walls and gates, or the specialized Travelift that burns biodiesel and runs vegetable oil in its hydraulics to eliminate contamination risk should a line break. The KKMI partners insist that such changes have to be worked



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Above—Years of experience has led KKMI to conclude that for sanding, vacuum sanders and tarping are a better solution to trap particles and meet air emission standards than wet-sanding, which requires disposal of an even larger mess of contaminated water. **Right**—An open-topped shipping container covered in clear plastic serves as a reasonably priced spray booth with good ambient light and no risk of explosion from electric lights.



operating our business properly.”

A 2% environmental charge for all work done at the yard, Kaplan said, doesn't come close to covering the development of the yard's best management practices. An example was KKMI's belief early on that wet-sanding was the best way to keep dust particles out of the air and meet emissions standards. The company concluded that with the volume of contaminated water, wet-sanding created a bigger mess and ran afoul of the Clean Water Act. “The better solution is tarping and vacuum sanders,” Kaplan said. The company pays for the lesson, shares the knowledge with other yards, and hopes for a reciprocal savings down the road. “If we share what we learn, that's the right message. Hopefully somebody else figures out something we didn't think about,” Kaplan said.

into the business plan to be financially sustainable.

Keefe: “I like the challenge of conquering safety, health, and environmental issues in the boatyard, and doing it with a value proposition and not violating the Clean Water Act.”

Kaplan: “Everybody fears these California regulations, but here we're [meeting them] in arguably one of the most expensive physical environments and under very difficult market conditions. We finished our first year [in Sausalito] in the black, and we're

On top of the specific systems and major infrastructure investments required to meet safety and environmental standards, KKMI has found that regular small expenses will inevitably increase the cost of service.

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"Where the customer wasn't paying before to have the boat tarped, now they are. That extra 15 minutes each way is going on the clock," Kaplan said.

Consumable materials and safety equipment for workers also add costs. Some clients balk at the safety gear itemized on their bills. "It's not unusual to expect to pay for at least two pairs of gloves for every day a guy works on your boat, because he's going to stop to eat lunch," Kaplan said. "This [yacht] is a luxury; if you have been fortunate enough in life to afford one, part of the cost is to be a good steward of the environment and to be willing to pay for the protection of the people who are working on that vessel for your family."

At the same time, clients save on the expense of materials in ways they wouldn't have in the past. "We've been very aggressive in the pricing of our materials," Kaplan said. Markup is a thing of the past. "It's too easy for clients to get on the Internet and see what they can pay for whatever it is and then hold that price over our

The well-stocked store at KKMI has a database of 30,000 stock-keeping units. In the composite materials department, everything from basic fiberglass roving to carbon fiber unidirectionals is in stock for yard crew and customers alike.

heads." It might seem that this change would be an incentive for KKMI to get out of the materials business. To the contrary, the company prides itself on the yard store in Richmond, with a database of over 30,000 individual stock-keeping units (SKUs) and prices that are competitive with the major marine-supply stores.

Ralf Morgan in purchasing said, "We justify having an inventory that would make most accountants apoplectic." It costs money to pull workers off a job while they wait for parts, or even for them to walk across more of the yard to get materials on hand. That's why the store was moved into the large central service building shortly after Morgan completed a study of workers' motions on the job. Eliminating seemingly minor



inefficiencies provides some of the advantages Kaplan says allow KKMI to deliver quality work in fewer billable hours and to remain competitive while paying the environmental bill.

Efficiency at the Point Richmond yard carries to the mechanic's shop, located on a converted 60' (18.3m) lighter aboard ship (LASH) barge. Boats can be brought alongside and engines pulled by a crane on the



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A temporary fabric-covered structure welded to a surplus Travelift (seen at left) can be driven anywhere in the yard to shelter a project. Here, it covers the bow section of a Sunseeker that can't be fully enclosed by the less-mobile fabric-covered structure that's anchored to shipping containers at yard level.

One end of the shelter's frame was welded to a surplus Travelift so the shelter could be driven anywhere on the property and set up to cover a project without moving the boat, erecting a new structure, or, in the case of the Sunseeker, maintaining a custom painting hall. More savings.

Managing Risk

There's an industry adage that any yard is just one lawsuit away from bankruptcy. While liability is difficult to dodge on the water, an important measure of a yard's sustainability is how it has minimized its risks. A service yard owner cannot know the true condition or characteristics of every

boat that comes in for repair, rebuild, or restoration. That's especially true in a yard that caters to highly competitive racing sailors who push the envelope in performance and structural tolerances. The number of surplus bulb keels and a few TP52 (15.85m) hulls on the hard for service at the Point Richmond yard attest to KKMI being that sort of yard.

Keefe, who manages some fast ocean-racers and superyachts for their owners, said he doesn't worry more about the strength and longevity of advanced-composite boats than about any other modern boats. But as a partner at KKMI he confirmed that he worries all the time about the reengineering of refitted vessels, regardless of their materials. He recalled that up until the late 1980s, engineers were seldom involved in refit work, and, given that overbuilding and uncomplicated application of wood, metal, and FRP materials were standard at the time, there was probably little need. But engineering has come to matter more, he said, "as you get different building materials, different cores,

barge roof and lowered directly into the shop.

The yard also realizes savings in the many temporary shelters that house large projects. A big Sunseeker, in for a yacht-quality paint job, was covered by a fabric-over-metal-frame building.

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Bulb keels—some canting, some fixed—are indicative of clients who often push the structural tolerances of their high-performance sailboats and rely on the yard to maintain and tune the racing machines.

working at safety margins that are less and less.”

Keefe recalled examining an Aquamet keelbolt for a redesigned keel on a racing boat. The bolt had been overstressed such that its diameter had been reduced by 2mm ($\frac{5}{64}$ ”), “like you take piece of taffy candy and stretch it,” Keefe said. Avoiding

that sort of potential disaster requires a broad knowledge of materials, build technologies, the quality of construction and engineering typical of various manufacturers and custom builders; even then, one can’t be too careful.

To protect the yard, KKMI has outside engineers sign off on all changes it makes to any boat, and strict record-keeping protocols assure that materials specified are the materials installed. Kaplan said the yard relies on a number of good metal- and composites-testing labs to determine the characteristics of materials to be replaced or reengineered, and to verify the specifics of some repair components.

Also working in the yard’s favor: employees average 24 years’ experience in the marine trades, working on a diverse range of vessels. This

diminishes potential errors and increases the likelihood that someone even in the accounting office can recognize and correct any errors that do occur. Kaplan: “Our CFO [Cindy Revel] understands the repair business almost to the level of being a technician.” For instance, he said, she knows there’s a ratio of catalyst that needs to be billed to a composite construction job. If that ratio seems off, she reports it to the crew responsible for the job.

Finding and Keeping Good Help

Between the two yards, KKMI maintains a crew of 54; four years ago (pre-recession) it was 58 at Point Richmond alone. Work force has been a problem from day one, Kaplan said. “The Bay Area is an expensive place to live, so we’ve had a difficult time recruiting people from outside.” He noted there are few relevant training opportunities in California, and referred to IYRS and The Landing School (Newport, Rhode Island, and Arundel, Maine, respectively) as “the happy hunting ground” in past

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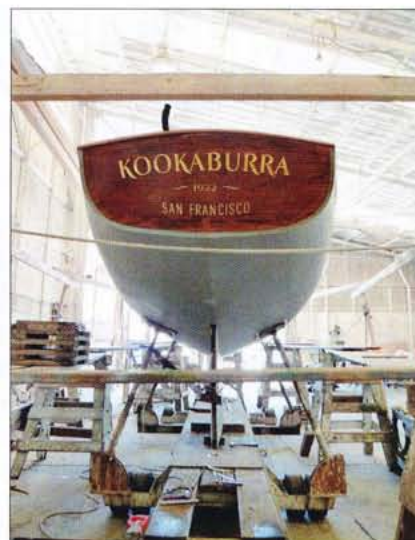
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KKMI looks for well-rounded yard crew. **Right**—This boat-builder applied a carbon fiber patch to the aluminum-honeycomb-cored USA 76 in the morning, and in the afternoon made some finishing touches to the woodwork in the cockpit of Kookaburra (**far right**), whose spars are shown on page 19.



employee searches. The recession has limited KKMI's need for new workers, although Kaplan is always looking.

"This recession has not provided what a lot of people expected," Kaplan said. "As a result of companies needing to contract, they were going to be reducing their staff, which was going to expand the labor pool, and you would be able to hire good people. What we found was that the people that actually went out

into that pool were not as qualified." As a result, he's been hiring new people very selectively.

That average of 24 years in the industry makes for an experienced crew whose talents KKMI appreciates. But, as Kaplan noted, "the bad news is we have an aging work force." Standard practices back when most of the crew started were different from

KKMI's new best practices. The employer must insist on kneepads, eye protection, gloves, and respirators until they become second nature, which can take a while as crew didn't have those protections for their first 20 years on the job. That history manifests in injuries and illness. "As an employer we get the legacy of those sins that weren't committed on our

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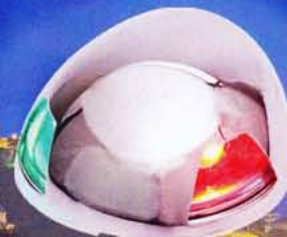
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watch, but must be paid for on our watch," Kaplan said.

The company is cautious about apprenticeships. According to Kaplan, it's hard to justify the expense of having a trainee on the shop floor. That said, he's keen to have well-rounded builders who can tackle a range of projects. One young builder I spoke with said he'd been repairing a prepreg carbon hull in the morning and working on the plank-on-frame rebuild of a classic 1920s-vintage Bird Boat-class sloop in the afternoon. Attaining that diverse knowledge and those abilities often means picking up new skills on the job. Kaplan cited a recent cross-training opportunity for one of the paint crew to learn lamination skills by helping build the frames for that sloop.

"We're cautious about [formal] training opportunities," Kaplan said, noting that a pending four-day on-site training session with American Boat & Yacht Council instructors will cost KKMI about \$5,000 per student when all expenses and lost labor are factored

in. For that reason, he said they carefully pick candidates to train, weighing how committed the worker is to staying at the company and how motivated he or she will be to apply the lessons learned to future jobs.

In consideration of one-third of the work force who are Latino, training and safety seminars are delivered in Spanish and English. Kaplan said he relies on bilingual crew members as translators for some meetings and professional-development seminars, but he conceded that it would be better to have some Spanish-language training sessions. He also requested a *Professional BoatBuilder* Spanish-language edition.

Conclusions

Reviewing the recorded details of my visit, I find a fairly comprehensive list of best practices in business and boat repair that any service yard would do well to follow. But in sharing those details, Kaplan and Keefe aren't at risk of giving anything away. Their years of industry experience and business intelligence have taught

them that there is no magic formula for a service yard to make money, and the few advantages you can hope to find in the trade today are better won by changing the industry broadly as opposed to one yard individually.

Environmental respectability is one of those collective improvements in which KKMI has been a leader. Kaplan recalled the ceremony when the Point Richmond yard won the 2001 Small Industry of the Year award from the California Water Environment Association: "There were about 400 environmental regulators there, and when they announced that the small industry of the year was a boatyard, the laughter was deafening—they thought it was a joke." In 2011 the Sausalito yard won the same accolade. "When they announced that a boatyard had won, there wasn't a snicker," Kaplan said. "In 10 years there was a profound change in the perspective that those regulators had about our industry." **PBB**

About the Author: Aaron Porter is the editor of *Professional BoatBuilder*.

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