

Transforming Raw Materials into Reality

By Mike Sammons, product manager, Miller Electric Mfg. Co., Appleton, WI

Theoretically, anodized aluminum cannot be welded, but that didn't stop PipeWelders® Marine, Inc., Ft. Lauderdale, FL, from becoming what probably is the world's dominant designer and fabricator of tuna towers. Using a variety of Miller Electric's AC/DC TIG welding machines, PipeWelders outfits 20 or more yachts each month with anodized aluminum structures that soar above the deck.

About 90 percent of the world's sport fishing yacht owners—those with boats from Hatteras, Viking, Bertram and the like—turn to PipeWelders for a custom-designed tower. Clients fly in from Scandinavia, Saudi Arabia, South America and the Pacific Rim to visit PipeWelders. Jordan's late King Hussein was a valued customer.

The Knack

The anodizing process, which closely resembles electroplating, converts the aluminum surface to aluminum oxide. The oxide coating can vary in thickness from 0.0002 in. to 0.001 in. It is hard, dense and dielectric (nonconductive). Unlike the rust on steel, aluminum oxide protects the base metal, providing increased corrosion resistance, excellent wear and abrasion properties, and a wide range of decorative finishes (color varies with the thickness of the coating).

Unfortunately for welding operators, aluminum oxide melts at approximately 3600 deg. F, whereas "raw" aluminum melts at about 1200 deg. F. Historically, very few operators have been able to develop a technique and find a machine that lets them manipulate the AC TIG arc so that it 1) penetrates the anodized coating and 2) establishes a good weld puddle without adding so much heat that the puddle rolls out



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of the joint or the arc blows through the base metal.

"The technique for welding on anodized aluminum is like playing the violin," says George Irvine, Jr., chairman and owner of PipeWelders. "If you don't have instantaneous timing and good movement of your torch and rod, the weld bead just goes plop! The puddle falls away and you're welding on air. Plus, you've just damaged a \$50,000 tuna tower."

John Winters, a welder/fabricator with PipeWelders, adds more detail. "Because we're hanging over railings or welding upside down half the time, we're not in a position to use a foot pedal. Instead, we use a Miller micro switch mounted on the TIG torch handle to manually pulse the arc. We pulse the arc on, break through the anodizing, establish the weld puddle, add 5356 filler rod, then shut off the arc and move forward. Starting and stopping the arc in series creates a nice, even bead with attractive ripples."

"Customers are looking for the nice rippled bead that we produce," states Irvine. "People who don't know how to weld on anodized aluminum will buff and

ing anodized aluminum. However, until recently, those welding anodized aluminum have not found a new machine whose arc characteristics matched this old TIG unit, which came out of production more than 20 years ago.

"The 330 ABP lets me direct the heat more on the end of the electrode where I like to keep it," says Dave Flaherty, a welder/fabricator at PipeWelders. Fortunately, because these old machines are hard to service, "Miller's new Syncrowave® 350 LX works good on anodized aluminum, too. Other TIG units tend to scatter the electricity around the weld."

"I don't see too much difference in the arc performance between the old Miller welder and the new one. It's almost the same thing," says Patrick Estafani, welder/fabricator. "The biggest difference is that the Syncrowave 350 LX has a digital display."

For welding on anodized aluminum with the Syncrowave, most of the operators set the output at 200 to 225 amps and position the balance control at the "6" setting. This provides an arc with more penetration than cleaning, as the "3" setting represents a balanced output.

The Syncrowave 350 LX features built-in pulsing controls that let operators set peak and background amp levels and the number of pulses per second. The pulsing feature works well for many applications, but not for tuna towers. The awkward nature of making a continuous, circular weld requires operators to vary the amount of time between pulses so they can shift their body around the joint.

Sight Fishing

PipeWelders has an unusual name for a company that builds marine

grind
down the
weld to make it
smooth. But in our industry, that says you don't know what you're doing—that you're not a craftsman."

Since the 1960s, PipeWelders has relied on Miller Electric's 330 ABP AC/DC TIG machine for weld-



PipeWelders has separate shops for machining, canvas, fiberglass, fabrication and welding, painting, a custom shop that fits part things together and a dock-side installation facility at its Ft. Lauderdale, FL, location.

equipment. The company got its start because fishermen hunting for giant bluefin tuna and billfish built platforms on top of their cabin cruisers—the higher up, the easier it was to spot the fish.

In the early 1950s, one of the leading tuna fishermen constructed a high tuna tower from household plumbing and pipe fittings. Unfortunately, the Gulf Stream gets extremely choppy in winter; the tower fell apart during the 45-mile run from Ft. Lauderdale to the Bimini fishing grounds. This fisherman went to Jerry Wilson, the foreman responsible for pipe welding at the Florida Power & Light plant then under construction, and asked him to weld the tower back together. It worked.

Soon, anyone wanting a tuna tower heard that all they had to do was “go see the pipe welder.” A company named PipeWelders, and a new industry, were born.

Wilson quickly realized that lightweight aluminum pipe would work better than any ferrous metal, and that anodized aluminum would provide corrosion resistance to salt water. It didn't matter that anodized metal “couldn't” be welded.

“Through trial and error, Wilson developed and perfected a tech-

nique for welding on anodized aluminum,” says Winters. “Experimentation leading to perfection remains a company hallmark.

“PipeWelders has been in the business longer than anyone else, and we're the most innovative company by far. That's because our designers aren't afraid to fail, to try something new or put money in research and development to develop a new design, such as the Plexiglas lights molded into the corners of a fiberglass hardtop. We've made 90

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percent more mistakes than anybody, but that experience got us where we are and now it enables us to build a tower with a lifetime warranty.”

Raw Products

PipeWelders employs more than 100 people. Unlike most fabricators this size, “we are unusual because we buy raw materials,” says Irvine, who purchased the company in 1977. “We rarely buy finished products, and those are usually things like lights. This gives us complete

quality control, and there isn't anybody else who can really do what we do. If you don't do something like this everyday, you're not going to be good at it.”

PipeWelders has separate shops for machining, canvas, fiberglass, fabrication and welding, painting, a custom shop that fits part things together and a dockside installation facility. In addition to the Ft. Lauderdale location, PipeWelders has fully rigged, 22 ft.-long trailers at Hatteras' North Carolina and Viking's

New Jersey facility for remote work.

George Blake, supervisor of manufacturing, says “these trailers are essentially a smaller version of this shop. We've got a Syncrowave 250 TIG welder, a Trailblazer® engine drive with an AC/DC, CC/CV welding output, benders and jigs, a drill press and all the tools and parts required to build a tower. The trailers and their three-person staff can go anywhere in the world and do any job. We like yachts to come to Ft. Lauderdale, but if you want a tower,

we're the one company that will come to you and build it.”

Depending upon the size of the yacht, a tuna tower can cost from \$40,000 to \$100,000. “Our prices are just a little more than other people's, but nobody matches our quality and custom design work,” says Blake.

Dockside Welding

Building a tuna tower can involve adding a fiberglass hardtop above

es, rod holders, hydraulic cylinders for the lift platforms on the aft end and outriggers (long aluminum spars used to dance a bait or an attractor lure across the surface of the water).

Blake estimates that anodized aluminum (schedule 40 pipe, mostly 5052, 6061 and 6463 series, in 1-in. to 4-in. dia.) accounts for about 85 percent of the metal purchased and stainless steel accounts for the other 15 percent. The exact amount of

cause stainless steel weighs more and finished products from stainless cost about three times more.

“With stainless, we polish the weld so the metal looks like it is molded together from a single piece,” says Flaherty. “This takes a lot of time. Say someone wants a stainless bow rail. We have to machine all the copes to produce tight fit-up. With aluminum, we cut the copes with a band saw because a small gap is no big deal; just add a little more filler. There's no room for error with stainless because grinding out the excess filler and buffing it means that much more work. We use so little filler rod on a stainless weld that after it's buffed, you have no clue that the joint was welded.”

“Stainless is much harder to fit and bend, too,” adds Winters. “The whole rail has to be fixed in a jig and each weld has to be made under an exact amount of pressure. It has to

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the main deck for the bridge, a second hardtop (the flying bridge) for spotting fish, a Bimini top (which supports canvas to shield the bridge from sun or rain), a windshield, bow and bridge railings, ladders from the main deck to the bridges, radar arch-

metal used isn't known, but Lenny Doussan, the Tri-Gas sales representative working with PipeWelders, notes the company consumes 75 argon shielding gas cylinders (336 cu. ft. size) per month. Most of the metal on a tower is aluminum be-



PipeWelders has an unusual name for a company that builds marine equipment. The company got its start helping fishermen hunting for giant bluefin tuna and billfish, which built platforms on top of their cabin cruisers—the higher up, the easier it was to spot the fish. Only a certain percentage of a tower gets fabricated inside a building. By necessity, a lot of the welding takes place on the yacht (in PipeWelder's six covered slips).

cool under pressure, then be removed from the bender and shifted to the next weld. It's very time consuming, and all of the angles must be accurate because we can't make changes to the shape of the finished product. Conversely, with aluminum, if the bend isn't right, we can just tap it with a mallet."

While much of the welding takes place in four shops, only a certain percentage of a tower gets fabricated inside a building. By necessity, a lot of the welding takes place on the yacht (in PipeWelder's six covered slips). While TRIGAS has kept the Miller 330 ABP's at the slips running for years with good maintenance, it's time for new equipment.

"We're installing six new Syn-crowave 250's for dockside work," says Doussan. "All six will be housed inside a shelter, but three of these units are environmentally protected. Their inside components are coated to add protection from humidity and

salt. We plan to track the service record between these three units and compare it to the standard units."

Home Grown

Because of its unusual work, PipeWelders rarely can hire new employees that possess all of the skills required. Typically, it recruits graduates from McFatter, the nearby Broward County Technical School. Graduates work their way up as an apprentice, starting out as a welders helper (which includes sweeping floors and stockroom work while learning how to weld and shape pipe).

"You can teach people how to weld in class, but you can't teach them how to build a tuna tower," says Blake. "In fact, we're really like a school for teaching people how to weld anodized aluminum, but we're trying to change that."

To start, PipeWelders sends all its scrap aluminum to McFatter so the students can practice. PipeWelders

also participates in the school improvement program, and Irvine sits on the school's board to represent the employment needs of the marine industry (the second largest industry in Broward County). Irvine is highly passionate about changing the image of trade craftsman from the "dropout" stereotype to that of a highly skilled worker who typically makes a better wage than 50 percent of the employed people in the country.

"We're not just looking for guys who can weld. We're looking for guys who can read and interpret drawings and blueprints and perform mathematical calculations. We need employees with a good education," states Irvine, "or we're not going to turn out a product the market wants."

With Irvine's kind of commitment to education and 90 percent of the world's sport fishing yachts coming through its docks, it's easy to see that PipeWelders will continue to lead the tuna tower industry for a