PROFESSIONAL BOATBUILDER

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the newly formed Axson Technologies.

Sixteen years later, Axson Technologies has worldwide subsidiaries serving 10,000 customers. With its expertise in modeling, it has a large presence in the marine industry, providing a range of tooling and manufacturing products, and building composite and wood-epoxy structures for cruising and racing designs. The firm is now partnering with international companies specializing in demolding, injection and extrusion machines, sprayable silicone, carbon pre-pregs, and natural biocomposites; and there's a new subsidiary in Nantes, in the center of the French shipping and boatbuilding industry.

Until recently, basic plug manufacturing had not really evolved in 50 years, but thanks to computer-aided design and computer numerically controlled three-dimensional machining, that's starting to change. Axson has adapted a technique for modeling big parts such as hulls or decks: a CNC-cut polystyrene core is fully covered by a thick layer (1.5″/38mm or more) of extrudable paste. Once cured, the plug is machined again to various levels of finish, up to mirrorlike, or it is sanded and finished by hand. First employed by the automotive industry, extrudable pastes can be spread by hand or by the CNC machine itself with a pneumatic extrusion gun, at a materials cost of around $24/sq ft ($260/m^2). The major challenge is keeping out air; if it's trapped under the surface, bubbles can develop, which leave holes after machining.

The other problem is exothermia, which can destroy the polystyrene core, and wrinkle or crack the surface. Because polyurethane resin is too susceptible to moisture to cure reliably, extrudable pastes are based on epoxy, mixed with hardener at a 1:1 ratio. After the paste cures 16 hours at room temperature, it has a resistance modulus high enough to get a machinable plug.

Depending on the intended finish level, low-density fillers from 0.68 to 1.58, depending on the application, can be used—the heavier ones giving the best surface finish. Dedicated to large-plug manufacturing, SCP270 paste has an average density of 0.87 kg/m^3. Because it's perfectly airtight and has no porosity, it's possible to laminate up to 10 molds from a single plug. With a higher Tg factor (88°C/190°F instead of 34°C/93°F), SC300GY is best suited for higher-temperature special tooling.

Another development is in silicone vacuum bags, which help solve a big problem in closed-mold infusion: waste. Commonly used in the aerospace industry, they are still quite rare in boatbuilding because of the high costs of materials and manufacturing. Axson SVB 20, a two-part sprayable silicone, is one of several recently developed products that offer an alternative to conventional bags. With an average cost of $18/sq ft ($195/m^2), the process is simple and quick. Silicone resin is sprayed by hand on the mold, flange, and vacuum connector to make an airtight bag perfectly tailored to the surface geometry. The rotary head of the air gun helps spread a consistent thickness of silicone around ⅛″ (3mm), or more if needed. Curing time (around 15 minutes at 73°F/23°C) is as fast as the spraying operation.

After curing, the reusable bag is tough enough to be handled, but because of silicone's relatively low mechanical resistance, size is a limiting factor. One could build up additional coats, or add a reinforcement fabric in order to improve bag strength, but price and working time will rise accordingly. Polyester and vinyl ester resins have given mixed results with SVB20, so solvent-free epoxy is recommended. For all those reasons, a sprayed silicone bag is best suited for relatively small parts, such as rudders, centerboards, keel fins, and skegs. Axson is constantly refining the process, and expects future improvements.

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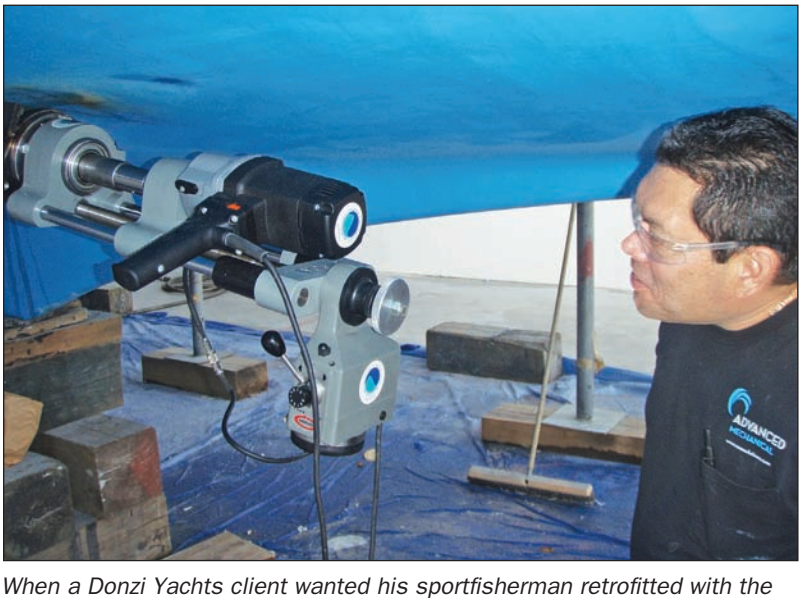
—Jean-Yves Poirier

A True Bore

Longtime boatbuilder Bob Roscioli bought the Donzi name from Donzi's past-president Dick Genth and started building large sportfishermen in 1986. His



AME

When a Donzi Yachts client wanted his sportfisherman retrofitted with the BOSS shaft and thrust bearing assembly, the builder retained Advanced Mechanical Enterprises to precisely increase the diameter of the stern-tube bore.

company is called Donzi Yachts, separate from Donzi Marine, which builds smaller boats—sportfishermen and speedboats under 50′ (15.2m). Now standard equipment on Donzi Yachts is installation of the BOSS, an acronym for the Bolt-On Propulsion System, from Seatorque Control Systems in Stuart, Florida. The BOSS is "an enclosed, oil-lubricated, self-contained shaft and thrust bearing assembly designed and produced for the OEM inboard boat manufacturer." It extends from the transmission coupling to the propeller. Benefits are said to include reduced installation times, 8% more delivered horsepower, and only 2% mechanical losses. Shaft sizes are 1″–4″ (25mm–102mm), though larger custom sizes are available.

This year, the owner of a 2003 Roscioli-built Donzi sportfisherman brought his boat to the Roscioli Yachting Center for a refit; among the jobs requested was retrofitting the BOSS. Because this new piece of equipment was larger in diameter than the existing shaft, the stern tube had to be line-bored, which meant enlarging its internal diameter. Another South Florida company called Advanced Mechanical Enterprises was brought in to make the bore.

For this job, AME fabricated custom fixtures to position the boring machine at precisely the right location and angle to increase the stern tube's ID from 4.250″ to 5.030″ (108mm to 128mm).

AME's specialized services include computerized laser and optical alignment, balancing, welding, precision machining, and infrared thermography.

One of AME's technicians tells how the line-boring job was accomplished:

"The centering fixture was machined from Delrin [a DuPont acetal resin] with a 2″ [51mm] ID [inside diameter] to accept the boring bar and a tapered OD [outside diameter] to center it in the stern-tube bore. The fixture was also split so it could be removed after the machinery mounting fixtures were fastened to the stern tube. We centered the line-boring bar in the stern tube using the cones that were bored to the same ID as the OD of the boring-bar shaft. Once the boring bar was centered, we were able to install the outer mounting sleeve, which later allowed our boring equipment to be fixture attached.

"The mounting sleeve was fabricated to ensure the line-boring machine would be properly held in place. To create the sleeve, the OD of the stern tube was measured; a piece of steel piping approximately the same size was torch-cut to cover the section of the stern tube where the boring machine would be attached. Holes were drilled in the pipe and transferred to the stern tube, which were then tapped into the fiberglass.

"We then welded angle iron to the sleeve and welded the flange so that the after/outside boring-bar bearing could be attached to it. The boring machine was then mounted onto the bearing housing.

"The inside bearing housing was machined with a taper to center the forward inner bearing of the stern tube so it would be self-centering. Holes were drilled

through the bearing-housing flange. The bearing housing was fastened to the forward end of the stern tube using holes that were drilled through the bearing-house flange.

"The line-boring machine has a variable-speed drive motor with twin guide bars and a single lead screw. In first gear, the output can be between 30 and 75 rpm and in second, 90 and 230 rpm. In this particular case, a 6′ [1.8m] boring bar was utilized. The cutter was a ½″ [12mm] carbide-tipped tool bit that was inserted into the boring bar to make cuts. The boring equipment was centered to the original bore of the stern tube."

Got that?

It worked, and AME was justifiably proud.

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Seatorque Control Systems, 2779 SE Monroe St., Stuart, FL 34997 USA, tel. 772–220–3020, fax 772–220–3012, on the Web at www.seatorque.com.

New Model From Regulator

When Regulator Marine, manufacturer of offshore sportfishing boats between 23′ and 34′ (7m and 10.4m), commissioned naval architect Lou Codega to design its new 28 FS, the idea was to incorporate "the latest in fishing innovations" with the "fishability" of its most popular model, the 21-year-old Regulator 26. You won't find *fishability* in *Webster's Dictionary*, but if you fish, you know what it means: ease of movement around the boat as a hooked fish runs; tight maneuvering of the boat; ability to adroitly back down on a big fish; bringing catch aboard…

Toward that goal, the 28 FS has a flush deck for unobstructed movement around the center console. There's more than 270 qt [255 l] of fishbox/stowage in the transom and an equal amount under the forward seats.

The 27′8″ x 9′5″ (8.4m x 2.9m) hull has 24° deadrise aft and a transom bracket, which Codega says, "takes full advantage of the sharp bow entry and deep-V hull design," and "offers an exceptionally soft ride with top speeds in excess of 60 mph [97 kmh] while offering extraordinary efficiencies."

The hull is single-skin fiberglass 3600 0/90 biaxial cloth with two layer strips of 24/15 +/– 45 to build out the strakes. Resin is Reichhold polyester ISO/DCPD. The transom is cored with urethane foam. Owen Maxwell, vice-president of product research and development, describes other details of the boat's construction: "Unique to Regulator is the full-height fiberglass grillage system. This is a female-molded part so that below-deck compartments such as the aft mechanical bilge area are fully finished with gelcoat. Because the grillage is made from a full-height and hull-length mold, the fitting is assured the same way every time. Decks, liners, and consoles are all cored using a combination of urethane foams, whaleboard, and ABS. Whaleboard [Richlite Co., Tacoma, Washington], an ultra-high-density phenolic-impregnated kraft board, is used in areas where screw retention must be superior, such as the console mounting flange. ABS is used primarily as a hard point for through-bolting, such as T-top mounting points.